2012 CMS Manual of Practice

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16. Abstract (Limit: 250 words)

The 2012 Changeable Message Sign (CMS) Manual of Practice report is intended as a replacement of the agency's 2000 statewide technical document which outlined standard practice in the use of agency CMS. The 2012 document includes information derived from existing FHWA standards, MUTCD requirements, the MnDOT 2012 Field Manual and CMS/DMS best practices identification from twelve other state departments of transportation. Key stakeholders from the Minnesota Department of Public Safety, Greater Minnesota MnDOT Districts, cities, counties, local agencies and private vendors also contributed to the development of the CMS Manual of Practice guidelines. Information included in this report has been developed for 6th to 8th grade readability levels and contains guidance based upon human factors research and findings. The following topics are addressed:

- Description of agency permanent and portable CMS sign operations throughout Minnesota
- Message content guidelines, including content, length, message unit and load, format, splitting
- Message priority requirements for traffic incident management purposes
- Acceptable standard practice abbreviations for CMS message sets
- Single and dual-phased CMS message set requirements and conformance
- Complete message set library for permanent and portable CMS, field guide for portable CMS library

A complete set of integrated, interactive training modules to supplement report information is also available for this report under separate cover.

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TABLE OF CONTENTS

List of Figures

List of Tables

Appendices

Glossary of Acronyms

ACRONYMS	MEANING
AMBER	America's Missing Broadcast Emergency Response
BCA	Bureau of Criminal Apprehension
CAD	Computer Aided Dispatch
CCTV	Closed Circuit Television
CMS	Changeable Message Sign
DMS	Dynamic Message Sign
DOT	Department of Transportation
DPS	Department of Public Safety
FIRST	Freeway Incident Response Safety Team
FHWA	Federal Highway Administration
HAR	Highway Advisory Radio
HAZMAT	Hazardous Material
IRIS	Intelligent Roadway Information System
ITS	Intelligent Transportation Systems
IWZ	Intelligent Work Zones
LED	Light Emitting Diode
MnDOT	Minnesota Department of Transportation
Mn MUTCD	Minnesota Manual on Uniform Traffic Control Devices
MUTCD	Manual on Uniform Traffic Control Devices
OTSO	Office of Traffic, Security and Operations
PCMS	Portable Changeable Message Sign
PSA	Public Service Announcement
RTMC	Regional Transportation Management Center
TEO	Traffic Engineering Organization
TMC	Traffic Management Center
TOCC	Transportation Operation and Communications Centers
TTC	Temporary Traffic Control
VMS	Variable Message Sign

1.0 INTRODUCTION

1.1 PURPOSE

This document is in conformance with the Mn MUTCD and the guidelines set forth by FHWA. It is intended to be used as a guide for MnDOT internal stakeholders and external stakeholders, including other agencies and private contractors.

1.2 TYPES OF CMS

A changeable message sign (CMS) is a traffic control device whose message can be changed manually, electrically, mechanically, or electromechanically to provide motorists with information about traffic congestion, traffic crashes, maintenance operations, adverse weather conditions, roadway conditions, special events, or other highway features (i.e., drawbridges, toll booths, weigh stations). A changeable message sign may be referred to as a variable message sign (VMS) or a dynamic message sign (DMS) in some publications.

- **Permanent CMS** are signs installed in the ground or on other highway superstructure such as bridges and tunnels.
- **Portable CMS** (PCMS) are variable message signs that can be moved to a location as required. In moving operations, portable signs may be mounted on a truck.

1.3 BENEFITS OF CMS

The benefits of using changeable message signs result in:

- Improved traffic flow as vehicles approach incidents, resulting in fewer secondary crashes.
- Improved use of alternate routes during downstream incidents.
- Improved lane merges for lanes that are closed downstream.
- Improved traffic operations during maintenance and construction activities and special events.

1.4 MAINTAINING CREDIBILITY OF CMS

Changeable message signs must provide timely, reliable, accurate and relevant information. They must be used properly to be effective. Credibility is an extremely important consideration in the proper operation of a CMS system. One way to improve credibility is to update CMS to reflect current traffic conditions. A motorist who sees an out of date sign will come to distrust the signing system. Each time the information displayed is incorrect, the credibility of the system decreases. Eventually messages are ignored and the CMS system is ignored.

Credible Message Checklist

- Is the information ***accurate***?
- Is the information ***current***?
- Is the information ***relevant*** to all motorists using that facility?
- Is the information being presented ***not apparent*** to motorists?
- Is the information ***non-repetitive***?
- Is the message ***understandable***?

To ensure that a message is credible and effective, consider the following:

- Is the information displayed ***accurate***? (i.e., a crash is observed at a different location than displayed on a CMS).
- Is the information ***current?*** (i.e., the message is not consistent with current conditions).
- Is the information ***relevant*** to all motorists using that facility?
- Is the information ***obvious*** to motorists (i.e., displaying *HEAVY CONGESTION* when motorists are driving bumper-to-bumper in peak traffic)? If this is the case, the message is not credible and should not be posted.
- Is the information ***repetitive?*** (the message is the same each morning when motorists pass the sign). Displaying the same information on a CMS each day for recurrent congestion can result in many motorists ignoring the CMS after a time. When an important message is displayed that will impact the trip, the motorist may not read the message.
- Is the message ***understandable***? Messages that are ***poorly designed*** *(misspelled words, poor grammar)* are difficult to read or comprehend and may be confusing to motorists. Keep the message simple and straightforward.

1.5 Maintaining a Living Document

This document has been created as a living document that can be revised to reflect future technology, policies and research. The responsibility to maintain this document belongs to the MnDOT Office of Traffic, Safety and Technology (OTST). This document will be reviewed and updated on an annual basis.

1.6 Training Materials

Training materials have been developed that provide additional information for CMS operators. The training materials include exercises designed to reinforce understanding of MnDOT CMS guidelines.

1.7 Guidelines Development Procedure

The guidelines in this document were developed at the request of MnDOT to improve the operation and effectiveness of the MnDOT CMS system. These protocols and procedures were developed following extensive review of national standards as well as the practices of numerous states. Meetings were also held with MnDOT staff and other stakeholders, including the Minnesota State Patrol, to ensure that these guidelines meet the specific needs and conditions of the State of Minnesota.

2.0 MESSAGE GUIDELINES

2.1 MESSAGE TYPES

There are several levels or priorities of messages that can be displayed on a CMS. The following list displays examples of the message types used on MnDOT CMS. These messages and their purposes are explained further on the following pages. A general summary of each message and important information related to each message type can be found in **Table 1**.

Message Types

- Incident Management
- Work Zone Applications
- Travel Times
- Adverse Weather, Environmental, or Roadway Condition
- Special Events
- Abducted Child Alert
- Traffic Safety Campaigns
- Test Messages

TIP:

When determining how much advanced notice is needed, take into account the following factors to make an informed decision:

- **Type of Incident (Road Closure/Lane Closure)**
- **Time Needed to Clear the Incident**
- **Availability of Alternate Routes**

2.1.1 Incident Management

The following guidelines should be considered when displaying incident messages on CMS:

Messages should be displayed for all verified major incidents (i.e., multi-vehicle crash affected several lanes, truck overturn) that occur on the freeway downstream of the CMS. The message should include the location of the incident (or closure) and the number of lanes closed. **Figure 1** demonstrates how much advance warning should be given to motorists in the event of a major incident. Information about verified minor incidents and lane closures should be displayed for incidents, provided that information about the location and the number of lanes closed can also be given.

- Information about verified lane-blocking incidents that occur on an intersecting freeway may be displayed on CMS that are located upstream of the interchange with that freeway depending on the location, severity and duration of the incident.
- CMS located on freeways leading to other states may display messages concerning verified incidents on connecting freeways in adjoining states depending on the location, severity and duration of the incident.

General guidelines for the placement of incident notification messages on either portable or permanent CMS located in urban and rural environments are shown in **Figure 1** on the next page.

Traffic Diversion

Depending on the severity of the incident, it may be necessary to divert traffic to an alternate route. Traffic diversions may also be necessary in work zone applications.

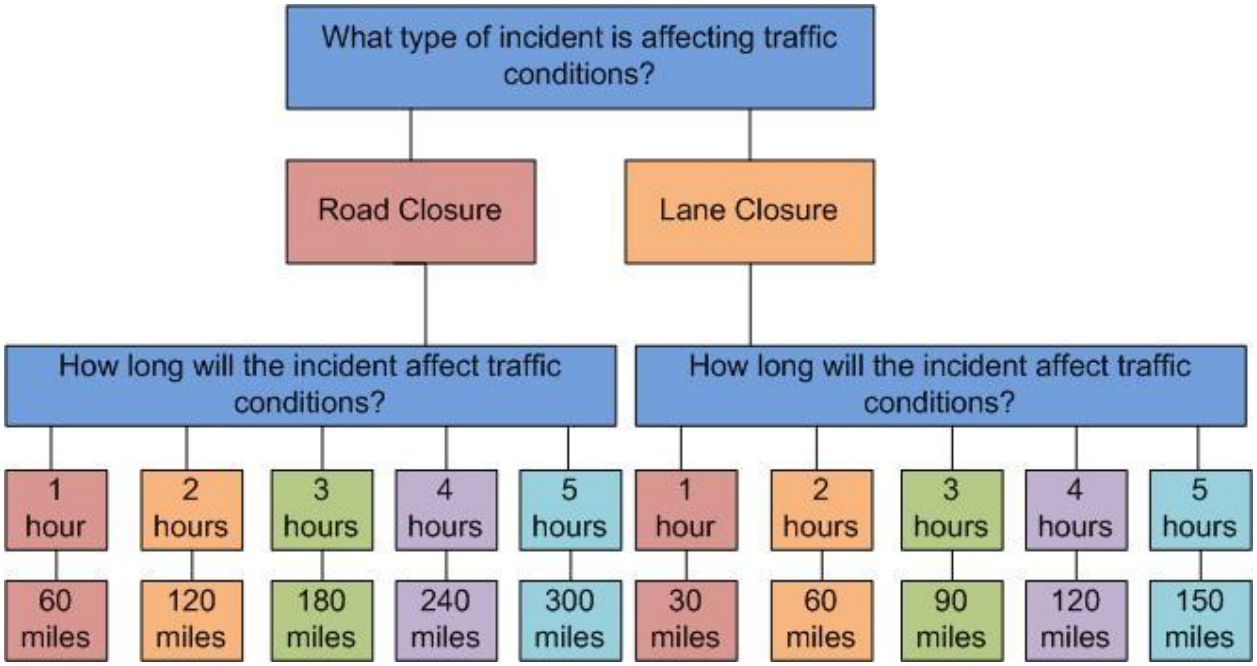
CMS messages shall not divert motorists to specific alternative routes for *partial closure* of a road unless positive route guidance is available along the alternative route in the form of:

a) guide signs and/or trailblazers; or,
b) law enforcement or traffic control personnel positioned at critical locations along the alternative route to control and guide traffic.

