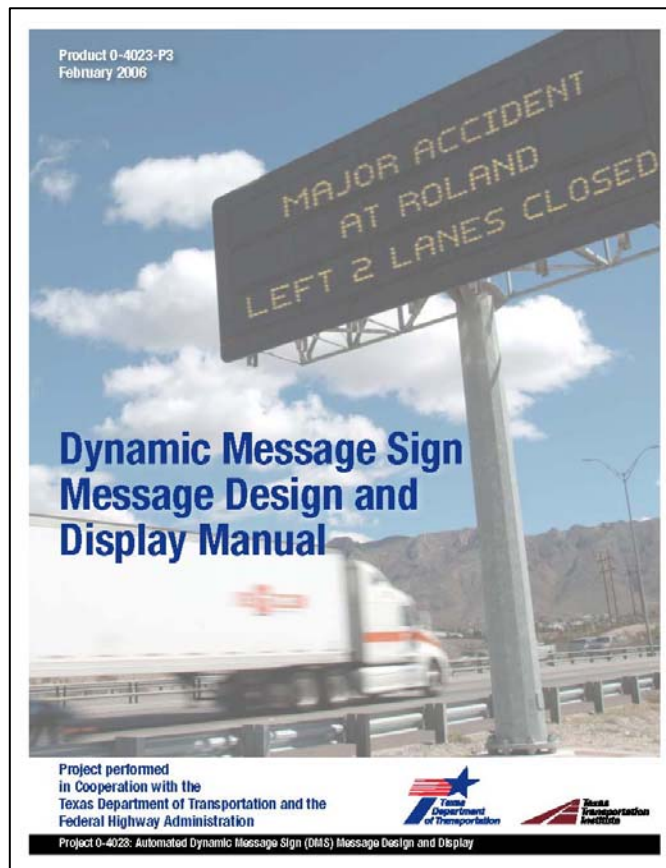


DYNAMIC MESSAGE SIGN MESSAGE DESIGN & DISPLAY MANUAL TRAINING

One-Day “Core” Course

Participant Notebook



for
Texas Department of Transportation

March 2009

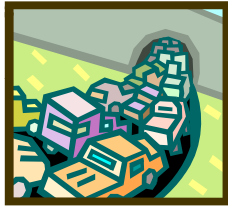
Principles of DMS Operations

Module 2

2-1

DMSs are used to manage traffic by displaying:

- Early warning messages



DMS Manual: pg 2-1

2-2

DMSs are used to manage traffic by displaying:

- Early warning messages
- Advisory messages



DMS Manual: pg 2-1

2-3

DMSs are used to manage traffic by displaying:

- Early warning messages
- Advisory messages
- Alternative routing messages



DMS Manual: pg 2-1

2-4

What Motorists Expect From DMSs

- Up-to-the-minute information

DMS Manual: pg 2-2

2-5

What Motorists Expect From DMSs

- Up-to-the-minute information
- Reliable information

DMS Manual: pg 2-2

2-6

What Motorists Expect From DMSs

- Up-to-the-minute information
- Reliable information
- Accurate information

DMS Manual: pg 2-2

2-7

What Motorists Expect From DMSs

- Up-to-the-minute information
- Reliable information
- Accurate information
- Relevant information

DMS Manual: pg 2-2

2-8

Credibility Is Critical!

Never display specific traffic information before it is verified

DMS Manual: pg 2-2

2-9

How Is Credibility Damaged?

By displaying messages that are:

- Inaccurate

RT LANE
CLOSED
AHEAD

DMS Manual: pg 2-2

2-10

How Is Credibility Damaged?

By displaying messages that are:

- Inaccurate
- Not current

ACCIDENT
1 MILE

DMS Manual: pg 2-2

2-11

How Is Credibility Damaged?

By displaying messages that are:

- Inaccurate
- Not current
- Irrelevant



DMS Manual: pg 2-2

2-12

How Is Credibility Damaged?

By displaying messages that are:

- Inaccurate
- Not current
- Irrelevant
- Obvious

CAUTION
CONGESTION
AHEAD

DMS Manual: pg 2-2

2-13

How Is Credibility Damaged?

By displaying messages that are:

- Inaccurate
- Not current
- Irrelevant
- Obvious
- Trivial

EXPECT
1 MIN DELAY
AHEAD

DMS Manual: pg 2-2

2-14

How Is Credibility Damaged?

By displaying messages that are:

- Inaccurate
- Not current
- Irrelevant
- Obvious
- Trivial
- Incorrect (especially numbers)

DMS Manual: pg 2-2

2-15

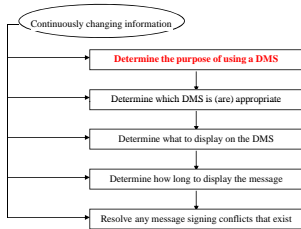




DMS Operating Fundamentals

Module 3

DMS Operating Fundamentals



DMS Manual: pg 3-1

3-2

Determine Purpose

What is the problem I am trying to address?

- Type of problem
- Location of problem
- Scope (e.g., number of lanes blocked, minor or major)
- Potential duration
- Extent of impacts

DMS Manual: pg 3-2

3-3

Determine Purpose

What verified information do I have?

- Incident
- Conditions on primary route
- Conditions on diversion route

DMS Manual: pg 3-2

3-4

Determine Purpose

Who is the audience for the DMS message?

- All users of the freeway
- Select group

DMS Manual: pg 3-3

3-5

Determine Purpose

What type of driver response is desired?

- Reduce speed
- Move out of blocked/closed lane
- Take another route

DMS Manual: pg 3-3

3-6

Determine Purpose

What type of driver response is desired?

- Reduce speed
- Move out of blocked/closed lane
- Take another route

Effective messages encourage driver response

DMS Manual: pg 3-3

3-7

Determine Purpose

Where should the response take place?

- Type of response desired
- Layout of the roadway system
- Type and severity of problem
- Existing guidance along alternative route

DMS Manual: pg 3-3

3-8

Determine Purpose

What degree of response is desired?

- Keep message displayed for more response
- Turn message off for less response

DMS Manual: pg 3-4

3-9

Determine Appropriate DMSs

Proximity of DMSs to problem

Questions:

- Expected problem longer than expected travel time?
- Significant number of motorists passing sign?

DMS Manual: pg 3-4

3-10

Determine Appropriate DMSs

Characteristics of DMS hardware

- Type of sign
- Number of lines
- Number of characters per line
- Need to move portable signs in place
- Relationship to info on static signs

DMS Manual: pg 3-4

3-11

Determine Appropriate DMSs

External Influences

- Traffic speed
- Vertical/ horizontal curves
- Sun position
- Guide signs
- Rain or fog

DMS Manual: pg 3-5

3-12

Determine What to Display

Base information needs and DMS message

- Type of problem
- Location of problem
- Lanes affected
- Location of lane closure
- Effect on Travel

DMS Manual: pg 3-5

3-13

Determine What to Display

Base information needs and DMS message

- Audience for message
- Proper response or driving action by motorist
- Reason to follow recommended driving action

DMS Manual: pg 3-5

3-14

Determine What to Display

On diversion routes, operator must know:

- Current traffic conditions
- Current traffic capacity constraints
- Guide sign information

DMS Manual: pg 3-6

3-15

Determine Duration of Display

Off-peak

- May be desirable to turn message off by hand

DMS Manual: pg 3-7

3-16

Determine Duration of Display

Off-peak

- May be desirable to turn message off manually once no longer needed

Peak

- May be desirable to estimate duration and have system turn message off automatically

DMS Manual: pg 3-7

3-17

Resolve Signing Conflicts

Most common types of conflicts:

- Two events on same freeway
- One event on freeway and second on intersecting freeway
- One event on freeway and second on connecting freeway in adjacent state

DMS Manual: pg 3-7

3-18

Resolve Signing Conflicts

Most common types of conflicts:

- Two events on intersecting freeway
- One event on an intersecting freeway and a second on a connecting freeway in an adjacent state

DMS Manual: pg 3-8

3-19

Principles of DMS Message Design

Module 4



PART 1 Overview of Issues

DMS Manual: pg 4-1 4-2

Overview of DMS Issues

Direct link with motoring public


Effective Messages *Poorly Designed Message*



DMS Manual: pg 4-1 4-3

Overview of DMS Issues

Direct link with motoring public
Messages must be standard and consistent




DMS Manual: pg 4-1

4-4

Overview of DMS Issues

Direct link with motoring public
Messages must be standard and consistent
Only few seconds to communicate




DMS Manual: pg 4-1

4-5

Overview of DMS Issues

Message length controlled by exposure time



DMS Manual: pg 4-1

4-6

Overview of DMS Issues

Message length controlled by exposure time

Some needed information must be omitted



DMS Manual: pg 4-1

4-7

Overview of DMS Issues

Message length controlled by exposure time

Some needed information must be omitted

Motorist understanding must be enhanced



DMS Manual: pg 4-2

4-8

PART 2 Selecting an Audience

DMS Manual: pg 4-3

4-9

Audience for Message

Why is it necessary to think about the audience of the message?

DMS Manual: pg 4-3

4-10

Audience for Message

Unfamiliar Motorists Will Have Difficulty Understanding:

- Local street and highway names
- Abbreviations for local landmarks, bridges, entertainment and recreational facilities

= longer message processing times

DMS Manual: pg 4-3

4-11

PART 3 Definitions and Message Design Considerations

DMS Manual: pg 4-4

4-12

Message Design Considerations

Content: specific information displayed
Length: number of words or characters
Load: number of units of information
Info Unit: answer to a motorist question
Format: order of information units

DMS Manual: pg 4-4 4-13

Message Content

Motorists want to know:

- What is wrong ahead
- Where
- What to do
- Reason to follow advice

DMS Manual: pg 4-4 4-14

Message Length

Constraints:

- Message must fit on DMS
- Maximum length controlled by reading time
- Motorist time shares reading & driving task
- Motorist must read entire DMS message
- Message familiarity enhances reading time
 - Reading time longer if unfamiliar
 - Reading time shorter if familiar

DMS Manual: pg 4-4 4-15

Message Length

8-word maximum at 55 mph

7-word maximum at 65 mph

What if the message is longer than this?

DMS Manual: pg 4-5

4-16

Message Length

8-word maximum at 55 mph

7-word maximum at 65 mph

If too long, motorists may reduce speed

We should always try to minimize the length of the message

DMS Manual: pg 4-5

4-17

Message Load and Info Unit

Question

1. What happened ?
2. Where?
3. Who is advisory for?
4. What is advised?

Answer

ACCIDENT
PAST ROWLAND
FAIR PARK
USE FITZHUGH

Info Unit

1 Unit
1 Unit
1 Unit
1 Unit

4 Units

DMS Manual: pg 4-6

4-18

Message Load and Info Units

Information Units for Entire Message:

- No more than 4 units for speeds \geq 35 mph
- No more than 5 units for speeds < 35 mph

Information Units in a Message Phase:

- No more than 3 units

Information Units on a Line:

- No more than 2 units

DMS Manual: pg 4-7 4-19

Message Format

Must place Information Units in the proper order to:

- Enhance motorist expectations
- Reduce reading time
- Enhance understanding

DMS Manual: pg 4-7 4-20

PART 4
Base DMS Message

DMS Manual: pg 4-8 4-21

Base DMS Message

The "Base" DMS Message:

- Sum total of all information motorists want to have
- Will normally exceed the maximum number of information units
- Must normally be reduced in length

DMS Manual: pg 4-8

4-22

Base DMS Message

The Base DMS Message Elements

- Incident/Roadwork Descriptor
- Incident/Roadwork Location
- Lanes Affected
- (Closure Descriptor)
- (Location of Closure)

DMS Manual: pg 4-8

4-23

Base DMS Message

The Base DMS Message Elements (cont'd)

- Effect on Travel
- Audience for Action
- Action
- One Good Reason for Following Action

DMS Manual: pg 4-8

4-24

Descriptor Element

Descriptor element informs motorists of the unusual situation

DMS Manual: pg 4-8

4-25

Location Element

Location element informs motorists of the location of unusual situation

- Must follow the Descriptor
- No need for route number or name if on same freeway

DMS Manual: pg 4-9

4-26

Location Element

For commuters:

- Reference to street names, exit names or numbers, landmarks

For unfamiliar motorists:

- Reference by distance, exit numbers

DMS Manual: pg 4-9

4-27

Location Element

Preferred by Familiar or Unfamiliar Drivers?

familiar

ACCIDENT
AT ROWLAND

unfamiliar

ACCIDENT
1 MILE

*both familiar
and unfamiliar*

ACCIDENT
AT EXIT 12

DMS Manual: pg 4-9

4-28

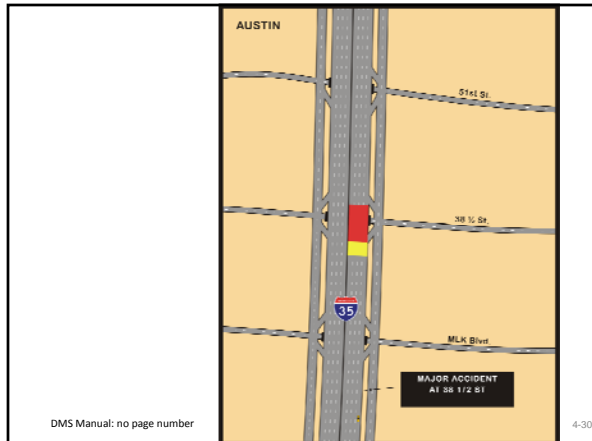
Location Element

Subtle differences in location terms can be important

- Near
- At
- Before
- Past
- From
- Between

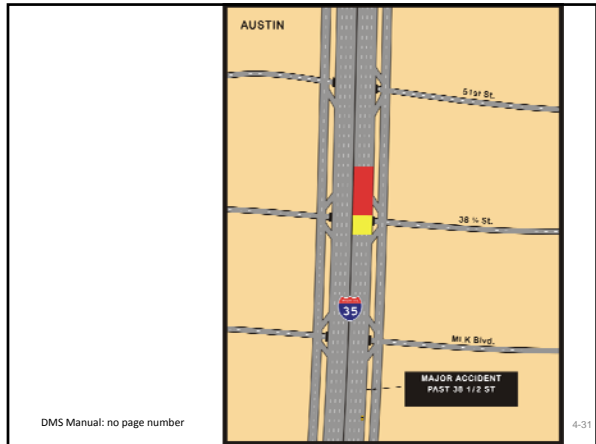
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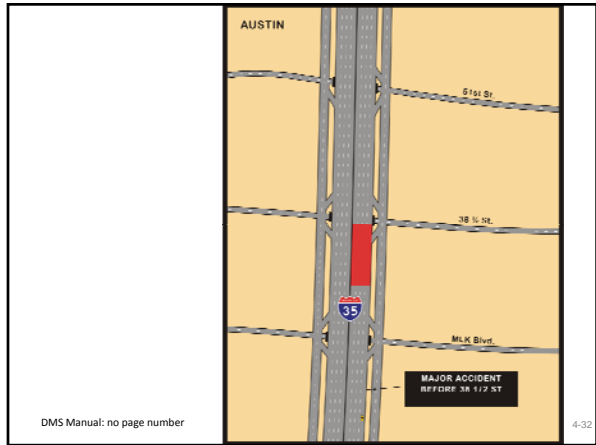
4-29

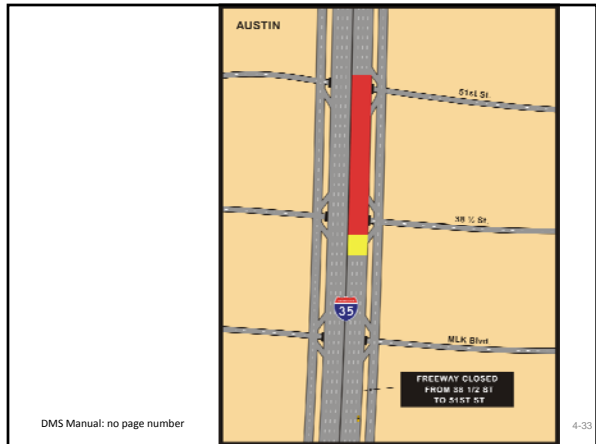


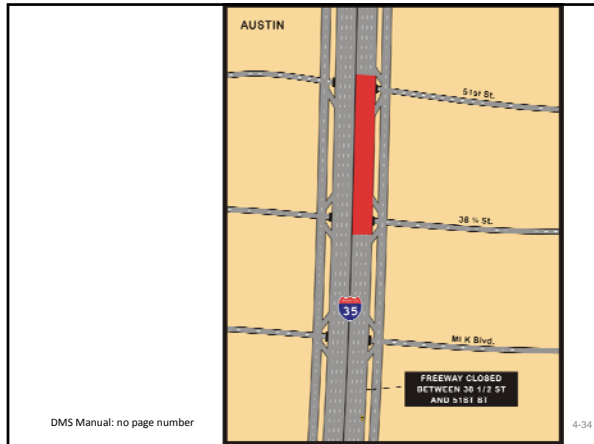
DMS Manual: no page number

4-30









Lanes Affected Element

Lanes Affected element gives specific info about which lanes or exit ramps are closed or blocked

Helps motorists prepare to change to open lanes or use another ramp

DMS Manual: pg 4-10 4-35

Closure Descriptor Element

Closure Descriptor element used in place of *Incident/Roadwork* Descriptor when all lanes are closed

DMS Manual: pg 4-10 4-36

Effect on Travel Element

Effect on Travel element informs motorist of severity of problem

Helps motorist make informed diversion decisions

Can imply expected arrival time

DMS Manual: pg 4-10 4-37

Effect on Travel Element

Delay

- (number) MIN DELAY
- AVOID (number) MIN DELAY
- SAVE (number) MIN

ACCIDENT
AT EXIT 12
20 MIN DELAY
USE ROUTE 46

Example of
"X MIN DELAY"

ACCIDENT
AT EXIT 12
USE ROUTE 46
AVOID 20 MIN DELAY

Example of
"AVOID X MIN DELAY"

ACCIDENT
AT EXIT 12
USE ROUTE 46
SAVE 20 MIN

Example of
"SAVE X MIN"

DMS Manual: pg 4-11 4-38

Effect on Travel Element

Travel Time

- Motorists can measure and refute
- Speed sensors ⇔ large errors in congested conditions

TRAVEL TIME
TO DOWNTOWN
10 MIN AT 8:20

TRAVEL TIME
TO DOWNTOWN
8-12 MINS

DMS Manual: pg 4-12 4-39

Audience for Action Element

Audience for Action element used only when the *Action* applies to a specific group of motorists

Thus, must always be accompanied by an *Action* message element

DMS Manual: pg 4-13 4-40

Audience for Action Element

The word *TRAFFIC* with a destination is not generally used. There is one exception

MAJOR ACCIDENT PAST I-30 FAIR PARK USE FITZHUGH	MAJOR ACCIDENT FAIR PARK TRAFFIC USE FITZHUGH
--	---

"TRAFFIC" not required *"TRAFFIC" required*

DMS Manual: pg 4-14 4-41

Action Element

Action element is necessary because it tells motorists what to do

It is best that every incident management message have an *Action* statement

DMS Manual: pg 4-14 4-42

Good Reason Element

Motorists must be confident that he/she is taking the best course of action

In most cases, the *Good Reason* is implied

DMS Manual: pg 4-14

4-43

PART 5 Word and Word Phrase Meanings and Criteria

DMS Manual: pg 4-15

4-44

Word Meanings & Criteria

USE - Route that will take motorists to destination

TAKE - Directive to begin first "leg" of route

FOLLOW - Motorist will be guided by other signs

EXIT - Sometimes used as a verb

GO - Not used

DMS Manual: pg 4-15

4-45

Word Meanings & Criteria

ROADWORK – shorter than CONSTRUCTION
EXIT – when referring to an off ramp on freeway
RAMP – when referring to an on ramp
NITE – shorter than NIGHT
FOR 1 WEEK – Mon through Fri
WEEKEND – Sat AM to Sun PM

DMS Manual: pg 4-15

4-46

Advance Notification Messages

- Use dates only when necessary
- Use text/number format (i.e., JUN 12)
- Do not repeat month abbreviation (i.e., JUN 12 – 15)
- Avoid day/date/time messages because it far exceeds information load limits

DMS Manual: pg 4-17 and TTI Report 0-4748-1

4-47

PART 6 Diversion/Detour Route Descriptors

DMS Manual: pg 4-19

4-48

Route Characteristic Differences

- Presence of electronic or human surveillance
 - Existing guide signs or trailblazers to freeway
 - Police and/or traffic control personnel at critical decision points
 - Incident emergency route plan signing
 - Roadwork traffic control plan (temporary traffic control devices present)
- See Tables 4.1 and 4.2 (p. 4-22)

DMS Manual: pg 4-19

4-49

PART 7 Dynamic Features on DMSs

DMS Manual: pg 4-23

4-50

Dynamic Features on DMSs

AVOID flashing an entire one-phase message

**MAJOR ACCIDENT
AT ROWLAND
LEFT 2 LANES CLOSED**

DMS Manual: pg 4-23

4-51

Dynamic Features on DMSs

AVOID flashing one line of a one-phase message

**MAJOR ACCIDENT
AT ROWLAND
LEFT 2 LANES CLOSED**

DMS Manual: pg 4-23 4-52

Dynamic Features on DMSs

AVOID alternating text

**MAJOR ACCIDENT
AT ROWLAND
LEFT 2 LANES CLOSED**

DMS Manual: pg 4-24 4-53

Dynamic Features on DMSs

AVOID alternating text

**MAJOR ACCIDENT
AT ROWLAND
TUNE TO 530 AM**

DMS Manual: pg 4-24 4-54

Designing Base Message: Incidents and Roadwork

Modules 5 & 6



Base Message Elements

- Incident/Roadwork Descriptor
- Incident/Roadwork Location
- Lanes Closed
- Effect on Travel
- Audience for Action
- Action
- Good Reason for Following Action

DMS Manual: pg 5-1 & 6-1

5&6-2

Lane Closures: DMS Close to Incident/Roadwork



DMS Manual: pg 5-2 & 6-2

5&6-3

Effect on Travel

Table 5.4 TERMS FOR EFFECT ON TRAVEL
DMS ON SAME FREEWAY AND RELATIVELY CLOSE TO INCIDENT

Large Signs	Portable Signs
EXPECT DELAY	EXPECT DELAY
EXPECT MAJOR DELAY	EXPECT MAJOR DELAY
EXPECT MINOR DELAY	EXPECT MINOR DELAY

** Indicates that the next portion of the message will be displayed on the next line(s) of DMS.

Table 6.4 ACCEPTABLE TERMS FOR EFFECT ON TRAVEL
DMS ON SAME FREEWAY AND RELATIVELY CLOSE TO ROADWORK

Large Signs	Portable Signs
EXPECT DELAY	EXPECT DELAY
EXPECT MAJOR DELAY	EXPECT MAJOR DELAY
EXPECT MINOR DELAY	EXPECT MINOR DELAY

** Indicates that the next portion of the message will be displayed on the next line(s) of DMS.

DMS Manual: pg 5-5 & 6-5

58&-7

Action

Motorists are not advised to take an alternative route: No diversion

Table 5.5 TERMS FOR ACTION
DMS ON SAME FREEWAY AND RELATIVELY CLOSE TO INCIDENT
MOTORISTS ARE NOT ADVISED TO TAKE AN ALTERNATIVE ROUTE-
NO DIVERSION ACTION

Large Signs	Portable Signs
BE PREPARED TO STOP	BE (REPAIRED) TO STOP
USE CAUTION	USE CAUTION

** Indicates that the next portion of the message will be displayed on the next line(s) of DMS.

Table 6.5 ACCEPTABLE TERMS FOR ACTION
DMS ON SAME FREEWAY AND RELATIVELY CLOSE TO ROADWORK
MOTORISTS ARE NOT ADVISED TO TAKE AN ALTERNATIVE ROUTE-
NO DIVERSION ACTION

Large Signs	Portable Signs
BE PREPARED TO STOP	BE (REPAIRED) TO STOP
USE CAUTION	USE CAUTION

