

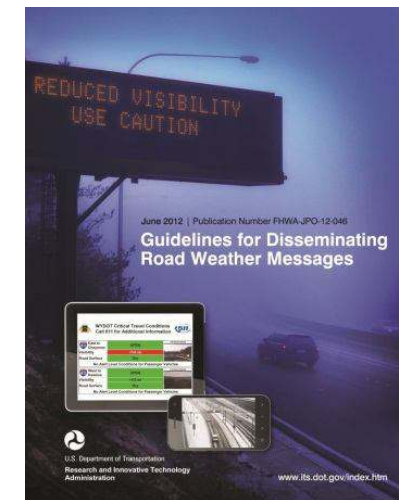
Communicating Winter Conditions and Other Weather Information to Road Users

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0. OUTLINE

1. Introduction – Motivation for Road Weather Messaging Guidelines
2. Role of FHWA Road Weather Program
3. Objectives and Approach for Messaging Guidelines
4. Phase 1 – Identify Requirements and Develop Preliminary Guidelines
5. Phase 2 – Evaluate and Refine the Guidelines
6. Conclusions

1. INTRODUCTION – Motivation for Messaging Guidelines

- Transportation agencies need to determine the most effective ways to inform, warn, and advise travelers of adverse winter and other weather conditions.
- There is lack of uniform, consistent and effective road weather messages as well as dissemination methods throughout the country. This jeopardizes the safety and mobility of people who often have to travel in bad weather.
- Little had been done to evaluate the content, usefulness and effectiveness of the information and the means by which they are delivered to the travelers.
- No standards or guidelines exist that identify the most effective format/content and means by which different types of weather and road condition information can be communicated to the public.

2. Role of FHWA Road Weather Management Program

PROGRAM GOALS:

- Understand the impacts of weather on highway mobility and safety
- Develop, implement, and promote strategies and tools to mitigate those impacts, including traveler information strategies.

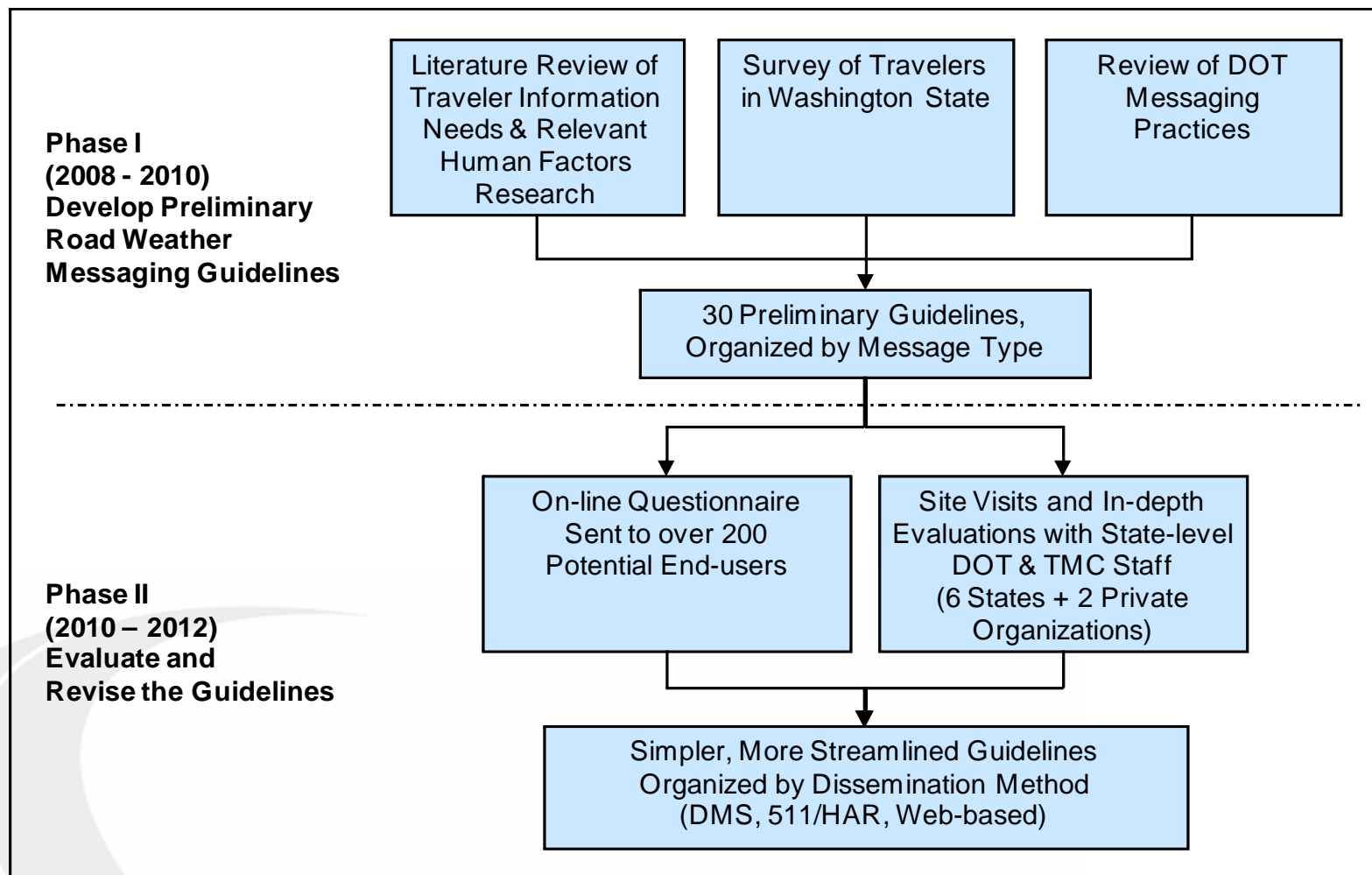
RESEARCH AND DEVELOPMENT AREAS:

- Performance Monitoring and Evaluation
- Data Capture and Management
- Dynamic Mobility Applications
- Weather-Responsive Traffic Management

3A. Objectives of Messaging Guidelines

1. Identify the information requirements of travelers across a representative number of weather events and travel scenarios including winter weather.
2. Evaluate the current state of the practice in weather-responsive traffic advisory and control strategies in terms of meeting those information requirements.
3. Recommend ways to improve those practices including development and implementation of road weather communication and messaging design guidelines.

3B. Approach for Messaging Guidelines



4A. Phase 1 - Identify Traveler Requirements for Representative Scenarios

Travel Scenarios							
<i>Trip Purpose</i>	<i>Time Constraints</i>	<i>Network Familiarity</i>	<i>Trip Duration</i>	<i>Trip Origin</i>	<i>Regional Differences</i>	<i>Vehicle Type</i>	<i>Travel Environment</i>
Commute	High	High	< ½ day	Home	Same-State	PV	Urban
1-way trip	Med	Med	1 Day	Home	Multi-State	PV	Interstate
Recreation	Low	Low	Multi-day	Trip-Leg (Hotel)	Same-State	PV	Mountain/Rural
Commercial Vehicle Travel	High	High	Multi-day	Trip-Leg (Rest Area)	Multi-State	CV	Interstate
Local CV Operation	High	High	1 Day	Home (Warehouse / Depot)	Same-State	CV	Urban

4B. Phase 1 – Develop Preliminary Guidelines



**What are the Key
Mobility Impacts?**

For Example:

***Reduced traction
Congestion
Poor visibility
Road closures***

**What are the Traveler
Decisions to be made?**

For Example:

***Expect & plan for delays
Use alternative route
Change travel modes
Drive with greater caution?
Change their driving behavior
Make safety-related preparations
Cancel their trip***