In addition, both of the following conditions must also be met:

- The CMS operator has current and continuously-updated knowledge of the traffic conditions on the alternative route; and,
- The alternative route will result in a significant saving of time for the diverted motorists. "Soft" diversion messages (i.e., **USE OTHER ROUTES**) may be displayed when conditions warrant.

Figure 1: Guidelines for Advance Warning Distance Message Posting during Major Incidents



2.1.2 Work Zone Applications

Road or lane closures may be warranted by construction or maintenance activities. The use of a road or lane closure message on either a permanent or a portable CMS may include alternate route or detour information.

Advanced Notification of Closures

Traffic-related information that provides advance notice of upcoming roadwork may be displayed but should be replaced by current information whenever possible. The upcoming roadwork may be on a freeway that could possibly affect the drivers' trips (i.e., the same freeway as the CMS, a downstream intersecting freeway). If advanced notification of a closure is needed more than six (6) days in advance of the roadwork activity, the operator should use calendar dates to inform motorists of when the roadwork activity will be taking place. If the roadwork activity will be taking place six (6) days or less, then the individual days of the week should be used (i.e., Monday, Tuesday). The following is an example of an acceptable advanced notification message:

Intelligent Work Zones (IWZ)

An intelligent work zone is a system of devices that provides motorists and/or workers with real-time information to improve mobility and increase safety when driving through a work zone. There are different types of intelligent work zone systems that can be used and typically involve the presence of a portable CMS on the road during the duration of the work zone activity. They can include any of the following types of messages or systems: Conflict Warning messages (i.e., Trucks Entering, Prepare to Stop)

- Trucks Entering Warning messages
- Excessive Speed Warning messages
- Dynamic Speed Advisory messages
- Dynamic Late Merge (Zipper Merge) messages
- Traveler Information messages
- Travel Time messages
- Travel Delay messages

2.1.3 Travel Times or Delay

Travel time information is typically displayed on permanent CMS during AM and PM peak periods or when typical travel times are increased along a travel corridor due to any of the following conditions:

- Congestion
- Construction-related traffic delays
- Incidents that cause traffic delays

Travel time messages should use real-time traffic data to calculate travel times. The RTMC provides an automatic travel time information feed to CMS within the metro area and in other locations through IRIS.

2.1.4 Adverse Weather, Environmental and Roadway Conditions

Permanent or portable CMS may be used to display unexpected adverse weather, environmental or roadway conditions downstream that may impact the driver visibility and safety (i.e., fog, major snow storms, sand storms, icy roadway, high cross winds, broken pavement).

When used, messages are restricted to a specific location and a specific CMS. The roadway condition must be in the vicinity of the sign in use.

District Use

In special instances, weather warnings or advisory messages may be posted to CMS that are area-specific. The District Engineer, district representative or RTMC/TOCC Supervisor will make the final decision. Types of messages include:

- High Wind Advisories
- Road Conditions (i.e., icy roads)
- Closed Highway/Freeway

2.1.5 Special Events

Traffic-related information that provides advance notice of upcoming special events that will adversely affect travel by generating major traffic or by requiring street or highway closures (i.e., parades, street auto races) may be displayed on either permanent or portable CMS at the discretion of the District Engineer. The advance notification of a special event should not be given more than six days (6) prior to the event. The use of individual days of the week (i.e., Monday, Tuesday) is preferred over calendar dates.

TIP:

When creating a special event message, remember the following:

- **The message must not be used to advertise the event**
- **The message is limited to two frames/phases**
- **Must be used to direct traffic to reduce congestion**

MnDOT allows other agencies or contractors to use CMS to direct traffic to an alternate route or to parking areas for large events (i.e., Minnesota State Fair). These signs must have a valid permit obtained from the MnDOT Permits Office and the message must be approved in advance by the District Engineer or representative. The message used for the event and the sign requirements MUST abide by the guidelines set forth in this document, the 2011 MN MUTCD and the 2011 MnDOT Temporary Traffic Control Zone Layouts Field Manual.

2.1.6 MnDOT Abducted Child Policy

The Abducted Child Policy is a voluntary program through which emergency alerts are issued to notify the public of child abductions or missing persons. Only verified information will be displayed on a permanent CMS sign. Vehicle descriptions will only be displayed when accompanied by a license plate number. If there is a need to post an abducted child message, the operator will be notified by a supervisor to post the message.

The phrase "Abducted Child" is preferred over the phrase Amber Alert" in order to improve message clarity and ensure understanding of the message by the public.

> *TIP:*
> **It is important to remember that Abducted Child Alert messages are considered Traffic Safety Campaign messages. Refer to** Section 2.2 **of this document for information regarding message priority.**

2.1.7 Traffic Safety Campaigns

Each year the Department of Public Safety develops a list of Traffic Safety campaign priorities and requests approval to display messages associated with these campaigns from the State Traffic Engineer. Typically, the State Traffic Engineer approves up to thirty (30) days per year for the display of Traffic Safety campaign messages.

The following guidelines apply in the development and posting of Traffic Safety campaign messages:

- Traffic Safety campaign messages may only be displayed as supplements to national or statewide traffic/driver safety campaigns on the same topic (i.e., drunk driving) and to coincide during the same period of time as national or statewide campaigns;
- The wording of the message must directly relate to the specific safety campaign in use;
- Safety messages should only be displayed on weekends (Friday/Saturday/Sunday) and should avoid weekday peak travel periods (i.e., morning or afternoon rush hours);
- The RTMC Traffic Operations and TOCC staff will develop appropriate message content;
- It is the responsibility of the District Traffic Engineer in each District to make sure that safety messages are deployed according to these guidelines.

Examples of types of Traffic Safety messages:

- Buckle Up
- DWI Enforcement
- Move Over Law
- Motorcycle Safety
- Speed Limit Enforcement
- No Texting

2.1.8 Test Messages

It is sometimes necessary to display test messages on a permanent or portable CMS to ensure correct operations or to "burn-in" a new sign. Acceptable test messages should be posted to the sign stating "TEST MESSAGE", display a portion of the alphabet or a sequence of numbers. If other test messages need to be displayed, these shall be reviewed and approved in advance by RTMC or TOCC Supervisors.

2.1.9 Displaying Messages for Other Agencies

Permanent CMS may be used to display messages relating to major incidents and major construction for other agencies, including adjoining states and cities. MnDOT will control the message priority level for other agency message requests. If another agency's message is pre-empted by MnDOT based on higher priority needs, MnDOT staff shall notify the other agency. When displaying a message on behalf of another agency, the message must first be approved by the District Engineer or representative.

2.1.10 Blank Signs

Both permanent CMS and portable CMS will remain in blank mode unless a message is warranted by traffic, roadway, environmental or pavement conditions or for the purposes of advance notification of roadwork or special events.

2.2 MESSAGE PRIORITIZATION

The variability of conditions on the road opens up the potential for conflict in terms of which situations will be handled in what order. This potential for conflict requires that priorities be established concerning which types of events should be handled first in a situation where several incidents and/or traffic conditions are occurring simultaneously. Prioritizing which types of events are to be dealt with and in what order helps to eliminate confusion and loss of time in critical situations. For this reason, the following order of priority has been developed as a guide for operators who will be responsible for managing and posting messages to the CMS system.

Message Priority Levels (Listed in order of importance):

1. Incident Management
2. Work Zone Applications
3. Travel Times
4. Adverse Weather, Environmental, or Roadway Condition
5. Special Events
6. Abducted Child Alert
7. Traffic Safety Campaigns
8. Test Messages

See **Table 1** for more information.

Table 1: CMS Message Types and Quick Reference Guidelines

Priority - Message Type	Guidelines
Priority 1 **Incident Management**	• Messages should be posted on CMS upstream of an incident • Messages should include location of the incident and the number of lanes closed • Information concerning verified lane-blocking incidents that occur on an intersecting freeway may be displayed on CMS that are located upstream of the interchange with that freeway, depending on the location, severity and duration of the incident. • CMS located on freeways leading to other states may display message concerning verified incidents on connecting freeways with adjoining states depending on the location, severity and duration of the event.

Priority 2
Work Zone Applications
	• Advanced Notification of Closures or Specialized Maintenance Operations
	  ○ If notice is given more than six days in advance, you can use calendar dates.
	  ○ If notice is given six days or less in advance, do not use calendar dates.

Priority 3 **Travel Times**	• Displayed When Travel Times are Lengthened Due to Congestion

Priority 4
Adverse Weather, Environmental, or Roadway Conditions
	• May Be Used if:
	  ○ Unexpected Weather, Environmental, or Roadway Conditions Affect Driver Visibility or Safety
	  ○ To Advise Motorists of Specific Regulations Due to Unexpected Weather or Roadway Conditions
	• Messages Restricted to Specific Location and CMS
	• Extreme Weather Conditions messages are permitted to warn motorists of potentially dangerous weather (i.e. Blizzards, High winds, Floods)
	• **DO NOT** Use for General Weather, Environmental, or Roadway Conditions Information

Priority 5 **Special Events**	• Notice of a special event should not be given more than six (6) days in advance
Priority 6 **Abducted Child Alert**	**ONLY USE** when: • The Child Abduction has been Confirmed • The Child is Under the Age of 18. • The Child is Believe to be in Danger of Bodily Harm or Death • The Abductor's Vehicle License Plate is Known
Priority 7 **Traffic Safety Campaigns**	• Examples (i.e. Buckle Up, DWI Enforcement, Speed Limit Enforcement, Motorcycle Safety, Texting, Move Over Law) • Traffic Safety Campaign messages are displayed throughout the campaign unless a message of higher priority is issued.

Priority 8
Test Messages
	• May Be Necessary for the Following:
	  ○ To Assure Correct Operations
	  ○ To "Burn-in" a New Sign
	  ○ Special Studies
	• Acceptable Messages
	  ○ TEST MESSAGE
	  ○ Portion of Alphabet

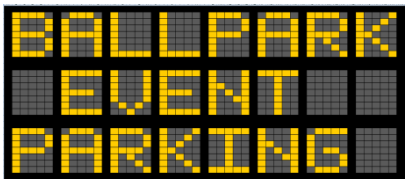
2.3 Prohibited Messages

Advertisements
It is MnDOT policy to prohibit the use of CMS to display advertisements on permanent or portable CMS. This policy includes messages that reference or name specific:

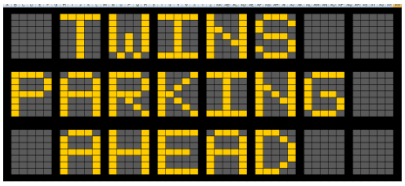
- Products
- Services
- Political Party Candidates/Campaigns

Messages for special events should be designed such that advertising is not embedded in the message. See the following example below.

