



# Project Summary

Texas Department of Transportation

## 0-4986: An Assessment of Frontage Road Yield Treatment Effectiveness

### *Background*

A very important element of traffic operations and safety within the freeway-frontage road interchange environment in Texas is that of yield treatments and related merging and weaving guidance. The current state-of-practice for such treatments in Texas varies widely and leads to operational inconsistency and driver confusion. The goal of this research project was to assess the effectiveness of the wide variety of frontage road exit ramp and U-turn yield treatments that exist in Texas, identify those that exhibited the best operations and safety, and develop enhanced guidance for future deployment and management of these parts of the freeway network.

### *What the Researchers Did*

Field data were collected at a number of sites around Texas representative of current yield treatments in practice. Researchers developed a calibrated model from several key operational and geometric features of each case study site to simulate operating characteristics (i.e., variances in speed, volumes, and driveway densities) for two levels of analysis. A “Level 1” procedure involved selection of real-world sites for data collection, analysis, and simulation model calibration. After calibration of the model for each site, different yielding treatments were applied to each calibrated site. Since “Level 1” analysis was limited to the geometric and traffic conditions at the selected sites, a “Level 2” analysis was performed to consider the performance of various yield treatments on a wide variety of feasible combinations of geometric and operating conditions. A similar “Level 2” analysis was performed for various frontage road U-turn yielding configurations.

Due to the large volume of results obtained, researchers developed a database software program, the Frontage Road Yield Treatment Analysis Tool (FRYTAT), that incorporated all the results obtained from the analyses. FRYTAT will provide TxDOT with an easy-to-use tool to provide fairly quick answers in the selection of appropriate yield treatments at the numerous exit ramp and frontage roads as well as U-turn and frontage road merge areas.

### *Research Performed by:*

Texas Transportation Institute (TTI),  
The Texas A&M University System  
The University of Texas at Arlington (UTA)

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**Project Completed:** 8-31-08

## What They Found

Results showed that with respect to both traffic operations performance (total delays in network) as well as safety (surrogate safety crashes in models), Category 1 (exit ramp has own lane, double/single solid line, no YIELD sign), Category 1A (exit ramp has own lane, no double/single solid line, no YIELD sign), and Category 2 (frontage road drops lane prior to exit ramp gore, exit ramp has own lane, double/single solid line, no YIELD sign) performed the best.

## What This Means

The following conclusions can be made from the analysis performed in this research:

- Category 3 (featuring a forced merge of exit ramp with frontage road) and Category 6 (featuring a short deceleration lane for the exit ramp) treatments consistently produced the worst overall performance in terms of operations and safety.
- Categories 1, 1A, and 2 (exit ramp has own lane with or without DO NOT CROSS DOUBLE WHITE LINE and without YIELD sign) treatments consistently performed the best.
- Generally, YIELD signs caused increased delays and were not found to increase safety.
- Retrofitting all current Category 3 and 6 treatment options to Category 2 is recommended to provide uniformity for drivers and consistency for Texas Department of Transportation districts. See Figure 1 for a sample illustration of recommended retrofitting from Category 3 (forced merge) to Category 2.
- Provision of a continuous lane for U-turning traffic will result in better operation and safety.

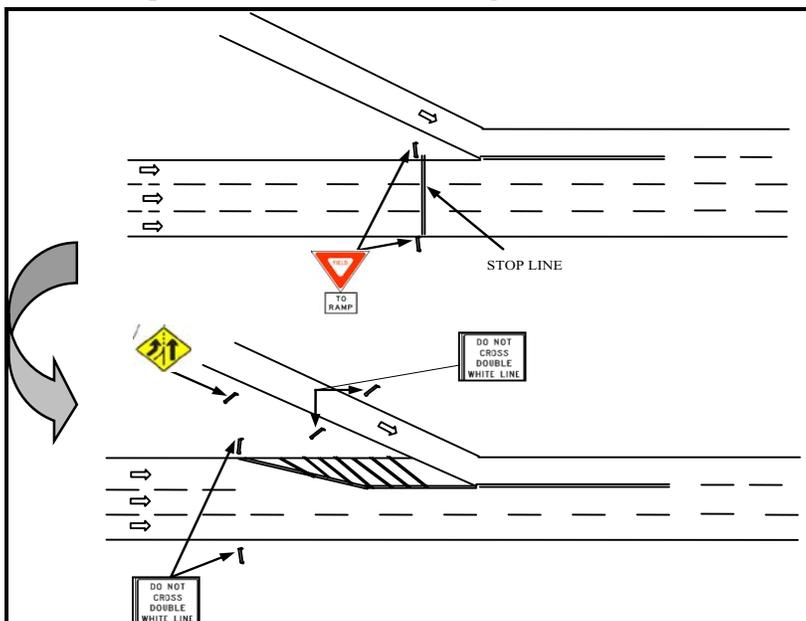


Figure 1. Illustration of Recommended Retrofit Yield Treatment.

The addition of a YIELD sign did not appear to improve safety when an acceleration lane was provided for the U-turn traffic.

Further analysis will be required to explore the impacts of other geometric limitations, such as grade, on the yielding behavior of drivers. It might also be necessary to perform a similar analysis on driver yielding behavior in other states as driver behavior and comprehension of yielding might vary from state to state.

### For More Information:

0-4986-1 An Assessment of Yield Treatments at Frontage Road–Exit Ramp and Frontage Road–U-Turn Merge Areas

0-4986-2 Development of Frontage Road Yield Treatment Analysis Tool (Frytat) Database Software

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