** Indicates that the next portion of the message will be displayed on the next line(s) of DMS.

DMS Manual: pg 5-6 & 6-6

58&-8

Action soft diversion

Table 5.6 TERMS FOR ACTION
DMS ON SAME FREEWAY AND RELATIVELY CLOSE TO INCIDENT
MOTORISTS ARE ADVISED TO TAKE AN ALTERNATIVE ROUTE-
SOFT DIVERSION

Large Signs	Portable Signs
USE OTHER ROUTES	USE OTHER ROUTES

** Indicates that the next portion of the message will be displayed on the next line(s) of DMS.

Table 6.6 ACCEPTABLE TERMS FOR ACTION
DMS ON SAME FREEWAY AND RELATIVELY CLOSE TO ROADWORK
MOTORISTS ARE ADVISED TO TAKE AN ALTERNATIVE ROUTE-
SOFT DIVERSION

Large Signs	Portable Signs
USE OTHER ROUTES	USE OTHER ROUTES

** Indicates that the next portion of the message will be displayed on the next line(s) of DMS.

DMS Manual: pg 5-7 & 6-7

58&-9

Total Freeway or Ramp Closures



DMS Manual: pg 5-30 & 6-29

5&6-16

Action: with diversion

Table 4.32 ACCEPTABLE TERMS FOR ACTION
VMS ON SAME FREEWAY AND RELATIVELY CLOSE TO CLOSURE
MOTORISTS ARE ADVISED TO TAKE A SPECIFIC TYPE 6 DIVERSION (DETOUR) ROUTE

Large Signs	Portable Signs
EXIT AND FOLLOW DETOUR	EXIT AND FOLLOW DETOUR
EXIT AND FOLLOW SIGNS	EXIT AND FOLLOW SIGNS
FOLLOW DETOUR	FOLLOW DETOUR
FOLLOW SIGNS	FOLLOW SIGNS

** Indicates that the next portion of the message will be displayed on the next line(s) of DMS.

DMS Manual: pg 6-35

5&6-17

Action: with diversion

Table 4.33 ACCEPTABLE TERMS FOR ACTION
VMS ON SAME FREEWAY AND RELATIVELY CLOSE TO CLOSURE
MOTORISTS ARE ADVISED TO TAKE A SPECIFIC TYPE 5 DIVERSION ROUTE

Large Signs	Portable Signs
EXIT AND FOLLOW DETOUR	EXIT AND FOLLOW DETOUR
EXIT AND FOLLOW SIGNS	EXIT AND FOLLOW SIGNS
FOLLOW DETOUR	FOLLOW DETOUR
FOLLOW SIGNS	FOLLOW SIGNS
EXIT AT [highway, street name] [cardinal direction]	EXIT AT [highway, street name] [cardinal direction]
FOLLOW DETOUR	FOLLOW DETOUR
FOLLOW SIGNS	FOLLOW SIGNS
EXIT AT [ramp number] [cardinal direction]	EXIT AT [ramp number] [cardinal direction]
FOLLOW DETOUR	FOLLOW DETOUR
FOLLOW SIGNS	FOLLOW SIGNS
EXIT AT [ramp number] [cardinal direction]	EXIT AT [ramp number] [cardinal direction]
FOLLOW DETOUR	FOLLOW DETOUR
FOLLOW SIGNS	FOLLOW SIGNS
TAKE [exit ramp name] EXIT	TAKE [exit ramp name] EXIT
FOLLOW DETOUR	FOLLOW DETOUR
FOLLOW SIGNS	FOLLOW SIGNS
TAKE [highway, street name] [cardinal direction]	TAKE [highway, street name] [cardinal direction]
FOLLOW DETOUR	FOLLOW DETOUR
FOLLOW SIGNS	FOLLOW SIGNS
TAKE [ramp number] [cardinal direction]	TAKE [ramp number] [cardinal direction]
FOLLOW DETOUR	FOLLOW DETOUR
FOLLOW SIGNS	FOLLOW SIGNS
TAKE [ramp number] [cardinal direction]	TAKE [ramp number] [cardinal direction]
FOLLOW DETOUR	FOLLOW DETOUR
FOLLOW SIGNS	FOLLOW SIGNS

** Indicates that the next portion of the message will be displayed on the next line(s) of DMS.

DMS Manual: pg 5-38

5&6-18

Establishing the Maximum Message Length

Module 7

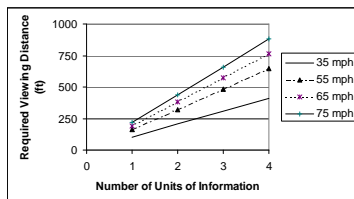
PART 1 Message Length and DMS Viewing Distance Requirements

DMS Manual: pg 7-1

7-2

Required Viewing Distances to DMS

- For a given number of info units: Higher speeds require higher, legibility distances

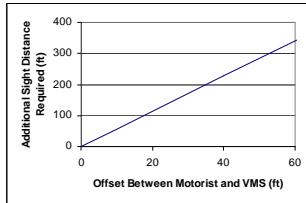


DMS Manual: pg 7-1

7-3

Sight Distance for Lateral Offset

- Longer lateral distances require more legibility distance



DMS Manual: pg 7-2

7-4

Factors Reducing Legibility Distance to a DMS

Lighting Conditions



DMS Manual: pg 7-2

7-5

Factors Reducing Legibility Distance to a DMS

Sun Position



DMS Manual: pg 7-2

7-6

Factors Reducing Legibility Distance to a DMS

Vertical & Horizontal Curvature



DMS Manual: pg 7-2

7-7

Factors Reducing Legibility Distance to a DMS

Spot obstructions



DMS Manual: pg 7-2

7-8

Factors Reducing Legibility Distance to a DMS

Rain or fog



DMS Manual: pg 7-2

7-9

Factors Reducing Legibility
Distance to a DMS

Trucks in the traffic stream



DMS Manual: pg 7-2

7-10

Therefore,
Maximum allowable number of units of
information may have to be REDUCED

DMS Manual: pg 7-2

7-11

PART 2
Maximum Legibility Distances for
Day & Night Operations

DMS Manual: pg 7-4

7-12

Day & Night

Suggested legibility distances

Condition	Light-Emitting Diode ^a	Fiberoptic	Incandescent Bulb	Reflective Disk
Mid-Day	800	700	700	700
Washout	800	700	700	400
Backlight	600	400	400	200
Nighttime	600	600	600	350

^a Valid only for the newer aluminum indium gallium phosphide (or equivalent) LEDs.

DMS Manual: pg 7-4

7-13

Day & Night

Maximum number of units of info

Condition	Light-Emitting Diode ^a			Fiberoptic			Incandescent Bulb			Reflective Disk		
	0-35 mph	36-55 mph	56-70 mph	0-35 mph	36-55 mph	56-70 mph	0-35 mph	36-55 mph	56-70 mph	0-35 mph	36-55 mph	56-70 mph
Mid-Day	5 units	4 units	4 units	5 units	4 units	3 units	5 units	4 units	3 units	5 units	4 units	3 units
Washout	5 units	4 units	4 units	5 units	4 units	3 units	5 units	4 units	3 units	4 units	3 units	2 units
Backlight	4 units	4 units	3 units	4 units	3 units	2 units	4 units	3 units	2 units	2 units	1 unit	1 unit
Nighttime	4 units	4 units	3 units	4 units	3 units	3 units	4 units	3 units	3 units	3 units	2 units	1 unit

^a Valid only for the newer aluminum indium gallium phosphide (or equivalent) LEDs.

DMS Manual: pg 7-5

7-14

Reduce Units for Vertical Curves

Only necessary in very extreme cases

Condition	PORTABLE LED DMS ^a Mounting Height: 7 feet											
	Vertical Curve Design Speed						20-foot Offset			60-foot Offset		
	30 mph	35 mph	40 mph	30 mph	35 mph	40 mph	30 mph	35 mph	40 mph	30 mph	35 mph	40 mph
Mid-Day	3 units	2 units	1 unit	5 units	5 units	3 units	3 units	3 units	3 units	3 units	3 units	3 units
Washout	3 units	2 units	1 unit	5 units	5 units	3 units	3 units	3 units	3 units	3 units	3 units	3 units
Backlight	2 units	1 unit	1 unit	4 units	4 units	2 units	2 units	2 units	2 units	2 units	2 units	2 units
Nighttime	2 units	1 unit	1 unit	4 units	4 units	2 units	2 units	2 units	2 units	2 units	2 units	2 units

^a Valid only for the newer aluminum indium gallium phosphide (or equivalent) LEDs.

DMS Manual: pg 7-9

7-15

Reduce Units for Fog

Table 7.13 Number of Units of Information that Must Be Subtracted from Number Given in Table 7.2 Due to Effects of Fog in Daytime Conditions
PORTABLE LED^a DMS

Visibility Range in Fog	No Offset			20-ft Offset			60-ft Offset		
	0-35 mph	36-55 mph	56-70 mph	0-35 mph	36-55 mph	56-70 mph	0-35 mph	36-55 mph	56-70 mph
0.5 mi	0	0	0	0	0	0	0	0	0
0.25 mi	0	0	1 unit	0	1 unit	1 unit	2 units	2 units	2 units
0.1 mi	2 units	2 units	2 units	3 units	3 units	3 units	5 units ^b	4 units ^b	4 units ^b

^a Valid only for the newer aluminum indium gallium phosphide (or equivalent) LEDs.
^b Adequate sight distance not available for any message under this viewing condition.

DMS Manual: pg 7-19

7-19

Reduce Units for Large Trucks

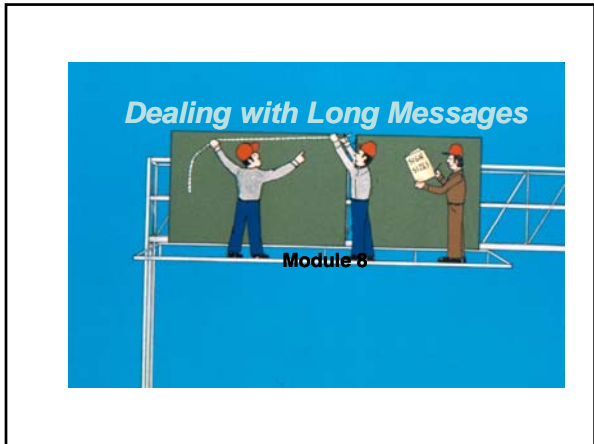
Table 7.17 Percent of Motorists Able to Fully Read a DMS Message with Maximum Base Number of Units (Eight-Lane Roadway; Four Lanes in Each Direction)

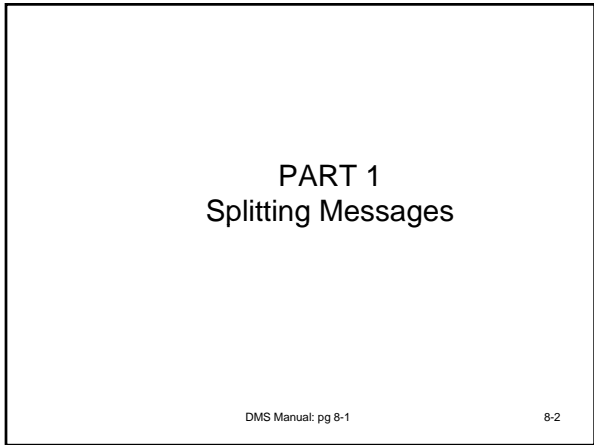
Percent Trucks	Operating Speed Range								
	0-35 mph			36-55 mph			56-70 mph		
	2000 vph	4000 vph	6000 vph	2000 vph	4000 vph	6000 vph	2000 vph	4000 vph	6000 vph
5	90	80	70	90	80	70	90	80	70
10	80	60	45	80	65	45	80	65	45
20	65	35	20*	70	35	20*	65	35	20*
30	60	30*	30*	60	30*	30*	55	30*	30*
50	50*	50*	50*	50*	50*	50*	50*	50*	50*

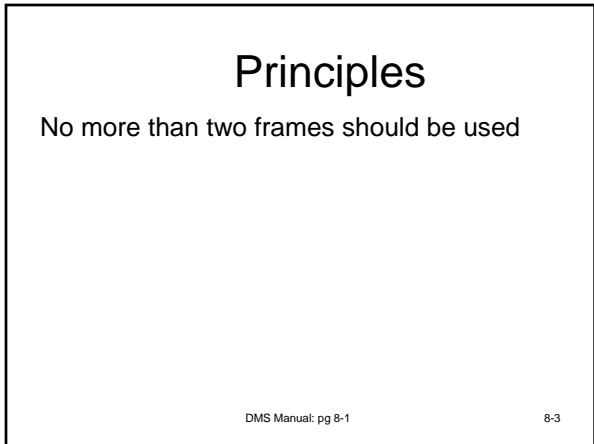
Note: Assumes a 70%/20%/10%/0% split of truck traffic in shoulder, right center, left center, and median travel lanes, respectively.
^a Under these conditions, only truck drivers are assumed to be able to see the DMS.
vph = vehicles per hour.

DMS Manual: pg 7-22

7-20







Principles

Each frame must be understood by itself

Acceptable

MAJOR ACCIDENT
AT I-10
Phase 1

GALVESTON
USE I-410 EAST
Phase 2

Unacceptable

MAJOR ACCIDENT
AT I-10
GALVESTON TRAFFIC
Phase 1

USE
I-410 EAST
Phase 2

DMS Manual: pg 8-1 8-4

Principles

Compatible units of information should be displayed on the same frame

Acceptable

MAJOR ACCIDENT
AT RIVER DR
Phase 1

EXIT AT RT-20
USE
OTHER ROUTES
Phase 2

Unacceptable

MAJOR ACCIDENT
AT RIVER DR
EXIT AT RT-20
Phase 1

USE
OTHER ROUTES
Phase 2

DMS Manual: pg 8-2 8-5

Principles

A message line should not contain portions of two different units of info

Acceptable

MAJOR ACCIDENT
AT RIVER DR
Phase 1

EXIT AT RT-20
USE
OTHER ROUTES
Phase 2

Unacceptable

MAJOR ACCIDENT
AT RT-20
Phase 1

EXIT AT RIVER
DR USE
OTHER ROUTES
Phase 2

DMS Manual: pg 8-3 8-6

Principles

Limit of 3 units of info on a single frame at high speeds

Acceptable

BEST ROUTE
TO DALLAS
USE I-30

Unacceptable

I-45 CLOSED
AT SMITH ST
USE I-30 TO I-35E

DMS Manual: pg 8-4 (example is different than in manual)

8-7

PART 2 Approaches to Reducing Message Length

DMS Manual: pg 8-5

8-8

Reducing Message Length

Delete "Dead" Words
Formatting Messages
Using Abbreviations

DMS Manual: pg 8-5

8-9

Delete Dead Words

Street, Avenue, Boulevard

Ahead

DMS Manual: pg 8-5 8-10

Formatting Messages

Order of information units dependent upon whether *Incident/Roadwork Descriptor* message element is:

- Part of message, or
- Replaced by or combined with *Lanes Closed* message element

DMS Manual: pg 8-6 8-11

Formatting Messages

Messages with *Incident Descriptor*
(One Frame)

Message Elements for Lane Closure Incidents	Message Elements for Freeway Closure Incidents
1. Incident Descriptor	1. Incident Descriptor
2. Incident Location	2. Incident Location
3. Lanes Closed (Blocked)	3. Lanes Closed (Blocked)
4. Audience for Action (if needed)	4. Audience for Action (if needed)
5. Action	5. Action
6. Good Reason for Following Action*	

*When BEST ROUTE TO is used as the Good Reason, then the Good Reason for Following Action message element is placed before the Active message element.

DMS Manual: pg 8-6 8-12

Using Abbreviations

Unacceptable Terms

Table 8.10 UNACCEPTABLE Abbreviation Terms

Word/Phrase	Abbreviation Term	Recommended Alternatives
Alternate Route	ALT RTE	OTHER RTE
Detour Route	DETOUR RT	DETOUR RTE
Feder Road	FEDR RD	FEDER RD
Frontage Road	FRNTO RD	FRONTAGE RD
High Occupancy Vehicle Lane	HOV LANE	Investigate other terms
Interchange 14 Incident at	INTCH 14 INCID AT	Use full word: INTERCHANGE 14 ACCDT AT
Major Congestion	MAJ CONG	ACCID AT MAJ CONGESTION
Road Work	RD WK	ROADWORK
Vicinity of	VIC OF	BEFORE, PAST, AT
Eastbound Traffic	EB TRAFFIC	[route] E
Northbound Traffic	NB TRAFFIC	[route] N
Southbound Traffic	SB TRAFFIC	[route] S
Westbound Traffic	WB TRAFFIC	[route] W
[route] Eastbound	[route] EB	[route] E
[route] Northbound	[route] NB	[route] N
[route] Southbound	[route] SB	[route] S
[route] Westbound	[route] WB	[route] W

DMS Manual: pg 8-12

8-16

PART 3

Reducing Message Units of Information

DMS Manual: pg 8-13

8-17

Reformatting

Units of information can be reduced by:

- Omitting unimportant words
- Omitting redundant information
- Combining *Base DMS Message* elements

DMS Manual: pg 8-13

8-18

The Original Message:

ROAD CLOSED AHEAD
DUE TO CONSTRUCTION
FOLLOW DETOUR ROUTE

Can Be Shortened To:

ROAD CLOSED
1 MILE
FOLLOW DETOUR

With Better Results.

DMS Manual: pg 8-13 8-19

PART 4
Reducing Units of Info from Base
Message

DMS Manual: pg 8-14 8-20

**Reducing Base Message
Units**

Reduce the number of units of info in the
Base DMS Message by:

- Applying Initial Reduction Approaches
- Then Secondary Reduction Approaches
using
- Priority Reduction Principles

DMS Manual: pg 8-14 8-21

Initial Reduction Approaches

Reducing Redundancy in Incident/Roadwork Messages

- Omit reference to same freeway

Message Elements		Revised Message Elements
Incident on Same Freeway (US-75 North) as DMS (US-75 North)		
Incident Descriptor	MAJOR ACCIDENT ON US-75 NORTH PAST I-435	MAJOR ACCIDENT PAST I-435
Location	PAST I-435	
Lanes Closed	ALL LANES CLOSED	ALL LANES CLOSED

DMS Manual: pg 8-14

8-22

Initial Reduction Approaches

Combining Message Elements for Incident Messages

- Combine *Incident Descriptor*, *Location*, *Lanes Affected* elements

Message Elements		Revised Message Elements
Incident on Same Freeway (US-75 North) as DMS (US-75 North)		
Incident Descriptor	MAJOR ACCIDENT AT ARAPAHO RD	FREEWAY CLOSED AT ARAPAHO RD
Location	AT ARAPAHO RD	
Lanes Closed	ALL LANES CLOSED	

DMS Manual: pg 8-15

8-23

Initial Reduction Approaches

Incident on Another Freeway (I-635 West) than DMS (US-75 North)		
Incident Descriptor	MAJOR ACCIDENT ON I-635 WEST AT HILLSIDE RD	I-635 WEST CLOSED AT HILLSIDE RD
Location	AT HILLSIDE RD	
Lanes Closed	ALL LANES CLOSED	
Closed Roadway Due to Incident on Same Freeway (US-75 North) as DMS (US-75 North)		
Incident Descriptor	TRUCK ACCIDENT PAST ARAPAHO RD	FREEWAY CLOSED
Location	ALL LANES CLOSED	
Lanes Closed	ALL LANES CLOSED	
Location of Closure	AT ARAPAHO RD	
Audience for Action	US-75 NORTH TRAFFIC	
Action	EXIT AT ARAPAHO RD FOLLOW DETOUR	EXIT AT ARAPAHO FOLLOW DETOUR
Closed Exit Ramp at Major Interchange (I-435) on Same Freeway (US-75 North) as DMS (US-75 North)		
Incident Descriptor	MAJOR ACCIDENT ON I-435 WEST RAMP	RAMP CLOSED
Location	ON I-435 WEST RAMP	
Lanes Closed	RAMP CLOSED	
Location of Closure	TO I-435 WEST	TO I-435 WEST
Audience for Action	I-435 WEST TRAFFIC	
Action	EXIT FORBEST LANE FOLLOW DETOUR	EXIT AT FORBEST LANE FOLLOW DETOUR

DMS Manual: pg 8-15

8-24

Initial Reduction Approaches

- Combine *Roadwork Descriptor*, *Location* and *Lanes Closed* message elements

Message Elements		Revised Message Elements
Roadwork on Different Highway (I-435 West than DMS (US-75 North))		
Roadwork Descriptor	ROADWORK ON I-435 WEST FROM HILLCREST RD TO PRESTON RD	I-435 WEST CLOSED FROM HILLCREST TO PRESTON
Closure Location		
Lanes Closed	ALL LANES CLOSED	

DMS Manual: pg 8-18

8-28

Initial Reduction Approaches

- Combining *Location of Closure* and *Action* message elements

Message Component and Message		Revised Message
Closed Roadway Due to Roadwork on Same Freeway as DMS		
Roadwork Descriptor	ROADWORK PAST ARAPAH0 RD	FREWAY CLOSED
Lane Closure Location	ALL LANES CLOSED AT ARAPAH0 RD	
Location of Closure	US-75 NORTH TRAFFIC: EXIT AT ARAPAH0 RD	EXIT AT ARAPAH0
Advice for Action	FOLLOW DETOUR	FOLLOW DETOUR

DMS Manual: pg 8-18

8-29

Secondary Reduction Approaches

- Reducing Number of Destinations in *Action* Message Element

Reduced Message After Applying Initial Reduction Approaches		Revised Message	
Roadwork on Same Highway (I-20 East) as DMS (I-20 East)			
I-20 CLOSED	BEST ROUTE TO DALLAS I-35 E USE I-30	I-20 CLOSED	BEST ROUTE TO DALLAS USE I-30
Phase 1	Phase 2	Phase 1	Phase 2

DMS Manual: pg 8-19

8-30

Priority Reduction Principles

Table 8.18 Information Order of Priority for Incidents	
Message Elements For Lane Closure Incidents	Message Elements For Freeway Closure Incidents
1. Lane Closure (Blockage)	1. Freeway Closure (Blocked)
2. Lane Closure Location	2. Location of Closure
3. Diversion Action	3. Diversion Action
4. Audience for Action (if needed)	4. Audience for Action (if needed)

Table 8.19 Information Order of Priority for Roadwork	
Message Elements For Lane Closure for Roadwork	Message Elements for Freeway Closure for Roadwork
1. Lane Closure (Blockage)	1. Freeway Closure (Blocked)
2. Lane Closure Location	2. Location of Closure
3. Action Concerning Speed Reductions	3. Action Concerning Speed Reductions
4. Diversion Action	4. Diversion Action
5. Audience for Action (if needed)	5. Audience for Action (if needed)

DMS Manual: pg 8-20

8-31

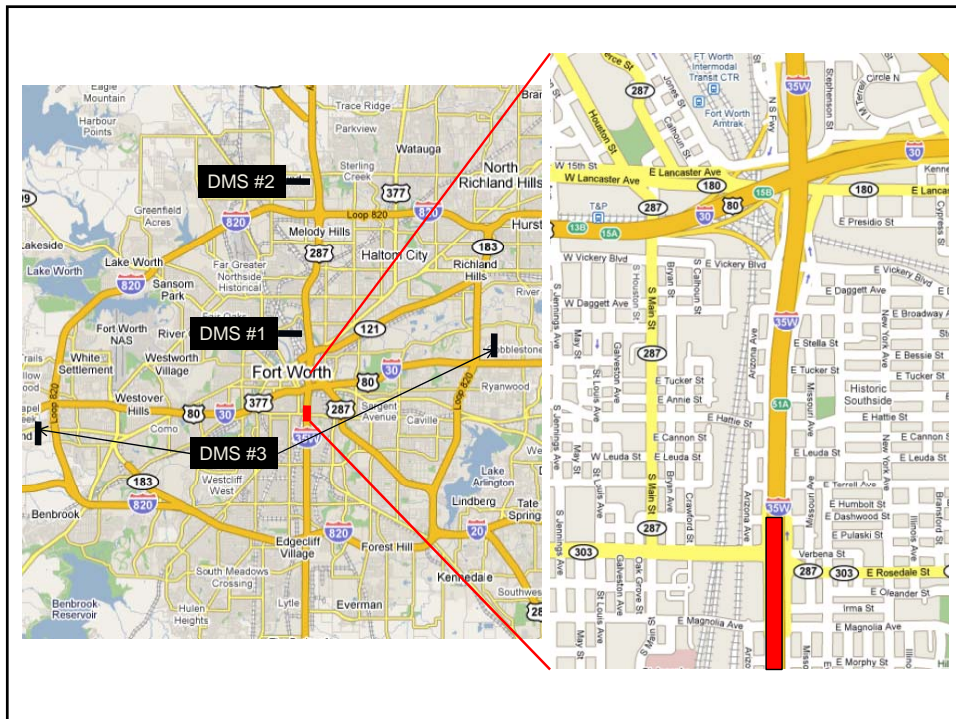
Exercises

Urban Example

A tanker truck overturns on I-35W southbound just past the I-30 interchange. All lanes are closed southbound beginning at the Rosedale Exit (see map on next slide)

- What message should be put on a DMS just upstream of the closure (DMS #1)?
- What message should be put on a DMS prior to I-820 (DMS #2)?
- What message should be put on DMSs on I-30 approaching I-35W (DMS #3)?