Acceptable



Prohibited



Repetitive Messages
CMS should not be used to display the same message on a daily basis. Should this become the case, the use of a static sign should be considered.

Public Service Announcements
Public Service Announcements (PSAs) which do not provide information related to traffic safety are not allowed.

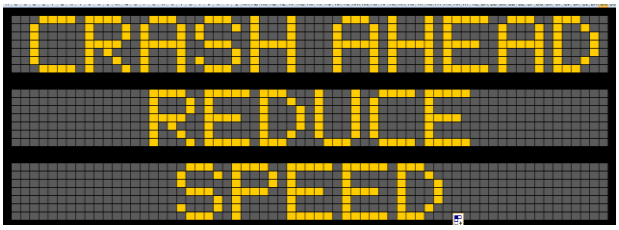
2.4 Message Creation Guidelines

When creating a message, it is important to keep the message simple, yet accurately display the correct information. Each message should include the following information as clearly as possible:

- The **EVENT** – this should tell the driver what has happened.
- The **LOCATION** - this should tell the driver where the event has occurred.
- The **ACTION** – this should tell the driver what to do.

The following examples show how to incorporate these three units of information.

Single Phase Example



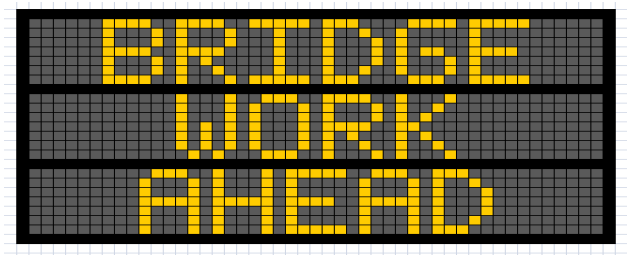
EVENT/LOCATION

ACTION

ACTION

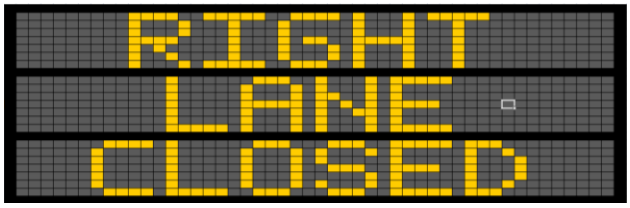
Dual Phase Example

Phase 1



EVENT
EVENT
LOCATION

Phase 2



ACTION
ACTION
ACTION

Use of Graphics and Symbols

Graphics and symbols may be used to display standard signs and symbols consistent with the Minnesota Manual on Uniform Traffic Control Devices (Mn MUTCD). The use of graphics and symbols on CMS is permitted only if the CMS is capable of replicating the appropriate color combinations, the lettering style, sign/symbol size and line spacing with the Mn MUTCD. For more information regarding these guidelines, refer to Section 2B of the Mn MUTCD.

Use of Dynamic Features and Animation

Changeable message signs shall not include animation, rapid flashing, dissolving, exploding, scrolling or other dynamic elements. The following features should be avoided:

- Flashing an entire one-frame message
- Flashing one line of a one-frame message.
- Alternating text on one line of a three-line CMS while keeping the other two lines of text the same.

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PERMANENT CMS GUIDELINES

3.0 PERMANENT CHANGEABLE MESSAGE SIGNS

3.1 INTRODUCTION

Permanent CMS vary in size and display capabilities depending on their intended use. They may be ground-mounted on posts or sign bridges, mounted on structures, tunnels or other special devices. The sign size and display must meet Mn MUTCD requirements for character size at the posted speed. Sign size varies from very large (three lines of 18 characters each) to small signs which may display only two lines and 7 characters per line. The purpose of a permanent CMS is to communicate real-time roadway or traffic information to travelers, as conditions warrant, so they may react to those conditions in a safe and timely manner. Permanent CMS effectiveness is dependent on providing information that is timely, accurate, and reliable.

3.2 PERMANENT CMS LOCATIONS

Permanent CMS are typically installed on high traffic corridors that may experience incidents or non-recurring congestion. Permanent CMS should be located where they may provide alternate route options for motorists.

In the Metro District, all permanent CMS are controlled by the Regional Transportation Management Center (RTMC). Each of the remaining MnDOT Districts is responsible for control and maintenance of permanent CMS in their jurisdiction. A majority of outstate permanent CMS are controlled by the State Patrol at one of the Transportation Operations and Communications Centers (TOCCs). Although permanent CMS can be activated on site, to be most effective, permanent CMS should be controlled remotely from either the RTMC or TOCCs.

3.3 TYPES OF PERMANENT CMS

There are several types of permanent CMS that are in use by MnDOT. The operator must be aware of the type of sign that he/she is using because of the different limitations that each sign possesses. The different types of signs and their limitations are documented in the following sections.

3.3.1 Side Mount (Type A)

Side mount applications of permanent CMS are typically used on four-lane highways where motorists are able to read the message from the left lane without the CMS being obscured by traffic in the adjacent lane. Side mount CMS are used on outstate freeways and metro area expressways.

Side mount CMS may also be used in long-term construction projects. Long term construction projects are construction projects in which the time to complete the project is more than 3 years. These signs can be controlled through IRIS, where the local TOCC or project manager is responsible for posting messages.

3.3.2 Overhead Mount (Type B)

Overhead mounting of permanent CMS is recommended when there are three or more lanes in each direction on the road. This allows motorists to read the posted message without the CMS being obscured by vehicles in adjacent lanes. Overhead mounting is most commonly used on metro area freeways although some overhead CMS are located on freeways/highways outside of the metro area.

3.3.3 Managed Lane Signs

Managed lane signs are installed over lanes of traffic and provide real-time information to help motorists make informed commuting decisions. Also known as Intelligent Lane Control Signals (ILCS), these signs display information about dynamic road conditions that improve traffic flow, reduce congestion and increase safety. Examples of managed lanes signs can be found along I-35W and I-94 in Metro District (**Figure 2**). A list of managed lane sign messages can be found in **Table 2**.

Figure 2: Managed Lane on I-35W

3.3.4 Other Sign Applications

Blank-out signs and CMS mounted over a static sign or included as part of a static sign may also be used in place of permanent CMS where only a single-phase display is needed or where only part of the message needs to be changed. Examples of signs in this category include those that display an OPEN/CLOSED message for a weigh station or a dynamic price message and sign used for HOV express lanes.

Table 2: Managed Lane CMS Examples

Sign	Description	Sign	Description
	No message to display		MnPass lane
	Normal speeds and conditions		Drivers should proceed with caution
	Lane closed		Lane closed ahead
	Lane closed in 1 mile		Merge either direction
	Merge left		Merge right
	Cautionary speed limit		Metro Transit bus only lane

3.4 PERMITTED MESSAGE TYPES

3.4.1 Incident Management

The following guidelines apply when displaying incident messages on permanent CMS:

- Messages should be displayed for all verified major incidents (i.e., multi-vehicle crash affected several lanes, truck overturn) that occur on the freeway downstream of the CMS. The message should include the location of the incident (or closure) and the number of lanes that are closed.
- Information about verified minor incidents and lane closures should be displayed for incidents, but only if accurate information about the location and the number of lanes closed can be provided.
- Information about verified lane-blocking incidents which occur on an intersecting freeway may be displayed on CMS that are located upstream of the interchange with that freeway, depending on the location, severity and duration of the incident.
- CMS located on freeways leading to other states may display messages about verified incidents on connecting freeways within adjoining states, depending on the location, severity and duration of the incident.

TIP:

When determining how much advanced notice for the posting of a sign is required, take into account the following factors:

- **Type of Incident (Road Closure/Lane Closure)**
- **Time Needed to Clear the Incident**
- **Availability of Alternate Routes**

METRO AREA ONLY:

If a permanent CMS is currently displaying travel times, the operator should determine whether or not the travel time message provides more valuable information to the driver rather than displaying information about a non-blocking minor incident having little effect on traffic and which is not creating a safety hazard.

3.4.2 Work Zone Applications

Messages should be displayed for all active construction or maintenance work that occurs on the freeway downstream of the permanent CMS. The message should include the location of the incident (or closure) and the number of lanes closed. If possible, the closed lane or lanes should be referenced specifically in the message (i.e., “RIGHT LANE CLOSED”).

Long-Term Construction

For long-term construction, permanent CMS should only be used for the first three (3) days of the work period in order to maintain the effectiveness of the CMS. After that time, static signing and/or portable CMS should be used for the duration of the period. If necessary,

permanent CMS can be used for temporary lane closures that may occur within a long-term construction project.

Advanced Notification

Advanced notification of upcoming roadwork may be displayed upon permanent CMS to inform motorists of closures that will affect future travel in that corridor. If advanced notification of a closure is needed more than six (6) days in advance of the roadwork activity, the operator should use calendar dates to inform motorists of when the roadwork activity will be taking place. If the roadwork activity will be taking place six (6) days or less, then the individual days of the week should be used (i.e., Monday, Tuesday). Cardinal directions (NB, SB, EB, WB) should be used where possible to clarify the location of the closure. The following figure is an example of an acceptable advanced notification message used within Metro District:

3.4.3 Travel Times or Delays

Travel time information is displayed on CMS during AM and PM peak periods (i.e., rush hours) or when typical travel times are lengthened along a travel corridor due to any of the following conditions:

- Congestion
- Construction-related traffic delays
- Incidents that cause traffic delays

Travel time messages should use real-time traffic data to calculate travel times. The RTMC provides an automatic travel time information feed to CMS within the metro area and in other locations through IRIS.

Delay time may be used in rural areas that do not typically experience recurring congestion but only non-recurring congestion related to either an incident or construction activities day. To avoid motorist confusion, only direct travel times are displayed on metro area CMS and delay times are not used.

3.4.4 Adverse Weather, Environment and Roadway Conditions

CMS may be used to display unexpected adverse weather, environmental or roadway conditions that may impact the driver visibility and safety (i.e., fog, major snow storms, sand storms, icy roadway, high cross winds, broken pavement).

When used, messages are restricted to a specific location and to be displayed upon specific CMS. The roadway condition must be in the vicinity of the sign or signs in use.

