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EFFECTIVENESS OF BUS BULBS FOR BUS STOPS

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SUMMARY

The objective of the research were to identify and evaluate factors that impact the operation and safety risks of bus bulbs for motor vehicle drivers and bus passengers compared to conventional bus stops. Guidelines and procedures for the implementation and use of bus bulbs in New Jersey were also developed. Data were collected at two locations where bus bulbs were to be constructed in New Jersey. The data were used to develop a methodology for evaluating the potential bus travel time savings due to a bus bulb. The research demonstrates that bus bulbs can be an effective alternative to curbside bus stops. The research also demonstrates that achieving these benefits requires careful consideration of conditions at the bus stop prior to installation of the bus bulb.

INTRODUCTION/BACKGROUND

Bus bulbs represent one type of bus stop design that is appropriate for use under certain transit, roadway and sidewalk conditions. Under this design, the sidewalk at an intersection is extended into the street to a distance equal to the depth of a typical parallel parking space. Buses stop in the traffic lane instead of weaving into and out of the bus stop. Bus bulbs create additional space to include bus stop amenities such as shelters and benches and also reduce the crossing distance of pedestrians at the intersection. The primary motivation for installing bus bulbs is to reduce sidewalk congestion and to improve transit operation by reducing bus delays through the elimination of bus-weaving maneuvers into and out of a curbside bus stop.

The safety and effectiveness of bus bulbs are questioned in urban locations where heavy vehicular volumes and possible long dwell-times at the bus stop may result in

increased delays and possible head-on collisions as vehicles may attempt to go around the stopped bus. Benefits attributed to bus bulbs, including reduced delays to buses and traffic calming effects, must be weighed against the delays to other vehicular traffic on the roadway as well as possible safety impacts. The research performs an evaluation on the effectiveness for bus bulbs taking into account the particular conditions and driver population of this State.

RESEARCH APPROACH

The tasks performed to accomplish the objectives of the research included first identifying bus stop locations that could be considered for bus bulb installation. From the literature, specifications were then developed providing measurements and guidance for the design of bus bulbs. A methodology for evaluating the effectiveness of bus bulbs was developed. A before-data collection was performed at two locations where bus bulbs were to be constructed in New Jersey. Using the data collected, the data were analyzed to determine the expected bus travel time savings at the bus bulbs. From the research, rules and guidelines for the use of bus bulbs in New Jersey were developed.

FINDINGS

The expected bus travel time savings from a bus bulb can be shown to be the re-entry delay minus the increase in intersection delay after the bus bulb is constructed. The expression demonstrates that reduction in bus travel time savings from the bus bulbs must be weighed against increases in intersection delays when a bus bulb is considered for installation. An operational analysis with and without a bus bulb for three locations was performed. Overall, the intersections perform at good levels of service with minimal delays. The analysis showed that installing a bus bulb would result in the reduction in the approach capacity between 8 and 11 percent and an increase in control delay from between 7 and 16 percent. Bus travel time savings as a result of the bus bulbs ranges between 15 and 30 seconds per bus stop. The bus travel time savings are reported per bus stop and suggests that for significant bus travel time savings to be achieved for the route, several bus bulbs would be warranted.

CONCLUSIONS

Based on conditions found in New Jersey, the recommended length and width for bus bulbs is 45 feet (13.7 m) long, based on the length of a typical New Jersey Transit bus, with a width of 6 feet. A double 10 ft radii design for curb extension is also recommended. This curb radii allows for mechanical street cleaning and requires a 14-1/2 foot curb transition length for a 6 ft wide bus bulb.

The research demonstrates that bus bulbs can be an effective alternative to curbside bus stops with the potential to reduce bus re-entry delays, increase bus speeds, decrease the walking distance for pedestrians, and provide additional sidewalk area for bus patrons. The research also demonstrates that achieving these benefits requires careful consideration of conditions at the bus stop prior to installation of the bus bulb. In urban areas, consideration must also be made to the impact of the bus bulb on the operation of the adjacent intersection.

RECOMMENDATIONS

Bus bulbs should be installed in locations in New Jersey that have the greatest potential to achieve the benefits associated with their installation. These benefits include: reduce bus delays through the elimination of bus weaving maneuvers into and out of the curb lane; provide additional sidewalk area for bus patrons to wait; remove fewer parking spaces than a traditional curb-side bus stop; and decrease the walking distance for pedestrians crossing the roadway.

To achieve these benefits, bus bulbs should be considered at locations when the following factors are present:

- Bus re-entry delays exist,
- Roadway volume in the lane adjacent to the curb lane exceeds 500 vehicles during the peak hour,
- 24-hour parking is available both upstream and downstream of the bus bulb,
- Vehicle speed on the roadway is less than 35 mph,
- Bus volumes are 20 or more per peak hour on the roadway,
- Passenger volumes exceed 20 to 40 boardings an hour,
- Average peak-period dwell time exceeds 30 seconds per bus,
- Pedestrian volumes exceed 30 pedestrians per hour,
- Level-of-Service for the intersection approach adjacent to the bus bulb is C or better,
- Right turns represent no more than 5 percent of through volume.