**What are the appropriate
Dissemination Methods?**

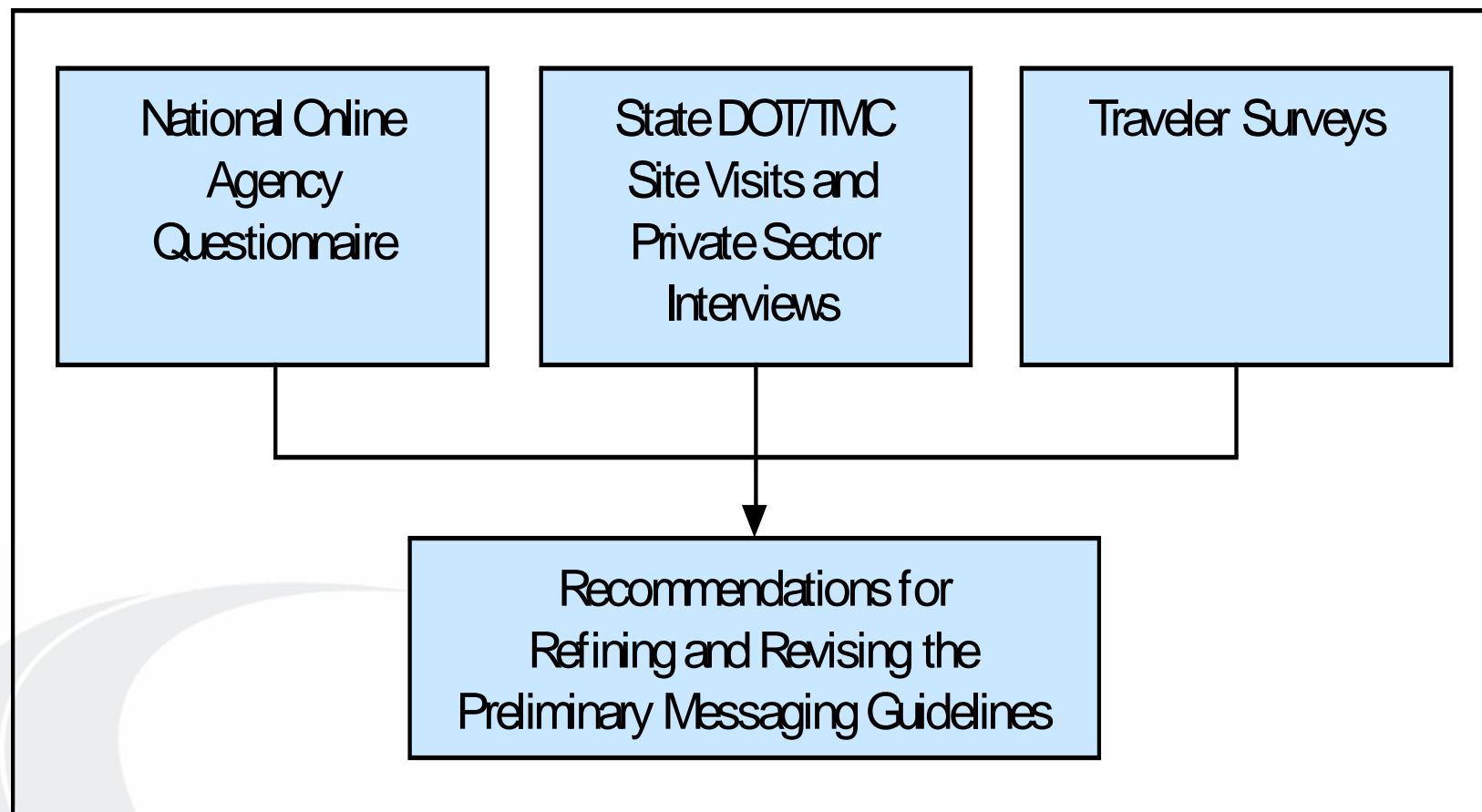
For Example:

***DMS
HAR
511
Navigation devices
Cell phones
Kiosks
Websites***

4C. Phase 1 – Preliminary Messaging Guidelines

1. Guidelines organized around traveler information needs and driving decisions.
2. 30 guidelines and 4 tutorials for road weather advisory and control information reflecting relevant literature and best practices for topics such as:
 - Message content, length, and structure
 - Design of fonts, colors, icons, and alerts
 - Display of map, weather, and traffic information
 - How to communicate timeframe, urgency, likelihood
3. Specific guidelines organized by design topic and message type (e.g., short text, auditory, open-format).

5A. Phase 2 - Evaluate and Revise the Guidelines: Framework



5B. Phase 2 – Participants in Guidelines Evaluation

1. Kansas City (KC) Scout TMC, Missouri
2. Wyoming Statewide TMC (WYDOT)
3. Colorado Springs, Colorado TMC (CSTMC)
4. Colorado DOT, Colorado (CDOT)
5. Washington State DOT (WSDOT) and six Northwest Regional TMCs
6. Maryland (MD) Coordinated Highway Action Response Team (CHART)
7. Meridian Environmental Technology, Inc.
8. Castle Rock, Inc

5C. Kansas City TMC Winter DMS Messages

GIVE SNOW PLOWS ROOM TO WORK USE CAUTION	BLOWING SNOW REDUCED VISIBILITY TRAVEL NOT ADVISED	REDUCED VISIBILITY USE HEADLIGHTS USE CAUTION
SNOW PLOWING IN EFFECT EXPECT DELAYS	SEVERE THUNDERSTORM WARNING TUNE TO LOCAL MEDIA	WATER OVER ROADWAY [LANE SPECIFIED]
HIGH WIND ADVISORY USE CAUTION	FOG CONDITIONS REDUCED VISIBILITY USE CAUTION	DO NOT USE CRUISE CONTROL DURING [RAIN/ SNOW/ ICE]
EXTREME WEATHER USE CAUTION ON BRIDGES AND RAMPS	EXTREME WEATHER CONDITIONS TRAVEL NOT ADVISED	MAJOR WINTER STORM EXPECT DELAYS LIMIT TRAVEL

5D. Sample Guideline

Chapter Title

Guideline Title

Introduction

Design Guidelines

Examples

Chapter 2 Dynamic Message Signs

GUIDELINE 2-2. DETERMINING DMS MESSAGE LENGTH LIMITS

Introduction

This guideline provides a method for determining the appropriate length of a DMS message by considering information units, which are a measurement of the amount of information in a message. Information units are often defined as the answers to basic questions (e.g., what, where, who).

