An Analysis of Short-Term Implementation of Ramp Control on the Dan Ryan Expressway

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ABRIDGMENT

•THE Chicago Area Expressway Surveillance Project undertook a ramp metering study on the northbound Dan Ryan Expressway with objectives of supplementing past experience in the general application of control techniques and gaining additional knowledge of the relative effects of various geometric design features on ramp control.

An interplay between the expressway and frontage street resulted in the generation of exceedingly high entrance ramp demands at the point where the expressway curves away from the frontage street. Congestion was triggered by high volumes force-merging with a near-capacity expressway, while the frontage street, through its discontinuity, was directly involved in sustaining the cause of congestion and delaying the local recovery from congested operations.

Ramp control, in the form of one-vehicle-at-a-time metering utilizing manually-operated portable equipment, was used on four successive entrance ramps to adjust merge demands to a level that could be accommodated.

Control of the four entrance ramps did not eliminate congestion, but significantly reduced the extent and duration. The severity of congestion was reduced such that individual motorists saved up to 5 minutes in traversing the 3.6-mile study section. A daily average of 627 vehicle hours of expressway travel time was saved during control, while the peak-period vehicle-miles of expressway travel increased by 5 percent.

Delays incurred were at the expense of vehicles waiting in queues at the controlled ramps. Even though motorists using the metered ramps were subjected to individual delays of up to 7 minutes in queues, compliance with the one-vehicle-at-a-time scheme averaged over 90 percent. There was negligible delay to surface street traffic in the corridor.

Ramp metering at just four ramps did not produce enough diversion to downstream ramps and/or surface street routes to completely prevent expressway overloading from occurring in the study section, but shifted the point of initial overloading upstream. The benefits derived from this study appear to be primarily attributable to a small amount of diversion to downstream ramps and to a reduction of merging turbulence produced by one-at-a-time entry at a decreased rate.

This initial study pointed out the need to extend control to additional upstream entrance ramps and to adjust the level of control on a traffic-actuated basis in order to further improve expressway operations.

Portable metering devices again proved valuable in providing the means for conducting short-term studies without the expense and delay inherent to permanent installations.

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