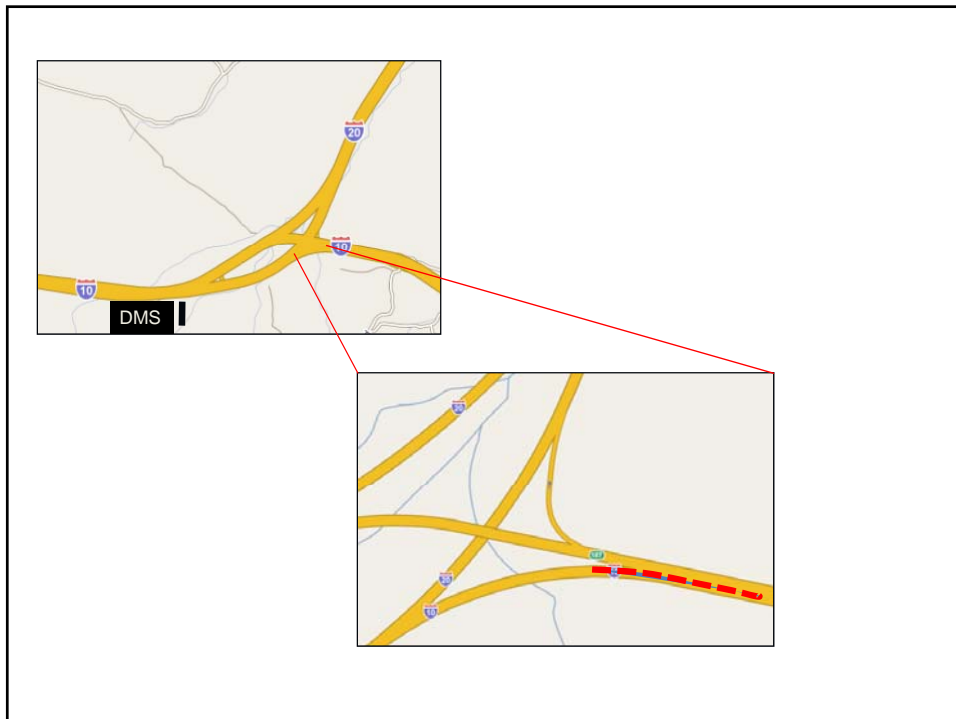
Assume all DMS can display 3 lines at 18 characters per line



Rural Example

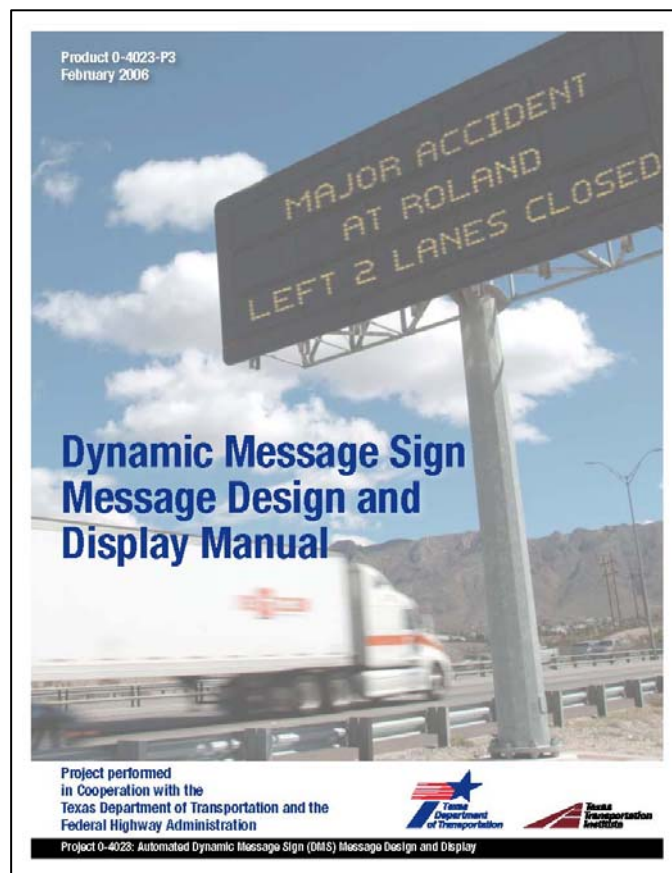
Road repairs are being made in the left lane of I-10 eastbound (2 lanes per direction) just past the I-10/I-20 split in west Texas (see map on next page). The lane closure begins just past the curve.

- What message should be put on a DMS located upstream of the I-10/I-20 split (3 lines, 15 characters per line)?



DYNAMIC MESSAGE SIGN MESSAGE DESIGN & DISPLAY MANUAL TRAINING

Instructor Guide



For
Texas Department of Transportation

March 2009

DMS MESSAGE DESIGN AND DISPLAY TRAINING WORKSHOP

Agenda

Day 1

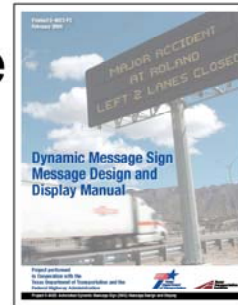
	Duration
Introductions*	20 Min
Module 1	30 Min
Module 2*	30 Min
Break	20 Min
Module 3*	45 Min
Module 4*	75 Min
Break	20 Min
Modules 5 & 6*	30 Min
Module 7*	30 Min

Day 2

Module 8*	30 Min
Break	20 Min
Modules 9 & 10	20 Min
Module 12	10 Min
Module 14	45 Min
Break	20 Min
Final Exercises*	60 Min
Break	20 Min
Module 15	10 Min
Module 16	20 Min
Module 17	20 Min
Module 18	5 Min
Module 19	20 Min

* For a one-day course, these core modules involve 5 hours of instruction.

Dynamic Message Sign Message Design & Display Manual Training Course



OBJECTIVE OF MODULE:

- Introduce the DMS Message Design and Display Manual
- Introduce key concepts to be covered

DURATION:

- 30 Min

POINTS TO ADD:

- Discuss instructor background
- Query students on name, background, previously involvement with DMS and portable changeable message signs (PCMS)

Dynamic Message Signs (DMSs):

Primary real-time links of TxDOT to the
motoring public



DMS Manual: pg 1-1

1-2

POINTS TO ADD:

- If message is not well designed and understood, public impression of TxDOT is degraded

DMSs

Represent primary concept of ITS to public



DMS Manual: pg 1-1

1-3

POINTS TO ADD:

- Other ITS components important (fiber, cameras, sensors, etc.), but are not readily seen or acknowledged by most motorists

DMSs

Messages should be consistent with respect to:

- Content
- Format
- Application

DMS Manual: pg 1-1

1-4

POINTS TO ADD:

- Content = what's said in the message
- Format = how the message is organized
- Application = where and how the message is used in a particular situation
 - Example: whether or not motorists are told if it is a "TRUCK ACCIDENT" or just "MAJOR ACCIDENT"
 - Preference would be the latter, but some districts prefer to use former

DMS Message Design Process

DMS operations require good understanding of:

- Traffic operations
- Human factors

DMS Manual: pg 1-2

1-5

POINTS TO ADD:

- Traffic operations affect how much time a driver will have to view a message if the sign is readable from a given distance away
 - i.e., dependent on how fast traffic is traveling
- Traffic operations concepts are also needed to assess how roadway curvature, large trucks, etc. affect reading times
- An understanding of human factors is needed to understand how far away drivers can read a DMS, and how environmental conditions affect this visibility.
- Human factors also come into play in determining how much information motorists can process and use to make decisions

Message Design Process



DMS Manual: no page reference

1-6

POINTS TO ADD:

- What information motorists want and could use to make driving decisions typically exceeds what they could read and process from a DMS while driving a vehicle
- Thus, information must be prioritized and limited to what they can handle

Message Design Process

$$\text{Required message reading time} \leq \text{Reading time available while approaching DMS}$$

DMS Manual: pg 1-2

1-7

POINTS TO ADD:

- The message designer must limit the amount of information presented on the sign so that the time it takes to read the message (while driving) is less than the maximum time available the sign provides for reading the message

Message Design Process

Required message reading time \leq Reading time available while approaching DMS

Distance traveled during time needed to read message \leq Maximum distance at which message can first be read

DMS Manual: pg 1-2

1-8

POINTS TO ADD:

- Distances traveled during a set period of time are dependent on speed

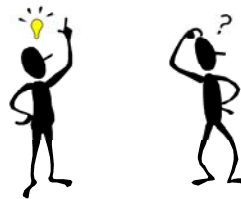
ASK:

- What will a driver do to give him or her more time to read a message? (slow down, possibly creating large speed differentials in traffic stream)

There is a Maximum Message Length

Affected by:

- Legibility distance of message
- Motorist perception, information processing capabilities



DMS Manual: pg 1-2

1-9

POINT TO ADD:

- Even if the DMS is made extremely large, motorist information processing capabilities limit how much information can be effectively used while driving
- Generally, we can only keep up to 5 units of information straight in our short-term memory

Available Message Viewing Distance

Affected by:

- Type of DMS
- Sun position
- Geometric design
- Environmental conditions



DMS Manual: pg 1-2

1-10

POINTS TO ADD:

- We will talk about each of these in more detail later in the workshop

Focus of Manual

- Design of effective messages for incidents & roadwork
- When & where to display messages
- Design of effective messages for:
 - AMBER alert
 - High water & floods
 - Ozone
 - Planned special events

DMS Manual: pg 1-3

1-11

POINTS TO ADD:

- Some concepts presented may differ from your local district practices
- Information presented is based on 30+ years of national research and experiences
- Where practices differ from what is in this manual, find out why the differences exist

DMS Near Incident/Roadwork



DMS Manual: pg 1-2

1-12

POINTS TO ADD:

- Motorist information needs differ depending on where they are relative to an incident or roadwork location

ASK:

- When motorists are just upstream of an incident, what options do they have? (None) What information can they react to?
 - What the problem is
 - Where it is
 - What lane is it in

DMS Far From Incident/Roadwork



DMS Manual: pg 1-2

1-13

ASK:

- When motorists are farther upstream of an incident, what options do they have? (they could find a different route) What information can they react to?
 - What the problem is (helps them assess how bad it is)
 - Where it is (how it affects their trip)
 - How many lanes closed (how bad it is)
 - What other route(s) should be used

DMS on a Different Freeway



DMS Manual: pg 1-2

1-14

POINTS TO ADD:

- In some cases, it is important to help motorists on an intersecting roadway know that there is a problem
 - It may affect some motorists planning to go that way
 - Prepares the rest that there may be more traffic, weaving, etc. from the traffic that is diverting

Manual Designed for:

- New users of DMSs
- Experienced users of DMSs

At

- Entry level
- Experienced with traffic operations
- Managers

DMS Manual: pg 1-1

1-15

POINTS TO ADD:

- Part of the manual explains the underlying principles of message design (new user)
- Part of the manual provides quick reference look up tables for consistent formatting of message elements (experienced users)
- Part of the manual provides analytical procedures to use in high-level message design decisions (managers)

ASK:

Any questions?

Principles of DMS Operations

Module 2

2-1

OBJECTIVE OF MODULE:

Describe the key principles that affect how effective (or ineffective) a DMS message will be for a motorist

DURATION:

30 Min

DMSs are used to manage traffic by displaying:

- Early warning messages



DMS Manual: pg 2-1

2-2

POINTS TO ADD:

- If drivers know about something that will happen in future, they have much more flexibility in how to respond

DMSs are used to manage traffic by displaying:

- Early warning messages
- Advisory messages



DMS Manual: pg 2-1

2-3

POINTS TO ADD:

- Informing drivers of what they will encounter downstream helps them be better prepared to properly react

ASK:

- How well can you make snap or immediate decisions?
Are your decisions and actions usually improved if you have some advance warning about the need to make a decision or to react?

DMSs are used to manage traffic by displaying:

- Early warning messages
- Advisory messages
- Alternative routing messages



POINTS TO ADD:

- Sometimes, it is necessary to encourage or direct drivers to use other routes. This can reduce traffic demand and congestion at the problem location

What Motorists Expect From DMSs

- Up-to-the-minute information

DMS Manual: pg 2-2

2-5

POINTS TO ADD:

- Drivers understand that the signs can be easily changed and should reflect what is going on

ASK:

- What are the challenges to providing up-to-the-minute information?
- How do you address these challenges?

What Motorists Expect From DMSs

- Up-to-the-minute information
- Reliable information

DMS Manual: pg 2-2

2-6

POINTS TO ADD:

- Drivers want to be able to trust the information so that they can make the best decision possible for them

ASK:

- What are the challenges to providing reliable information?
- How do you address these challenges?

What Motorists Expect From DMSs

- Up-to-the-minute information
- Reliable information
- Accurate information

DMS Manual: pg 2-2

2-7

POINTS TO ADD:

- Accurate and reliable information are similar in meaning, but do have subtle differences

ASK:

- Can you have reliable information that is not accurate?
 - Small time between when a problem occurs and when the information is posted on the sign
- Can you have accurate information that is not reliable?
 - Trying to post travel times that are too precise (minutes and seconds), because traffic conditions change too fast

What Motorists Expect From DMSs

- Up-to-the-minute information
- Reliable information
- Accurate information
- Relevant information

DMS Manual: pg 2-2

2-8

POINTS TO ADD:

- Relevant implies that the information being presented will be useful to a significant portion of motorists viewing the sign

Credibility Is Critical!

Never display specific traffic information
before it is verified

DMS Manual: pg 2-2

2-9

POINTS TO ADD:

- “Verified” means that it comes from a DOT or other trusted source and not just a cell phone call from a driver. This is most important when deciding on posting messages about an incident (its location, number of lanes affected, etc.). Automated travel time messages are considered to be verified by the system software, but incident alarms created by the software need to be verified to determine location, lanes blocked, etc. as well.


ASK:

- What can happen if unverified information is used?
 - False alarm (no problem exists)
 - Problem location incorrect
 - Etc.

How Is Credibility Damaged?

By displaying messages that are:

- Inaccurate



RT LANE
CLOSED
AHEAD

DMS Manual: pg 2-2

2-10

POINTS TO ADD:

- None

ASK:

- If it is actually the left lane closed, what problems does that create for the driver?
- Is that worse than if they had not known anything about the problem?

How Is Credibility Damaged?

By displaying messages that are:

- Inaccurate
- Not current

ACCIDENT
1 MILE

POINTS TO ADD:

- Displaying information after the problem has been cleared severely weakens TXDOT credibility with the motoring public

How Is Credibility Damaged?

By displaying messages that are:

- Inaccurate
- Not current
- Irrelevant



DMS Manual: pg 2-2

2-12

POINTS TO ADD:

- Other examples include messages that support a local team (i.e., "GO AGGIES! BEAT XXXX")

ASK:

- What should a motorist who sees this sign decide or do? (nothing. Humorous, but totally irrelevant)

How Is Credibility Damaged?

By displaying messages that are:

- Inaccurate
- Not current
- Irrelevant
- Obvious



CAUTION
CONGESTION
AHEAD

POINTS TO ADD:

- This may be a useful message if it is due to an unexpected situation (i.e., incident) and is beyond the visible range of the congestion. Once in congestion, it is of no use, though

How Is Credibility Damaged?

By displaying messages that are:

- Inaccurate
- Not current
- Irrelevant
- Obvious
- Trivial

EXPECT
1 MIN DELAY
AHEAD

DMS Manual: pg 2-2

2-14

POINTS TO ADD:

- None

ASK:

- Would you do anything different if you saw this message on your way home?

How Is Credibility Damaged?

By displaying messages that are:

- Inaccurate
- Not current
- Irrelevant
- Obvious
- Trivial
- Incorrect (especially numbers)

POINTS TO ADD:

- None



DMS Manual: no page reference

2-16

POINTS TO ADD:

- Credibility of this sign was damaged because no one checked the contractor's employee after he was told to put a message on the sign.

ASK:

- What does this message say? (Prepare to Stop)
- is this a credible sign? (no, click on red X)



DMS Manual: no page reference

2-17

POINTS TO ADD:

- Posting Spanish messages is not currently common practice within TxDOT.

DMS Operating Fundamentals

Module 3

OBJECTIVE OF MODULE:

- Provide an overview of the systems engineering process applied to DMS use

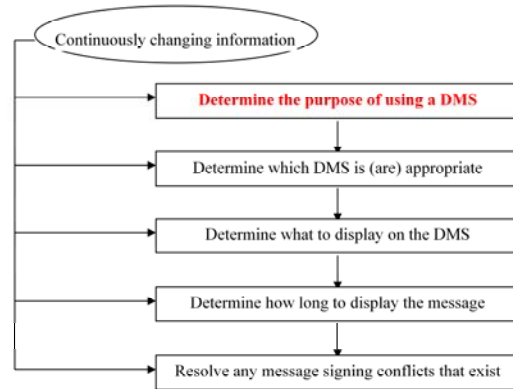
DURATION:

- 45 Min

POINTS TO ADD:

- DMS are tools used to help solve or improve upon problems that drivers encounter
- Systems engineering is a well-accepted approach used in many disciplines to guide problem resolution procedures.
- The problem, and information needed to mitigate the problem, should dictate what, where, and how DMSs are used

DMS Operating Fundamentals



DMS Manual: pg 3-1

3-2

POINTS TO ADD:

- Note that the overall process is a continuously reinforcing system
- The process is also very dynamic, dependent upon when in the process new information is obtained or conditions change

Determine Purpose

What is the problem I am trying to address?

- Type of problem
- Location of problem
- Scope (e.g., number of lanes blocked, minor or major)
- Potential duration
- Extent of impacts

DMS Manual: pg 3-2

3-3

POINTS TO ADD:

- The better the problem being addressed is understood, the better the message that can be created to address it
- It is always important to understand as much about the characteristics of the problem as possible. These are the types of things drivers want to know

Determine Purpose

What verified information do I have?

- Incident
- Conditions on primary route
- Conditions on diversion route

DMS Manual: pg 3-2

3-4

POINTS TO ADD:

- Verified information is that which comes from a trusted source. It may be from cameras, other DOT personnel, law enforcement, etc.
- Information provided directly from drivers is generally not considered verified

Determine Purpose

Who is the audience for the DMS message?

- All users of the freeway
- Select group

DMS Manual: pg 3-3

3-5

POINTS TO ADD:

- None

ASK

•What types of groups may have a need for specific information targeted for them?

- truck traffic
- traffic destined for a specific venue
- traffic planning to travel on the route in the future
- etc.

Determine Purpose

What type of driver response is desired?

- Reduce speed
- Move out of blocked/closed lane
- Take another route

DMS Manual: pg 3-3

3-6

POINTS TO ADD:

- Being more alert and aware of potential trouble may be another response, but is harder to observe or measure

Determine Purpose

What type of driver response is desired?

- Reduce speed
- Move out of blocked/closed lane
- Take another route

Effective messages encourage driver response

POINTS TO ADD:

- none

Determine Purpose

Where should the response take place?

- Type of response desired
- Layout of the roadway system
- Type and severity of problem
- Existing guidance along alternative route

DMS Manual: pg 3-3

3-8

POINTS TO ADD:

- Layout refers to both the location of exits and entrances, continuity of alternative routes, and number of possible alternative routes

Determine Purpose

What degree of response is desired?

- Keep message displayed for more response
- Turn message off for less response

DMS Manual: pg 3-4

3-9

POINTS TO ADD:

- For some messages, you can manage the degree of response by how you choose to display the message
- Changing the content of a message is another way to manage the response to reduce driver response

ASK:

- Can all messages be managed in this way? (no) Which ones can? (messages targeting drivers for a particular destination like a fair or concert) Which ones can't? (messages that indicate an incident ahead)
- How could a message content be changed to affect response? (i.e., showing the estimated delay to increase delay, remove the delay statement to reduce response)

Determine Appropriate DMSs

Proximity of DMSs to problem

Questions:

- Expected problem longer than expected travel time?
- Significant number of motorists passing sign?

DMS Manual: pg 3-4

3-10

POINTS TO ADD:

- It is often difficult to know whether a significant number of motorists passing a DMS are destined to travel past the incident or situation

- ASK

- How do you decide how far away from the problem you will activate DMSs?

Determine Appropriate DMSs

Characteristics of DMS hardware

- Type of sign
- Number of lines
- Number of characters per line
- Need to move portable signs in place
- Relationship to info on static signs

DMS Manual: pg 3-4

3-11

POINTS TO ADD:

- If a permanent DMS is not located in the proper location, or cannot present all of the information that needs to be presented, it may be necessary to supplement them with portable signs (PCMS, static warning signs)
- We do not want to have contradictory information presented on a DMS and on a static sign

Determine Appropriate DMSs

External Influences

- Traffic speed
- Vertical/ horizontal curves
- Sun position
- Guide signs
- Rain or fog

DMS Manual: pg 3-5

3-12

POINTS TO ADD:

- External influences, combined with the characteristics of the DMS itself, define how much time a driver has to view and read a message
- Some of these are only considered in initial positioning of the DMS, others should at least be thought about each time it is used
- ASK
 - Which items are “one-time” factors, and which are “each time” factors? (curvature is a one-time consideration, others may affect messages each time the sign is used)

Determine What to Display

Base information needs and DMS message

- Type of problem
- Location of problem
- Lanes affected
- Location of lane closure
- Effect on Travel

DMS Manual: pg 3-5

3-13

POINTS TO ADD:

- These items are what research indicates drivers want to have in order to make a driving decision and response to a situation

Determine What to Display

Base information needs and DMS message

- Audience for message
- Proper response or driving action by motorist
- Reason to follow recommended driving action

DMS Manual: pg 3-5

3-14

POINTS TO ADD:

- None

Determine What to Display

On diversion routes, operator must know:

- Current traffic conditions
- Current traffic capacity constraints
- Guide sign information

DMS Manual: pg 3-6

3-15

POINTS TO ADD:

- Whenever diversion routes are specified, we do not want to put drivers in a worse situation than they already are

- ASK

- Why would an operator need to know the current capacity constraints when determining what to display? (affects how much traffic the diversion route can handle, could affect what the operator chooses to put on the message to encourage diversion)

Determine Duration of Display

Off-peak

- May be desirable to turn message off by hand

POINTS TO ADD:

- Turning messages on and off by hand allows operators to be more responsive to actual events and conditions, but significantly increases operator workload

Determine Duration of Display

Off-peak

- May be desirable to turn message off manually once no longer needed

Peak

- May be desirable to estimate duration and have system turn message off automatically

DMS Manual: pg 3-7

3-17

POINTS TO ADD:

- On the other hand, having the system turn off messages automatically can reduce operator workload and protect against “forgetting” to turn it off, but reduces responsiveness of the message to conditions

Resolve Signing Conflicts

Most common types of conflicts:

- Two events on same freeway
- One event on freeway and second on intersecting freeway
- One event on freeway and second on connecting freeway in adjacent state

DMS Manual: pg 3-7

3-18

POINTS TO ADD:

- None

Resolve Signing Conflicts

Most common types of conflicts:

- Two events on intersecting freeway
- One event on an intersecting freeway and a second on a connecting freeway in an adjacent state

DMS Manual: pg 3-8

3-19

POINTS TO ADD:

- None

ASK

- What priorities do you establish regarding messages when more than one situation exists that DMS could be used for?

