Guidance on Use of Channelization for Two-Lane Two-Way Work Zone Configurations

tech transfer summary

This project provides guidance regarding the use of traffic control devices to separate opposing traffic in two-lane, two-way, work zone configurations.

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RESEARCH PROJECT TITLE
Guidelines on Use of Temporary Barriers in Work Zones

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The mission of the Center for Transportation Research and Education (CTRE) at Iowa State University is to develop and implement innovative methods, materials, and technologies for improving transportation efficiency, safety, reliability, and sustainability while improving the learning environment of students, faculty, and staff in transportation-related fields.

Objectives

The objectives of this research were to assess the advantages and disadvantages in terms of cost, safety, mobility, and ease of application/removal of various types of traffic control devices (TCDs) used to separate opposing lanes of traffic in two-lane two-way (TLTW) work zones and summarize information for their use.

Problem Statement

Agencies have little guidance regarding the use of TCDs to separate opposing traffic in TLTW configurations.

Background

Addressing work zone crashes is critical for both the traveling public and highway workers. TLTW work zone configurations pose a special crash risk because the separation between opposing lanes of high-volume, high-speed, multilane traffic narrows to a head-to-head configuration, increasing the potential for conflicts with oncoming traffic.

TCDs used to separate opposing traffic in TLTW configurations include channelizers and temporary barriers, each of which has its own advantages and disadvantages in terms of cost, safety, mobility, and ease of application/removal.

Channelizers such as tubular markers and cones are cost-effective and easy to apply/remove but provide minimal protection from opposing vehicles. Temporary barriers of concrete or other materials provide positive protection from oncoming vehicles but are significantly more expensive and not easily moved. Barriers also tend to have a wider footprint and may restrict traffic flow.

Willie Sorenson, Iowa DOT

Channelizers (left) and concrete barriers (right) used in Iowa work zones to separate traffic in TLTW operations

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Research Description

The researchers gathered information about the advantages and disadvantages of eight types of TCDs used to separate opposing traffic in TLTW work zone configurations. The devices included four channelizers (longitudinal channelizing devices, cones and tubular markers, vertical panels, and drums) and four types of temporary barriers (portable concrete barriers [PCBs], moveable concrete barriers, ballast-filled barriers, and steel barriers).

Additionally, the researchers identified available guidance from 24 states on the use of channelizers or barriers in TLTW work zone configurations; most guidance addressed positive protection devices.

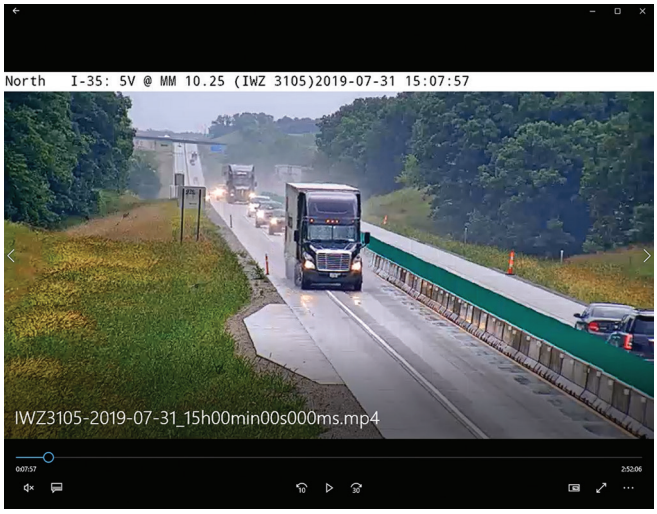
The team evaluated safety impacts of channelizers and temporary barriers in TLTW work zones through a brief literature review and two analyses focusing on TLTW work zones in Iowa.

The first analysis evaluated the lateral lane position of large trucks in TLTW work zones during the 2019 and 2020 construction seasons. Lateral lane position, manually reduced from traffic camera video, was used to measure the "friction" vehicles experience in the presence of certain TCDs. Six TLTW work zones were identified that used curbing with tubular markers to separate opposing lanes of traffic; three used tubular markers only, and only one used a positive protection device, PCBs.

The second analysis reviewed the crash type and sequence of events for crashes that occurred within five TLTW work zones during the 2019 construction season. Three of these work zones used curbing with tubular markers, one used tubular markers only, and one used PCBs. Crashes were combined by separator type. The first events for each crash (e.g., crossed centerline, ran off road) were reviewed to determine any patterns, and the type of crash (e.g., rear-end, head-on) was also summarized.

Key Findings

- In the analysis of lateral lane position, 20% of large trucks positioned themselves over the right lane line when a PCB was present, compared to 4% when only tubular markers were present or 3% when curbing with tubular markers was present.
- Large trucks were most likely to be positioned within their lane when separated from opposing traffic by only tubular markers (73%), compared to 51% when curbing with tubular markers was used or 43% when PCBs were used (43%).



Large truck positioned well over the right lane line in the presence of PCBs

- The analysis of crashes in TLTW work zones that used tubular markers only or PCBs did not yield useful insights due to the small sample size.
- For work zones that used curbing with tubular markers, the majority of crashes were rear-end crashes, likely due to congestion and traffic volume. About 21% of crashes involved vehicles crossing into opposing lanes of traffic.

Implementation Readiness and Benefits

Understanding the advantages, disadvantages, and safety performance of the different TCDs used to separate opposing lanes of traffic in TLTW work zones can help agencies mitigate the potentially severe crashes that can occur when high-volume, high-speed, multilane traffic is channeled into a head-to-head configuration.

The report summarizes the advantages and disadvantages of four channelizers and four types of temporary barriers used to separate TLTW traffic. Guidance from 24 states on the use of these devices in TLTW configurations is also summarized.

Due to the small sample size of the crash analysis, no definitive patterns or insights emerged. However, the initial findings indicate that evaluating additional data would be useful.