SPR RESEARCH PROGRAM SECOND-STAGE PROBLEM STATEMENT FY 2009

ODOT Research Unit
200 Hawthorne Ave. SE
Suite B-240
Salem OR 97301-5192

Phone (503) 986-2700
Fax (503) 986-2844

I. PROBLEM NUMBER

CM-09-08

II. PROBLEM TITLE

Changeable Snow Zone Signs

III. RESEARCH PROBLEM STATEMENT

ODOT's Mission: To provide a safe, efficient transportation system that supports economic opportunity and livable communities for Oregonians.

Manually changing the condition on snow zone signage from no condition to condition A to condition B, etc and back, poses a safety problem for the public and maintenance workers.

Currently, maintenance workers (crew members that operate a snow plow or gravel truck) have to stop on an area of road that is known to be in difficult weather areas to change the snow zone signs. The weather and road conditions are hazardous when changing these signs and most of these signs are located in mountainous or remote areas. Often these areas do not have adequate room on the shoulder to properly park a large maintenance vehicle. Most snow zone signs are 7 feet tall. The crew member has to climb up a sign post and change the signage (most are manual, however, there are some automated signs) using a variety of different methods from large lag bolts in the sign post to a variety of different sign post designs (most common is a ladder-type design) during extreme snow, ice, and wind storm conditions.

Maintenance workers may have to change the signs several times a week, depending on the weather conditions. This exposes the plows and maintenance workers to additional hazards as well as travelers on the highway. There are several design concepts that have been put into use over many years to help the maintenance worker reach the sign to change it. The most popular concept is a ladder-type design attached to one of the sign posts (*Please see attachment A for several pictures of types of sign designs*). There is also an automated drum design currently in use in Region 5.

Currently none of the ladders (or other design concepts) have been crashed tested. It is unknown how the sign, and specifically the ladder-type designs, would react under crash conditions or which design concept would be the best for safety reasons. The OSHA (Occupational Safety & Health Administration) standards have also not been reviewed for safety to the crew member when climbing these ladder-type designs. This exposes travelers to an unknown risk if they go off the highway and hit the sign (and installed portion to help crew member climb up, e.g.

ladder). However, removing the ladders exposes maintenance workers to a high risk of injury and delay (from plowing or other activities) in changing these signs.

Currently ODOT has no standard for snow zone signage other then the sign standards themselves (which do not have a specific design for this issue). Often District Managers (DM's) are left to come up with a solution themselves which may or may not be efficient and/or the safest design.

Additionally, the OARs (Oregon Administrative Rules) and ORS (Oregon Revised Statutes) have specifically designated background color, text color, and wording for these signs to be enforceable to law enforcement. The use of VMS has been ruled out due to the elongated text which is legally required (currently the statements for Condition A, B, and C do not fit on VMS signs with fixed character lengths). Additionally, power costs to operate a VMS with white background and with black text are prohibitive.

IV. RESEARCH OBJECTIVES

There is a need to develop and approve an experimental snow zone sign. This sign should consider safety to the public and maintenance crew members changing it in extreme weather conditions. It should be inexpensive to manufacture and install. Also testing of the sign is needed given the signs may have addition weight, bars and/or levelers that could be a hazard if the sign was hit by a vehicle.

The primary purpose of this research study is to three-fold:

1)Discover different sign design concepts (including automated options) and offer them for the TAC (Technical Advisory Committee) to consider for taking them to the next stages of the research project as described below (i.e. maintenance activities for maximum safety and minimum cost both to the public and to the maintenance worker);

2)To discover if one or several of these concepts is a good candidate for crash testing and meets any OARs, ORS, or OSHA standards needed. Develop a criteria matrix to determine when a manual sign would make a better construction/replacement project versus an automated option given location, safety, need, access to power, etc. This will help provide a feasible option to DM's (district managers) for considering what to install at these remote locations when a new sign or replacement sign is needed given cost, weather considerations, safety concerns, and maintenance activities. An inventory will be gathered of automated snow zone signs versus manual signs, which should help to plan a more statewide approach in looking at the need for manual signs versus automated signs;

3)To advance a final design concept(s), which has adequate crash testing and that meets (or exceeds) OSHA standards. This design(s) will be implemented as a standard for the ODOT signing manual. Assuming the TAC approves of the crash testing results, this design will be accepted as a standard for all manual changing Snow Zone signs across ODOT.

V. WORK TASKS, COST ESTIMATE AND DURATION

1. Project Initiation: Collect background information. Collect snow zone sign locations and estimated frequency of use (changing the signs) per site. Determine (small sample) of the delay between when the condition changed as to when the snow zone sign was changed (if possible). Review design concepts for a variety of districts within ODOT for each region. Review OARs , ORS, OSHA, and snow zone signage requirements for enforcement.

