Project Summary

Texas Department of Transportation

0-5426: Best Practices for Separation Devices Between Toll Lanes and Free Lanes

Background

Transportation agencies find themselves pushing the envelope of innovation to keep up with congestion caused by exploding demand for limited roadway space. Managed lanes offer potential as an innovative means of ameliorating congestion. These special-purpose lanes, which include high-occupancy vehicle (HOV) and high-occupancy toll (HOT) lanes, allow adept engineers to manipulate roadway parameters to achieve varying levels of service, vehicle compositions, and driver behaviors.

HOV lanes have been used for decades, and a great deal of literature chronicles experiences with them; however, HOT lanes are a much newer innovation, and the knowledge base dealing with them is significantly smaller. Because managed lanes, including HOT lanes, are controlled-access facilities and must somehow be separated from general-purpose lanes, several key questions must be asked. Principally, what type of delineation technique should be used? What are the properties of different delineators that make some more favorable than others? How do roadway characteristics, such as available width and traffic volume, factor into the choice of delineation? Much has been written on the safety and cost aspects of different delineation techniques used for HOV lanes; are these analyses applicable to other managed lanes as well? What about the other characteristics of the techniques: what are they, and how important are they to the choice of delineation? This work begins to address some of these questions and sheds some early light on their ultimate answers.

What the Researchers Did

Answers to questions regarding managed lane delineation were sought through two parallel activities. Experiences with managed lane delineation documented through papers, reports, and agency guidelines were carefully collected and evaluated. Recognizing that field experience was evolving as the research was being conducted, the research team sought a means of gathering experience-based information that had not yet been published. This was accomplished through assembly of an expert panel that was guided through carefully structured discussions regarding applicability of the three basic delineation families to managed lanes. These delineation families include buffers, posts, and barriers, and each has distinct advantages and disadvantages for any application scenario.

The review of written delineation experience indicated that the amount of existing information on a given type of managed lane depends on the type of facility in question. There is a wealth of literature addressing safety and cost aspects of HOV lanes, but the applicability of this information to HOT lanes and other managed lanes is not always clear.

The goal of the expert panel was to initiate a wide-ranging discussion on all conceivable factors that may influence the choice of a technique for delineating managed lanes. Many possible structures for the discussion were considered. The final arrangement brought the panelists together with a moderator to guide the talks.

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Discussion of the delineation techniques occurred in two steps: first, panelists considered the implications of different roadway conditions on the choice of delineation. Specifically, they were asked the question: “If this condition were present, would this delineation technique be acceptable?” More important than the simple answer is the exchange of ideas and reasoning that inspired the answer; these were recorded and analyzed. Second, panelists considered characteristics inherent to each type of delineation technique that would not vary from site to site. They were asked to determine whether the inherent characteristics for each delineation style posed any particular disadvantage for that style compared to the others.

What They Found

The expert panel discussions, together with written records of experience with managed lane delineation techniques, led to several particular observations and recommendations:

- Generalizations about choosing the best form of delineation are very difficult to make because each distinct situation presents a vast, tangled web of different emphases, limitations, and demands. The panel emphasized that different delineation devices exhibit both advantages and disadvantages under different scenarios; the magnitude of pluses and minuses can vary enormously from situation to situation. Managed facilities exist that demonstrate very successful applications of all types of delineation across a variety of scenarios.
- In cases of restricted right-of-way, buffers and posts are preferable to barriers. Concrete barriers should not be considered for single-lane facilities unless a barrier-to-barrier clear width of at least 18 ft can be provided.
- The expert panel strongly discouraged the use of concrete barriers without grade-separated, fly-over connections; weaving sections introduce the possibility of drivers striking the end of the barrier at high speeds.
- Concrete barriers provide the best means of controlling access and are therefore the best means of guaranteeing toll collection from all users.
- Buffer-type delineators are the least costly in terms of both initial and maintenance costs.
- Post-type delineators can significantly reduce illegal crossing of the delineation zone, compared to buffer-only installations, but represent large continuous maintenance costs.
- The panel generally found posts to be the least favorable type of delineation. However, panel members agreed that posts could be used successfully to ease drivers into the idea of having a separated, managed facility that can be entered only at specific locations. Once the managed lane is established, the posts could be removed to leave just the buffer.

What This Means

The optimal answer to the question of which delineation technique should be used for a particular managed lane project will likely not come from a simple fixed guideline. Rather, the best answer will likely come from application of a series of “If-Then” question-statements regarding facility characteristics, right-of-way availability, demand versus capacity relationships, and the objectives for the project. The information provided in this report can provide experience-based answers to these project-specific issues.

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