



Project Summary Report 0-4174-S

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Project 0-4174: Traffic Control Devices and Strategies to Improve the Safety of Mobile and Short Duration Work Zones

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Practices to Improve the Safety of Mobile and Short Duration Maintenance Operations

Maintenance work is often accomplished using mobile or short duration work zones. Typically, mobile operations consist of one or more vehicles that move along the road intermittently or continuously at very slow speeds relative to the normal traffic stream. Short duration operations involve work that occupies a location for up to one hour.

Both types of operations present a challenge due to the impracticality of installing an extensive amount of traffic control devices, since it takes longer to set up the traffic control devices than to perform the work activity. This project identified and evaluated traffic control devices and practices that could be used to improve the safety of mobile and short duration maintenance operations.

What We Did...

During the first year, researchers conducted a survey of state transportation agencies, held seven discussion groups with Texas Department of Transportation (TxDOT) maintenance and supervisory personnel, and made field observations of mobile and short duration operations in five TxDOT districts. These activities identified the hazards encountered by both workers and motorists during mobile and short duration maintenance operations.

During the second year, researchers compiled a synthesis of previous research, as well as conducted focus groups in three cities, motorist surveys in four cities, and a field study. These activities were undertaken to assess motorist comprehension and the operational effectiveness of current and innovative

traffic control devices used to inform motorists about:

- the number of vehicles in a work convoy,
- the speed differential between the work convoy and traffic,
- passing a work convoy on two-lane, two-way roadways, and
- the LANE BLOCKED sign.

In addition, with input from an advisory panel comprised of TxDOT personnel and contractors, researchers:

- examined the terminology used to define mobile and short duration operations to determine whether changes would help maintenance personnel distinguish between these types of operations,
- developed maintenance traffic control plans for select mobile and short duration operations,



- developed guidance for the use of trail and shadow vehicles for selected operations based on roadway volume (average daily traffic) and posted speed, and
- developed quick reference tables that direct maintenance personnel to the appropriate mobile and short duration practice(s).

What We Found...

The results of first-year activities showed that the primary hazards encountered by workers and motorists during mobile and short duration operations relate to:

- apparent motorist misunderstanding of traffic control devices,
- vehicles entering the work convoy,
- speed differential between approaching traffic and the work convoy, and
- passing maneuvers around the work convoy on two-lane, two-way roadways.

The results of second-year activities yielded the following findings.

- The WORK CONVOY sign (Figure 1a) does not convey to motorists that they are approaching multiple work vehicles.
- Placing the number of work vehicles on the sign (Figure 1b) provides motorists with more specific information and thus improved motorist understanding.



a. WORK CONVOY Sign.

b. # VEHICLE CONVOY Sign.

Figure 1. Current and Modified WORK CONVOY Signs.

- Motorists understood that the YOUR SPEED display (Figure 2a) was telling them how fast they were traveling. However, this display does not provide information to motorists about the speed differential between themselves and the work vehicle.
- The MY SPEED display (shows the speed of the work vehicle) and the YOUR SPEED/MY SPEED display (shows the speed of the approaching motorist and the speed of the work vehicle) were not understood by motorists (Figures 2b and 2c, respectively). The speed shown on the MY SPEED display was commonly mistaken as the speed the motorist was traveling instead of the speed of the work vehicle. Most motorists could not recall all of the YOUR SPEED/MY SPEED display and thus did not understand the display.
- For mobile operations on two-lane, two-way roadways with unimproved shoulders, the addition of the PASS WITH CARE message and the DO NOT PASS message improved motorist understanding of whether or not they were allowed to pass the work convoy. However, implementation of the PASS WITH CARE message would be difficult since the message would have to be removed/turned off every time the work vehicle entered a no passing zone. In addition, TxDOT expressed concern over the apparent shift in liability from the motorist to the work crew with the use of the PASS WITH CARE message.
- For mobile operations on two-lane, two-way roadways with improved shoulders, the addition of the message PASS ON SHOULDER did not improve motorist compliance of passing the work convoy to the right.





a. YOUR SPEED Display.



b. MY SPEED Display.



c. YOUR SPEED/MY SPEED Display.

Figure 2. Speed Displays Evaluated.

**LEFT
LANE
CLOSED**

**RIGHT
LANE
CLOSED**

**CENTER
LANE
CLOSED**

Figure 3. Recommended PCMS Messages for Mobile Operations on Divided Highways.

However, researchers believe that the results may have been impacted by a lack of time to read the PASS ON SHOULDER message prior to initiating the passing maneuver.

- The LANE BLOCKED sign is understood by motorists and operationally yields a response from motorists similar to a portable changeable message sign (PCMS).

The Researchers Recommend...

Based on the results of the activities conducted as part of this project, researchers recommend the following traffic control devices to improve the safety of mobile work zone operations.

- The “#” VEHICLE CONVOY sign (Figure 1b) should be used instead of

the WORK CONVOY sign (CW21-10). The number needs to be adjustable and easy to change.

- On two-way roadways, the DO NOT PASS sign (R4-1) should be placed on the rear of the trail vehicle when motorists are not allowed to pass the work convoy.
- The LANE BLOCKED sign (FCW20-6) should be required on divided highways with four or more lanes in each direction.
- A PCMS can be substituted for the LANE BLOCKED sign (FCW20-6) on divided highways with three or less lanes in each direction. TxDOT should require the use of the PCMS messages shown in Figure 3 and a minimum letter height of 12 inches.

In addition, researchers recommend the use of the following items, developed as part of this research project, to improve the safety of mobile and short duration operations (see Report 0-4174-2 for more details):

- maintenance traffic control plans for select mobile and short duration operations,
- guidance for the use of trail and shadow vehicles for selected operations based on the roadway volume (average daily traffic) and posted speed, and
- quick reference tables that direct maintenance personnel to the appropriate mobile and short duration practice(s).

Researchers also recommended changes to the work duration definitions used in the *Texas Manual on Uniform Traffic Control Devices* and *TxDOT Traffic Control Plans* to help better distinguish between the different types of operations (see Report 0-4174-2 for more details).



For More Details...

The research is documented in two reports:

- 0-4174-1, *Identification of Hazards Associated with Mobile and Short Duration Work Zones* and
- 0-4174-2, *Traffic Control Devices and Practices to Improve the Safety of Mobile and Short Duration Operations*.

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TxDOT Implementation Status—February 2005

The objective of this research project was to determine the types of traffic control devices and methodologies that can be used effectively to improve the safety of mobile and short duration maintenance operations on various types of roadways. One product was required for this project: recommendations containing devices and practices to be incorporated into the *Traffic Control Standard Sheets*. These recommendations have been incorporated in Chapter 8 of Research Report 0-4174-2, *Traffic Control Devices and Practices to Improve the Safety of Mobile and Short Duration Operations*, and are available for immediate implementation statewide. In addition, the researchers have developed a series of maintenance traffic control plan standards that identify the appropriate type of traffic control for a given maintenance operation on divided and undivided highways. It is intended that these standards be used by maintenance forces on a statewide basis pending review and approval by the Traffic Operations Division.

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