Principles of DMS Message Design

Module 4

OBJECTIVE OF MODULE:

- Present concepts regarding audience selection, message design definitions, concept of a base message, word and word phrase meanings

DURATION:

- 75 Min

PART 1

Overview of Issues

DMS Manual: pg 4-1

4-2

POINTS TO ADD:

- none

Overview of DMS Issues

Direct link with motoring public

Effective Messages

Poorly Designed Message



DMS Manual: pg 4-1

4-3

POINTS TO ADD:

- How DMS are used reflect directly on how the public perceives TxDOT

Overview of DMS Issues

Direct link with motoring public

Messages must be standard and consistent



DMS Manual: pg 4-1

4-4

POINTS TO ADD:

- Motorists travel to different locations, see how other agencies operate their signs
- Consistency improves performance for both familiar and unfamiliar motorists
- Similar in concept to why we standardize signs and markings in the MUTCD

Overview of DMS Issues

Direct link with motoring public

Messages must be standard and consistent

Only few seconds to communicate



DMS Manual: pg 4-1

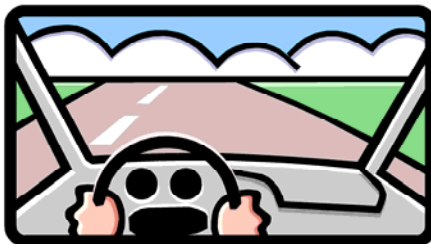
4-5

POINTS TO ADD:

- Time that driver can actually see and read the sign is limited, and must be shared with the other driving tasks that must continuously be attended to

Overview of DMS Issues

Message length controlled by exposure time



DMS Manual: pg 4-1

4-6

POINTS TO ADD:

- Important to only present as much information as drivers can effectively read and process while driving

ASK:

- If a driver does not have enough time to read a message while driving, what can he do to give him more time? (slow down)
- If they slow down, what types of problems can that create? (speed differentials, higher accident potential)

Overview of DMS Issues

Message length controlled by exposure time

Some needed information must be omitted



DMS Manual: pg 4-1

4-7

POINTS TO ADD:

- The more drivers know about a particular situation and what they should do, the better they can react
- Unfortunately, there is usually not enough time available on a single DMS to present all of this information to drivers

Overview of DMS Issues

Message length controlled by exposure time

Some needed information must be omitted

Motorist understanding must be enhanced



DMS Manual: pg 4-2

4-8

POINTS TO ADD:

- There are ways in which the information in a message is presented that can make it easier to motorists to understand. This will increase the likelihood that motorists will correctly interpret the message and act appropriately
- Motorists travel to different locations, see how other agencies operate their signs

PART 2

Selecting an Audience

DMS Manual: pg 4-3

4-9

POINTS TO ADD:

- None

Audience for Message

Why is it necessary to think about the audience of the message?

DMS Manual: pg 4-3

4-10

POINTS TO ADD:

- Information needs can much be different for different audiences
- These information needs may have different levels of urgency
- May have to decide which audience information needs are most critical to be met

Audience for Message

Unfamiliar Motorists Will Have Difficulty Understanding:

- Local street and highway names
- Abbreviations for local landmarks, bridges, entertainment and recreational facilities

= longer message processing times

DMS Manual: pg 4-3

4-11

POINTS TO ADD:

- Also, unfamiliar motorists will be less likely to make diversion decisions based on local hwy names and landmarks provided in message (which may be a good thing in some cases)

PART 3

Definitions and Message Design Considerations

DMS Manual: pg 4-4

4-12

POINTS TO ADD:

- None

Message Design Considerations

Content: specific information displayed

Length: number of words or characters

Load: number of units of information

Info Unit: answer to a motorist question

Format: order of information units

DMS Manual: pg 4-4

4-13

POINTS TO ADD:

- Length and Load are obviously related
- Length is important when trying to figure out if the message can fit on a given sign
- Load is important when determining how much information can be provided to drivers without overloading them

Message Content

Motorists want to know:

- What is wrong ahead
- Where
- What to do
- Reason to follow advice

DMS Manual: pg 4-4

4-14

POINTS TO ADD:

- Many times, the reason is implied by knowing what is wrong and what to do

Message Length

Constraints:

- Message must fit on DMS
- Maximum length controlled by reading time
- Motorist time shares reading & driving task
- Motorist must read entire DMS message
- Message familiarity enhances reading time
 - Reading time longer if unfamiliar
 - Reading time shorter if familiar

DMS Manual: pg 4-4

4-15

POINTS TO ADD:

- Usually, reading time limits amount of information that can be displayed. However, drivers have upper limits to how much they can process at one time (i.e., we can't just make sign letters bigger and put more on them)
- Drivers obtain information from DMS through short (0.5 sec) glances to the sign as they drive. They are not looking at the sign the entire time it is legible

Message Length

8-word maximum at 55 mph

7-word maximum at 65 mph

What if the message is longer than this?

DMS Manual: pg 4-5

4-16

POINTS TO ADD:

- Drivers need 2 seconds per unit of information
- Drivers can only process up to 4 units of information at one time
- Signs are designed to provide legibility distances that meet this 4-unit maximum, but not for the design driver (what we design for)

ASK:

- If message is longer, what happens? (drivers slow down to give themselves more reading time, drivers incorrectly read message and make incorrect decisions or fail to make a decision at all)

Message Length

8-word maximum at 55 mph

7-word maximum at 65 mph

If too long, motorists may reduce speed

***We should always try to minimize the length
of the message***

DMS Manual: pg 4-5

4-17

POINTS TO ADD:

Represents having 8 seconds or viewing time of the sign when traveling at that speed

Drivers require about 2 seconds per unit of information, or about 1 second per word. Given current DMS design characteristics, these are good maximums to try and stay below (although it is not always easy to do)

Message Load and Info Unit

<u>Question</u>	<u>Answer</u>	<u>Info Unit</u>
1. What happened ?	ACCIDENT	1 Unit
2. Where?	PAST ROWLAND	1 Unit
3. Who is advisory for?	FAIR PARK	1 Unit
4. What is advised?	USE FITZHUGH	1 Unit
		4 Units

DMS Manual: pg 4-6

4-18

POINTS TO ADD:

- As shown here, a unit of information can be 1 or 2 words (and in some cases, 3 words).

Message Load and Info Units

Information Units for Entire Message:

- No more than *4 units* for speeds \geq 35 mph
- No more than *5 units* for speeds $<$ 35 mph

Information Units in a Message Phase:

- No more than *3 units*

Information Units on a Line:

- No more than *2 units*

DMS Manual: pg 4-7

4-19

POINTS TO ADD:

- If 5 units, good chance that one of the 5 will not be retained and used by drivers (exceeds short-term memory capacity of some humans)
- Although 2 units can be shown on same lane, they cannot be just part of the unit (i.e., start the unit on one line, finish on the second, start 2nd unit on the 2nd line, finish on the 3rd line)

Message Format

Must place Information Units in the proper order to:

- Enhance motorist expectations
- Reduce reading time
- Enhance understanding

DMS Manual: pg 4-7

4-20

POINTS TO ADD:

- Drivers develop an expectancy of where certain bits of info will be found on a sign (like they know where distance info on a guide sign will be)

PART 4

Base DMS Message

DMS Manual: pg 4-8

4-21

POINTS TO ADD:

- None

Base DMS Message

The “*Base*” DMS Message:

- Sum total of all information motorists want to have
- Will normally exceed the maximum number of information units
- Must normally be reduced in length

DMS Manual: pg 4-8

4-22

POINTS TO ADD:

- Base message consists of base message elements in the manual
- Identifying all of the elements prior to message design ensures that the operator has fully thought through all facets of the situation and what types of information a driver might be able to use to make a better driving decision

Base DMS Message

The *Base DMS Message* Elements

- Incident/Roadwork Descriptor
- Incident/Roadwork Location
- Lanes Affected
- (Closure Descriptor)
- (Location of Closure)

DMS Manual: pg 4-8

4-23

POINTS TO ADD:

- 9 points are shown on this slide and next, but those in parentheses are only applicable to full roadway closure situations

Base DMS Message

The *Base DMS Message Elements* (cont'd)

- Effect on Travel
- Audience for Action
- Action
- One Good Reason for Following Action

DMS Manual: pg 4-8

4-24

POINTS TO ADD:

- none

Descriptor Element

Descriptor element informs motorists of the unusual situation

DMS Manual: pg 4-8

4-25

POINTS TO ADD:

- Number 1 item always indicated by motorists is to be told what the problem is. It helps them establish expectations about what they are likely to encounter

Location Element

Location element informs motorists of the location of unusual situation

- Must follow the Descriptor
- No need for route number or name if on same freeway

DMS Manual: pg 4-9

4-26

POINTS TO ADD:

- None

Location Element

For commuters:

- Reference to street names, exit names or numbers, landmarks

For unfamiliar motorists:

- Reference by distance, exit numbers

DMS Manual: pg 4-9

4-27

POINTS TO ADD:

- Most commuters travel without knowing distances (rely on names and landmarks)
- Unfamiliar drivers generally have no frame of reference of where a street name is relative to their route (unless it is where they intended to exit)

Location Element

Preferred by Familiar or Unfamiliar Drivers?

familiar

ACCIDENT
AT ROWLAND

unfamiliar

ACCIDENT
1 MILE

*both familiar
and unfamiliar*

ACCIDENT
AT EXIT 12

DMS Manual: pg 4-9

4-28

POINTS TO ADD:

- None

ASK:

- Is 1st message for familiar or unfamiliar? (familiar)
- Is 2nd message for familiar or unfamiliar? (unfamiliar)
- Is 3rd message for familiar or unfamiliar? (both)

Location Element

Subtle differences in location terms can be important

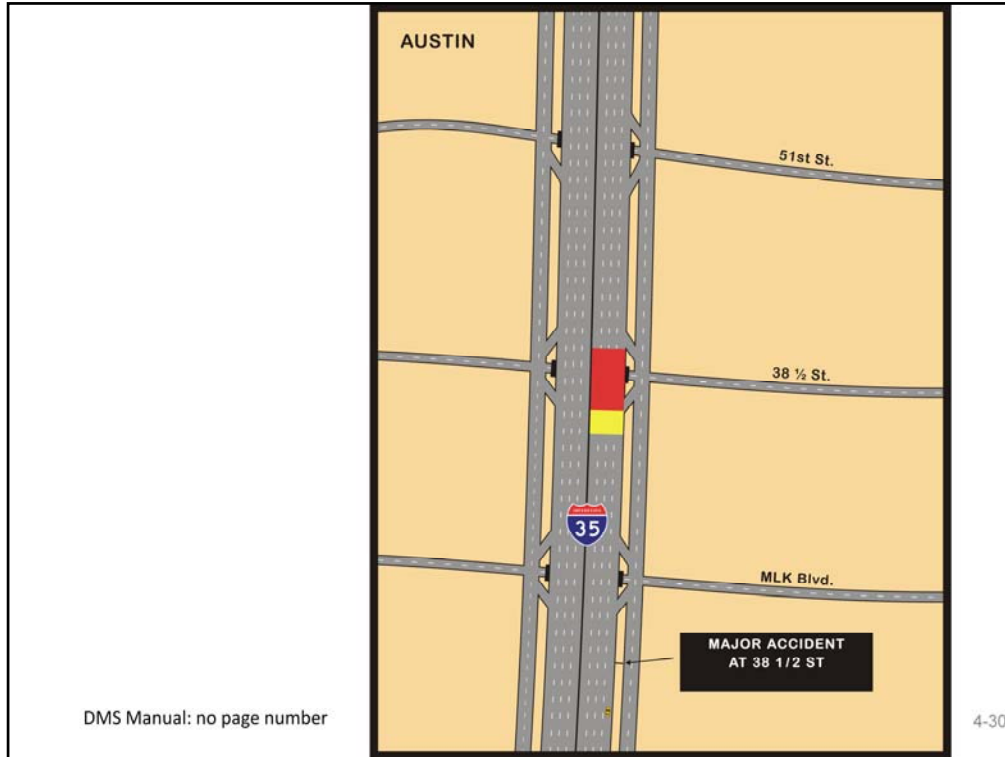
- Near
- At
- Before
- Past
- From
- Between

DMS Manual: no page number

4-29

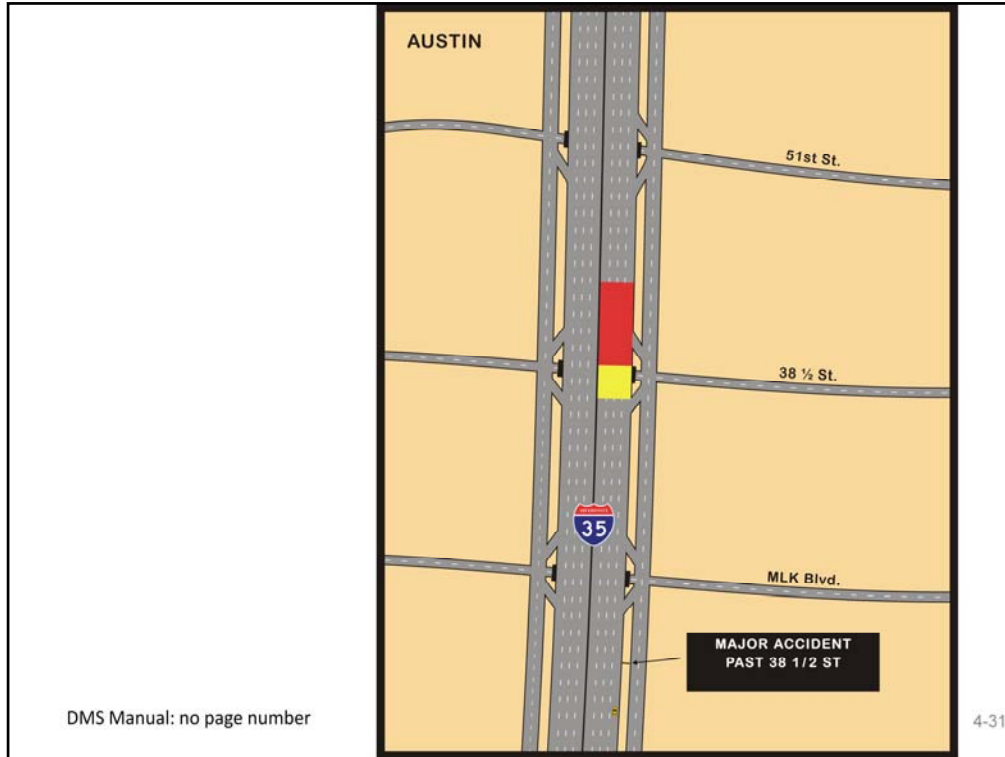
POINTS TO ADD:

- Studies have indicated that these terms do consistently imply where the problem is located on a facility



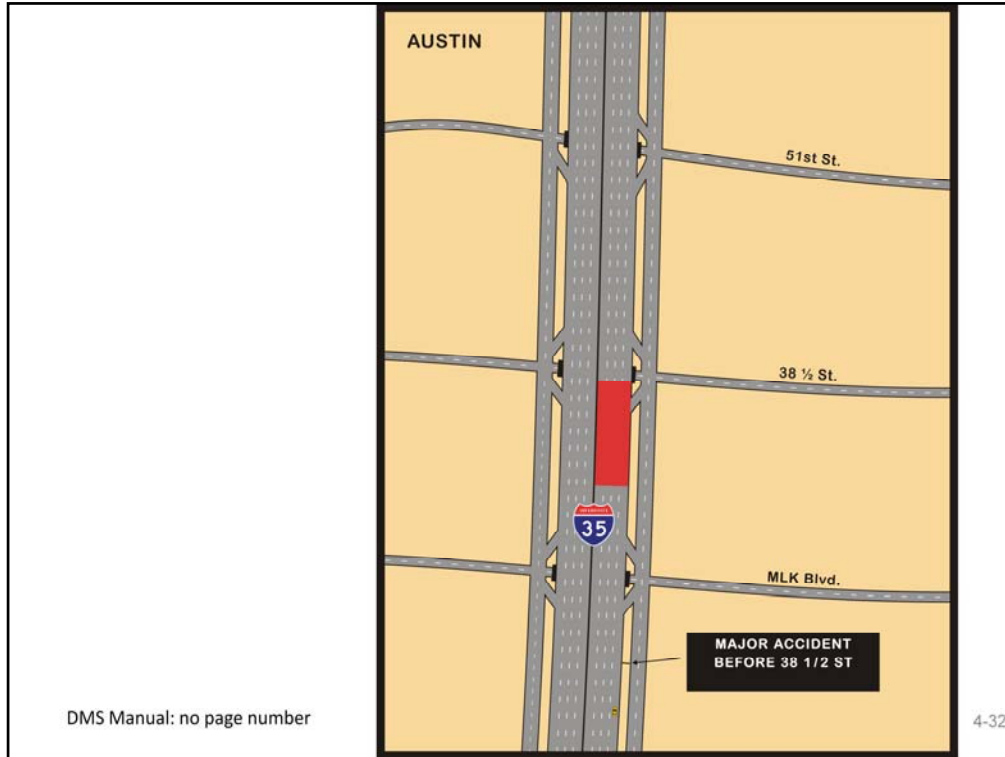
POINTS TO ADD:

- When the term “AT” is used, it implies to motorists that the exit to the cross street referenced by the “AT” term may not be available, but the entrance ramp past the cross-street would be open and available



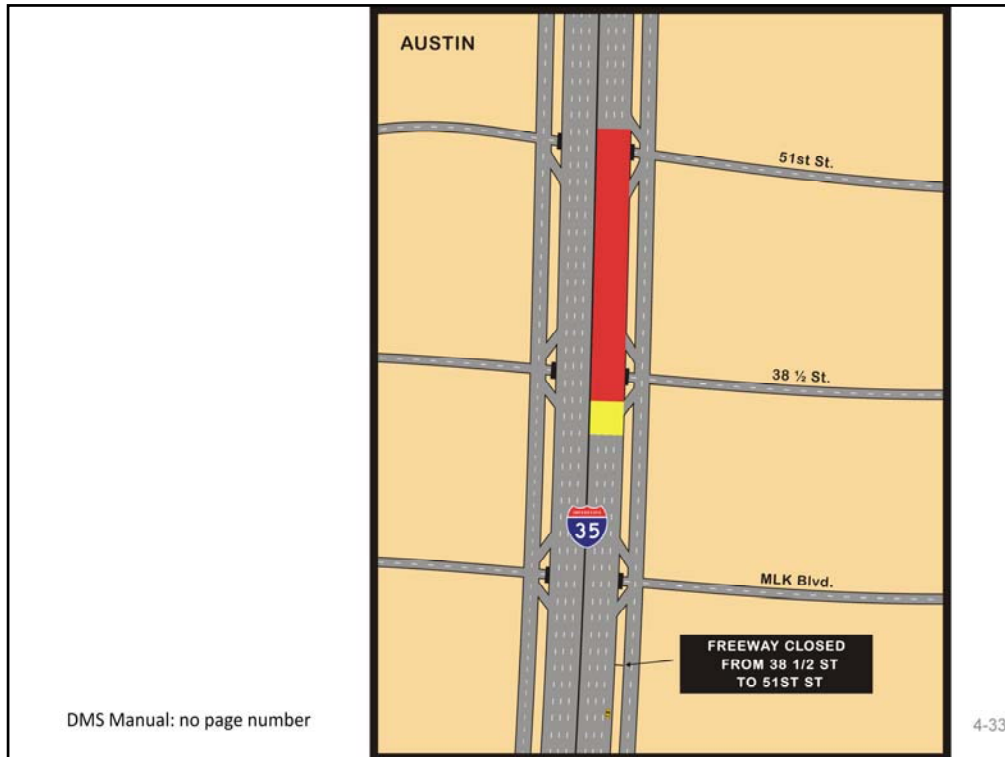
POINTS TO ADD:

- The term “PAST” implies to drivers that the exit ramp to the location named is open. However, the entrance ramp past the named location is not expected to be available to be used by drivers to return to the freeway



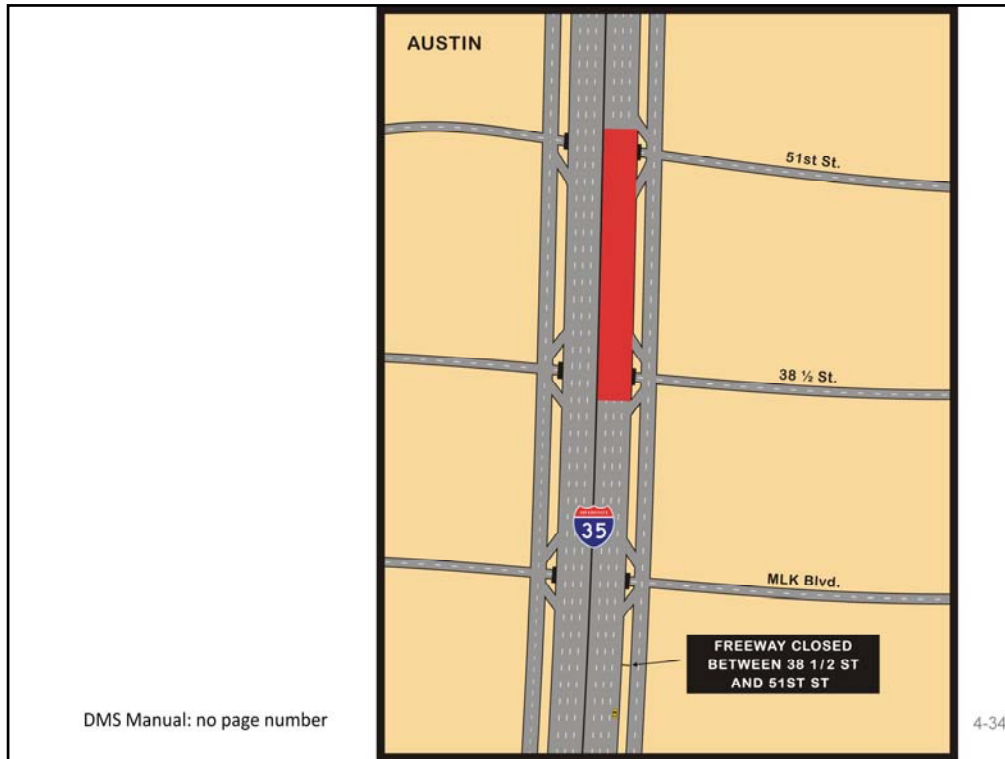
POINTS TO ADD:

- If the term “BEFORE” is used in the location element, the exit ramp to the named location is believed not be available, but the entrance past that name location is expected to be open and available



POINTS TO ADD:

- When the problem extends over a length of roadway, the “FROM” to “TO” terms can be used together
- The exit to the “FROM” location is expected by drivers to be open, and the entrance ramp after the “TO” location is also expected to be open and beyond the limits of the roadway problem



POINTS TO ADD:

- The terms “BETWEEN” and “AND” work like the “FROM/TO” pair to indicate a length of roadway segment
- This pair is longer than “FROM/TO”, so it doesn’t tend to be used as much
- Driver expectations of ramp availability is the same as for the “FROM/TO” combination

Lanes Affected Element

Lanes Affected element gives specific info about which lanes or exit ramps are closed or blocked

Helps motorists prepare to change to open lanes or use another ramp

DMS Manual: pg 4-10

4-35

POINTS TO ADD:

- none

Closure Descriptor Element

Closure Descriptor element used in place of *Incident/Roadwork* Descriptor when all lanes are closed

DMS Manual: pg 4-10

4-36

POINTS TO ADD:

- Often, the point where the roadway is closed is a significant distance upstream of where the problem is located
- On freeways, this will always be at an exit ramp

Effect on Travel Element

Effect on Travel element informs motorist of severity of problem

Helps motorist make informed diversion decisions

Can imply expected arrival time

DMS Manual: pg 4-10

4-37

POINTS TO ADD:

- Drivers are looking for information they can use on whether or not they should seek another route
- Lanes closed can also imply travel time impacts