Design Guidelines

- Keep messages as short and concise as possible.
- Use no more than:
 - 2 information units per line
 - 3 information units per phase
 - 4 information units per message read at speeds of 35 mi/h or more (Figure A)
 - 5 information units per message read at speeds less than 35 mi/h (Figure B)
- Messages may reference other sources containing additional information (e.g., 511, HAR).

An information unit can be defined as the answer to a basic question about the subject of the message. For example, in the table below, each answer to the question "what is the problem," is a single information unit.

Question	Answer (One information unit each)
What is the problem?	FLOODING, SLICK IN SPOTS, BLOWING SNOW
Where is the problem?	AT US-23, PAST I-5, METRO AREA
Who is affected?	NEW YORK, ALL TRAFFIC, WEST BOUND TRAFFIC
What should they do?	USE I-280 EAST. REDUCE SPEED, TRAVEL NOT ADVISED

Phase 1

MAJOR WINTER STORM
LIMIT TRAVEL

Phase 2

KC METRO AREA
EXPECT DELAYS

Figure A. Example message with 4 information units.

Phase 1

HIGH WINDS
ON BRIDGE
ROLLOVER RISK

Phase 2

TRUCKS AND BVS
DRIVE WITH CAUTION

Figure B. Example message with 5 information units.

Chapter 2 Dynamic Message Signs

Discussion

The recommendations for the number of information units that are appropriate for display are based on research and operational experience with DMS (1). The maximum number of information units per message includes the information units in all phases of the message, if multiple phases are used. If the message is too long to be read at normal speeds, it is likely that some drivers will slow down to read the message, affecting the traffic flow and creating a potential safety hazard. In general, the message length should be reduced as much as possible without losing the message intent. This can be accomplished by using some of the following methods (1):

1. Omit evident or redundant information.
2. Delete "dead" words. Examples of "dead" words are "street," "avenue," or "boulevard" following a familiar arterial name. The word "ahead" may also be unnecessary when the road weather condition is occurring on the same freeway as the DMS.
3. Use appropriate abbreviations.

Note that the method presented in this guideline is not the only method used to count information units. The Advanced Traveler Information System (ATIS) Guidelines (2) provide a word-by-word method to count information units (generally the "relevant words" in the message, often counting each word that is not a preposition as one unit). The method proposed by Dudek is included here since weather messages on DMSs are more structured in nature (1). Additionally, message length restrictions may be expressed as a count of individual words.

Design Considerations

The MUTCD (3) states that for PCMSs, messages should be limited to two phases, with no more than three lines of text per phase. If more than two phases are needed, multiple PCMSs may be used. Sometimes, it may be appropriate to link to other forms of media that can broadcast a larger amount of information. For HAR, the phrase "TUNE RADIO TO XX AM" may be used, where XX is the radio station (1). Additionally, one site reported using the phrase "TUNE TO LOCAL MEDIA"; however, this requires the driver to know how to do so. Another site uses "CALL 511" to direct travelers to the 511 phone system for information.

Notes for Other Dissemination Methods

The DMS message length limits are partially influenced by the amount of time available before the driver passes the sign, whereas messages on other devices, such as PEDs, do not have this limitation. However, they are still limited by the physical parameters of the device (e.g., display size, font size) and the traveler capabilities (e.g., visual acuity, memory limitations). Note that with PEDs, the intended use should be to provide information to a traveler when he or she is not driving. An important difference from DMSs is that PEDs and Twitter have space to display full sentences with supporting words. However, note that Twitter has a 140 character limit per message and many cell phone text messages have a 160 character limit. It is also important that messages using these methods include appropriate punctuation to facilitate understanding since the message may not be divided into multiple lines as it is on DMS.

References

1. Dudek, C. L. (2004). *Changeable message sign operation and messaging handbook* (Report No. FHWA-OP-03-070). College Station, TX: Texas Transportation Institute.
2. Campbell, J. L., Carney, C., and Kowitz, B. H. (1999). *Human factors design guidelines for Advanced Traveler Information Systems (ATIS) and Commercial Vehicle Operations (CVO)* (Report No. FHWA-RD-99-057). Washington, DC: Federal Highway Administration.
3. Federal Highway Administration. (2009). *Manual on Uniform Traffic Control Devices for Streets and Highways*. Washington, DC.

Note

NOTE: The use of Portable Electronic Devices, such as cell phones, while driving is a distraction. Consult the current on page 7 for more information.

Left-hand page

Right-hand page

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6. CONCLUSIONS

1. General road weather community indicates that the guidelines will be a valuable tool that provides useful information to message designers and other users.
2. The surveys, site visits, and interviews were valuable approaches for obtaining feedback on the guidelines from the selected state DOTs, TMCs and private service providers. .
3. State DOT and TMC users of the guidelines found the research foundation for the preliminary guidelines to be highly credible and confirming of their existing practices

To download the guidelines:

http://ntl.bts.gov/lib/45000/45600/45623/FinalPackage_JPO-12-046_V1.pdf