In special instances, weather warnings or advisory messages may be posted to CMS that are area-specific. The District Traffic Engineer or RTMC/TOCC Supervisor will make the final decision on the posting of weather warnings or advisory messages. Types of weather warning or advisory messages include:

- High Wind Advisories
- Road Conditions (i.e., icy roads)
- Closed Highway/Freeway
- Adverse/Unusual Weather Conditions

METRO AREA ONLY:

Adverse weather messages are typically limited to unusual conditions that would catch a motorist off-guard, such as a ramp or a bridge where icy conditions may occur during freeze/thaw cycles. Widespread area weather messages should be avoided in order to maintain the effectiveness of the messages.

3.4.5 Special Events

Traffic-related information which provides drivers with advance notice of upcoming special events that could adversely affect travel by generating major traffic or by requiring street or highway closures (i.e., parades, street auto races) may be displayed. The advance notification of a special event should not be given more than six (6) days prior to the event. The use of individual days of the week (i.e., Monday, Tuesday) is preferred over calendar dates.

Permanent CMS may be used to advise motorists of non-recurring congestion and delays caused by a major event. The messages may tell motorists to either use caution or advise them to use an alternate access if available. The following is an example of a message sign used by the RTMC to direct event traffic:

TIP:

When creating a special event message, remember the following:

- **The CMS must not be used to advertise the event**
- **The message is limited to two frames/phases**
- **The message must direct traffic to reduce congestion**

3.4.6 Abducted Child Policy

MnDOT's "Abducted Child Policy is a partnership with the Minnesota Bureau of Criminal Apprehension (BCA) through which emergency alerts are issued to notify the public of child abductions persons. Only verified information including vehicle description and license plate will be displayed on the CMS signs. If there is a need to post an abducted child message, the supervisor will advise an operator to post the message.

The phrase "Abducted Child" is preferred over "Amber Alert" for message clarity and understanding by the public. Below is an example of an Abducted Child message used in the metro area:

3.4.7 Public Safety Announcements (PSAs)

Each year the Department of Public Safety's (DPS) Office of Traffic Safety prioritizes their CMS safety message requests. These requests should be in conjunction with media events and/or enforcement saturations. To ensure motorists do not become desensitized to messages, the RTMC limits the number of days the CMS are activated for PSAs to thirty (30) per year. Greater Minnesota may use them more often, however, still within the media and enforcement period.

Sample Driver Safety Campaign Messages:

3.4.8 Traffic Safety Campaigns

Messages related to traffic or driver safety issues are displayed several times throughout the year. The Minnesota State Patrol and the Minnesota Department of Public Safety are responsible for determining which message and when messages are to be displayed on CMS. Types of messages included in this category:

- Buckle Up
- DWI Enforcement
- Move Over Law
- Motorcycle Safety
- Speed Limit Enforcement
- Texting

3.4.9 Test Messages

It is sometimes necessary to display messages on a CMS to ensure correct operations, to "burn-in" a new sign, or for special studies. Acceptable test messages should either display "TEST MESSAGE", display a portion of the alphabet or a sequence of numbers. Other test messages shall be reviewed and approved by RTMC or TOCC Supervisors before they are displayed.

3.4.10 Displaying Messages for Other Agencies

CMS may be used to display messages relating to major incidents and major construction for other agencies including adjoining states and cities. MnDOT controls message priority levels for these CMS. If another agency's message is pre-empted by MnDOT based on higher priority needs, MnDOT shall notify the other agency.

3.4.11 Blank Signs

CMS will be in a blank mode unless a message is warranted by traffic, roadway, environmental or pavement conditions, or advance notification of roadwork or special events.

3.5 PROHIBITED MESSAGES

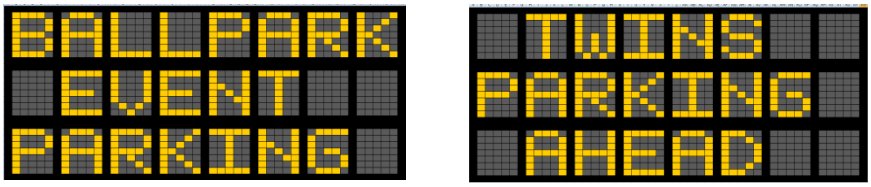
Advertisements

The use of CMS to display advertisements is prohibited. This policy includes messages that reference or name specific:

- Products
- Services
- Political Party Candidates/Campaigns

Messages for special events should be designed such that advertising is not embedded in the messages.

Acceptable **Prohibited**



Repetitive Messages
CMS should not be used to display the same message on a daily basis. Should this become the case, the use of a static sign should be considered.

Public Service Announcements (PSAs)
Public Service Announcements not related to the display of traffic safety information are prohibited.

3.6 Use of Sign Phasing

The use of dual phase messages on permanent CMS is permitted by the Mn MUTCD. Caution should be taken when posting a dual-phased message on an overhead CMS because it may be too much information for a motorist to read without slowing down.

3.7 Use of Graphics and Color

Graphics and symbols may be used to display standard signs and symbols consistent with the Mn MUTCD. The use of graphics and symbols on CMS is permitted only if the CMS is capable of replicating the appropriate color combinations, the lettering style, sign/symbol size and line spacing with the Mn MUTCD. For more information regarding these guidelines, refer to Section 2B of the Mn MUTCD.

3.8 Message Creation Guidelines

When creating a message, it is important to keep the message simple, yet accurately display the correct information. Each message should include the following information:

- The **EVENT** that tells the driver what has happened.
- The **LOCATION** that tells the driver where the event has happened.
- The **ACTION** that tells the driver what to do.

The following figures are examples of how to incorporate these three units of information. For sample messages for each of the units of information, refer to **Appendix F**.

Single Phase Example

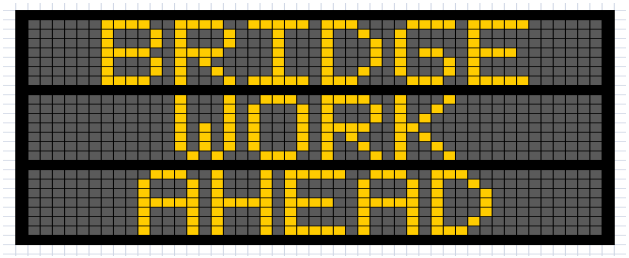
EVENT/LOCATION

ACTION

ACTION

Dual Phase Example

Phase 1

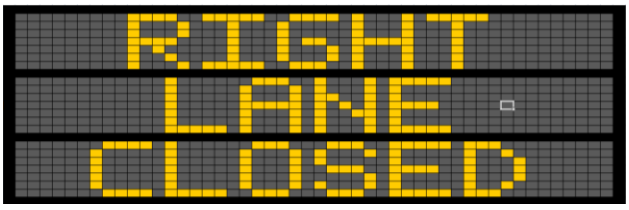


EVENT

EVENT

LOCATION

Phase 2



ACTION

ACTION

ACTION

3.9 TESTING/VERIFICATION OF CMS MESSAGE

After the CMS message is activated, it is important to verify that the correct message is displayed on the CMS. Verification can be completed through the use of Closed Circuit Television (CCTV) cameras. If a CCTV camera is unavailable, staff in the field can be asked to verify the correct message is being displayed. The CMS operator should not rely solely upon electronic verification from the software/computer system.

3.10 Documentation of CMS Usage

CMS control software is used to document sign usage by providing staff with timestamp, message placement and termination information.

The following information should be recorded whenever a permanent CMS is operated within the state right-of-way:

- Sign Identification Number
- Location
- Messages displayed
- Date of usage
- Time on and off
- Name of operator

PORTABLE CMS GUIDELINES

4.0 PORTABLE CHANGEABLE MESSAGE SIGNS (PCMS)

Portable Changeable Message Signs (PCMS) are capable of displaying up to three (3) lines and up to eight (8) characters per line. In some cases, truck-mounted signs with two (2) or three (3) lines per panel are also included in this category. The primary uses for PCMS are for providing messages for activities which include road construction, maintenance, work zone applications, special events and incident management. Portable signs are for temporary conditions and should NOT be used as permanent installations.

4.1 PORTABLE CMS CONTROL

Each district is in control of the PCMS physically located within its boundaries.

4.1.1 Temporary Work Zone Applications

A temporary work zone is a construction or maintenance activity that is active for three (3) days or less. Operations that may be considered as a temporary work zone include:

- Snow and Ice Operations
- Street Sweeping Operations
- Pothole Patching
- Striping Operations
- Mowing Operations
- Permitted Operations

For temporary work zone applications, the *Temporary Traffic Control Zone Layouts Field Manual* should be used to determine where PCMS should be placed in the field. In some instances, an additional PCMS upstream of the work zone may be necessary to increase the safety of MnDOT field staff or contractors.

Most of the messages needed for temporary work zones are preprogrammed into each individual sign. These messages should be used appropriately for each situation. Sign libraries differ among various types and manufacturers of PCMS. Please refer to **Appendix C** for message libraries that are typically used for each type of PCMS.

In some instances it may be necessary to create a new message to better inform drivers of the situation. If this is necessary, it is important to follow the information provided within the Message Guidelines section of this document. Careful consideration should be taken of the following information before creating a new PCMS message:

- The type of sign being used.
- The number of displays being used (see **Table 3** of this document)
- The number of lines on the sign.
- The number of frames being used (1, 2 or 3).
- Displaying a clear, concise message (See **Section 3.8** of this document).
    - Event
    - Location
    - Action
- If needed, refer to the list of abbreviations in **Table 4** of this document**.**
- Pre-programmed PCMS messages should **NOT** be deleted under any circumstances.

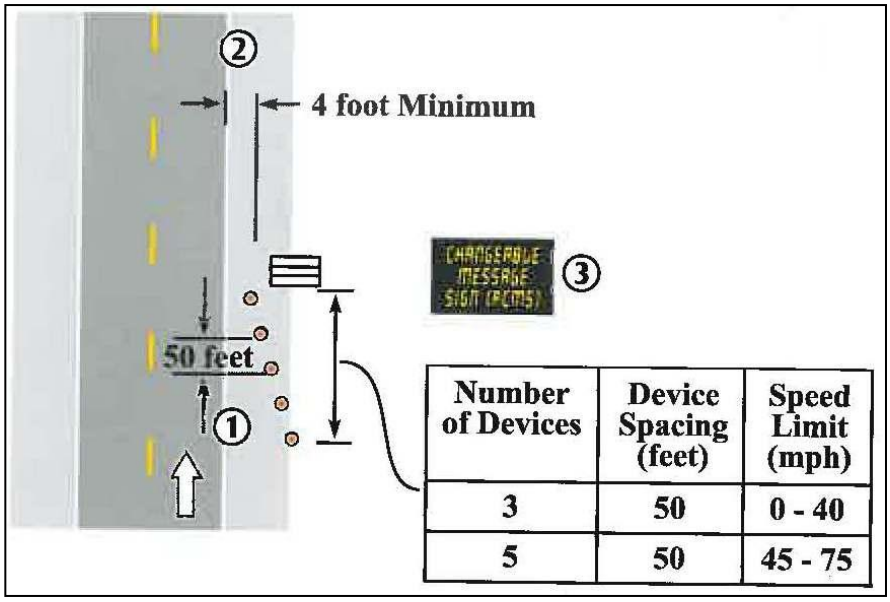
When using PCMS for temporary work zones, it is important to use only messages specific to the operations of the particular work zone. If construction or maintenance activities are not in progress, the PCMS should be left blank.

