The Influence of Traffic Calming Devices on Fire Vehicle Travel Times January 1996

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INTRODUCTION

Traffic calming devices are used on Portland's neighborhood streets when traffic conditions are out of character with their adjacent residential, institutional, and recreational land uses. Calming devices are used to slow vehicle speeds; to encourage the use of more appropriate streets for through trips; and to enhance pedestrian, bicycle, and transit safety. The devices have proven to be effective without significantly impacting convenience, mobility, and travel time for drivers. At the same time certain devices affect the speed of various fire vehicles and may increase overall response times.

During the Fall of 1995 the City's Fire Bureau and Bureau of Traffic Management conducted a thorough data collection effort to help quantify the relationship between three types of traffic calming devices and fire vehicle travel times. Different types of fire vehicles were driven on streets calmed with traffic circles, 22-foot speed bumps, and 14-foot speed bumps. Figures 1, 2, and 3 illustrate the three devices. Table 1 lists basic information about the types of fire vehicles used in this study.

PURPOSE

The purpose of this paper is to present how speed bumps and traffic circles affect fire vehicle travel times. This paper describes how the data was collected and analyzed, presents the findings, and goes on to recommend additional areas in need of research.

RESEARCH METHOD

The testing considered four variables that influence the speed at which a fire vehicle can be negotiated around traffic circles or across speed bumps. The variables tested are: the driver, the type of fire vehicle, the desirable vehicle speed, and the types of calming devices.

The data collection effort involved six fire vehicles of varying characteristics. Test runs were conducted on a total of six streets. Two streets had 22-foot speed bumps. Two streets had 14-foot speed bumps, and two had traffic circles. A total of 36 different drivers participated in the testing. The total number of test runs on each street was four per vehicle, or 24 runs per street.

Each test run was video taped. The camera recorded the vehicle speeds that were detected and displayed by a radar gun. The time of day, to the nearest second, was superimposed on the recording.

Table 1. Fire Vehicle Specifications

Vehicle	Overall Length	Wheelbase	Weight (lbs)	Horse-power (HP)	Wt./HP Ratio (lbs/HP)	0-40 mph Accel. Time (sec)
Engine 18	29' 10"	15' 5"	34,860	185	188	19
Rescue 41	21'	11' 6"	na	185	na	12
Squad 1	27'	14' 6"	23,170	275	84	17
Truck 1	48'	21' 0"	53,000	450	118	20
Truck 4	57'	13' 0"	53,960	450	120	22
Truck 41	37' 6"	16' 9"	42,100	350	120	27

The speed and time information for each test run was transcribed from the video tapes to a spreadsheet. The information for each run was used to calculate the distance traveled after each second as well as the vehicle's distance from the starting line after each second of the run.

For various combinations of the four variables, the time needed to travel a length of street that had no calming device was compared to the time needed to travel the same length with a calming device. The time and impact distance required to decelerate from a desirable response speed, negotiate the calming device, and accelerate back to the original speed was determined from the data. The time required to travel the same impact distance without a calming device to influence the desirable response speed was calculated. The difference between the two travel times equals the delay associated with the calming device. This delay-per-device was calculated for all six vehicles as they negotiated every calming device on the six test streets. Delays-per-device were calculated for desirable response speeds of 25, 30, 35, and 40 mph.

FINDINGS

The results of the City's research are presented in Tables 2, 3, and 4. Depending on the type of fire vehicle and the desirable response speed, the three devices were found to create a range of delays for each device as follows:

- 22-foot bumps: 0.0 to 9.2 seconds of delay per bump
- 14-foot bumps: 1.0 to 9.4 seconds of delay per bump
- Traffic circles: 1.3 to 10.7 seconds of delay per circle

The drivers' performances did not appear to significantly influence the results. Their choices of deceleration and acceleration rates as well as their choices of minimum speeds near the devices were very consistent.

CONCLUSIONS

The purpose of this paper was to show how speed bumps and traffic circles used in Portland affect fire vehicle travel times. The results provide quantitative data that can be used in the determination of the impacts of one or more traffic calming devices on fire response times along a given emergency response route. Additional information is necessary in order to make a complete assessment of these impacts. This includes: 1) the types of fire vehicles responding to emergencies; 2) the desirable and appropriate speed of fire vehicles at each of the calming devices located along the response route; 3) the geographical area that will be affected by any increase in delay to response times; and 4) the use of this route by fire vehicles given the likely demand for emergency services and the availability of good alternative routes.

A full assessment of the impacts on response times for a given set of traffic calming devices needs to be balanced with the benefits of traffic calming on reducing speeding problems and enhancing public safety and livability along neighborhood streets. This paper provides the initial quantitative data that is necessary to begin to weigh the pros and cons of traffic calming.

RECOMMENDATIONS

The City needs to pursue full assessments of the impacts of specific traffic calming projects, either planned or existing projects, on emergency vehicle responses. This assessment needs to consider all the necessary information as summarized above. The results of this assessment then needs to be compared to the benefits of the traffic calming project, especially the benefits to public safety.

Due to the City's desire to provide both fast response for emergency services and slower overall traffic speeds on neighborhood streets, a public process should be undertaken to address the trade-offs between these two community values and to provide policy direction for implementing traffic calming on a city-wide basis. This should be done by revising the Transportation Element to include a classification for emergency response routes.

Factors that may need to be considered in addressing any trade-offs are options to mitigate impacts on fire vehicle response times. These options include the use of traffic signal preemption devices, the locating of new fire stations, fire vehicle modifications to minimize weight-to-horsepower ratios, securing and cushioning certain pieces of equipment, and improving vehicle suspensions.