Effect on Travel Element

Delay

- (number) MIN DELAY
- AVOID (number) MIN DELAY
- SAVE (*number*) MIN

ACCIDENT
AT EXIT 12
20 MIN DELAY
USE ROUTE 46

*Example of
"X MIN DELAY"*

ACCIDENT
AT EXIT 12
USE ROUTE 46
AVOID 20 MIN DELAY

*Example of
"AVOID X MIN DELAY"*

ACCIDENT
AT EXIT 12
USE ROUTE 46
SAVE 20 MIN

*Example of
"SAVE X MIN"*

DMS Manual: pg 4-11

4-38

POINTS TO ADD:

- Drivers correctly interpret DELAY to mean additional time beyond their normal trip time
- Driver threshold of tolerable delay before seeking a different route depends on the network
 - If frontage road available (and relatively open), 5 minutes or more of delay may yield substantial delay
 - W/O frontage roads, generally takes 20 minutes of delay before most people will consider diverting
- Very few agencies now using "SAVE XX MIN". Some concern that it can be misinterpreted by drivers, especially if their total trip time is still longer than normal. If they do not know how much additional delay they would have had, they may refute agency claims that they actually saved time by taking the alternative route

Effect on Travel Element

Travel Time

- Motorists can measure and refute
- Speed sensors ⇒ large errors in congested conditions

**TRAVEL TIME
TO DOWNTOWN
10 MIN AT 8:20**

**TRAVEL TIME
TO DOWNTOWN
8-12 MINS**

DMS Manual: pg 4-12

4-39

POINTS TO ADD:

- Travel times are desired by motorists
- FHWA encourages display of travel times on DMS (July 2004 policy memorandum)
- Systems that use spot sensors to measure speed and extrapolate to travel times can yield large errors in actual travel times when conditions are congested
- Fortunately, drivers understand that estimates are approximations only. This can be further emphasized as shown (one on left is how Houston formats their message, one on right is how San Antonio does it). Examples of these formats can be found outside of TX as well

Audience for Action Element

Audience for Action element used only when the *Action* applies to a specific group of motorists

Thus, must always be accompanied by an *Action* message element

DMS Manual: pg 4-13

4-40

POINTS TO ADD:

- Special events can often require audience-specific information

Audience for Action Element

The word *TRAFFIC* with a destination is not generally used. There is one exception

MAJOR ACCIDENT PAST I-30
FAIR PARK USE FITZHUGH

"TRAFFIC" not required

MAJOR ACCIDENT FAIR PARK TRAFFIC USE FITZHUGH
--

"TRAFFIC" required

DMS Manual: pg 4-14

4-41

POINTS TO ADD:

- None

ASK:

- Why does the message on the right require the word "TRAFFIC"?
- What would happen if it was not included in that message? (drivers would be confused whether FAIRPARK was the location of the accident or the audience who should use FITZHUGH)

Action Element

Action element is necessary because it tells motorists what to do

It is best that every incident management message have an *Action* statement

DMS Manual: pg 4-14

4-42

POINTS TO ADD:

- none

Good Reason Element

Motorists must be confident that he/she is taking the best course of action

In most cases, the *Good Reason* is implied

DMS Manual: pg 4-14

4-43

POINTS TO ADD:

- Again, special event messages are often where a good reason is beneficial in the message if you want the motorist to make a specific action (such as use a different route to the venue)

PART 5

Word and Word Phrase Meanings and Criteria

DMS Manual: pg 4-15

4-44

POINTS TO ADD:

- none

Word Meanings & Criteria

USE - Route that will take motorists to destination

TAKE - Directive to begin first “leg” of route

FOLLOW - Motorist will be guided by other signs

EXIT - Sometimes used as a verb

GO – Not used

DMS Manual: pg 4-15

4-45

POINTS TO ADD:

- USE* implies that the motorist need not return back to the original route, that the *USE* route will get them directly to their destination
- TAKE* implies additional info is forthcoming, help will exist along the way
- FOLLOW* implies a trailblazing or other signing will guide all along the route
- Remember that *EXIT* is both a noun and a verb. OK to use as a verb (*EXIT AT xx*), but make sure it is obvious that it is not the noun (*EXIT xx*) that is being referred to

Word Meanings & Criteria

ROADWORK – shorter than CONSTRUCTION

EXIT – when referring to an off ramp on freeway

RAMP – when referring to an on ramp

NITE – shorter than *NIGHT*

FOR 1 WEEK – *Mon through Fri*

WEEKEND – *Sat AM to Sun PM*

DMS Manual: pg 4-15

4-46

POINTS TO ADD:

- FOR 1 WEEK does not include weekends
- WEEKEND does not include Friday PM or early Monday morning up to peak period

Advance Notification Messages

- Use dates only when necessary
- Use text/number format (i.e., JUN 12)
- Do not repeat month abbreviation (i.e., JUN 12 – 15)
- Avoid day/date/time messages because it far exceeds information load limits

DMS Manual: pg 4-17 and TTI Report 0-4748-1

4-47

POINTS TO ADD:

- Dates only when necessary – drivers do not easily translate dates into days in the future when they may be traveling
- If “Tomorrow” would work for the message, that would be a better choice
- Posting day, date, and time information about a future event is of little or no benefit, because drivers cannot process that much info correctly

PART 6

Diversion/Detour Route Descriptors

DMS Manual: pg 4-19

4-48

POINTS TO ADD:

- None

Route Characteristic Differences

Presence of electronic or human surveillance

Existing guide signs or trailblazers to freeway

Police and/or traffic control personnel at critical decision points

Incident emergency route plan signing

Roadwork traffic control plan (temporary traffic control devices present)

See Tables 4.1 and 4.2 (p. 4-22)

DMS Manual: pg 4-19

4-49

POINTS TO ADD:

- All of these factors influence what type of information can be posted on a message that indicates diversion or detour information to drivers
- Specific diversion route information is typically not provided for fear of overloading the recommended route (although many drivers will choose a route different than the recommended route exactly because of that concern)

PART 7

Dynamic Features on DMSs

DMS Manual: pg 4-23

4-50

POINTS TO ADD:

- None

Dynamic Features on DMSs

AVOID flashing an
entire one-
phase message

MAJOR ACCIDENT
AT ROWLAND
LEFT 2 LANES CLOSED

DMS Manual: pg 4-23

4-51

POINTS TO ADD:

- Does not necessarily imply more important info to drivers
- Increases reading time required by drivers (may have to reduce amount of information to be provided)
- May also reduce level of comprehension by drivers
- No evidence to suggest that drivers are more likely to “see” the message if it is flashing (drivers do see messages even when not flashing; they may choose to ignore the info regardless of whether the message is flashed or not).

Dynamic Features on DMSs

AVOID flashing one
line of a one-
phase message

**MAJOR ACCIDENT
AT ROWLAND
LEFT 2 LANES CLOSED**

DMS Manual: pg 4-23

4-52

POINTS TO ADD:

- This technique also increases reading time, reduce comprehension rate by drivers
- Flashing info may be remembered; however, this comes at a price of lower retention rates of the other info

Dynamic Features on DMSs

AVOID alternating text

**MAJOR ACCIDENT
AT ROWLAND
LEFT 2 LANES CLOSED**

DMS Manual: pg 4-24

4-53

POINTS TO ADD:

- This technique also increases reading time over the standard practice of dividing the info into two separate phases

Dynamic Features on DMSs

AVOID alternating text

**MAJOR ACCIDENT
AT ROWLAND
TUNE TO 530 AM**

DMS Manual: pg 4-24

4-54

POINTS TO ADD:

- This technique also increases reading time over the standard practice of dividing the info into two separate phases

Designing Base Message: Incidents and Roadwork

Modules 5 & 6



OBJECTIVE OF MODULE:

Illustrate how the tables in Modules 5 and 6 are used to select statements and phrases corresponding to each base message element

DURATION:

30 Min

Base Message Elements

Incident/Roadwork Descriptor

Incident/Roadwork Location

Lanes Closed

Effect on Travel

Audience for Action

Action

Good Reason for Following Action

DMS Manual: pg 5-1 & 6-1

5&6-2

POINTS TO ADD:

- These were described in Module 4. In these modules, tables have been prepared to aid selection of appropriate phrase formats for each element

Lane Closures: DMS Close to Incident/Roadwork



DMS Manual: pg 5-2 & 6-2

5&6-3

POINTS TO ADD:

- Much of the information in Modules 5 and 6 is redundant, intended to be used as reference modules to look up appropriate/acceptable phrasing of base message elements
- Will review what exists in the portion of the modules that target lane closure situations, DMS close to the problem

Incident/Roadwork Descriptor

Table 5.1 INCIDENT DESCRIPTORS
DMS ON SAME FREEWAY AND RELATIVELY CLOSE TO INCIDENT

<u>Large Signs</u>	<u>Portable Signs</u>
ACCIDENT	ACCIDENT
ACCIDENT AHEAD	ACCIDENT AHEAD
MAJOR ACCIDENT	MAJOR ACCIDENT
MINOR ACCIDENT	MINOR ACCIDENT
TRUCK ACCIDENT	TRUCK ACCIDENT
STALLED VEHICLE	STALLED VEHICLE
VEHICLE FIRE	VEHICLE FIRE
FUEL SPILL	FUEL SPILL

"|" Indicates that the next portion of the message will be displayed on the next line(s) of DMS.

Table 6.1 ACCEPTABLE ROADWORK DESCRIPTORS
DMS ON SAME FREEWAY AND RELATIVELY CLOSE TO ROADWORK

<u>Large Signs</u>	<u>Portable Signs</u>
CONSTRUCTION*	CONST or ROADWORK*
ROADWORK	ROADWORK

* The word *CONSTRUCTION* will not fit on an eight-character line of a portable DMS. Therefore, the word must either be abbreviated or replaced with the word *ROADWORK*.

DMS Manual: pg 5-2 & 6-2

5&6-4

POINTS TO ADD:

- The process in both modules is identical. Tables have been prepared for each of the base message elements previously discussed. The user goes to the appropriate table for each element and selects a phrase
- The tables show how the phrase would be displayed on a permanent DMS and also on a PCMS

Incident/Roadwork Location

**Table 5.2 TERMS FOR INCIDENT LOCATION
DMS ON SAME FREEWAY AND RELATIVELY CLOSE TO INCIDENT**

Large Signs	Portable Signs
1 MILE (AHEAD)	1 MILE (AHEAD)
[number] MILES (AHEAD)	[number] MILES (AHEAD)
AHEAD	AHEAD
AT [highway, street name]	AT [highway, street name]
AT [exit ramp name] EXIT	AT [exit ramp name] EXIT
BEFORE [highway, street name]	BEFORE [highway, street name]
BEFORE [exit ramp name] EXIT	BEFORE [exit ramp name] EXIT
PAST [highway, street name]	PAST [highway, street name]
PAST [exit ramp name] EXIT	PAST [exit ramp name] EXIT
ON LEFT SHOULDER	ON LEFT SHOULDER
ON RIGHT SHOULDER	ON RIGHT SHOULDER
ON MAIN LANES	ON MAIN LNS
OVER [highway, street name]	OVER [highway, street name]

^{***} Indicates that the next portion of the message will be displayed on the next line(s) of DMS.

**Table 6.2 ACCEPTABLE TERMS FOR ROADWORK LOCATION
DMS ON SAME FREEWAY AND RELATIVELY CLOSE TO ROADWORK**

Large Signs	Portable Signs
1 MILE (AHEAD)	1 MILE (AHEAD)
[number] MILES (AHEAD)	[number] MILES (AHEAD)
AHEAD	AHEAD
AT [highway, street name]	AT [highway, street name]
AT [exit ramp name] EXIT	AT [exit ramp name] EXIT
BEFORE [highway, street name]	BEFORE [highway, street name]
BEFORE [exit ramp name] EXIT	BEFORE [exit ramp name] EXIT
PAST [highway, street name]	PAST [highway, street name]
PAST [exit ramp name] EXIT	PAST [exit ramp name] EXIT
OVER [highway, street name]	OVER [highway, street name]
FROM [highway, street name] TO [highway, street name]	
FROM [highway, street name] TO [exit ramp name] EXIT	
FROM [exit ramp name] EXIT TO [highway, street name]	
FROM [exit ramp name] EXIT TO [exit ramp name] EXIT	

^{***} Indicates that the next portion of the message will be displayed on the next line(s) of DMS.

POINTS TO ADD:

- For roadwork situations, location of the problem often extends over a significant length of roadway (i.e., lanes are closed for several miles). Table 6.2 shows how the “FROM/TO” combination of terms are used to define the problem location

Lanes Closed

**Table 5.3 TERMS FOR LANES CLOSED
DMS ON SAME FREEWAY AND RELATIVELY CLOSE TO INCIDENT**

<u>Large Signs</u>	<u>Portable Signs</u>
ALL LANES CLOSED	ALL LANES CLOSED
CENTER LANE CLOSED	CENTER LANE CLOSED
CENTER LANES CLOSED	CENTER LANES CLOSED
CENTER [number] LANES CLOSED	CENTER [number] LANES CLOSED
LEFT LANE CLOSED	LEFT LANE CLOSED
LEFT [number] LANES CLOSED	LEFT [number] LANES CLOSED
RIGHT LANE CLOSED	RIGHT LANE CLOSED
RIGHT [number] LANES CLOSED	RIGHT [number] LANES CLOSED
FREEWAY CLOSED	FREEWAY CLOSED
EXIT TO [highway, street name] CLOSED	EXIT TO [highway, street name] CLOSED

"|" Indicates that the next portion of the message will be displayed on the next line(s) of DMS.

**Table 6.3 ACCEPTABLE TERMS FOR LANES CLOSED
DMS ON SAME FREEWAY AND RELATIVELY CLOSE TO ROADWORK**

<u>Large Signs</u>	<u>Portable Signs</u>
CENTER LANE CLOSED	CENTER LANE CLOSED
CENTER LANES CLOSED	CENTER LANES CLOSED
CENTER [number] LANES CLOSED	CENTER [number] LANES CLOSED
LEFT LANE CLOSED	LEFT LANE CLOSED
LEFT [number] LANES CLOSED	LEFT [number] LANES CLOSED
RIGHT LANE CLOSED	RIGHT LANE CLOSED
RIGHT [number] LANES CLOSED	RIGHT [number] LANES CLOSED

"|" Indicates that the next portion of the message will be displayed on the next line(s) of DMS.

DMS Manual: pg 5-4 & 6-4

5&6-6

POINTS TO ADD:

- When displaying that multiple lanes are closed, consensus of panel was to use LEFT or RIGHT x LANES CLOSED

Effect on Travel

Large Signs EXPECT DELAY EXPECT MAJOR DELAY EXPECT MINOR DELAY	Portable Signs EXPECT DELAY EXPECT MAJOR DELAY EXPECT MINOR DELAY
--	---

"|" Indicates that the next portion of the message will be displayed on the next line(s) of DMS.

Large Signs EXPECT DELAY EXPECT MAJOR DELAY EXPECT MINOR DELAY	Portable Signs EXPECT DELAY EXPECT MAJOR DELAY EXPECT MINOR DELAY
--	---

"|" Indicates that the next portion of the message will be displayed on the next line(s) of DMS.

DMS Manual: pg 5-5 & 6-5

5&6-7

POINTS TO ADD:

- Generally, EXPECT DELAY does not provide much useful info to drivers (seen too much, does not imply anything to drivers)
- MAJOR delay, implies 45 minutes of delay or more (to 50 percent or more of drivers)
- MINOR delay implies 20 minutes of less to most drivers

ASK:

- If delays are between 20 and 45 minutes, what should be used? (if MAJOR is used, drivers are expecting worse conditions than they will actually encounter, probably a better choice than just EXPECT DELAY)

Action

Motorists are not advised to take an alternative route: No diversion

Table 5.5 TERMS FOR ACTION DMS ON SAME FREEWAY AND RELATIVELY CLOSE TO INCIDENT MOTORISTS ARE NOT ADVISED TO TAKE AN ALTERNATIVE ROUTE- NO DIVERSION ACTION	
Large Signs BE PREPARED TO STOP USE CAUTION	Portable Signs BE REPARED TO STOP USE CAUTION

"|" Indicates that the next portion of the message will be displayed on the next line(s) of DMS.

Table 6.5 ACCEPTABLE TERMS FOR ACTION DMS ON SAME FREEWAY AND RELATIVELY CLOSE TO ROADWORK MOTORISTS ARE NOT ADVISED TO TAKE AN ALTERNATIVE ROUTE- NO DIVERSION ACTION	
Large Signs BE PREPARED TO STOP USE CAUTION	Portable Signs BE PREPARED TO STOP USE CAUTION

"|" Indicates that the next portion of the message will be displayed on the next line(s) of DMS.

DMS Manual: pg 5-6 & 6-6

5&6-8

POINTS TO ADD:

- Action elements depend on whether or not diversion recommendations are to be made (diversion can be hard (forced) or soft (encouraged, but not required))
- If no diversion is going to be suggested, these terms are suggested for consideration

ASK:

- Have you used action statements different than these when there is no recommendation to divert?

Action *soft diversion*

Table 5.6 TERMS FOR ACTION
DMS ON SAME FREEWAY AND RELATIVELY CLOSE TO INCIDENT
MOTORISTS ARE ADVISED TO TAKE AN ALTERNATIVE ROUTE-
SOFT DIVERSION

Large Signs
USE OTHER ROUTES

Portable Signs
USE | OTHER | ROUTES

"|" Indicates that the next portion of the message will be displayed on the next line(s) of DMS.

Table 6.6 ACCEPTABLE TERMS FOR ACTION
DMS ON SAME FREEWAY AND RELATIVELY CLOSE TO ROADWORK
MOTORISTS ARE ADVISED TO TAKE AN ALTERNATIVE ROUTE-
SOFT DIVERSION

Large Signs
USE OTHER ROUTES

Portable Signs
USE | OTHER | ROUTES

"|" Indicates that the next portion of the message will be displayed on the next line(s) of DMS.

DMS Manual: pg 5-7 & 6-7

5&6-9

POINTS TO ADD:

- Many operators like to use the term ALTERNATIVE, but it is obviously longer than the word OTHER

ASK:

- Have any of you used different terms to encourage drivers to use a different route?

Action

Motorists are advised to take a specific Type 2 diversion route

Table 5.7 ACCEPTABLE TERMS FOR ACTION
DMS ON SAME FREEWAY BUT RELATIVELY FAR FROM INCIDENT
MOTORISTS ARE ADVISED TO TAKE A TYPE 2 DIVERSION ROUTE

Large Signs

EXIT AND USE | [freeway] [cardinal direction]
USE | [freeway] [cardinal direction]
TUNE RADIO TO [number] AM

Portable Signs

EXIT | AND USE | [freeway] [cardinal direction]
USE | [freeway] [cardinal direction]
TUNE | RADIO | TO [number] AM

"|" Indicates that the next portion of the message will be displayed on the next line(s) of DMS.

Table 6.7 ACCEPTABLE TERMS FOR ACTION
DMS ON SAME FREEWAY AND RELATIVELY CLOSE TO ROADWORK
MOTORISTS ARE ADVISED TO TAKE A TYPE 2 DIVERSION ROUTE

Large Signs

EXIT AND USE | [freeway] [cardinal direction]
USE | [freeway] [cardinal direction]
TUNE RADIO TO [number] AM

Portable Signs

EXIT | AND USE | [freeway] [cardinal direction]
USE | [freeway] [cardinal direction]
TUNE | RADIO | TO [number] AM

"|" Indicates that the next portion of the message will be displayed on the next line(s) of DMS.

DMS Manual: pg 5-8 & 6-8

5&6-10

POINTS TO ADD:

- From Tables 4.1 and 4.2, a type 2 diversion route has:
 - Surveillance (electronic, regular manual checks of conditions, etc.)
 - Signing that exists to direct motorists how to get back to the freeway or to the destination (if it is a diversion route for a special event, for instance)

Audience for Action

**Table 5.8 TERMS FOR AUDIENCE FOR ACTION
DMS ON SAME FREEWAY AND RELATIVELY CLOSE TO INCIDENT**

<u>Large Signs</u>	<u>Portable Signs</u>
<i>[highway, street name] [cardinal direction]</i>	<i>[highway, street name] [cardinal direction]</i>
<i>[highway, street name] [cardinal direction] TRAFFIC</i>	<i>[highway, street name] [cardinal direction] TRAFFIC</i>
<i>[route number] [cardinal direction]</i>	<i>[route number] [cardinal direction]</i>
<i>[name of city or state]</i>	<i>[name of city or state]</i>
<i>[name of event, tourist attraction]</i>	<i>[name of event, tourist attraction]</i>
<i>[name of stadium, park, etc.]</i>	<i>[name of stadium, park, etc.]</i>
<i>TO [highway, street name][cardinal direction]</i>	<i>TO [highway, street name][cardinal direction]</i>
<i>TO [route number] [cardinal direction]</i>	<i>TO [route number] [cardinal direction]</i>
<i>TO [name of city or state]</i>	<i>TO [name of city or state]</i>
<i>TO [name of event, tourist attraction]</i>	<i>TO [name of event, tourist attraction]</i>
<i>TO [name of stadium, park, etc.]</i>	<i>TO [name of stadium, park, etc.]</i>
ALL TRAFFIC	ALL TRAFFIC
ALL TRUCKS	ALL TRUCKS

"|" Indicates that the next portion of the message will be displayed on the next line(s) of DMS.

**Table 6.8 ACCEPTABLE TERMS FOR AUDIENCE FOR ACTION
DMS ON SAME FREEWAY AND RELATIVELY CLOSE TO ROADWORK**

<u>Large Signs</u>	<u>Portable Signs</u>
<i>[highway, street name] [cardinal direction]</i>	<i>[highway, street name] [cardinal direction]</i>
<i>[route number] [cardinal direction]</i>	<i>[route number] [cardinal direction]</i>
<i>[name of city or state]</i>	<i>[name of city or state]</i>
<i>[name of event, tourist attraction]</i>	<i>[name of event, tourist attraction]</i>
<i>[name of stadium, park, etc.]</i>	<i>[name of stadium, park, etc.]</i>
<i>TO [highway, street name][cardinal direction]</i>	<i>TO [highway, street name][cardinal direction]</i>
<i>TO [route number] [cardinal direction]</i>	<i>TO [route number] [cardinal direction]</i>
<i>TO [name of city or state]</i>	<i>TO [name of city or state]</i>
<i>TO [name of event, tourist attraction]</i>	<i>TO [name of event, tourist attraction]</i>
<i>TO [name of stadium, park, etc.]</i>	<i>TO [name of stadium, park, etc.]</i>
ALL TRAFFIC	ALL TRAFFIC
ALL TRUCKS	ALL TRUCKS

"|" Indicates that the next portion of the message will be displayed on the next line(s) of DMS.

POINTS TO ADD:

- Although an audience for action statement is often not used because it is implied (i.e., for ALL TRAFFIC), it is worthwhile to always think about exactly who the message is targeted for

Good Reason for Following Action

Table 5.9 TERMS FOR GOOD REASON FOR FOLLOWING THE ACTION
DMS ON SAME FREEWAY AND RELATIVELY CLOSE TO INCIDENT

<u>Large Signs</u>	<u>Portable Signs</u>
AVOID DELAY	AVOID DELAY
AVOID MAJOR DELAY	AVOID MAJOR DELAY
SAVE [number] MINUTES	SAVE [number] MIN
BEST ROUTE TO [destination]	BEST ROUTE TO [destination]

"|" Indicates that the next portion of the message will be displayed on the next line(s) of DMS.

Table 6.9 ACCEPTABLE TERMS FOR GOOD REASON FOR FOLLOWING THE ACTION
DMS ON SAME FREEWAY AND RELATIVELY CLOSE TO ROADWORK

<u>Large Signs</u>	<u>Portable Signs</u>
AVOID DELAY	AVOID DELAY
AVOID MAJOR DELAY	AVOID MAJOR DELAY
SAVE [number] MINUTES	SAVE [number] MIN
BEST ROUTE TO [destination]	BEST ROUTE TO [destination]

"|" Indicates that the next portion of the message will be displayed on the next line(s) of DMS.