4.2 MnDOT Field Manual for Temporary Traffic Control Zone Layouts

The Field Manual of Temporary Traffic Control Zone Layouts is included within the Minnesota Manual of Uniform Traffic Control Devices (Mn MUTCD). The field manual contains general Temporary Traffic Control (TTC) standards and layouts for temporary traffic control zones. This manual should be used for reference and guidance when placing PCMS in the field.

The general layout for a stand-alone PCMS (page 6K-4 of the Field Manual) is shown in **Figure 3** on the following page.

Figure 3: PCMS Typical Layout



Number of Devices	Device Spacing (feet)	Speed Limit (mph)
3	50	0 - 40
5	50	45 - 75

NOTES[1]:

1. Type B channelizing devices shall be used in the shoulder taper regardless of the locations on the shoulder or the width of the shoulder.
2. Trailer-mounted traffic control devices shall be placed at least 4 feet from the edge of the traveled lane. If the 4 feet clearance can not be met, then a full shoulder closure shall be provided.
3. Typical trailer-mounted traffic control devices may include flashing arrow boards, automated flagging assistance devices (AFADs), portable signals, portable changeable message signs, portable dynamic speed display signs, communications equipment, or other data collection devices.

4.3 TYPES OF PCMS

The following section describes the types of PCMS used by MnDOT for all applications. A list of requirements by sign type can be found in **Table 3** of this document.

4.3.1 Type A

Type A are signs used on Freeway Incident Response Safety Team (FIRST) trucks and select Maintenance Trucks. These signs are capable of posting a two line message with 14" character height, but are often used to create three (3) line messages at 10" character height. The signs are most often used to display sequential chevrons.

[1] Temporary Traffic Control Zone Layouts Field Manual, 2011. Minnesota Department of Transportation, pp. 6K-4.

Figure 4: Type A PCMS

Type A PCMS
Character Height: 10 inches or 14 inches
Number of Lines: 1 or 2
Characters Per Line: 8
Frames: 1
Used On: FIRST Vehicle, Metro Area Wide Vehicles
Used For: Incident Management

4.3.2 Type B

Type B signs consist of trailer-mounted and truck-mounted signs that are used for mobile applications. The typical character height on these signs is 14" and 16", with 8 characters per line. Type B signs can be divided into three subcategories. The naming convention used to describe each subcategory provides information to the user.

- First Letter = Sign Type (Always B)
- Second Digit = Number of lines that can be used (2 or 3)
- Third Digit = Number of characters per line (always 8)
- Fourth Digit = Character Height (14 or 16)

Figure 5 shows each subcategory under Type B PCMS and pertinent information needed for each subcategory.

Figure 5: Type B PCMS

Type B-2-8-14 PCMS
Character Height: 14 inches
Number of Lines: 2
Characters Per Line: 8
Frames: 2
Used For: Maintenance

Type B-2-8-16 PCMS
Character Height: 16 inches
Number of Lines: 2
Characters Per Line: 8
Frames: 2
Used For: Maintenance

Type B-3-8-16 PCMS
Character Height: 16 inches
Number of Lines: 3
Characters Per Line: 8
Frames: 2
Used For: Maintenance, Special Events

4.3.3 Type C

Type C signs consist of trailer-mounted signs that can be used for freeway applications (i.e., higher speed roads). Type C signs are capable of displaying up to three (3) lines of eight (8) characters with 18" character height.

Figure 6: Type C PCMS

Type C PCMS
Character Height: 18 inches
Number of Lines: 3
Characters Per Line: 8
Frames: 2 for Speed Limit Greater than 45 mph, 3 for Speed Limit Less than 45 mph
Used For: Maintenance, Construction, Special Events

Table 3: Requirements by Sign Type

Sign Type	Type A	Type B-2-8-14	Type B-2-8-16	Type B-3-8-16	Type C
Lines of Message	1 or 2	2	2	3	3
Typical Mounting	Vehicle Mounted	Vehicle or Trailer-Mounted	Vehicle or Trailer-Mounted	Vehicle or Trailer-Mounted	Trailer-Mounted
Allowed Usage	Emergency & Incident Mgmt	Advance Warning	Advance Warning	Advance Warning	Advance Warning & Advance Notice
Legibility Distance Req.	350 feet	750 feet	750 feet	750 feet	900 feet
Min. Character Height	10 inches or 14 inches	14 inches	16 inches	16 inches	18 inches
Maximum No. of Displays	1	2	2	2	40 mph or less = 3 45 mph or more = 2
Message Cycle	Constant	At least 2 seconds per display which includes a .5 max change interval	At least 2 seconds per display which includes a .5 max change interval	At least 2 seconds per display which includes a .5 max change interval	At least 2 seconds per display which includes a .5 max change interval
Minimum Sign Panel Height	5 feet (rural) 7 feet (urban)	5 feet (rural) 7 feet (urban)	5 feet (rural) 7 feet (urban)	5 feet (rural) 7 feet (urban)	5 feet (rural) 7 feet (urban)
Minimum PCMS Spacing	500 feet	1000 feet	1000 feet	1000 feet	1000 feet

Table 4: Mn MUTCD Abbreviations That Shall Be Used Only on PCMS

Word Message	Standard Abbreviation	Prompt Word That Should Precede the Abbreviation	Prompt Word That Should Follow the Abbreviation
Access	ACCS	-	Road
Ahead	AHD	Fog	-
Blocked	BLKD	Lane	-
Bridge	BR*	[Name]	-
Cannot	CANT	-	-
Center	CNTR	-	Lane
Chemical	CHEM	-	Spill
Condition	COND	Traffic	-
Congested	CONG	Traffic	-
Construction	CONST	-	Ahead
Crossing	XING	-	-
Do Not	DONT	-	-
Downtown	DWNTN	-	Traffic
Eastbound	E-BND	-	-
Emergency	EMER	-	-
Entrance, Enter	ENT	-	-
Exit	EX	Next	-
Express	EXP	-	Lane
Frontage	FRNTG	-	Road
Hazardous	HAZ	-	Driving
Highway-Rail Grade	RR-ING	-	-
Interstate	I-*	-	[Number]
It Is	ITS	-	-
Lane	LN	[Roadway Name]*, Right, Left, Center	-
Left	LFT	-	-
Local	LOC	-	Traffic
Lower	LWR	-	Level
Maintenance	MAINT	-	-
Major	MAJ	-	Accident
Minor	MNR	-	Accident
Normal	NORM	-	-
Northbound	N-BND	-	-
Oversized	OVRSZ	-	Load
Parking	PKING	-	-
Pavement	PVMT	Wet	-
Prepare	PREP	-	To Stop
Quality	QLTY	Air	-

Word Message	Standard Abbreviation	Prompt Word That Should Precede the Abbreviation	Prompt Word That Should Follow the Abbreviation
Right	RT	Keep, Next	-
Right	RT	-	Lane
Roadwork	RDWK	-	Ahead, [Distance]
Route	RT, RTE	Best	-
Service	SERV	-	-
Shoulder	SHLDR	-	-
Slippery	SLIP	-	-
Southbound	S-BND	-	-
Speed	SPD	-	-
Tires with Lugs	LUGS	-	[Number]
Traffic	TRAF	-	-
Travelers	TRVLRS	-	-
Two-Wheeled Vehicles	CYCLES	-	-
Upper	UPR	-	-
Vehicle(s)	VEH, VEHS	-	Level
Warning	WARN	-	-
Westbound	W-BND	-	-
Will Not	WONT	-	-

APPENDIX A

LIST OF ACCEPTABLE CMS ABBREVIATIONS

Table 1A-1 Mn MUTCD Acceptable Abbreviations

Word Message	Standard Abbreviation
Afternoon/Evening	PM
Alternate	ALT
AM Radio	AM
Avenue	AVE, AV
Bicycle	BIKE
Boulevard	BLVD
Bridge	See Table 1A-2
CB Radio	CB
Center	CTR
Circle	CIR*
Civil Defense	CD
Compressed Natural Gas	CNG
Court	CT
Crossing	X-ING
Drive	DR*
East	E
Electric Vehicle	EV
Expressway	EXPWY*
Feet	FT
FM Radio	FM
Freeway	FRWY, FWY*
Friday	FRI
Hazardous Material	HAZMAT
High Occupancy Vehicle	HOV
Highway	HWY*
Hospital	HOSP
Hour(s)	HR, HRS
Information	INFO
Inherently Low Emission Vehicle	ILEV
International	INTL
Interstate	See Table 1A-2
Junction	JCT
Lane	See Table 1A-2
Liquid Propane Gas	LP-GAS
Maximum	MAX

Word Message	Standard Abbreviation
Mile(s)	MI
Miles per Hour	MPH
Minimum	MIN
Minute(s)	MIN
Monday	MON
Morning/Late Night	AM
Mount	MT
Mountain	MNT
National	NATL
North	N
Parkway	PKWY*
Pedestrian	PED
Place	PL*
Pounds	LBS
Road	RD*
Saint	ST
Saturday	SAT
South	S
State, county, or other non-US or non-Interstate numbered route	(See Table 1A-2)
Street	ST*
Sunday	SUN
Telephone	PHONE
Temporary	TEMP
Terrace	TER*
Thursday	THURS
Thruway	THWY*
Tons of Weight	T
Trail	TR*
Tuesday	TUES
Turnpike	TPK*
Two-Way Intersection	2-WAY
US Numbered Route	US
Wednesday	WED
West	W

