I-5 ACTIVE TRAFFIC MANAGEMENT: EFFECTS OF YELLOW ARROWS

Introduction

On August 10, 2010, WSDOT activated the state's first Active Traffic Management (ATM) corridor on a 7.5 mile segment of Northbound I-5. Fifteen sign bridges are spaced at approximately half-mile intervals to provide real-time traffic information to drivers. As part of the ATM system, WSDOT uses a Lane Control system to create a safer driving environment and reduce congestion when there are incidents in the corridor.

Figure 1. A sign bridge over Northbound I-5 cautioning drivers of adverse conditions ahead.

During the first month of use, the lane control system was activated 51 times. There were 23 activations for maintenance or construction activities, 16 activations for disabled vehicles, 11 activations for collisions, and one activation for a presidential motorcade.

While one month of operations is too soon to evaluate the effects on collisions and congestion management, WSDOT has been pleased with the performance of the system. System operators have noted the positive driver response to lane control deployment, particularly drivers' response to the yellow merge arrow. The good reaction to the yellow merge arrow has given us incentive to look at the before and after effects of the yellow arrow.

Before Lane Control

Before implementation of the Lane Control system, drivers in the Smarter Highways corridor were less likely to be aware of disabled vehicles and other lane blocking incidents ahead of them. Upon reaching a blocking incident, vehicles became stuck in queue behind the incident. This situation presented an elevated risk of secondary collisions and an increase in congestion as vehicles from the blocked lane were forced to merge into adjacent, faster-moving lanes. As seen in Figure 2, drivers are stuck in queue behind the disabled vehicle.

Figure 2: A disabled vehicle blocking the right center lane.

Description of Lane Control

The Lane Control system allows WSDOT to advise drivers at least one mile in advance of an adverse traffic condition. This early warning provides drivers the opportunity to vacate an affected lane before being stuck in a queue behind a blocking incident.

Drivers are alerted to blocking incidents or construction lane closures with three distinct symbols; a yellow merge arrow, a red X, and a green arrow. A green arrow denotes a open lane. A directional yellow merge arrow accompanied by the word "merge" encourages motorists to shift into open lanes, and a red X indicates the lane is blocked.

I-5 ACTIVE TRAFFIC MANAGEMENT: EFFECTS OF YELLOW ARROWS

During an incident, the primary gantry (the sign bridge immediately upstream of the blocking incident) displays a red X above the affected lane to indicate the lane is closed immediately ahead. The secondary gantry, (the sign bridge a half mile upstream of the primary gantry) displays yellow merge arrows above the affected lane to provide advanced warning of closures ahead. In addition, both the primary and secondary gantries display green, downward-pointing arrows to denote open lanes. In addition to lane control symbols, text is used on variable message signs mounted on the sides of the roadway. This text supports the lane control symbols by describing the incident, e.g., "Accident Ahead, Right Lane Blocked."

Effects of Yellow Arrows

WSDOT has seen positive results through the use of the Lane Control system. Figures 3 and 4 shows an incident comparable to the incident before ATM where a disabled vehicle is blocking the right center lane. In this more recent incident the Lane Control system gives drivers an advanced warning of the blocking incident and, drivers are able to avoid the queue behind the disabled vehicle. Figure 4 illustrates the successful use of yellow merge arrows to provide advanced warning. Attentive motorists respond quickly to the yellow arrow and immediately begin vacating the affected lane. As a result, the queue directly behind the stalled vehicle is significantly reduced. Providing this advanced warning makes the merging smoother and thus makes the highway safer.

Figure 3: A disabled vehicle blocking the right center lane.

Figure 4: A merge arrow indicating the right center lane is blocked ahead.

Conclusion

Lane control helps drivers be more aware of the conditions ahead. The yellow merge arrow is a strong symbol telling drivers to change lanes, so motorists can avoid aggressive merging behavior which leads to reduced congestion and a decrease in the probability of secondary collisions.

The Future of Smarter Highways

WSDOT is also constructing Smarter Highways on SR 520 and I-90 between Seattle and Bellevue. The system will be activated on SR 520 in Fall, 2010 and on I-90 in Spring, 2011.