DMS Manual: pg 5-10 & 6-10

5&6-12

POINTS TO ADD:

- BEST ROUTE TO is most commonly used in conjunction with special events
- Also good practice to at least think about why a driver should follow the action recommended. If it is not obvious from the other information, this message element can be very helpful in improving driver response

ASK:

- Has anyone ever used a different good reason to follow the action in their message?

DMS Far From Incident/Roadwork

Tables differ slightly for Lanes Closed

Table 5.3 TERMS FOR LANES CLOSED
DMS ON SAME FREEWAY AND RELATIVELY CLOSE TO INCIDENT

<u>Large Signs</u>	<u>Portable Signs</u>
ALL LANES CLOSED	ALL LANES CLOSED
CENTER LANE CLOSED	CENTER LANE CLOSED
CENTER LANES CLOSED	CENTER LANES CLOSED
CENTER [number] LANES CLOSED	CENTER [number] LANES CLOSED
LEFT LANE CLOSED	LEFT LANE CLOSED
LEFT [number] LANES CLOSED	LEFT [number] LANES CLOSED
RIGHT LANE CLOSED	RIGHT LANE CLOSED
RIGHT [number] LANES CLOSED	RIGHT [number] LANES CLOSED
FREEWAY CLOSED	FREEWAY CLOSED
EXIT TO [highway, street name] CLOSED	EXIT TO [highway, street name] CLOSED

"| " Indicates that the next portion of the message will be displayed on the next line(s) of DMS.

Table 5.12 TERMS FOR LANES CLOSED
DMS ON SAME FREEWAY BUT RELATIVELY FAR FROM INCIDENT

<u>Large Signs</u>	<u>Portable Signs</u>
ALL LANES CLOSED	ALL LANES CLOSED
1 LANE CLOSED	1 LANE CLOSED
[number] LANES CLOSED	[number] LANES CLOSED
1 LANE OPEN	1 LANE OPEN
[number] LANES OPEN	[number] LANES OPEN

"| " Indicates that the next portion of the message will be displayed on the next line(s) of DMS

DMS Manual: pg 5-4 & 5-13

5&6-13

POINTS TO ADD:

- The rest of modules 5 and 6 are formatted in the same way (tables for each element)
- There exists a section for DMS far upstream from the incident or roadwork, and one for DMS on different roadways that intersect with the roadway with the incident or roadwork
- Most of the tables are the same for each DMS location section. A few tables do differ slightly, though

ASK:

- What is the primary different between the LANES CLOSED terms shown in Table 5.3 and those in Table 5.12? (which lanes closed are not shown in 5.12)
- Why not show which lanes are closed far upstream? (no need, can create operational problems at upstream interchanges because drivers have positioned themselves into open lanes too far upstream)

DMS on Different Freeway

Tables different for Incident Location

**Table 5.2 TERMS FOR INCIDENT LOCATION
DMS ON SAME FREEWAY AND RELATIVELY CLOSE TO INCIDENT**

Large Signs	Portable Signs
1 MILE (AHEAD)	1 MILE (AHEAD)
[number] MILES (AHEAD)	[number] MILES (AHEAD)
AHEAD	AHEAD
AT [highway, street name]	AT [highway, street name]
AT [exit ramp name] EXIT	AT [exit ramp name] EXIT
BEFORE [highway, street name]	BEFORE [highway, street name]
BEFORE [exit ramp name] EXIT	BEFORE [exit ramp name] EXIT
PAST [highway, street name]	PAST [highway, street name]
PAST [exit ramp name] EXIT	PAST [exit ramp name] EXIT
ON LEFT SHOULDER	ON LEFT SHOULDER
ON RIGHT SHOULDER	ON RIGHT SHOULDER
ON MAIN LANES	ON MAIN LNS
OVER [highway, street name]	OVER [highway, street name]

“|” Indicates that the next portion of the message will be displayed on the next line(s) of DMS.

**Table 5.20 TERMS FOR INCIDENT LOCATION
DMS ON DIFFERENT FREEWAY THAN INCIDENT**

Large Signs	Portable Signs
AT [highway, street name]*	AT [highway, street name]*
AT [exit ramp name] EXIT*	AT [exit ramp name] EXIT*
BEFORE [highway, street name]*	BEFORE [highway, street name]*
BEFORE [exit ramp name] EXIT*	BEFORE [exit ramp name] EXIT*
PAST [highway, street name]*	PAST [highway, street name]*
PAST [exit ramp name] EXIT*	PAST [exit ramp name] EXIT*
OVER [highway, street name]*	OVER [highway, street name]*

* Insert “ON [route number, highway name or street name][cardinal direction]” in front of the Incident Location.
 “|” Indicates that the next portion of the message will be displayed on the next line(s) of DMS.

DMS Manual: pg 5-3 & 5-22

5&6-14

POINTS TO ADD:

- Formatting of info about incident location differs slightly for DMS on a different roadway as compared to one on the same roadway

DMS on Different Freeway

Tables different for Action: No Diversion

Table 5.5 TERMS FOR ACTION DMS ON SAME FREEWAY AND RELATIVELY CLOSE TO INCIDENT MOTORISTS ARE NOT ADVISED TO TAKE AN ALTERNATIVE ROUTE- NO DIVERSION ACTION	
Large Signs BE PREPARED TO STOP USE CAUTION	Portable Signs BE REPARED TO STOP USE CAUTION

[†] Indicates that the next portion of the message will be displayed on the next line(s) of DMS.

Table 5.23 TERMS FOR ACTION DMS ON DIFFERENT FREEWAY THAN INCIDENT MOTORISTS ARE NOT ADVISED TO TAKE AN ALTERNATIVE ROUTE- NO DIVERSION ACTION	
Large Signs BE PREPARED TO STOP USE CAUTION STAY ON [route number][cardinal direction] STAY ON [highway, street name][cardinal direction]	Portable Signs BE PREPARED TO STOP USE CAUTION STAY ON [route number][cardinal direction] STAY ON [highway, street name][cardinal direction]

[†] Indicates that the next portion of the message will be displayed on the next line(s) of DMS.

DMS Manual: pg 5-6 & 5-25

5&6-15

POINTS TO ADD:

- If a DMS is located on a different freeway than where the problem is located, there may be a need to encourage drivers not to exit and use that cross roadway. STAY ON xx is therefore needed sometimes

Total Freeway or Ramp Closures



DMS Manual: pg 5-30 & 6-29

5&6-16

POINTS TO ADD:

- Modules 5 and 6 also have sections for total roadway closures. Within each section, subsections also exist for DMS close, DMS far upstream, and DMS on different roadways

Action: with diversion

Table 6.32 ACCEPTABLE TERMS FOR ACTION
DMS ON SAME FREEWAY AND RELATIVELY CLOSE TO CLOSURE
MOTORISTS ARE ADVISED TO TAKE A SPECIFIC TYPE 6 DIVERSION (DETOUR) ROUTE

Large Signs

EXIT AND FOLLOW DETOUR
EXIT AND FOLLOW SIGNS
FOLLOW DETOUR
FOLLOW SIGNS

Portable Signs

EXIT AND | FOLLOW | DETOUR
EXIT AND | FOLLOW | SIGNS
FOLLOW | DETOUR
FOLLOW | SIGNS

T Indicates that the next portion of the message will be displayed on the next line(s) of DMS.

DMS Manual: pg 6-35

5&6-17

POINTS TO ADD:

- Full roadway closures often require more extensive routing information to be provided to motorists. This will require use of EXIT, TAKE, etc. directions to be used
- A Type 5 diversion route is one with (see Table 4.1):
 - Police or traffic controllers at key locations directing traffic
 - Formal incident emergency route signing

Action: with diversion

Table 5.35 ACCEPTABLE TERMS FOR ACTION
VMS ON SAME FREEWAY AND RELATIVELY CLOSE TO CLOSURE
MOTORISTS ARE ADVISED TO TAKE A SPECIFIC TYPE 5 DIVERSION ROUTE

Large Signs	Portable Signs
EXIT AND FOLLOW DETOUR	EXIT AND FOLLOW DETOUR
EXIT AND FOLLOW SIGNS	EXIT AND FOLLOW SIGNS
FOLLOW DETOUR	FOLLOW DETOUR
FOLLOW SIGNS	FOLLOW SIGNS
EXIT AT [highway, street name] [cardinal direction] FOLLOW DETOUR	EXIT AT [highway, street name] [cardinal direction] FOLLOW DETOUR
EXIT AT [highway, street name] [cardinal direction] FOLLOW SIGNS	EXIT AT [highway, street name] [cardinal direction] FOLLOW SIGNS
EXIT AT [route number] [cardinal direction] FOLLOW DETOUR	EXIT AT [route number] [cardinal direction] FOLLOW DETOUR
EXIT AT [route number] [cardinal direction] FOLLOW SIGNS	EXIT AT [route number] [cardinal direction] FOLLOW SIGNS
TAKE [exit ramp name] EXIT FOLLOW DETOUR	TAKE [exit ramp name] EXIT FOLLOW DETOUR
TAKE [exit ramp name] EXIT FOLLOW SIGNS	TAKE [exit ramp name] EXIT FOLLOW SIGNS
TAKE [highway, street name] [cardinal direction] FOLLOW DETOUR	TAKE [highway, street name] [cardinal direction] FOLLOW DETOUR
TAKE [highway, street name] [cardinal direction] FOLLOW SIGNS	TAKE [highway, street name] [cardinal direction] FOLLOW SIGNS
TAKE [route number] [cardinal direction] FOLLOW DETOUR	TAKE [route number] [cardinal direction] FOLLOW DETOUR
TAKE [route number] [cardinal direction] FOLLOW SIGNS	TAKE [route number] [cardinal direction] FOLLOW SIGNS

** Indicates that the next portion of the message will be displayed on the next line(s) of VMS.

DMS Manual: pg 5-38

5&6-18

POINTS TO ADD:

- Full roadway closures often require more extensive routing information to be provided to motorists. This will require use of EXIT, TAKE, etc. directions to be used
- A Type 5 diversion route is one with (see Table 4.1):
 - Police or traffic controllers at key locations directing traffic
 - Formal incident emergency route signing

Establishing the Maximum Message Length

Module 7

OBJECTIVE OF MODULE:

Describe the procedures required to determine the maximum length of a message a sign, given that sign's characteristics, roadway geometrics, and environmental conditions

DURATION:

45 Min

PART 1
Message Length and DMS Viewing
Distance Requirements

DMS Manual: pg 7-1

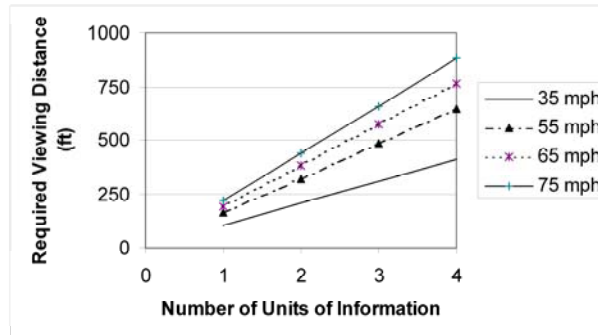
7-2

POINTS TO ADD:

- None

Required Viewing Distances to DMS

- For a given number of info units: Higher speeds require higher, legibility distances



DMS Manual: pg 7-1

7-3

POINTS TO ADD:

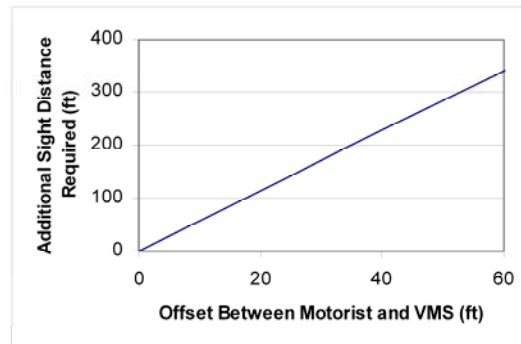
- This assumes that 2 seconds viewing time is needed per unit of information presented

ASK:

- If a sign (under prevailing conditions) cannot provide the legibility distance required for a message of a given number of information units, what can the operator do? (cut back on the number of units)

Sight Distance for Lateral Offset

- Longer lateral distances require more legibility distance



DMS Manual: pg 7-2

7-4

POINTS TO ADD:

- If a sign is positioned off to the side of the road, we assume the sign is not useful to drivers once it is beyond 10 degrees beyond the driver's line of sight
- This graph indicates how far upstream of the sign this 10 degree angle is reached, for a given offset distance
- For LED signs, their optics are such that they cannot even be viewed much beyond a 15 degree angle anyway
- This distance must therefore be subtracted from a sign's legibility distance because this distance is not usable viewing time

Factors Reducing Legibility Distance to a DMS

Lighting Conditions



DMS Manual: pg 7-2

7-5

POINTS TO ADD:

- Legibility at night is usually lower than during the day, even though it seems as though you can see the sign from farther away at night (target distance versus legibility distance)

Factors Reducing Legibility Distance to a DMS

Sun Position



DMS Manual: pg 7-2

7-6

POINTS TO ADD:

- Sun positions immediately on the sign face, and directly into the driver's eyes both used to seriously reduce DMS legibility
- With better LEDs now, only sun in the face of the driver is a now a problem

Factors Reducing Legibility Distance to a DMS

Vertical & Horizontal Curvature



DMS Manual: pg 7-2

7-7

POINTS TO ADD:

- Roadway geometrics are usually not a problem for permanent DMS, because they are mounted higher
- PCMS can be adversely affected by these conditions (and require reductions to information being presented), but only rarely

Factors Reducing Legibility Distance to a DMS

Spot obstructions



DMS Manual: pg 7-2

7-8

POINTS TO ADD:

- As with roadway geometrics, this is generally not a problem for permanent DMS (designers typically check for possible obstructions prior to designing and installing the sign)
- Spot obstructions can be a problem for PCMS (equipment or materials parked upstream on the shoulder, barriers and traffic control devices, etc.)

Factors Reducing Legibility Distance to a DMS

Rain or fog



DMS Manual: pg 7-2

7-9

POINTS TO ADD:

- None

Factors Reducing Legibility Distance to a DMS

Trucks in the traffic stream



DMS Manual: pg 7-2

7-10

POINTS TO ADD:

- Assessing how trucks will affect sign legibility is a complex process, since drivers tend to move around large vehicles depending on traffic volumes, topography, etc. It is possible to examine how much roadway space is available in between and around large trucks that will provide a given amount of viewing time to a sign

Therefore,

Maximum allowable number of units of
information may have to be REDUCED

DMS Manual: pg 7-2

7-11

POINTS TO ADD:

- Important to note that a given sign may not be able to display the same amount of information at all times under all conditions

PART 2
Maximum Legibility Distances for
Day & Night Operations

DMS Manual: pg 7-4

7-12

POINTS TO ADD:

- None

Day & Night

Suggested legibility
distances

Table 7.1 Suggested DMS Legibility Distances for Use in Message Design (ft)

Condition	Light-Emitting Diode [^]	Fiberoptic	Incandescent Bulb	Reflective Disk
Mid-Day	800	700	700	700
Washout	800	700	700	400
Backlight	600	400	400	200
Nighttime	600	600	600	350

[^] Valid only for the newer aluminum indium gallium phosphide (or equivalent) LEDs

DMS Manual: pg 7-4

7-13

POINTS TO ADD:

- These are for 18 inch character heights, normal fonts
- Distances are probably less for compressed fonts (depending on how the characters are designed)

Day & Night

Maximum number of
units of info

**Table 7.2 Maximum Number of Units of Information in DMS Message
(Base Maximum Message Length)**

Condition	Light-Emitting Diode ^A			Fiberoptic			Incandescent Bulb			Reflective Disk		
	0-35 mph	36-55 mph	56-70 mph	0-35 mph	36-55 mph	56-70 mph	0-35 mph	36-55 mph	56-70 mph	0-35 mph	36-55 mph	56-70 mph
Mid-Day	5 units	4 units	4 units	5 units	4 units	3 units	5 units	4 units	3 units	5 units	4 units	3 units
Washout	5 units	4 units	4 units	5 units	4 units	3 units	5 units	4 units	3 units	4 units	3 units	2 units
Backlight	4 units	4 units	3 units	4 units	3 units	2 units	4 units	3 units	2 units	2 units	1 unit	1 unit
Nighttime	4 units	4 units	3 units	4 units	3 units	3 units	4 units	3 units	3 units	3 units	2 units	1 unit

^A Valid only for the newer aluminum indium gallium phosphide (or equivalent) LEDs

POINTS TO ADD:

- The distances on the previous page can be divided by the speed of traffic and converted to maximum units of info that can be viewed over those distances (assuming 2 sec per unit)

Reduce Units for Vertical Curves

Only necessary in very extreme cases

Table 7.5 Number of Units of Information that Must Be <u>Subtracted</u> from Number Given in Table 7.2 Due to Vertical Curve PORTABLE LED DMS ^A Mounting Height: 7 feet						
Condition	Vertical Curve Design Speed					
	20-foot Offset			60-foot Offset		
	30 mph	35 mph	40 mph	30 mph	35 mph	40 mph
Mid-Day	3 units	2 units	1 unit	5 units	5 units	3 units
Washout	3 units	2 units	1 unit	5 units	5 units	3 units
Backlight	2 units	1 unit	1 unit	4 units	4 units	2 units
Nighttime	2 units	1 unit	1 unit	4 units	4 units	2 units

^AValid only for the newer aluminum indium gallium phosphide (or equivalent) LEDs.

DMS Manual: pg 7-9

7-15

POINTS TO ADD:

- Permanent DMS not a problem, only a PCMS issue usually
- The units shown are then subtracted from the maximum shown in Table 7.2
- Speeds shown are the design speed of the roadway (not operating speed)
- Note that these only apply if the PCMS is located on an actual hill that is obscuring sight distance to the sign

Reduce Units for Horizontal Curves

(Necessary only in extreme cases)

DMS Manual: pg 7-14

7-16

POINTS TO ADD:

- Horizontal curvature doesn't really cause problems for overhead signs, only PCMS
- Need to know actual curve radii to accurately estimate how much a message would need to be reduced
- Good practical advice – don't put the PCMS within or just downstream of a sharp curve

Reduce Units for Horizontal Curves

(Necessary only in extreme cases)

DMS Manual: pg 7-17

7-17

POINTS TO ADD:

- Horizontal curvature doesn't really cause problems for overhead signs, only PCMS
- Need to know actual curve radii to accurately estimate how much a message would need to be reduced
- Good practical advice – don't put the PCMS within or just downstream of a sharp curve

Reduce Units for Rain

Generally rain is insignificant

- As a rule, use maximum values in Table 7.2

Exception: rainfall over 2 inches per hour

- Reduce units of info in Table 7.2 by 1

DMS Manual: pg 7-18

7-18

POINTS TO ADD:

- Although rain and fog may reduce legibility distance a little, people also tend to drive slower in rain and fog

ASK:

- What are the key challenges in adjusting messages due to weather conditions? (difficult to measure how hard raining, how bad fog is, know how long it will be that severe conditions vary dramatically from one sign to the next, and change over time very quickly)

Reduce Units for Fog

**Table 7.13 Number of Units of Information that Must Be Subtracted from
Number Given in Table 7.2 Due to Effects of Fog in Daytime Conditions
PORTABLE LED^A DMS**

Visibility Range in Fog	No Offset			20-ft Offset			60-ft Offset		
	0-35 mph	36-55 mph	56-70 mph	0-35 mph	36-55 mph	56-70 mph	0-35 mph	36-55 mph	56-70 mph
0.5 mi	0	0	0	0	0	0	0	0	0
0.25 mi	0	0	1 unit	0	1 unit	1 unit	2 units	2 units	2 units
0.1 mi	2 units	2 units	2 units	3 units	3 units	3 units	5 units ^B	4 units ^B	4 units ^B

^A Valid only for the newer aluminum indium gallium phosphide (or equivalent) LEDs.

^B Adequate sight distance not available for any message under this viewing condition.

DMS Manual: pg 7-19

7-19

POINTS TO ADD:

- Once again, only PCMS are susceptible to this
- Generally, fog must be pretty thick to require adjustment (visibility reduced to ¼ mile or less)

Reduce Units for Large Trucks

**Table 7.17 Percent of Motorists Able to Fully Read a DMS Message
with Maximum Base Number of Units (Eight-Lane Roadway: Four Lanes in Each Direction)**

Percent Trucks	Operating Speed Range								
	0-35 mph			36-55 mph			56-70 mph		
	2000 vph	4000 vph	6000 vph	2000 vph	4000 vph	6000 vph	2000 vph	4000 vph	6000 vph
5	90	80	70	90	80	70	90	80	70
10	80	60	45	80	65	45	80	65	45
20	65	35	20*	70	35	20*	65	35	20*
30	60	30*	30*	60	30*	30*	55	30*	30*
50	50*	50*	50*	50*	50*	50*	50*	50*	50*

Note: Assumes a 70%/20%/10%/0% split of truck traffic in shoulder, right center, left center, and median travel lanes, respectively.
 * Under these conditions, only truck drivers are assumed to be able to see the DMS.
 vph = vehicles per hour.

DMS Manual: pg 7-22

7-20

POINTS TO ADD:

- Table 7.17 describes the percentage of drivers who could find a space in the traffic stream to read a message of 4 units of information on an 8-lane facility
- No guarantees that drivers would react cooperatively to fill in all gaps, so values are probably high
- If conditions are where the percentage is down below 80 percent or so, may want to think about reducing the length of the message



***Designing Messages
for Incidents
and
Roadwork***

Modules 9 & 10

OBJECTIVE OF MODULE:

- Tie the various modules together (particularly modules 5&6, 7, and 8) by listing all of the steps that would be required to create a new message

DURATION:

- 20 Min

Procedure for Incidents

PART 1: Lane closure (blockage) incidents

PART 2: Incidents that require closing the freeway

PART 3: Incidents on intersecting freeway that
require closing the connector ramp

DMS Manual: pg 9-i &10-i

9&10-2

POINTS TO ADD:

- Separate sequences of steps (mostly the same) exist for all three of the listed conditions. The user would go to their particular part of interest

Procedure for Incidents

In each PART:

- DMS on same freeway and relatively close to the incident
- DMS on same freeway but relatively far from incident
- DMS on different freeway than incident

DMS Manual: pg 9-i &10-i

9&10-3

POINTS TO ADD:

- Within each part, the steps (again very repetitive) are provided for each type of DMS of interest
- Concept of manual is that the operator or manager could go to this module, find the correct part, then find the correct DMS, and then follow the steps to create a message

Procedure for Incidents

Lane Closure (Blockage)

1. Establish initial maximum allowable number of units of information based on DMS type and operating speeds

DMS Manual: pg 9-1

9&10-4

POINTS TO ADD:

- None

Procedure for Incidents

Lane Closure (Blockage)

1. Establish initial maximum allowable number of units of information based on DMS type and operating speeds
2. Assess whether the message must be reduced because of local geometric sight distance restrictions to the DMS

DMS Manual: pg 9-1

9&10-5

POINTS TO ADD:

- None

Procedure for Incidents

Lane Closure (Blockage)

3. Assess whether the message must be reduced because of local environmental sight distance restrictions to the DMS such as of rain or fog

DMS Manual: pg 9-2

9&10-6

POINTS TO ADD:

- None

Procedure for Incidents

Lane Closure (Blockage)

3. Assess whether the message must be reduced because of local environmental sight distance restrictions to the DMS because of rain or fog
4. Finalize the maximum allowable units of information in the message

DMS Manual: pg 9-2

9&10-7

POINTS TO ADD:

- None

Procedure for Incidents

Lane Closure (Blockage)

5. Define the *Base DMS Message* to satisfy motorist information needs

DMS Manual: pg 9-2

9&10-8

POINTS TO ADD:

- “Need” in this context is more closely related to “wants.” A driver would be more likely and more accurately to make a correct driving response if they have all of the info in the base message. However, they will not necessarily have problems or make mistakes if they do not have the information

Procedure for Incidents

Lane Closure (Blockage)

5. Define the *Base DMS Message* to satisfy motorist information needs
6. Reduce the number of message units if necessary

DMS Manual: pg 9-4

9&10-9

POINTS TO ADD:

- None

Procedure for Incidents

Lane Closure (Blockage)

5. Define the *Base DMS Message* to satisfy motorist information needs
6. Reduce the number of message units if necessary
7. Format the message

POINTS TO ADD:

- None

Procedure for Incidents

Lane Closure (Blockage)

8. Adjust message to fit on existing DMS

DMS Manual: pg 9-5

9&10-11

POINTS TO ADD:

- None

Procedure for Incidents

Lane Closure (Blockage)

8. Adjust message to fit on existing DMS
9. Adjust message to fit on 3 lines or less

POINTS TO ADD:

- None

Procedure for Incidents

Lane Closure (Blockage)

8. Adjust message to fit on existing DMS
9. Adjust message to fit on 3 lines or less
10. Finalize DMS message

POINTS TO ADD:

- None

Procedure for Incidents

Detailed step-by-step procedure

Refers user to tables in

- *Module 7: Establishing Maximum Message Length*

DMS Manual: pg 7-1

9&10-14

POINTS TO ADD:

- None

Procedure for Incidents

Detailed step-by-step procedure

Refers user to tables in

- *Module 7: Establishing Maximum Message Length*
- *Module 5: Designing the Base DMS Message for Incidents*

For roadwork messages, tables in Module 6 would be used instead...