Table 1A-2 Mn MUTCD Abbreviations That Are Acceptable Only with a Prompt Word

Word Message	Standard Abbreviation	Prompt Word that should Precede the Abbreviation	Prompt Word that should Follow the Abbreviation
Access	ACCS	----	Road
Ahead	AHD	Fog	----
Blocked	BLKD	Lane	----
Bridge	BRDG	[Name]*	----
Cannot	CANT	----	----
Center	CNTR	----	Lane
Chemical	CHEM	----	Spill
Condition	COND	Traffic	----
Congested	CONG	Traffic	----
Construction	CONST	----	Ahead
Crossing	XING	----	----
Do Not	DON'T	----	----
Downtown	DWNTN	----	Traffic
Eastbound	E-BND	----	----
Emergency	EMER	----	----
Entrance, Enter	ENT	----	----
Exit	EX	Next	----
Express	EXP	----	Lane
Frontage	FRNTG	----	Road
Hazardous	HAZ	----	Driving
Highway-Rail Grade Crossing	RR XING	----	----
Interstate	I-*	----	[Number]
It Is	ITS	----	----
Lane	LN	(Roadway Name)*, Right, Left, Center	----
Left	LFT	----	----
Local	LOC	----	Traffic
Lower	LWR	----	Level
Maintenance	MAINT	----	----
Major	MAJ	----	Accident
Minor	MNR	----	Accident
Normal	NORM	----	----
Northbound	N-BND	----	----
Oversized	OVRSZ	----	Load
Parking	PKNG	----	----
Pavement	PVMT	WET	----

Word Message	Standard Abbreviation	Prompt Word that should Precede the Abbreviation	Prompt Word that should Follow the Abbreviation
Prepare	PREP	----	To Stop
Quality	QLTY	Air	----
Right	RT	Keep, Next	----
Right	RT	----	Lane
Roadwork	RDWK	----	Ahead (Distance)
Route	RT, RTE	Best	----
Service	SERV	----	----
Shoulder	SHLDR	----	----
Slippery	SLIP	----	----
Southbound	S-BND	----	----
Speed	SPD	----	----
State, county, or other non-US or non-Interstate numbered route	(Route Abbreviation determined by highway agency)**	----	(Number)
Tires with Lugs	LUGS	----	----
Traffic	TRAF	----	----
Travelers	TRVLRS	----	----
Two-Wheeled Vehicles	CYCLES	----	----
Upper	UPR	----	Level
Vehicle(s)	VEH, VEHS	----	----
Warning	WARN	----	----
Westbound	W-BND	----	----
Will Not	WONT	----	----

*This abbreviation when accompanied by the prompt word may be used on traffic control devices other than portable changeable message signs.

**A space and no dash shall be placed between the abbreviation and the number of the route.

APPENDIX B

PERMANENT CMS MESSAGE LIBRARY

MnDOT Permanent CMS Message Library

	CMS Line	CMS Message
Event	1	SPILLED LOAD
	1	STALL ON EXIT RAMP
	1	LINE 1 TEST
	1	ICE ON RAMP
	1	EVENT CONGESTION
	1	BRIDGE CLOSED
	1	GRASS FIRE
	1	ROAD WORK
	1	DEBRIS ON RAMP
	1	SNOW REMOVAL
	1	STALLED VEHICLE
	1	DEBRIS ON ROAD
	1	EMERGENCY VEHICLES
	1	FLASH FLOODING
	1	ANIMAL ON ROAD
	1	CRASH-ROAD CLOSED
	1	CRASH ON EXIT RAMP
	1	CRASH-RAMP CLOSED
	1	EXIT RAMP CLOSED
	1	ICE
	1	INCIDENT
	1	CRASH - JUST CLEARED
	1	INCIDENT-JUST CLEARED
	1	INCIDENT ON RAMP
	1	PAVEMENT FAILURE
	1	RAMP BLOCKED
	1	RAMP CLOSED
	1	ROAD WORK ON RAMP
	1	TRAFFIC LIGHTS OUT
	1	VEHICLE FIRE
	1	394 * REVERSIBLE RD
	1	CRASH
	1	FREEWAY TIME TO
	1	STALLED VEHICLE
	1	CONGESTION
	1	ROAD CLOSED
	1	STALL BLOCKING RAMP

MnDOT Permanent CMS Message Library		
	CMS Line	**CMS Message**
Location*	2	AT MOUNDS BLVD
	2	AHEAD
	2	IN MEDIAN
	2	EAST OF HURON BLVD
	2	AT HWY 280
	2	TO HWY 280 NORTH
	2	ON HWY 280 NORTH
	2	280 NORTH AT UNIVRSTY
	2	280 NORTH OF UNIVRSTY
	2	EAST OF HWY 280
	2	AT CRETIN-VANDALIA
	2	EAST OF CRETIN-VNDLIA
	2	AT SNELLING AVE
	2	EAST OF SNELLING AVE
	2	EAST OF LEXINGTON
	2	AT DALE ST
	2	EAST OF DALE ST
	2	AT MARION/KELLOGG
	2	EXIT TO MARION/KELLOG
	2	EAST OF MARION ST
	2	AT 35E
	2	ON 35E SOUTH
	2	IN 35E-94 COMMONS
	2	ON 35E NORTH
	2	35E NORTH AT MARYLAND
	2	35E NORTH OF MARYLAND
	2	35E NORTH AT WHEELOCK
	2	35E NORTH AT LRPNTEUR
	2	35E NORTH OF LRPNTEUR
	2	35E NORTH AT ROSELAWN
	2	35E NORTH OF ROSELAWN
	2	35E NORTH AT HWY 36
	2	35E NORTH OF HWY 36
	2	EAST OF 35E
	2	AT HWY 52
	2	TO HWY 52 SOUTH
	2	ON HWY 52 SOUTH
	2	EAST OF HWY 52
	2	EAST OF MOUNDS BLVD
	2	AT HWY 61
	2	EAST OF HWY 61
	2	280 NORTH AT HENNEPIN
	2	280 NORTH AT COMO

MnDOT Permanent CMS Message Library		
	CMS Line	**CMS Message**
Location*	2	HWY 280 OVER 10 MIN
	2	LINE 2 TEST
	2	CLOSED
	2	AT LEXINGTON PKWY
	2	AT MISSISSIPPI RIVER
	2	EAST OF RIVER
	2	AT HURON BLVD

*Each MnDOT CMS will have its own set of Line 2 messages based on the location of the sign and any major intersections/interchanges.

MnDOT Permanent CMS Message Library

	CMS Line	CMS Message
Action*	3	IN RIGHT 2 LANES
	3	LANE CLOSED
	3	LEFT 2 LANES CLOSED
	3	ON BOTH SHOULDERS
	3	ON LEFT SHOULDER
	3	ON RIGHT SHOULDER
	3	ROAD CLOSED
	3	REDUCED TO 1 LANE
	3	REDUCED TO 2 LANES
	3	RIGHT 2 LANES CLOSED
	3	USE RAMP
	3	REDUCE SPEED
	3	USE OTHER ROUTES
	3	MAJOR DELAY
	3	USE DETOUR
	3	IN RIGHT LANE
	3	LINE 3 TEST
	3	IN LEFT 2 LANES
	3	IN MEDIAN
	3	IN ALL LANES
	3	EXPECT DELAYS
	3	EXIT RAMP CLOSED
	3	RIGHT LANE CLOSED
	3	IN 2 CENTER LANES
	3	ALL LANES OPEN
	3	HOV LANES CLOSED
	3	IN HOV LANE
	3	IN LEFT LANE
	3	IN CENTER LANE
	3	USE CAUTION
	3	LEFT LANE CLOSED
	3	.
	3	RADIO 88.5 FM
	3	EXIT RAMPS CLOSED
	3	EXIT RAMP BLOCKED
	3	HOV LANE CLOSED
	3	35E OVER 30 MIN
	3	PREPARE TO STOP
	3	CENTER LANE CLOSED
	3	LINE 3 TEST

APPENDIX C

PORTABLE CMS MESSAGE LIBRARY

Type B-2-8-14

Standard Message Library

14" high characters, 8 characters maximum per line (on ~75" wide boards), 2 lines maximum per frame, 2 frames maximum per message. Characters shall be displayed in an approximate width to height ratio (also known as aspect ratio) of 5 to 9.

Message #	Line #	First Frame	Second Frame
1	1	ANTI	AHEAD
	2	ICING	
2	1	* *	
		* *	
3	1	<<<	
4	1	>>>	
5	1	CRASH	
	2	AHEAD	
6	1	LEFT LN	MERGE
	2	CLOSED	--->
7	1	LFT 2 LN	MERGE
	2	CLOSED	--->
8	1	LFT 3 LN	MERGE
	2	CLOSED	--->
9	1	LEFT LN	MERGE
	2	CLOSED	RIGHT
10	1	LFT 2 LN	MERGE
	2	CLOSED	RIGHT
11	1	LFT 3 LN	MERGE
	2	CLOSED	RIGHT
12	1	MOWER	
	2	AHEAD	
13	1	RAMP	AHEAD
	2	CLOSED	
14	1	ROAD	AHEAD
	2	CLOSED	
15	1	RIGHT LN	MERGE
	2	CLOSED	<---
16	1	RHT 2 LN	MERGE
	2	CLOSED	<---
17	1	RHT 3 LN	MERGE
	2	CLOSED	<---
18	1	RIGHT LN	MERGE
	2	CLOSED	LEFT
19	1	RHT 2 LN	MERGE
	2	CLOSED	LEFT
20	1	RHT 3 LN	MERGE
	2	CLOSED	LEFT
21	1	SHOULDER	AHEAD
	2	CLOSED	
22	1	SIGNAL	STOP
	2	OUT	AHEAD
23	1	SLOW	AHEAD
	2	TRAFFIC	
24	1	SNOW	AHEAD
	2	REMOVAL	
25	1	SWEEPER	
	2	AHEAD	
26	1	WATER	SLOW
	2	ON ROAD	DOWN
27	1	NEW	NEW
	2	MESSAGE	MESSAGE

Type B-2-8-16

Standard Message Library

16" high characters, 8 characters maximum per line (on ~75" wide boards), 2 lines maximum per frame, 2 frames maximum per message. Characters shall be displayed in an approximate width to height ratio (also known as aspect ratio) of 5 to 9.

