# Project Summary

Texas Department of Transportation

# 0-5619: Updated Work Zone Capacities

## Background

As traffic demand on Texas roadways continues to increase, the state must allocate substantial resources to constructing new roadways as well as maintaining the existing infrastructure. Roadway construction projects are among the most visible activities that the Texas Department of Transportation (TxDOT) carries out for the traveling public. TxDOT is careful about determining appropriate times for lane closures that provide the least impacts on the traveling public while at the same time facilitating the construction activities to allow for completion of the project in the least amount of time.

To better assure that construction contractors stay on project timelines, TxDOT constructs most major projects using incentives for early completion and/or liquidated damages for failure to meet the contractual deadlines. Lane assessments or lane rental fees on routine maintenance contracts as well as for standard roadway construction projects are also being used. A critical input into the analysis process for determining the dollar amount of incentive, penalty, or lane rental assessment is the use of accurate roadway capacity for roadway segments impacted by the construction project. As many of the capacity values currently being used are outdated, this research project served to update capacity values as well as to provide guidance in completing road user cost studies using simulation models.

## What the Researchers Did

This two-year research project was a joint collaboration of researchers from the Texas Transportation Institute (TTI) offices in Houston, College Station, and San Antonio and Texas A&M University – Kingsville (TAMUK). The researchers initially identified a matrix of nearly 400 work zones to study the impacts of each of the different combinations of factors affecting work zone capacity. With input from the project monitoring committee, they determined to concentrate on lane closures in Texas urban areas with the most common types of closures encountered by the traveling public. The project team closely monitored construction projects in the state and collected data at 18 lane closures for which the capacity of the work zone was estimated.


## Research Performed by:

Texas Transportation Institute (TTI),
The Texas A&M University System

Texas A&M University – Kingsville (TAMUK)

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


The data were collected using a variety of methods including on-site manual counts, data from road tube traffic counters placed within the work zone, video from roadside recordings, and data and/or video from the TxDOT Houston TranStar and San Antonio TransGuide traffic management centers. The researchers used the traffic data, as well as the characteristics of the individual work zones, to estimate the capacity of the work zones and to validate various models for evaluating work zones and estimating road user costs.

## What They Found

By analyzing the data collected at the field study sites, the project team determined that while lane closure configuration (i.e., number of lanes open versus total lanes) did not have a significant impact on the per lane capacity in the work zone, the roadway capacity was reduced by about 20 percent when compared to lanes not in a work area. The research results as presented in the table below can provide guidance in determining impacts of lane closures in planning work zone traffic control. In validating the simulation models using the urban area work zones, it was determined that the models tended to underestimate the capacities when compared to those as measured in the field. While there was no single model that could provide both capacity guidance and road user cost estimation, it may be necessary to use different models depending upon the type of construction activity and corridor of concern.

| Work Zone Configuration (total lanes – open lanes) | City | Description of Site Location | Maximum Observed Volume (vph/hr) |
|---|---|---|---|
| 3 – 1 | Houston | 1) IH 610 North Loop Eastbound near Liberty Road—two inside lanes closed in "moving" work zone | 1,160 |
| 2 – 1 | Orange | 2) IH 10 near US 90A—left lane closed | 1,650 |
| 2 – 1 | Orange | 3) IH 10 near US 90A—right lane closed | 1,690 |
| 2 – 1 | San Antonio | 4) IH 37 near IH 410—left lane closed | 1,620 |
| 2 – 1 | San Antonio | 5) IH 37 near IH 410—right lane closed | 1,680 |
| 3 – 2 | Pearland | 6) SH 288—at Sims Bayou—left lane closed | 1,510 |
| 3 – 2 | Pearland | 7) SH 288—at Sims Bayou—left lane closed | 1,670 |
| 3 – 2 | Pearland | 8) SH 288—at Sims Bayou—left lane closed | 1,740 |
| 3 – 2 | San Antonio | 9) IH 35 North of George Beach—left lane closed | 1,700 |
| 3 – 2 | San Antonio | 10) IH 35 North of George Beach—left lane closed | 1,740 |
| 3 – 2 | San Antonio | 11) IH 35 near Zarzamora Street—right lane closed | 1,680 |
| 3 – 2 | San Antonio | 12) IH 410 near IH 10—right lane closed | 1,640 |
| 4 – 3 | Houston | 13) IH 45 Southbound at West Little York—right lane closed for CCTV maintenance | 1,750 |
| 3 – 1 | Houston | 14) US 290 Eastbound at Gessner—nighttime only short-term closure | 1,380 |
| 3 – 1 | Houston | 15) US 290 Westbound at Jones Road—nighttime only short-term closure | 1,340 |
| 3 – 2 | San Antonio | 16) IH 35 Southbound at Splashtown—one left lane closed | 1,270 |
| 5 – 1 | San Antonio | 17) IH 410 at San Pedro—only right lane remaining open | 1,200 |
| 3 – 3 | San Antonio | 18) IH 410 at Rolling Ridge—three narrow lanes, no shoulders | 1,800 |

***Table. Summary of Measured Work Zone Capacities.***

## What This Means

This research project served to address questions concerning capacities in work zones along Texas freeways as well as provide TxDOT with insight regarding available software packages for work zone analysis and road user cost estimation. Project findings and recommendations from the authors are as follows:

- For work zone planning purposes, the per lane capacity values as presented in the table should be used as guidance in determining impacts of work zone lane closures.
- Depending upon the work zone configuration and size of the corridor to be evaluated for construction impact, TxDOT should use the QUEWZ-92 program, Kim's Model, or the QuickZone model to evaluate traffic operations in work zones.
- While QuickZone does provide good road user cost estimates for larger networks, the Jiang's model should be used for user cost estimates for simpler road closures.

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