DMS Manual: pg 7-1, 5-1, & 6-1

9&10-15

POINTS TO ADD:

- None

Modifying Messages to Improve Effectiveness

Module 12

OBJECTIVE OF MODULE:

- Introduce participants to the tables in the module that can be used as good examples

DURATION:

- 10 Min

Improving Message Effectiveness

Table 12.1 Incident Messages

Old Message		Recommended Message*		Notes
First Phase	Second Phase	First Phase	Second Phase	
ACCIDENT AHEAD USE CAUTION		ACCIDENT AT [location]		<ul style="list-style-type: none"> It is best to give the location of the incident. Knowledge of the incident location is useful to motorists to make diversion and other driving decisions. <i>AHEAD</i> is redundant and need not be displayed because it is understood by motorists that the accident is ahead on the freeway.
ACCIDENT AHEAD 21ST STREET USE CAUTION		ACCIDENT AT 21ST STREET LEFT 2 LANES CLOSED		<ul style="list-style-type: none"> <i>AT</i> should be displayed before the location of the incident. Knowledge of the number of lanes closed is useful to motorists to evaluate the potential amount of delay. Knowledge of which lanes are closed is useful to motorists to determine which lanes they should use to travel past the incident. <i>AHEAD</i> is redundant and need not be displayed because it is understood by motorists that the accident is ahead on the freeway.
ACCIDENT AHEAD I-84 EXPECT DELAYS		ACCIDENT AT [location] LEFT 2 LANES CLOSED		<ul style="list-style-type: none"> It is best to give the location of the incident rather than the information that the accident is on I-84. If the DMS is on I-84, it will be understood by motorists that the accident is on I-84 and it need not be displayed. Knowledge of the incident location is useful to motorists to make diversion and other driving decisions. Knowledge of the number of lanes closed is useful to motorists to evaluate the potential amount of delay. Knowledge of which lanes are closed is useful to motorists to determine which lanes they should use to travel past the incident. <i>AHEAD</i> is redundant and need not be displayed because it is understood by motorists that the accident is ahead on I-84.

* Assumes 3- or 4-line, 20 character per line DMS.

DMS Manual: pg 12-2

12-2

POINTS TO ADD:

- These examples come from all across the U.S.
- They illustrate how a message can be improved, and provide bullet lists of rationale behind why the recommended message design is preferable to the original (old) message

Improving Message Effectiveness

Old Message		Recommended Message'		Notes
First Phase	Second Phase	First Phase	Second Phase	
ACCIDENT AHEAD RIGHT LANES USE CAUTION		ACCIDENT AT [location] RIGHT 2 LANES CLOSED		<ul style="list-style-type: none"> It is best to give the location of the incident rather than the information that the accident is ahead. Knowledge of the incident location is useful to motorists to make diversion and other driving decisions. Knowledge of the number of lanes closed is useful to motorists to evaluate the potential amount of delay. AHEAD is redundant and need not be displayed because it is understood by motorists that the accident is ahead.
ACCIDENT AHEAD ONE RIGHT LANE OPEN	ACCIDENT AHEAD BROOK BRIDGE EXPECT DELAYS	ACCIDENT AT BROOK BRIDGE LEFT 2 LANES CLOSED		<ul style="list-style-type: none"> The current message has five units of information and can be reduced to three units. Knowledge of the number of lanes closed is useful to motorists to evaluate the potential amount of delay. Knowledge of which lanes are closed is useful to motorists to determine which lanes they should use to travel past the incident. AHEAD is redundant and need not be displayed because it is understood by motorists that the accident is ahead on the freeway.
ACCIDENT AHEAD REDUCE SPEED MERGE LEFT	RIGHT LANE CLOSED AHEAD DRIVE CAREFULLY	ACCIDENT AT [location] RIGHT LANE CLOSED		<ul style="list-style-type: none"> The current message has five units of information and can be reduced to three units. It is best to give the location of the accident. Knowledge of the accident location is useful to motorists to make diversion and other driving decisions. Knowledge of the number of lanes closed is useful to motorists to evaluate the potential amount of delay. AHEAD is redundant and need not be displayed because it is understood by motorists that the accident is ahead on the freeway. MERGE LEFT is redundant to RIGHT LANE CLOSED and can be omitted.

DMS Manual: pg 12-3

12-3

POINTS TO ADD:

- Often, a two phase message can be reduced down to a single phase and be more effective for motorists

Improving Message Effectiveness

Old Message		Recommended Message*		Notes
First Phase	Second Phase	First Phase	Second Phase	
ALL LANES CLOSED AHEAD KEEP RIGHT		FREEWAY CLOSED EXIT AT[location] FOLLOW DETOUR		<ul style="list-style-type: none"> • <i>FREEWAY CLOSED</i> is used rather than <i>ALL LANES CLOSED</i> because it is shorter and means the same thing to motorists. • Telling motorists where to exit is useful. • Telling motorists to follow a detour that is set up because of the closure gives motorists the assurance that they will have positive guidance along the alternative route.
ACCIDENT IH-84 EAST AT ROWLAND	USE ALTERNATE ROUTES	ACCIDENT AT ROWLAND USE OTHER ROUTES		<ul style="list-style-type: none"> • If the DMS is located on I-84 East, the accident is understood to be on I-84 East and it need not be displayed. • <i>OTHER</i> is used rather than <i>ALTERNATE</i> because it is shorter and easier to read and will be understood by motorists.
		ACCIDENT ON I-84 EAST AT ROWLAND	USE OTHER ROUTES	<ul style="list-style-type: none"> • If the DMS is located on a cross freeway to I-84 East, then <i>ON I-84 EAST</i> must be displayed. • <i>I-84</i> should be used rather than <i>IH-84</i>. Human factors research by TTI revealed that motorists do not understand "IH."
IH-84 EAST ACCIDENT AT ROWLAND	USE ALTERNATE ROUTES	ACCIDENT AT ROWLAND USE OTHER ROUTES		<ul style="list-style-type: none"> • If the DMS is located on I-84 EAST, the accident is understood to be on I-84 EAST and it need not be displayed. • The problem <i>ACCIDENT</i> should always be on the top line. • <i>OTHER</i> is used rather than <i>ALTERNATE</i> because it is shorter and easier to read and will be understood by motorists.
IH-84 EAST ACCIDENT DOWNTOWN	TWO RIGHT LANES CLOSED	ACCIDENT PAST DOWNTOWN RIGHT 2 LANES CLOSED		<ul style="list-style-type: none"> • If the DMS is located on I-84 East, the accident is understood to be on I-84 East and it need not be displayed. • The problem <i>ACCIDENT</i> should always be on the top line. • 2 should be used rather than <i>TWO</i> because it is shorter and more easily read by motorists. • <i>PAST</i> is displayed in front of <i>DOWNTOWN</i> to reduce possibility of confusion as to the location of the accident.

DMS Manual: pg 12-4

12-4

POINTS TO ADD:

- In other examples, multiple versions of two phase messages are shown how they can be improved
- In some instances, multiple approaches to improving the messages would work equally well. In those instances, the multiple improved message versions are all shown

Improving Message Effectiveness

Old Message		Recommended Message*		Notes
First Phase	Second Phase	First Phase	Second Phase	
IH-84 EB AT ROWLAND MAJOR ACCIDENT		MAJOR ACCIDENT AT ROWLAND 2 LANES CLOSED		<ul style="list-style-type: none"> The incident should be displayed on the top line followed by the location. The word <i>AT</i> should be separated from the first unit of information and be placed with the location of the incident (second unit of information). A message line should not contain portions of two different units of information. Knowledge of the number of lanes closed is useful to motorists to evaluate the potential amount of delay. Human factors research conducted by TTI revealed that a large majority of Texas motorists do not understand the meaning of the abbreviation <i>EB</i>.
IH-84 EAST CLOSED AT ROWLAND	USE ALTERNATE ROUTES	FREEWAY CLOSED AT ROWLAND USE OTHER ROUTES		<ul style="list-style-type: none"> <i>FREEWAY</i> is used rather than <i>I-84 EAST</i> because it is shorter and easier to read and is well understood to mean the freeway on which the motorist is traveling. The word <i>CLOSED</i> from the first unit of information should be separated from the word <i>AT</i> from the second unit of information. A message line should not contain portions of two different units of information. <i>OTHER</i> is used rather than <i>ALTERNATE</i> because it is shorter and easier to read.
IH-84 EB AT ROWLAND ACCIDENT	LEFT 2 LANES CLOSED EXPECT DELAY	ACCIDENT AT ROWLAND LEFT 2 LANES CLOSED		<ul style="list-style-type: none"> If the DMS is located on I-84 EAST, the accident is understood to be on I-84 EAST and it need not be displayed. The word <i>AT</i> should be separated from the first unit of information and be placed with the location of the incident (second unit of information). A message line should not contain portions of two different units of information. Knowledge of the number of lanes closed is useful to motorists to evaluate the potential amount of delay. <i>AHEAD</i> is redundant and need not be displayed because it is understood by motorists that the accident is ahead on I-84. The abbreviation <i>EB</i> should not be used. Recent human factors studies conducted by TTI indicated that a large percentage of Texas motorists would not understand the abbreviation <i>EB</i>. When two lanes are closed due to an accident, most motorists will <i>EXPECT DELAYS</i>. Thus, it can be omitted.

DMS Manual: pg 12-5

12-5

POINTS TO ADD:

- Examples are provided for both incident messages and roadwork messages

Improving Message Effectiveness

Old Message		Recommended Message		Notes
First Phase	Second Phase	First Phase	Second Phase	
IH-84 EB AT ROWLAND FREEWAY CLOSED	AVOID DELAY USE ALTERNATE ROUTES	FREEWAY CLOSED AT ROWLAND USE OTHER ROUTES		<ul style="list-style-type: none"> The current message has five units of information and can be reduced to three units. The incident should be displayed on the top line followed by the incident location. Human factors research conducted by TTI revealed that a large majority of Texas motorists do not understand the meaning of the abbreviation <i>EB</i>. <i>OTHER</i> is used rather than <i>ALTERNATE</i> because it is shorter and easier to read and will be understood by motorists
FREEWAY CLOSED AT ROWLAND MAJOR ACCIDENT	ALL TRAFFIC EXIT ROWLAND	FREEWAY CLOSED EXIT AT ROWLAND USE SERVICE RD		<ul style="list-style-type: none"> The current message has five units of information and can be reduced to four units. <i>FREEWAY CLOSED</i> is used rather than <i>MAJOR ACCIDENT</i> because it represents the immediate problem the motorists will face. If the freeway is closed, the motorists will understand that <i>ALL TRAFFIC</i> must exit. The recommendation is to tell the motorists that they should <i>EXIT AT WASHINGTON</i> and then <i>USE SERVICE ROAD</i> to bypass the incident.
MAJOR ACCIDENT AT ROWLAND ON MAIN LANES	AVOID DELAY USE ALTERNATE ROUTE	MAJOR ACCIDENT AT ROWLAND USE OTHER ROUTES		<ul style="list-style-type: none"> Information that the accident is <i>ON MAIN LANES</i> will be understood by motorists and it need not be displayed. <i>OTHER</i> is used rather than <i>ALTERNATE</i> because it is shorter and easier to read. The motorist would assume that if told to use other routes the motorist would avoid delay. Thus <i>AVOID DELAY</i> need not be displayed.
MAJOR ACCIDENT AT ROWLAND CLEARED AT 5:10	LEFT 2 LANES CLOSED EXPECT DELAY	MAJOR ACCIDENT AT ROWLAND CLEARED AT 5:10		<ul style="list-style-type: none"> Conflicting information is given in the current message. The first message phase states that the accident was cleared at 5:10; the second phase states that two lanes are closed. The recommended message is based on the assumption that the former is true.

DMS Manual: pg 12-6

12-6

POINTS TO ADD:

- None

Message Design Example - Incident: Large DMS

Module 14

OBJECTIVE OF MODULE:

If most participants have not designed a message before, this optional module can be shown to illustrate the step-by-step procedure to create a message

DURATION:

45 Min

All Lanes Closed



DMS Manual: pg 14-2

14-2

POINTS TO ADD:

- Note that DMS #2 is located several exits upstream of the interchange
- The accident is located within the interchange

All Lanes Closed

Define Situation

- Analyze Incident and Incident Scene Characteristics

DMS Manual: pg 14-3

14-3

POINTS TO ADD:

- None

All Lanes Closed

Design Message for DMS on Same Freeway Relatively Close to Incident

- DMS #1

DMS Manual: pg 14-4

14-4

POINTS TO ADD:

- None

DMS #1: All Lanes Closed

Identify DMS Characteristics

DMS Manual: pg 14-4

14-5

POINTS TO ADD:

- None

DMS #1: All Lanes Closed

Identify DMS Characteristics

Review Conditions at DMS Location

DMS Manual: pg 14-4

14-6

POINTS TO ADD:

- None

DMS #1: All Lanes Closed

Identify DMS Characteristics

Review Conditions at DMS Location

**Identify Diversion Route
Characteristics**

DMS Manual: pg 14-4

14-7

POINTS TO ADD:

- None

DMS #1: All Lanes Closed



DMS Manual: pg 14-2 &14-4

14-8

POINTS TO ADD:

- None

DMS #1: All Lanes Closed

Identify DMS Characteristics

Review Conditions at DMS Location

Identify Diversion Route

Characteristics

Set Objectives

DMS Manual: pg 14-5

14-9

POINTS TO ADD:

- None

DMS #1: All Lanes Closed

**Establish Initial Maximum Allowable
Number of Units of Info in the
Message Based on DMS Type and
Freeway Operating Speeds**

DMS Manual: pg 14-5

14-10

POINTS TO ADD:

- None

DMS #1: All Lanes Closed

Step 1

**Determine Freeway Operating Speed at the
DMS Location.**

Freeway speed is *30 mph*

DMS Manual: pg 14-5

14-11

POINTS TO ADD:

- None

DMS #1: All Lanes Closed

Step 2

Determine the Initial Maximum Allowable Number of Units of Information in the Message from Table 7.2, page 7-4.

Based on sun position, max allowable of 5 *units*

DMS Manual: pg 14-5

14-12

POINTS TO ADD:

- None

**Assess Whether the Message Must Be
Reduced Because of Local
Geometric Sight Distance
Restrictions to DMS**

DMS Manual: pg 14-6

14-13

POINTS TO ADD:

- None

DMS #1: All Lanes Closed

Step 3

Determine Whether There are Sight Distance Restrictions to the DMS Because of a Vertical Curve Using the Guidelines in Section 7.3 *UNITS OF INFORMATION REDUCTIONS FOR VERTICAL CURVES* on page 7-6

No reductions in max of *5 units*

Go to Step 5

DMS Manual: pg 14-6

14-14

POINTS TO ADD:

- None

DMS #1: All Lanes Closed

Step 5

Determine Whether There are Sight Distance Restrictions to the DMS Because of a Horizontal Curve Using the Guidelines in Section 7.4 *UNITS OF INFORMATION REDUCTIONS FOR HORIZONTAL CURVES* on page 7-10

No reductions in max of 5 *units*

Go to Step 7

DMS Manual: pg 14-6

14-15

POINTS TO ADD:

- None

**Assess Whether the Message Must Be
Reduced Because of Environmental
Sight Distance Restrictions to DMS
(Rain/Fog)**

DMS Manual: pg 14-6

14-16

POINTS TO ADD:

- None

DMS #1: All Lanes Closed

Step 7

**Determine Whether Rainfall near the DMS
Exceeds 2 Inches per Hour**

No. No reductions in max of *5 units*

Go to Step 9

DMS Manual: pg 14-6

14-17

POINTS TO ADD:

- None

DMS #1: All Lanes Closed

Step 9

Determine Whether Fog Exists near the DMS

No. No reductions in max of 5 *units*

Go to Step 11

DMS Manual: pg 14-6

14-18

POINTS TO ADD:

- None

Finalize the Maximum Allowable Units of Information in the Message

DMS Manual: pg 14-6

14-19

POINTS TO ADD:

- None

DMS #1: All Lanes Closed

Step 11

**Based on Steps 1 through 10, Finalize the
Maximum Allowable Number of Units of
Information in the Message**

No reductions in max of *5 units*

DMS Manual: pg 14-6

14-20

POINTS TO ADD:

- None

**Define *Base DMS Message* to Satisfy
Motorist Information Needs**

DMS Manual: pg 14-6

14-21

POINTS TO ADD:

- None

DMS #1: All Lanes Closed

Step 12

Select *Incident Descriptor* Message Element
from Table 5.28, page 5-31

***Incident Descriptor:* MAJOR ACCIDENT**

DMS Manual: pg 14-6

14-22

POINTS TO ADD:

- None

DMS #1: All Lanes Closed

Step 13

Select *Incident Location* Message Element
from Table 5.29, page 5-32

Location: PAST I-22

DMS Manual: pg 14-6

14-23

POINTS TO ADD:

- None

DMS #1: All Lanes Closed

Step 14

Select *Lanes Closed* Message Element from
Table 5.30, page 5-33

***Lanes Closed:* ALL LANES CLOSED**

DMS Manual: pg 14-6

14-24

POINTS TO ADD:

- None

DMS #1: All Lanes Closed

Step 15

Select *Closure Location* Message Element
from Table 5.31, page 5-34

***Closure Location:* AT I-22**

DMS Manual: pg 14-7

14-25

POINTS TO ADD:

- None

DMS #1: All Lanes Closed

Step 16

**Determine Whether Diversion Traffic Control
is in Place**

“Yes.” Go to Step 20

DMS Manual: pg 14-7

14-26

POINTS TO ADD:

- None

DMS #1: All Lanes Closed

Step 20

Select Type 5 Diversion (Detour) Route
Action Message Element from Table 5.35,
page 5-38

Action:

**EXIT AT I-22
FOLLOW DETOUR**

DMS Manual: pg 14-7

14-27

POINTS TO ADD:

- None

DMS #1: All Lanes Closed

Step 21

**Establish Whether *Action* Message Is for a
Select Group of Motorists**

“No.” Go to Step 23

DMS Manual: pg 14-7

14-28

POINTS TO ADD:

- None

DMS #1: All Lanes Closed

Step 23

**Examine Whether the Diversion Route May
Be Perceived by Motorists as Being a
Most Logical Route**

“Yes.” Go to Step 25

DMS Manual: pg 14-7

14-29

POINTS TO ADD:

- None

DMS #1: All Lanes Closed

Summary

Incident Descriptor: MAJOR ACCIDENT
Location: PAST I-22
Lanes Closed: ALL LANES CLOSED
Closure Location: AT I-22
Action: EXIT AT I-22
FOLLOW DETOUR

6 Units of Information

DMS Manual: pg 14-7

14-30

POINTS TO ADD:

- None

Reduce the Number of Message Units If Necessary

DMS Manual: pg 14-8

14-31

POINTS TO ADD:

- None

DMS #1: All Lanes Closed

Step 25

Examine Whether the Number of Units of Information Units in the Base DMS Message Is Greater than the Maximum Allowable from Step 11

“Yes.”

Base DMS Message = 6 *units*

Maximum Allowable = 5 *units*

Continue to Step 26

DMS Manual: pg 14-8

14-32

POINTS TO ADD:

- None

DMS #1: All Lanes Closed

Step 26

**Omit *Incident Descriptor* Message Element
According to Guidelines in the Section on
*Combining Message Elements for Incident
Messages* Beginning on page 8-15**

**FREEWAY CLOSED
EXIT AT I-22
FOLLOW DETOUR**

3 Units of Information

DMS Manual: pg 14-8

14-33

POINTS TO ADD:

- None

DMS #1: All Lanes Closed

Step 27

Examine Whether the Number of Units of Information Units in the Base DMS Message Is Greater than the Maximum Allowable from Step 11

“No.”

Revised DMS Message = 3 units

Maximum Allowable = 5 units

Go to Step 32

DMS Manual: pg 14-8

14-34

POINTS TO ADD:

- None

DMS #1: All Lanes Closed

Step 32

Format the Message According to Guidelines in the Sections on *FORMATTING MESSAGES* on page 8-6 and *REDUCING MESSAGE UNITS OF INFORMATION FROM THE BASE MESSAGE* on Page 8-14

Tables 8-5 and 8-12 apply

Freeway Closure: **FREEWAY CLOSED**

Location of Closure

& Action:

EXIT AT I-22

FOLLOW DETOUR

DMS Manual: pg 14-8

14-35

POINTS TO ADD:

- None

DMS #1: All Lanes Closed

Step 37

**Examine Whether There are 3 or Fewer
Decision-Relevant Units of Information
Displayed on Each of the Phases**

“Yes.” Go to Step 39

DMS Manual: pg 14-9

14-36

POINTS TO ADD:

- None

DMS #1: All Lanes Closed

Step 39

Examine Whether Message Elements Are Split in Such a Way That a Part of One Message Element is on the Same Line as a Part of a Second Message Element

“No.” Go to Step 41

DMS Manual: pg 14-9

14-37

POINTS TO ADD:

- None

DMS #1: All Lanes Closed

Step 41

**Examine Whether the Message or Any of the
Message Lines Are Too Long to Fit in the
Available Message Space**

“No.” Go to Step 45

DMS Manual: pg 14-9

14-38

POINTS TO ADD:

- None

DMS #1: All Lanes Closed

Step 45

**Review Message for Inconsistencies and
Incompatibility**

No inconsistencies in message

DMS Manual: pg 14-9

14-39

POINTS TO ADD:

- None

DMS #1: All Lanes Closed

Step 46

Make Additional Adjustments if Necessary

No adjustments necessary

**FREEWAY CLOSED
EXIT AT I-22
FOLLOW DETOUR**

3 Units of Information

DMS Manual: pg 14-9

14-40

POINTS TO ADD:

- None

DMS #1: All Lanes Closed

Summary

Base DMS Message vs. Final Message

MAJOR ACCIDENT PAST I-22 ALL LANES CLOSED AT I-22 EXIT AT I-22 FOLLOW DETOUR	FREeway CLOSED EXIT AT I-22 FOLLOW DETOUR
---	---

DMS Manual: pg 14-9

14-41

POINTS TO ADD:

- None

DMS #1: All Lanes Closed

Assess Effects of Large Trucks on the Ability of Motorists to View the Message (Tables 7.14 – 7.17, pages 7-21 & 7-22)

DMS Manual: pg 14-10

14-42

POINTS TO ADD:

- None

AMBER Alert

Module 15

OBJECTIVE OF MODULE:

- Summarize general operations during amber and silver alerts, highlight research findings that have influenced current message protocols being used

DURATION:

- 10 Min

Programs & Policies

Texas AMBER alert network and policies

- Activated by Governor Rick Perry
- TX Dept of Public Safety is in charge
- Any law enforcement agency can activate
- When activated, TxDOT displays on DMSs
- TxDOT coordinator for design and display of messages *Brian Fariello, San Antonio*

DMS Manual: pg 15-1

15-2

POINTS TO ADD:

- None

Priority of Information

1. Situation descriptor
2. Vehicle descriptor
3. License plate number
4. Telephone number (to dial)
5. Tune to radio (local radio or HAR)

DMS Manual: pg 15-3

15-3

POINTS TO ADD:

- Driver surveys indicate this is the priority of information desired

Priority of AMBER Alert Information

1. Situation Descriptor

KIDNAPPED CHILD

AMBER ALERT - OK

(SILVER ALERT – Understood?)