Message #	Line #	First Frame	Second Frame
1	1	ANTI	AHEAD
	2	ICING	
2	1	* *	
		* *	
3	1	<<<	
4	1	>>>	
5	1	CRASH	
	2	AHEAD	
6	1	LEFT LN	MERGE
	2	CLOSED	--->
7	1	LFT 2 LN	MERGE
	2	CLOSED	--->
8	1	LFT 3 LN	MERGE
	2	CLOSED	--->
9	1	LEFT LN	MERGE
	2	CLOSED	RIGHT
10	1	LFT 2 LN	MERGE
	2	CLOSED	RIGHT
11	1	LFT 3 LN	MERGE
	2	CLOSED	RIGHT
12	1	MOWER	
	2	AHEAD	
13	1	RAMP	AHEAD
	2	CLOSED	
14	1	ROAD	AHEAD
	2	CLOSED	
15	1	RIGHT LN	MERGE
	2	CLOSED	<---
16	1	RHT 2 LN	MERGE
	2	CLOSED	<---
17	1	RHT 3 LN	MERGE
	2	CLOSED	<---
18	1	RIGHT LN	MERGE
	2	CLOSED	LEFT
19	1	RHT 2 LN	MERGE
	2	CLOSED	LEFT
20	1	RHT 3 LN	MERGE
	2	CLOSED	LEFT
21	1	SHOULDER	AHEAD
	2	CLOSED	
22	1	SIGNAL	STOP
	2	OUT	AHEAD
23	1	SLOW	AHEAD
	2	TRAFFIC	
24	1	SNOW	AHEAD
	2	REMOVAL	
25	1	SWEEPER	
	2	AHEAD	
26	1	WATER	SLOW
	2	ON ROAD	DOWN
27	1	NEW	NEW
	2	MESSAGE	MESSAGE

Type B-3-8-16

Standard Message Library

16" high characters, 8 characters maximum per line (on ~ 75" wide boards), 3 lines maximum per frame, 2 frames maximum per message. Characters shall be displayed in an approximate width to height ratio (also known as aspect ratio) of 5 to 9. All one frame messages shall flash.

Message #	First Frame	Second Frame
1	ANTI ICING AHEAD	USE CAUTION
2	CRASH AHEAD	USE CAUTION
3	LEFT LANE CLOSED	MERGE RIGHT
4	LEFT 2 LANES CLOSED	MERGE RIGHT
5	LEFT 3 LANES CLOSED	MERGE RIGHT
6	MOWER AHEAD	USE CAUTION
7	*NEW* *MESSAGE*	*NEW* *MESSAGE*
8	RAMP CLOSED AHEAD	USE ALT ROUTE
9	RIGHT LANE CLOSED	MERGE LEFT
10	RIGHT 2 LANES CLOSED	MERGE LEFT
11	RIGHT 3 LANES CLOSED	MERGE LEFT
12	ROAD CLOSED AHEAD	FOLLOW DETOUR
13	ROAD CLOSED AHEAD	USE ALT ROUTE
14	ROAD WORK AHEAD	USE CAUTION
15	SHOULDER CLOSED AHEAD	USE CAUTION

Message #	First Frame	Second Frame
16	SIGNAL OUT	STOP AHEAD
17	SLOW TRAFFIC AHEAD	USE
18	SNOW REMOVAL AHEAD	USE
19	SWEEPER AHEAD	USE CAUTION
20	WATER ON ROAD	SLOW DOWN
21	WET	KEEP OFF LINES
22	**<----**	
23	**---->**	
24	*** *** *** ***	
25	**<<<**	
26+A73	**>>>**	
27	◊	◊
28	**> | >> | >>>**	
29*	RT LANE CLOSED	SLOW TRAFFIC
30*	LFT LANE CLOSED	SLOW TRAFFIC
31**	MERGE LEFT	BEGIN MERGE
32**	MERGE RIGHT	BEGIN MERGE
33***	STOPPED TRAFFIC	USE ALL LANES
34****	USE BOTH LANES	DURING BACKUPS

** Mobile Layour #46: No Queue - Advanced warning: vehicle or trailer*

*** Mobile Layour #46: Queue detected - Shadow Vehicle #2*

**** Mobile Layour #46: Queue detected - Advanced warning: vehicle or trailer*

***** Mobile Layout #53: Stationary Layout (Use in place of static sign) Note #3*

Type C PCMS

Standard Message Library

18" high characters, 8 characters maximum per line (on ~ 75" wide boards), 3 lines maximum per frame, 2 frames maximum per message. Characters shall be displayed in an approximate width to height ratio (also known as aspect ratio) of 5 to 9. All one frame messages shall flash.

Message #	First Frame	Second Frame
1	ANTI ICING AHEAD	USE CAUTION
2	CRASH AHEAD	USE CAUTION
3	LEFT LANE CLOSED	MERGE RIGHT
4	LEFT 2 LANES CLOSED	MERGE RIGHT
5	LEFT 3 LANES CLOSED	MERGE RIGHT
6	MOWER AHEAD	USE CAUTION
7	*NEW MESSAGE*	*NEW MESSAGE*
8	RAMP CLOSED AHEAD	USE ALT ROUTE
9	RIGHT LANE CLOSED	MERGE LEFT
10	RIGHT 2 LANES CLOSED	MERGE LEFT
11	RIGHT 3 LANES CLOSED	MERGE LEFT
12	ROAD CLOSED AHEAD	FOLLOW DETOUR
13	ROAD CLOSED AHEAD	USE ALT ROUTE
14	ROAD WORK AHEAD	USE CAUTION
15	SHOULDER CLOSED AHEAD	USE CAUTION

Message #	First Frame	Second Frame
16	SIGNAL OUT	STOP AHEAD
17	SLOW TRAFFIC AHEAD	USE
18	SNOW REMOVAL AHEAD	USE
19	SWEEPER AHEAD	USE CAUTION
20	WATER ON ROAD	SLOW DOWN
21	WET	KEEP OFF LINES
22	**<----**	
23	**---->**	
24	*** * * ***	
25	**<<<**	
26+A73	**>>>**	
27	◊	◊
28	**> | >> | >>>**	
29*	RT LANE CLOSED	SLOW TRAFFIC
30*	LFT LANE CLOSED	SLOW TRAFFIC
31**	MERGE LEFT	BEGIN MERGE
32**	MERGE RIGHT	BEGIN MERGE
33***	STOPPED TRAFFIC	USE ALL LANES
34****	USE BOTH LANES	DURING BACKUPS

** Mobile Layour #46: No Queue - Advanced warning: vehicle or trailer*

*** Mobile Layour #46: Queue detected - Shadow Vehicle #2*

**** Mobile Layour #46: Queue detected - Advanced warning: vehicle or trailer*

***** Mobile Layout #53: Stationary Layout (Use in place of static sign) Note #3*

APPENDIX D

QUICK REFERENCE SHEETS

PERMANENT CMS OPERATOR QUICK REFERENCE SHEET

CMS Message Types and Quick Reference Guidelines

Priority - Message Type	Guidelines
Priority 1 **Incident Management**	• Messages should be posted on CMS upstream of an incident • Messages should include location of the incident and the number of lanes closed • Information concerning verified lane-blocking incidents that occur on an intersecting freeway may be displayed on CMS that are located upstream of the interchange with that freeway, depending on the location, severity and duration of the incident. • CMS located on freeways leading to other states may display message concerning verified incidents on connecting freeways with adjoining states depending on the location, severity and duration of the event.

Priority 2
Work Zone Applications
	• Advanced Notification of Closures or Specialized Maintenance Operations
	  ○ If notice is given more than six days in advance, you can use calendar dates.
	  ○ If notice is given six days or less in advance, do not use calendar dates.

Priority 3 **Travel Times**	• Displayed When Travel Times are Lengthened Due to Congestion

Priority 4
Adverse Weather, Environmental, or Roadway Conditions
	• May Be Used if:
	  ○ Unexpected Weather, Environmental, or Roadway Conditions Affect Driver Visibility or Safety
	  ○ To Advise Motorists of Specific Regulations Due to Unexpected Weather or Roadway Conditions
	• Messages Restricted to Specific Location and CMS
	• Extreme Weather Conditions messages are permitted to warn motorists of potentially dangerous weather (i.e. Blizzards, High winds, Floods)
	• **DO NOT** Use for General Weather, Environmental, or Roadway Conditions Information

Priority 5 **Special Events**	• Notice of a special event should not be given more than six (6) days in advance
Priority 6 **Abducted Child Alert**	**ONLY USE** when: • The Child Abduction has been Confirmed • The Child is Under the Age of 18. • The Child is Believe to be in Danger of Bodily Harm or Death • The Abductor's Vehicle License Plate is Known
Priority 7 **Traffic Safety Campaigns**	• Examples (i.e. Buckle Up, DWI Enforcement, Speed Limit Enforcement, Motorcycle Safety, Texting, Move Over Law) • Traffic Safety Campaign messages are displayed throughout the campaign unless a message of higher priority is issued.

Priority 8
Test Messages
	• May Be Necessary for the Following:
	  ○ To Assure Correct Operations
	  ○ To "Burn-in" a New Sign
	  ○ Special Studies
	• Acceptable Messages
	  ○ TEST MESSAGE
	  ○ Portion of Alphabet

PORTABLE CMS OPERATOR QUICK REFERENCE SHEET

Portable CMS Field Sheet

Sign Type	Lines	Characters	Character Height	Frames	Uses
Type A	2	8	14”	1	Emergency and Incident Management
Type B-2-8-14	2	8	14”	2	Advance Warning
Type B-2-8-16	2	8	16”	2	Advance Warning
Type B-3-8-16	3	8	16”	2	Advance Warning
Type C	3	8	18”	40 mph - 3 45+ mph - 2	Advance Warning & Advance Notice

Type B-2-8-14 or B-2-8-16 PCMS Message Library

Message #	Line #	First Frame	Second Frame
1	1 2	ANTI ICING	AHEAD
2	1	* * * *	
3	1	<<<	
4	1	>>>	
5	1 2	CRASH AHEAD	
6	1 2	LEFT LN CLOSED	MERGE --->
7	1 2	LFT 2 LN CLOSED	MERGE --->
8	1 2	LFT 3 LN CLOSED	MERGE --->
9	1 2	LEFT LN CLOSED	MERGE RIGHT
10	1 2	LFT 2 LN CLOSED	MERGE RIGHT
11	1 2	LFT 3 LN CLOSED	MERGE RIGHT
12	1 2	MOWER AHEAD	
13	1 2	RAMP CLOSED	AHEAD
14	1 2	ROAD CLOSED	AHEAD
15	1 2	RIGHT LN CLOSED	MERGE <---
16	1 2	RHT 2 LN CLOSED	MERGE <---
17	1 2	RHT 3 LN CLOSED	MERGE <---
18	1 2	RIGHT LN CLOSED	MERGE LEFT
19	1 2	RHT 2 LN CLOSED	MERGE LEFT
20	1 2	RHT 3 LN CLOSED	MERGE LEFT
21	1 2	SHOULDER CLOSED	AHEAD
22	1 2	SIGNAL OUT	STOP AHEAD
23	1 2	SLOW TRAFFIC	AHEAD
24	1 2	SNOW REMOVAL	AHEAD
25	1 2	SWEEPER AHEAD	
26	1 2	WATER ON ROAD	SLOW DOWN
27	1 2	NEW MESSAGE	NEW MESSAGE

