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REPORT TITLE
Lane Occupancy Charges

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SUMMARY
Occupancy of travel lanes during construction and road maintenance are ordinary activities frequently undertaken to maintain the well-being of road infrastructure. The timing of these activities impacts traffic flow and generates delays. Thus, it imposes costs on the users on heavily traveled routes due to traffic slowdowns or even shutdowns. At rush-hour these direct and indirect costs come to a peak. Construction and road maintenance closures can take place at times that the negative impacts would be minimized. This study focused on the appropriate guidelines for lane occupancy charges to the contractor that would eventually minimize the disutility of traffic lane closure. The project research team examined heavily traveled locations in the NJ region, with the cooperation of NJ DOT engineers, to examine traffic and construction patterns to be used in the analysis and definition of the general occupancy charge guidelines. Information regarding traffic flow with respect to time of day, season, AADT, highway characteristics, etc. were reviewed in this examination. The project considered both economic and simulation analysis for examining the impact on user cost and construction operations due to different patterns of lane closure.

INTRODUCTION/BACKGROUND

During recent years innovative bidding and contracts (i.e., bonus/rental charge method, cost-plus-time method) have been used in Europe and more recently in the US. FHWA approved this method in 1985, on an experimental basis. To date, several states have used these contractual methods. A national survey was undertaken to examine the experience and use of lane occupancy charges in the 50 US states. The survey included questions on the definition and methodologies used in defining lane occupancy charges and the type of economic and traffic analysis used.

RESEARCH APPROACH

The objective of this study was to address the NJDOT need in developing appropriate guidelines for lane charges that would minimize the closure of traffic lanes. The developed guidelines considered the impact on traffic and road users, depending on the characteristics of the projects. The guidelines identify lane occupancy charges which are suitable to reduce closure of lanes to traffic. The study provides the general lane closure guidelines that can be used on a specific project and with respect to the specific project characteristics related to the AADT during the time of day, season, and type of highway/ lane closure. These guidelines were defined based on the examination of the effects of lane closures on traffic flow. The guidelines were defined based on project types and characteristics identified by NJDOT engineers. It is expected that the criteria used to determine lane rental for maintenance and construction schedule alternatives are, first, able to reduce private and social costs; second, able to impact construction and maintenance costs; and third, acceptable to the public and decision makers.

FINDINGS & METHODOLOGY

The methodology is based on i) the estimation of traffic delay using traffic simulation analysis; and ii) calculation of total delay cost using average earning values. The delay, and thus cost, is a function of: time of day, day of the week, number of lanes closed, road characteristics and grade, etc.

Using the example of a 2-lane road with one lane closed along a 0.5-mile work zone with work zone capacity of 1450 passenger cars per hour and 10 hours duration at an average approach speed of 70mph and average work speed of 50mph the queuing and moving delays were calculated for a total delay.

The delays are subject to the number of trucks in the system. Using these results and the value of time as percent of wage rate at the range of $10.50 to $15 an hour, one can estimate the cost of the delay. Without trucks in the system the cost ranges between $4,719 and $6,741 an hour (table 1). At the present time with $6 an hour charges, the lane closing charges would have been $2,696.58, which is only 57 percent of the calculated minimum.

The cost is much larger with trucks in the system. Taking the average scenario of 10% trucks with an opportunity cost per truck of $50 an hour and cost per other vehicle of $15 an hour, the total delay cost can reach $16,014.84. This is 3.4 times larger than the smaller amount before and almost 6 times larger than the present practice.

Table 1. Total queuing and moving delay costs

% Truck	Total Delay (veh-hr)	Cost per hour @			Queuing Delay		Moving Delay	
		$6.00*	$10.50	$15.00	Truck	Car	Truck	Car
0	449.43	2696.58	4719.02	6741.45	0	419.72	0	29.71
5	646.25	3877.50	8061.97	10824.69	30.827	585.713	1.4855	28.2245
10	865.67	5194.02	12508.93	16014.90	83.596	752.364	2.971	26.739
15	1122.42	6734.52	18435.69	22728.93	163.906	928.8	4.4565	25.2535
20	1413.99	8483.94	26017.40	31107.70	276.856	1107.424	5.942	23.768

*The $6 an hour is used across the board.

CONCLUSIONS & RECOMMENDATIONS

The methodology defined in this research considers the traffic characteristics of specific work zone scenarios and highway characteristics in order to estimate traffic delays for alternative scenarios. Specifically, queuing delay, using CORSIM, was estimated by combining the simulation results and a deterministic model, while a mathematical model was developed for estimating moving delay. Lane occupancy charges were then defined using the delay as a function of: time of day, day of the week, number of lanes closed, road characteristics and grade, etc. In addition the methodology for defining lane occupancy charges considers traffic characteristics and demographics of road users income. Alternatively, average values of income may be considered for simplifying the analysis. As it appears from the illustrative example, the methodology is sensitive to the percentage of trucks using the roadway since delays on the moving of goods will provide significant impact on both traffic and revenue loss.

As suggested in this research, in order to determine the lane occupancy charges accurately, one needs to survey the road users in order to determine:

- *the mix of users between trucks, buses and cars,*
- *the income groups of each user category,*
- *the congestion level per time of day, and*
- *the vehicle hour delay per hour of the day.*

Alternatively a weighted average of users and their value of time may be used to simplify the calculations.

The methodology developed and presented herein is flexible enough to consider any model and eventual assumptions that NJDOT engineers feel better represents the specific conditions where lane occupancy charges are applied.

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