ABDUCTED CHILD – not as good

MISSING CHILD – No

DMS Manual: pg 15-4

15-4

POINTS TO ADD:

- Some drivers confused amber alert with homeland security threat levels (change to Kidnapped Child)
- Missing child implied that foul play was not expected. Thus, is an appropriate term for a silver alert when an elderly person cannot be located

2. Vehicle Description

Color

Make

Vehicle type (pickup, van, etc.)

Many drivers are not able to identify differences among models

Should never be displayed unless the license plate number is also displayed

POINTS TO ADD:

- Although drivers say they can, very few can distinguish between vehicle make
- General vehicle types work best (auto, van, pickup, etc.)

3. License Plate Number

LIC # ABC-123 – Texas plate

- Equals 3 units of information
- If included will exceed max. units
- Majority will not read and recall

MA LIC # DE4-567 – out of state

- Many will not be able to interpret

POINTS TO ADD:

- Amber alert messages far exceed the recommended maximum # of units for a message
- These are PSA type messages, not those that require immediate driver decisions and actions
- It should be remembered that drivers will not likely be able to recall much of the info even a few seconds after passing the sign

4. *Telephone Number*

Typical 10-digit number

- Equals 3 units of information
- If included will exceed max. units
- Majority will not read and recall
- When used should be short or easy to remember
 - *DIAL 911 (511), CALL 1 FIND A CHILD*
- Will dial 911 if not given

POINTS TO ADD:

- None

Priority of AMBER Alert Information

5. Tune To Radio

Appropriate messages

TUNE TO 530 AM

TUNE RADIO TO 530 AM

Always include AM/FM

DMS Manual: pg 15-6

15-8

POINTS TO ADD:

- For areas with an HAR system, this may be the most effective way to get information out to drivers

Catastrophic Event

Module 16

OBJECTIVE OF MODULE:

- Summarize general operations and recommended messages for major catastrophes

DURATION:

- 15 Min

Programs & Policies

National Incident Management System –
Incident Command System
Texas Office of Homeland Security
Governor's Division of Emergency Management.
State Operation Center
Texas Security Analysis and Alert Center

FHWA Policy

DMS Manual: pg 16-1

16-2

POINTS TO ADD:

- TxDOT serves in a support role when emergency conditions occur

DMS Messages

Traffic management component involves

- Closing access to the city (area)
- Evacuation of the city (area)

Closing Access to City/Area

Similar to roadway closures due to incidents/roadwork

DMS relatively close to event

**I (XX) NORTH CLOSED
AT (Location)**

**I (XX) NORTH CLOSED
AT (Location)
TUNE TO 530 AM**

DMS Manual: pg 16-3

16-4

POINTS TO ADD:

- Principles of message design remain the same

Closing Access to City/Area

DMS far from event

**(City or Location)
CLOSED TO
ALL TRAFFIC**

Option 1

**ALL ROADS TO
(City or Location)
CLOSED**

Option 2

DMS Manual: pg 16-4

16-5

Evacuation of City/Area

**HOV LANES OPEN
TO ALL TRAFFIC**

DMS Manual: pg 16-4

16-6

Hurricanes

- 4 Stages
 - Prior to hurricane threat (all season)
 - Prior to formal evacuations
 - During formal evacuations
 - No longer safe to evacuate
- For more information...
 - Guidelines for Hurricane Evacuation Marking and Signing
 - <http://tti.tamu.edu/documents/0-4962-P1.pdf>

DMS Manual: no page reference

16-7

POINTS TO ADD:

- Information on next few slides is not in manual. Result of TxDOT research project 0-4962

Stage 1: All Season

Phase 1

**HURRICANE
SEASON
IS HERE**

DMS Manual: no page reference

16-8

POINTS TO ADD:

- This is the recommended phase during stage 1

Stage 1: All Season

Phase 1

HURRICANE
SEASON
IS HERE

Phase 2

DO YOU KNOW
YOUR EVACUATION
ROUTE?

EVACUATION ROUTE
INFORMATION
CALL <phone # >

PLAN TO
RIDESHARE WITH
NEIGHBORS OR FAMILY

RIDESHARING
REDUCES
EVACUATION TRAFFIC

MAKE AN
EVACUATION PLAN

IS YOUR
VEHICLE MAINTENANCE
UP TO DATE?

YOUR EMERGENCY
BROADCAST NETWORK
IS xxxx AM

DMS Manual: no page reference

16-9

POINTS TO ADD:

- Phase 2 examples of messages that can be used to create a library or rotation of messages throughout the season

Stage 2: Prior to Evacuation

Phase 1

**HURRICANE
IN
GULF**

DMS Manual: no page reference

16-10

POINTS TO ADD:

- Phase 1 for all messages during this stage

Stage 2: Prior to Evacuation

Phase 1

HURRICANE
IN
GULF

Phase 2

EVACUATION ROUTE
INFORMATION
CALL <phone # >

RED CROSS
SHELTER INFORMATION
CALL <phone # >

PLAN TO
RIDESHARE WITH
NEIGHBORS OR FAMILY

RIDESHARING
REDUCES
EVACUATION TRAFFIC

REMEMBER TO
TAKE MAPS
IF EVACUATING

YOUR EMERGENCY
BROADCAST NETWORK
IS xxxx AM

CHECK YOUR
EVACUATION SUPPLIES

DMS Manual: no page reference

16-11

POINTS TO ADD:

- Phase 2 examples that can be used to create a library or rotation of messages during this stage

Stage 3: Evacuation

Phase 1

**HURRICANE
EVACUATION
IN PROGRESS**

DMS Manual: no page reference

16-12

POINTS TO ADD:

- Phase 1 of message during this stage

Stage 3: Evacuation

Phase 1

HURRICANE
EVACUATION
IN PROGRESS

Phase 2

FUEL
AVAILABLE
NEXT EXIT

RIDESHARE
WITH
NEIGHBORS OR FAMILY

RIDESHARING
REDUCES
EVACUATION TRAFFIC

NEXT FUEL
AVAILABLE
10 MILES <or EXIT XX>

TUNE TO
EMER BROADCAST
xxxx AM

TAKE STATE
AND LOCAL
MAPS

DO NOT STOP
ON SHOULDER

RED CROSS
SHELTER INFORMATION
CALL< phone #>

DMS Manual: no page reference

16-13

POINTS TO ADD:

- Phase 1 examples that can be used during this stage
- In the second box on the left, only one of the location options in the bottom line would be used
- Last message on left would be appropriate when shoulder lanes have been activated for evacuation

Stage 4: Not Safe to Evacuate

Phase 1

HURRICANE
LANDFALL
SOON

EXTREME
WIND
WARNING

Phase 2

GO TO
NEAREST
SHELTER

SEEK
SHELTER
NOW

LOCAL SHELTER
INFORMATION
CALL< phone #>

DMS Manual: no page reference

16-14

POINTS TO ADD:

- There are two possible phase 1 message options during this phase. The first one listed is a general warning. The second is an example if there are specific warnings or conditions to advise drivers about
- Right side are phase 2 message examples. Any of these can be mixed with either phase 1 example

High Water & Floods

Module 17

OBJECTIVE OF MODULE:

- Summarize recommendations regarding messages to warn about high water and flooding conditions

DURATION:

- 15 Min

Conditions & Driver Needs

High water on freeway but passable

- Be alerted about high water
- Know the location of high water
- Be confident that they can pass through
- Be confident that they do not have to exit

DMS Manual: pg 17-1

17-2

POINTS TO ADD:

- On high-speed facilities, standing water can be hazardous for drivers. Drivers want to be notified if standing water exists, and whether it is ok to drive through (if across all lanes)

Conditions & Driver Needs

High water on freeway and ***flooded***

- Be alerted about freeway closure
- Know the location of closure
- Be informed as to which exits to take

DMS Manual: pg 17-1

17-3

POINTS TO ADD:

- None

Message Format for Passable

1. Water descriptor message element
2. Water location message element
3. Action message element

WATER ON FREEWAY
(Water Location)
(Action)

DMS Manual: pg 17-2

17-4

POINTS TO ADD:

- The overall message format for water on road messages is the same as for incident and roadwork messages (problem, location, action)

1. Water Descriptor

No clear cut choice

WATER ON ROAD (FREEWAY)

WATER AHEAD

DMS Manual: pg 17-2

17-5

POINTS TO ADD:

- None

2. Water Location

Depends upon whether water is

- **Downstream of crossing hwy or street**

PAST [hwy, street name]

- **Between exit & entrance ramp**

AT [hwy, street name]

PAST [exit ramp name]

POINTS TO ADD:

- Location terms previously discussed also apply in this module

2. Water Location (Cont.)

Depends upon whether water is

- **Upstream of exit ramp**

BEFORE [exit ramp name]

DMS Manual: pg 17-3

17-7

POINTS TO ADD:

- None

3. Action

*BE PREPARED TO STOP
USE CAUTION*

DMS Manual: pg 17-3

17-8

POINTS TO ADD:

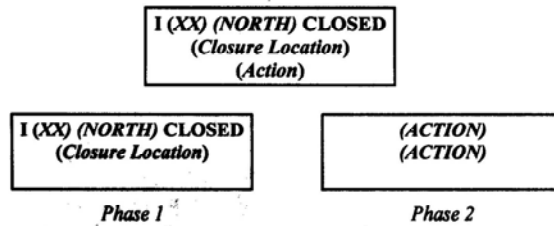
- None

ASK:

- Do you use any other types of action statements for water on road conditions?

Message Format for Flood

1. Freeway closure descriptor message element
2. Closure location message element
3. Action message element



DMS Manual: pg 17-4

17-9

POINTS TO ADD:

- If roadway is flooded, road closure messages are similar to those for total road closures for incidents or roadwork

Ozone

Module 18

OBJECTIVE:

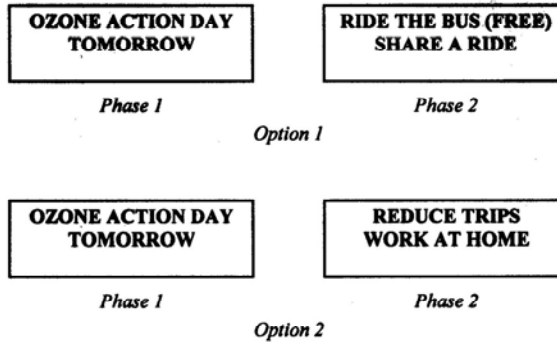
- Illustrate common messages used to support ozone action days

DURATION:

- 5 Min

DMS Messages

Day prior to ozone action day



DMS Manual: pg 18-1

18-2

POINTS TO ADD:

- None

DMS Messages

Day of ozone action day

**OZONE ACTION DAY
TODAY**

Phase 1

**REDUCE TRIPS
WALK TO LUNCH**

Phase 2

DMS Manual: pg 18-2

18-3

POINTS TO ADD:

- None

Planned Special Events

Module 19

OBJECTIVE OF MODULE:

- Summarize recommendations regarding design of special event message

DURATION:

- 15 Min

Impacts & Strategies

Driver groups

- Traveling to the event
- Not traveling to the event

DMS Manual: pg 19-1

19-2

POINTS TO ADD:

- None

Impacts & Strategies

Categories of events

- Discrete/recurring at permanent venue
- Continuous
- Street use
- Regional/multi-venue
- Rural

DMS Manual: pg 19-1

19-3

POINTS TO ADD:

- Recurrent events at permanent venues allows operators to “tweak” plans after each occurrence and evolve a plan that is most effective (also develops driver expectancy)

DMS Messages – Driving to Event

Likely scenarios

- Inform of direct route to event
- Divert to alternative route

DMS Manual: pg 19-3

19-4

POINTS TO ADD:

- None

DMS Messages – Driving to Event

Best signing strategies

- Audience for Action (top line)
- Exit information or route information
- Parking information
 - Important, but should not be displayed on DMS*
- Trailblazers guiding to venue/parking

DMS Manual: pg 19-3

19-5

POINTS TO ADD:

- For special events signing, display of audience as top line of message is recommended

DMS Messages – Driving to Event

Informing of exits to take or routes to use

**FAIR PARK
TAKE NEXT 2 EXITS**

Example 1

**FAIR PARK
EXIT AT 2ND AVE**

Example 2

DMS Manual: pg 19-3

19-6

POINTS TO ADD:

- None

DMS Messages – Driving to Event

Divert to Alternative Route

**FAIR PARK
TAKE FITZHUGH
AVOID MAJOR DELAY**

Example 1

**FAIR PARK
TAKE FITZHUGH
SAVE 20 MIN**

Example 2

**FAIR PARK
TAKE FITZHUGH
AVOID 20 MIN DELAY**

Example 3

**FAIR PARK
BEST ROUTE
USE FITZHUGH AVE**

Example 4

DMS Manual: pg 19-4

19-7

POINTS TO ADD:

- None

Exercises

OBJECTIVE:

- Allow participants to utilize concepts presented in workshop to create messages for various hypothetical situations

DURATION:

- 1 hour

Urban Example

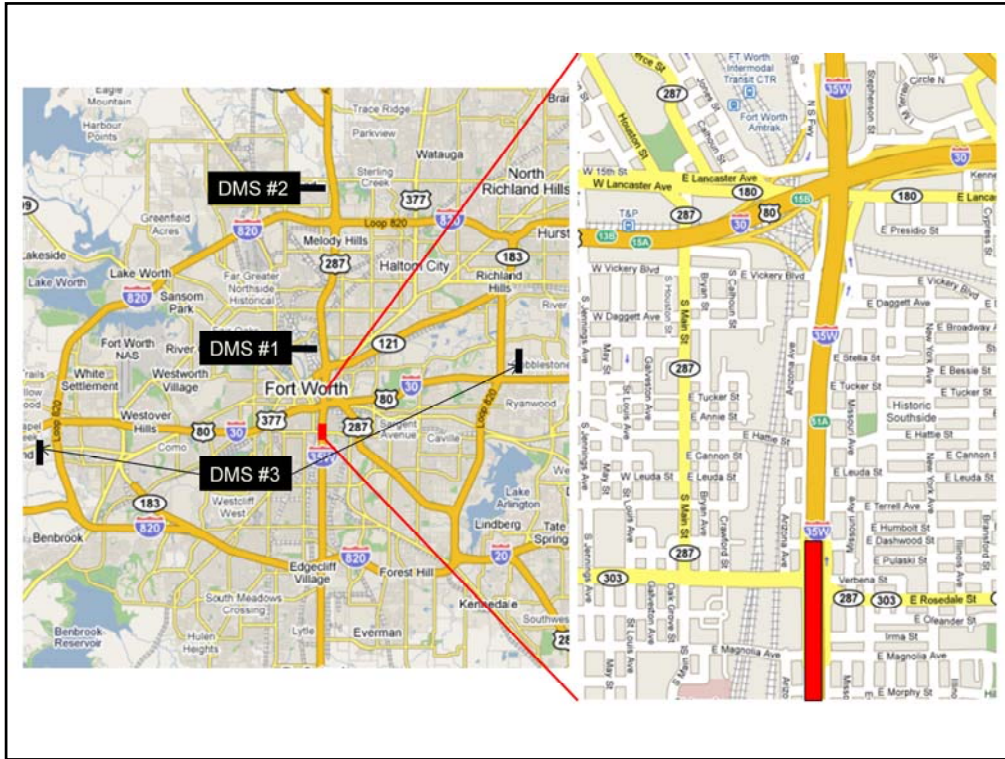
A tanker truck overturns on I-35W southbound just past the I-30 interchange. All lanes are closed southbound beginning at the Rosedale Exit (see map on next slide)

- What message should be put on a DMS just upstream of the closure (DMS #1)?
- What message should be put on a DMS prior to I-820 (DMS #2)?
- What message should be put on DMSs on I-30 approaching I-35W (DMS #3)?

Assume all DMS can display 3 lines at 18 characters per line

POINTS TO ADD:

- None



POINTS TO ADD:

- Note that the DMS of interest on I-30 are outside of the I-820 loop.

DMS #1 Possibilities

Some one phase message possibilities...

TRUCK ACCIDENT
AT ROSEDALE
ALL LANES CLOSED

FREEWAY CLOSED
AT ROSEDALE
USE OTHER ROUTE

FREEWAY CLOSED
PAST I-30
EXPECT DELAYS

Some two phase message possibilities...

TRUCK ACCIDENT
AT ROSEDALE

ALL LANES CLOSED
USE OTHER ROUTE

FREEWAY CLOSED
AT ROSEDALE

USE OTHER ROUTE
AVOID
MAJOR DELAYS

A preferred two-phase
message

FREEWAY CLOSED
PAST I-30

EXIT ROSEDALE
FOLLOW DETOUR

POINTS TO ADD:

- This slide is not provided in the student workbooks.
- Information on this DMS is likely to be most useful to local drivers. However, indicating that the freeway is closed will tell most familiar drivers that they need to find another route to their destination if possible.
- At some point, it is likely that law enforcement will implement a complete detour onto the frontage road around the incident. Since telling familiar drivers that the freeway is closed will encourage diversion, it would be best if those unfamiliar drivers who reach the incident location simply followed that detour rather than try to find their own way around the problem. Notifying them that there is a detour to follow will reduce their anxiety about what they should do.

DMS #2 Possibilities

Some one phase message possibilities...

TRUCK ACCIDENT
AT ROSEDALE
ALL LANES CLOSED

FREEWAY CLOSED
AT ROSEDALE
USE OTHER ROUTE

FREEWAY CLOSED
PAST I-30
EXPECT DELAYS

Some two phase message possibilities...

TRUCK ACCIDENT
AT ROSEDALE

ALL LANES CLOSED
USE OTHER ROUTE

FREEWAY CLOSED
AT ROSEDALE

USE OTHER ROUTE
AVOID
MAJOR DELAYS

A preferred two-phase
message

FREEWAY CLOSED
PAST I-30

WACO TRAFFIC
USE I-820 WEST

POINTS TO ADD:

- This slide is not in the student notebooks.
- It is possible to identify the problem, location, and effect on traffic in different ways on a single phase. However, if one allows the driver to recognize that a FREEWAY CLOSED condition will generate large delays, one can avoid using an effect on traffic statement, and provide a preferred action instead, as in the 2nd one-phase example.
- For DMS far upstream and a severe problem such as this, it would be most beneficial if any traffic could be diverted as far away from the incident as possible. Identifying a specific audience and a specific route gives the driver more information and confidence to follow that information. It should be noted that drivers destined beyond Waco (Austin, San Antonio, etc.) will understand that the message applies to them as well. These drivers are also less likely to know exactly where Rosedale is, and so will not likely try to find another route around the problem. Indicating that the problem is beyond a major interchange (I-30) is also helpful to those drivers (familiar and unfamiliar) who had planned to exit at that interchange to know that the interchange is open.

DMS #3 Possibilities

Some one phase message possibilities...

TRUCK ACCIDENT
I-35W SOUTHBOUND
ALL LANES CLOSED

I-35W SOUTHBOUND
CLOSED
AT ROSEDALE

I-35W SOUTHBOUND
CLOSED
EXPECT DELAYS

Some two phase message possibilities...

TRUCK ACCIDENT
I-35W SOUTHBOUND
AT ROSEDALE

USE OTHER ROUTES

I-35W SOUTHBOUND
CLOSED
AT ROSEDALE

USE OTHER ROUTES
AVOID
MAJOR DELAYS

A preferred two-phase
message

I-35W SOUTHBOUND
CLOSED
AT ROSEDALE

WACO TRAFFIC
USE I-820

POINTS TO ADD:

- Remember that this slide is not in the student workbooks.
- The goals are similar to those for DMS #2. However, since the problem is not on the drivers roadway, the audience for the message must be identified. In the top examples, this means that a unit of information must be used (compare these messages to the #2 signs).
- For the preferred message, the “USE OTHER ROUTES, AVOID MAJOR DELAYS” message could work well for DMS inside the I-820 loop. However, it would be more beneficial to encourage non-local drivers from entering the downtown area, which is why WACO TRAFFIC are encouraged to use the alternate route.

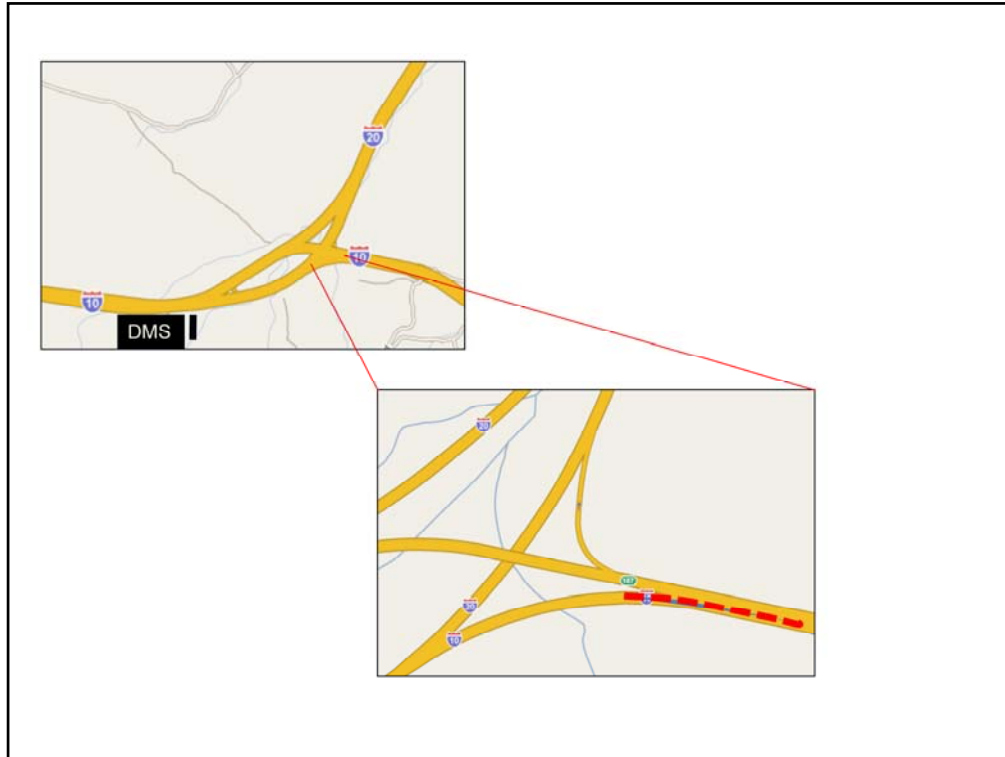
Rural Example

Road repairs are being made in the left lane of I-10 eastbound (2 lanes per direction) just past the I-10/I-20 split in west Texas (see map on next page). The lane closure begins just past the curve.

- What message should be put on a DMS located upstream of the I-10/I-20 split (3 lines, 15 characters per line)?

POINTS TO ADD:

- None



POINTS TO ADD:

- Note that the advance warning signs for the lane closure will extend upstream into the I-10/I-20 split. Most likely, they will say “LEFT LANE CLOSED”
- Also, the DMS is located prior to the widening of I-10 for the split, so there is only two lanes.

DMS Possibilities

ROADWORK
LEFT LANE CLOSED
USE CAUTION

ROADWORK
PAST I-20
LEFT LANE CLOSED

LEFT LANE CLOSED
PAST I-20
USE CAUTION

Preferred one-phase message

I-10 ROADWORK
PAST I-20
1 LANE CLOSED

POINTS TO ADD:

- Remember that this slide is not included in the student workbooks.
- Using “LEFT LANE CLOSED” upstream on the DMS could cause confusion for drivers, since the left lane would be the one destined for I-20
- Although motorists normally assume the problem (ROADWORK) is on the roadway they are on if a roadway is not specified, it is less clear at major freeway splits.
- Consequently, in this example, it may be necessary to indicate which roadway the roadwork is located (i.e., the audience of the message), its location (past I-20), and that it involved a lane closure (so they expect additional signing about which lane is closed). Remind them it is not necessary to tell them which lane is closed far upstream.