Type B-3-8-16 or Type C PCMS Message Library

Message #	First Frame	Second Frame
1	ANTI ICING AHEAD	USE CAUTION
2	CRASH AHEAD	USE CAUTION
3	LEFT LANE CLOSED	MERGE RIGHT
4	LEFT 2 LANES CLOSED	MERGE RIGHT
5	LEFT 3 LANES CLOSED	MERGE RIGHT
6	MOWER AHEAD	USE CAUTION
7	*NEW MESSAGE*	*NEW MESSAGE*
8	RAMP CLOSED AHEAD	USE ALT ROUTE
9	RIGHT LANE CLOSED	MERGE LEFT
10	RIGHT 2 LANES CLOSED	MERGE LEFT
11	RIGHT 3 LANES CLOSED	MERGE LEFT
12	ROAD CLOSED AHEAD	FOLLOW DETOUR
13	ROAD CLOSED AHEAD	USE ALT ROUTE
14	ROAD WORK AHEAD	USE CAUTION
15	SHOULDER CLOSED AHEAD	USE CAUTION

Message #	First Frame	Second Frame
16	SIGNAL OUT	STOP AHEAD
17	SLOW TRAFFIC AHEAD	USE
18	SNOW REMOVAL AHEAD	USE
19	SWEEPER AHEAD	USE CAUTION
20	WATER ON ROAD	SLOW DOWN
21	WET	KEEP OFF LINES
22	<----	
23	---->	
24	* * * *	
25	<<<	
26+A73	>>>	
27	◊	◊
28	> | >> | >>>	
29*	RT LANE CLOSED	SLOW TRAFFIC
30*	LFT LANE CLOSED	SLOW TRAFFIC
31**	MERGE LEFT	BEGIN MERGE
32**	MERGE RIGHT	BEGIN MERGE
33***	STOPPED TRAFFIC	USE ALL LANES
34****	USE BOTH LANES	DURING BACKUPS

** Mobile Layour #46: No Queue - Advanced warning: vehicle or trailer*

*** Mobile Layour #46: Queue detected - Shadow Vehicle #2*

**** Mobile Layour #46: Queue detected - Advanced warning: vehicle or trailer*

***** Mobile Layout #53: Stationary Layout (Use in place of static sign) Note #3*

APPENDIX E

SAMPLE PCMS MAINTENANCE LOGS

MnDOT Electronic Equipment (PCMS & Arrowboards)

PRE-TRIP/POST-TRIP **Field Personnel Checklist**

Name of Field Personnel:

Date: _____ **(Turn log in daily to Supervisor to be attached to daily worksheet)**

LIBRARY MESSAGE # OR NEW MESSAGE

Message to be displayed/PCMS Message Library #:	*Phase 1*	Expample: Message #__, #__, #___	*Phase 2*	

NOTE: If more than one message during scheduled shift, record all in above box by number.

PCMS: Circle one: VERMAC ADDCO INTELLISYS **PCMS Type:** A B C

PCMS ID Unit # _____ Odometer reading (if applicable)_____

Tires	*Tire Pressure (psi)*	*Tread Condition*	*Valve Caps*
Left Tire			
Right Tire			

Checklist:

Battery		**Trailer**	
Corrosion (clean if necessary)		*Brakes (including brake lights)*	
Water level (add if necessary)		*Welds*	
Cables		*Secure brackets*	
Run Sign (alternator should be charging)		*Secure straps*	
Sign plugged in (if solar)		*Hitch*	
Static Signs		*Chains crossed and secure*	
Zipper Merge Signs- Layout #46 & 53		**Computer**	
Oil and Fuel Levels - Add if necessary		Operational	
Lights (bulb and panel)		MnDOT library installed	
Proper bulb installation		**Solar Boards**	
All leds/bulbs working		If left unattended for extended period of time-Direct solar panel	

POST TRIP: ALL ABOVE ITEMS SHALL BE IN GOOD WORKING CONDITION OR THE REPAIR LOG BOOK SHALL BE USED AND SENT TO MECHANIC FOR REPAIR.

POST TRIP SIGNATURE_____

Blank sign at end of use. If new message, do not save!

COMMENTS:

MnDOT PCMS Maintenance Log

PCMS Manufacturer: _____ **PCMS Type:** _____

PCMS ID #: _____

Date Sign was Sent to Shop	**Reason for Sending the PCMS to Mechanics:**		
	Repair (describe):	*Regular Maintenance:*	*Other (describe):*
Date of Previous Maintenance			

Name of Mechanic	**Today's Date**	**Odometer reading (if applicable)**

Description of Repair/Maintenance Done to Sign

Recommendations to Avoid Similar Issues in the Future

Comments:	**Date Returned to Service**
	Project Date of Next Maintenance:

APPENDIX F

SAMPLE MESSAGES BY MESSAGE TYPE (EVENT, LOCATION AND ACTION)

Event Messages

The following is a list of approved messages to be used on the first line of a permanent sign to describe the event or incident that is taking place. This list is not all inclusive and messages may be used at the discretion of the District Traffic Engineer or RTMC Supervisor.

- **CRASH** – should be used when a verifiable crash is affecting normal traffic flow or creates a safety hazard. A crash refers to spinout, jack-knifed truck, rollover, injury crash, etc. Being overly descriptive should be avoided only makes the messages more complicated and difficult for motorists to read.

- **STALLED VEHICLE** – Should be used when a verifiable stalled vehicle is affecting the normal traffic flow or creates a safety hazard.

- **CONGESTION** – May be used in the event of non-recurring congestion either resulting from a previous incident or event.

- **EVENT CONGESTION** – May be used to warn of non-recurring congestion related to a special event.

- **ROAD CLOSED** – Shall be used when the mainline roadway is completely closed due to either roadwork or an incident. May also use **CRASH – ROAD CLOSED** as this message is more specific.

- **RAMP CLOSED** - Shall be used when the mainline roadway is completely closed due to either roadwork or an incident. May also use **CRASH – RAMP CLOSED** as this message is more specific.

- **DEBRIS ON ROAD** – Should be used to alert motorists of any verifiable debris that is affecting normal traffic flow or is a hazard to motorists.

- **VEHICLE FIRE** - Should be used to alert motorists of any verifiable vehicle fire that is affecting normal traffic flow or is a hazard to motorists.

- **GRASS FIRE** - Should be used to alert motorists of any verifiable grass fire that is affecting normal traffic flow or is a hazard to motorists.

- **FLOODING** – May be used to alert motorists of flooding conditions that may be caused due to heavy rains.

- **ROADWORK** – Should be used to alert motorists to any verifiable roadwork being performed by maintenance personnel or construction projects.

- **PAVEMENT BUCKLE** - Should be used to alert motorists of a pavement failure that is affecting the normal flow of traffic or is a safety hazard.

Other event messages unique to outstate situations include the following:

- **FOG**
- **HIGH WINDS**
- **ICE**
- **SLIPPERY**

Location Messages

Line two messages will refer to the location of an incident, or to the location of congestion that is due to an incident or some other non-recurring event.

Considerations for Developing Location Messages

- Location may state "**AHEAD**" should the event be within the next ½ mile of the sign. Other variations such as "**AHEAD 1 MILE**", "**AHEAD 2 MILES**", etc. may be used.
- Location Messages should be supplemented with either **AT** (location), **ON** (location), **NORTH OF** (location), **SOUTH OF** (location), **EAST OF** (location), or **WEST OF** (location) as appropriate.
- Location messages should use familiar cross street names used on green guide signs. Avoid unfamiliar overpasses or alternative roadway names that aren't repeated on static signing.
- For signs close to the event, the location message should be as specific as possible; however, as messages are posted further away, the message may need to be more general to avoid confusing motorists unfamiliar with the area.
- Rural applications may want to consider town names rather than cross street names for messages that are posted further away, as static guide signs typically provide town names rather than cross streets in rural applications. Mileposts can also be utilized in rural applications but are not recommended for the metro area.

Action Messages

The following is a list of approved messages to be used as an action message on a permanent CMS to describe the action the motorist should take or to inform them of conditions downstream. This list is not all inclusive and messages may be used at the discretion of the District Traffic Engineer or RTMC Supervisor.

- **PREPARE TO STOP** – Should be used for an incident or event that is causing abrupt slowdowns in traffic flow immediately downstream of the CMS location. If stopped traffic reaches the point of the CMS, a new message should be posted.

- **LANE CLOSED** – Should be used when a lane is blocked or closed due to an incident. Similar to zipper merge, it is preferred to be less-specific on CMS deployed greater than 1 mile away from the event to avoid motorists from vacating the lane too early. Other options for multilane corridors may include "REDUCED TO 1 LANE" or "**REDUCED TO 2 LANES**".

- **LANE SPECIFIC CLOSURES** – May be used immediately prior to an event location to inform motorists of what lane is needed to be vacated. Messages include **RIGHT LANE CLOSED**, **RIGHT 2 LANES CLOSED**, etc.

- **ON SHOULDER** – May be used to inform motorists of an incident that is on the shoulder that is affecting the normal traffic flow or is a potential safety hazard. If the CMS displays a travel time message, it may be more advisable to display the travel time if the event is causing a safety hazard. The message should include specifically what shoulder the event is on such as **ON RIGHT SHOULDER**, **ON LEFT SHOULDER**, or **ON BOTH SHOULDERS**.

- **EXPECT DELAYS** – Should be used for an event that is causing backups that are greater than normal or not expected for that time of day. This message is preferred to "**PREPARE TO STOP**" when the congestion has reached the CMS location or can be used on CMS further out to encourage motorists to use alternate routes. If the CMS is displaying a travel time, it may be more advisable to display the travel time over this message as it is more specific.

- **MAJOR DELAYS** – Should be used for an event that is causing greater than 2 miles of traffic backup. If the CMS is displaying a travel time, it may be more advisable to display the travel time over this message as it is more specific.

- **USE CAUTION** – Should be used to inform motorists of a safety hazard where the safety of a motorist or incident responder is at risk. This message should not be overused to maintain its effectiveness.

- **USE OTHER ROUTES** – Should be used for an incident that causes the road to close and motorists are required to find another route.

- **FOLLOW DETOUR** – Should be used for construction closures where an alternate route is assigned with posted detour signs.

- **JUST CLEARED** – Should be used for an incident that has just cleared but traffic conditions have not returned to normal.

- **RADIO 88.5 FM** – Specific to the metro area, this message should be used when the KBEM traffic announcer at the RTMC is providing continuous traffic updates on KBEM radio 88.5 FM for a major incident. The message should be taken down after the broadcast is completed.