CLEAR ROADS
research for winter highway maintenance

RESEARCH BRIEF

DECEMBER 2018

PLOWING INTERSECTIONS AND INTERCHANGES: TRAINING MATERIALS FOR 10 CONFIGURATIONS

RESULTS SUMMARY

Through a comprehensive nationwide survey, researchers gathered information about best practices for plowing ten different intersections and interchanges. With this data, they developed a complete set of training materials, including a video (with clearing animations), a manual, and reference cards.

PROJECT DETAILS

Project Title: Developing a Training Video and Manual for Best Practices and Techniques in Clearing Different Interchange Configurations and Other Geometric Layouts

Project Number: No. CR14-03

Project Cost: $113,619

Report Date: November 2018

Project Champion:
Justin Droste, P.E.
Michigan Department of Transportation
drostej@michigan.gov

Investigator: Yan Qi, Ph.D., P.E.
Southern Illinois University Edwardsville
yqi@siue.edu

As our highway system continues to serve increasing traffic volumes, civil engineers develop intersections and interchanges that allow traffic to flow quickly and efficiently, using multiple merging and turning points. However, intersecting roadways can be very challenging for snow removal crews. Clear Roads undertook this project to identify best practices in snow removal for ten different intersection and interchange configurations and to develop training materials for each.

Need for Research

While every winter maintenance agency has its own approach to clearing different types of intersections and interchanges, there were no best practices guidelines addressing how to most effectively plow these road configurations. Nor were training materials available. This project addressed that need while providing another offering in Clear Roads' growing selection of training materials for snow maintenance professionals.

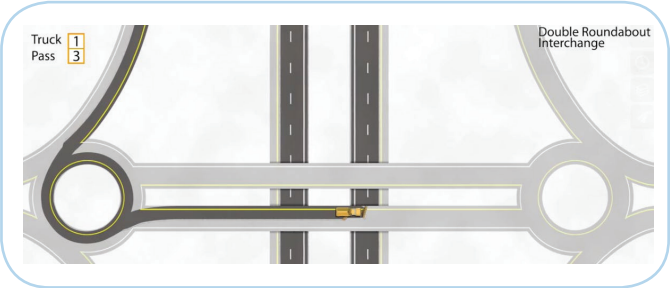
Objectives and Methodology

This project sought to determine the most effective practices used by agencies nationwide for clearing snow from ten common, and/or emerging, types of intersections and interchanges. The practices would be adaptable to all agencies in the U.S. and Canada. To accomplish this, researchers determined best practices and then developed a set of resources to assist agencies: a training video with clearing animations, reference cards and a practice manual. These tools allow agencies to

- Better train their operators
- Evaluate their equipment needs
- Review other resources
- Improve service levels.

There are many intersection and interchange configurations in use throughout the country. The Technical Advisory Committee selected ten configurations for this project: four intersections and six interchange geometries. Researchers then developed a comprehensive survey that asked participants to evaluate and com-

CONTINUED



This is an image from the manual and training video: an animated sequence shows the plow path for clearing a Double Roundabout Interchange. The icon in the upper left-hand corner shows that this is the path of Truck #1 on Pass #3 of the clearing sequence.

ment on proposed plow paths, techniques and equipment for clearing snow from the ten road layouts.

The survey was distributed to Clear Roads member states, the American Association of State Highway and Transportation Officials (AASHTO) Snow and Ice Listserv, the Winter Maintenance and Effects LinkedIn page and the AASHTO Standing Committee on Maintenance. The survey gathered responses from 76 participants in 21 states, including primarily state DOT professionals, but also from those in municipal public works, federal agencies, tribal and territorial agencies, and a metropolitan airport. The survey's responses allowed researchers to identify best practices for clearing snow from the ten configurations. They then used the data to develop the training package: a video, a practice manual and reference cards.

Results

The robust survey results provided researchers with the information they needed to develop training materials for effective snow removal from these intersection and interchange configurations:

1. Roundabout Intersection
2. Four-Leg Intersection
3. Displaced Left-Turn Intersection
4. Median U-turn Intersection
5. Double Roundabout Interchange
6. Diamond Interchange
7. Cloverleaf Interchange with C/D Lanes
8. Single-Point Interchange
9. Diverging Diamond Interchange
10. Directional T Interchange.

The primary training tool researchers created is a 66-minute video with a chapter menu directing to each geometry type. The video sequences include detailed animated sequences for each configuration, showing plow trucks following specific plow paths to clear the roads. Each sequence uses an easy-to-understand icon that indicates the truck number, the pass number, the position of the front blade, and use of a right or left wing plow. Each animated sequence shows a moving truck with different plow positions, how a truck clears each geometry and how multiple trucks can combine their efforts where suggested.

Accompanying the video are two more tools: a practice manual that presents the plow paths as clear diagrams with descriptions, and a set of reference card diagrams that can be kept in a truck. The video and manual also present safety pointers and techniques for clearing intersections and interchanges.

Researchers note that each agency may have its own unique situations and conditions, such as number of trucks, types of equipment, workforce size, total lane miles, expected levels of service and other aspects. The video sequences show efficient and effective methods of clearing snow that were evaluated by survey respondents as "best practices." However, agencies with fewer trucks and different equipment may adjust the trucks and equipment to match their own resources. The plow paths and techniques shown in the video are not the only workable approaches.

Benefits and Further Research

The maps and data generated through this project provide a standard framework for comparing winter weather severity across the United States. This allows agencies to make cost comparisons with states that have similar climates and consider new budget scenarios based on the successes of other agencies—ultimately improving the effectiveness and efficiency of their winter maintenance operations.

> "The animations and reference cards will be useful for operator training and provide a good base for winter agencies looking to improve their clearing techniques at intersections and interchanges."

Project Champion Justin Droste, P.E.
Michigan Department of Transportation
drostej@michigan.gov

Produced by CTC & Associates LLC on behalf of the Clear Roads pooled fund project #TPF-5(218), led by the Minnesota Department of Transportation.