0-6781: Improved Nighttime Work Zone Channelization in Confined Urban Projects

Background

Turning into and out of driveways in confined or dense urban work zones can present significant challenges to drivers, especially during nighttime conditions when other visual cues about the driveways may be masked in the dark. These challenges can lead to erratic behaviors by drivers such as stopping in a travel lane or making a sharp turn without proper turn signal indications, and adversely affect safety and mobility in the work zone. This project focused on identifying alternative work zone delineation strategies at driveways using various types of work zone channelization devices, evaluating these strategies in both controlled and field conditions, and developing guidance for the effective use of the high-performing channelizing strategies at these driveways.

What the Researchers Did

During the first year of the project, the researchers conducted a closed-course study to identify several delineation treatments for driveways in work zones that could be more easily detected and interpreted as a driveway access point. The driveway delineation alternatives were developed from combinations of various work zone channelizing devices in the *Texas Manual on Uniform Traffic Control Devices*. Combinations of devices whose height, shape, and retroreflective delineation patterns varied the most from the standard roadside channelization devices used throughout the work zone did a better job of helping drivers identify driveways earlier and make a turn into

the proper gap between channelizing devices. The exception was the use of type 1 barricades, which confused drivers due to their use as prohibitive devices for closed lanes and roadways.

During the second year of the project, the researchers conducted a human factors study of driving behavior in real work zones with multiple driveway access points located in McKinney and Houston, Texas. Selected driveways were delineated with three different treatments:

1. Low-profile 18-inch-tall longitudinal channelizing devices (LCDs) on the main lane with 42-inch-tall cones in the driveway radii.

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2. 42-inch-tall cones on the main lane with low-profile 18-inch-tall LCDs in the driveway radii.
3. Standard 36-inch drums on both the main lane and in the driveway radii.

Paid participants drove an instrumented vehicle with eye-tracking equipment through the work zone. They were asked to identify specific business driveways and make turns into those driveways. Their visual attention during their driveway approach was recorded. The number of missed turn attempts and the participant's opinion of the driveway treatments were also recorded.

What They Found

The researchers hypothesized that participants would glance more frequently and for longer durations at treatments that made it easier to identify a particular driveway. This is based on the idea that participants would have to do less scanning along the roadside looking for the driveway opening as they traveled through the work zone. If the treatment made the driveway more difficult to identify, the percentage of glances in other areas (i.e., upstream and downstream of the driveway) would be higher.

The results showed that the participants appeared to locate the driveway more easily when the alternative delineation treatments were used, evidenced by a higher percentage of roadside glances to the driveway access point. The data also suggest that drivers may have some difficulty identifying the driveways with standard drum treatments. In addition, the treatment glance duration data showed that using LCDs in the driveway radii resulted in longer glances than the other treatments at night, which was considered favorable, since more time looking at the treatment was indicative of the success of the treatment in attracting driver attention.

Some of the participants actually missed the driveway where they were asked to turn. The standard drum treatment driveways had the highest percentage of missed turns at night. This suggests that the current practice of delineating driveways with drums, which look the same as the rest of the work zone channelization, is somewhat challenging to motorists.

Participants also indicated that they preferred either alternative driveway treatment over the standard channelizing drums that were used all along the roadside of the work zones.

What This Means

The results showed that both alternative driveway delineation treatments provided visual differences when compared to the standard drum delineation treatment in both daytime and nighttime conditions. Differences in height, shape, and retroreflective delineation patterns can provide visual cues to drivers that help them readily locate and identify driveways in work zones.