Month 1-2, task duration 1-2 months

Cost: $3,500

2. Literature Review: Conduct an in-depth review of literature, reports, and procedure

manuals used as guidance for background information on this issue in other states. Special consideration will be given to the current practices of State Agencies that have processes and resources similar to that of ODOT.

Month 2-4 task duration: 1-2 months

Cost: $3,500

3. Survey ODOT Personnel and Consultants: Interview ODOT personnel who participate in maintenance and operation of current changeable snow zone signs to gain their perspective on various design's pros and cons.

Month 3-6, task duration: 1-2 months

Cost: $5,000

4. Develop Sample of Design Concepts and Test Data: Develop a representative (based on type of design, type of highway, regional representation, cost to install, time taken to change signs, cost to fix/maintain, crash data, etc.) sample of current roadway snow zone signs and include safety issues with regard to each of them. Collect snow zone sign locations and detailed frequency of use (changing the signs) per site. Determine if any manual snow zones signs are currently scheduled to be installed or replaced. Develop a draft criteria matrix for use to determine when a manual sign would make a better construction/replacement project versus an automated option given location, safety, need, access to power, etc. Already there are at least 3 regions with 4 design concepts in place. Document any safety issues with current inventory.

Month 6-14, task duration: 6-9 months

Cost: $5,000

5. Analyze Data: Analyze the cost, efficiency, safety data and sign data to determine:

The design concept features that were contributing factors to maximize safety.

The design concept features that were contributing factors to minimize cost.

Any potential revisions to the best choice for design concept (given safety and cost) and review process to implement changes.

The impacts of ODOT's change in operations to implement and operate a newly selected changeable snow zone design, including activities related to the maintenance crews, training, and TOC's (Transportation Operations Centers).

13-17 Months, task duration: 2-3 months

Cost: $5,000

6. Develop Crash Test Data Results:

Prepare for bidding process to outsource crash testing of recommended design concept. Award bid for crash testing. Crash testing results returned for review and acceptance. Return results for TAC review.

17-23 Months, task duration: 5-6 months

Cost: $55,000

7. Prepare Final Report: Prepare materials from research project to incorporate into final report. This report should include sign designs, crash testing results, and any additional inventory information discovered during this project.

23-25 Months, task duration: 1-2 months

Cost: $6,000

The estimated cost of this research project is $83,000

VI. IMPLEMENTATION

Assuming a successful project and in conjunction with Office of Maintenance**,** develop recommended guidelines for ODOT to implement the chosen design as a standard design for maintenance and operations groups. The recommendations and guidelines developed from this research could be incorporated into the future ODOT standard design policy manual for the Oregon Supplement to the MUTCD.

VII. POTENTIAL BENEFITS

An OSHA approved, crash tested, efficient sign design would decrease the risk of snow zone area fatalities and injuries. This research will provide ODOT with a standard manual sign which should be fabricated easily, with reasonable cost, and can be implemented statewide.

Implementation of improvements regarding snow zone sign operations for chain-up areas improves safety to the public, safety to ODOT maintenance crews, efficiency in time for crew members to change the manual signs, and potentially has a larger cost savings in adopting a standard for DM's and other construction projects to refer to.

There is a potentially larger cost savings in determining a sign inventory with a "choice matrix" to help DM's be able to determine if an automated sign is a viable choice at that location or if a neighboring district has a sign close-by. This should aid future construction and/or replacement activities of snow zone signage. This will also help statewide coordination and planning between the boundaries of each district. Traffic flow will also be improved if the crew member spends less time stopped to change the snow zone signage.

Additionally, there is further room for continued research for a remote device concept (Portable Variable Messaging Sign or PVMS) and potential comparison of cost savings from operation of an electronic sign design.

VIII. SUBMITTED BY

Stage 1 Submitter

Michael Stinson

District 11 Manager

2557 Altamont Drive

Klamath Falls, OR 97603

541-883-1002

michael.j.stinson@odot.state.or.us

Stage 2 Submitter

Jon Lazarus

ODOT Research Coordinator for Construction and Materials

200 Hawthorne Ste B-240

Salem, Oregon 97301-5192

503-986-2852

jon.m.lazarus@odot.state.or.us

ODOT champion

TBD

IX. Appendix A: Pictures of Snow Zone signage

Changeable Snow Zone sign:

Step-type of design (possibly removeable type of step):

Ladder-style type of design:

Box step-up style design:

Hand crank style of design:

Hand crank style of design (2):

Region 5 automated drum style of design: