Role of Highway Shoulders in Traffic Operation

A. TARAGIN, Highway Engineer, Highway Transport Research Branch
Bureau of Public Roads

● HIGHWAY shoulders are an integral part of a road structure. Since a highway is designed and constructed to accommodate traffic, it is very important to evaluate the effect of the shoulders on traffic operation. A Highway Research Board committee organized in 1947 undertook to evaluate this effect.

Because of the broad functions of highway shoulders the committee felt that the research should be divided into the following main categories:

1. Effect of shoulder width and type on traffic when the shoulder is not occupied by parked vehicles or other objects
2. Effect of shoulder width and type on traffic when the shoulder is occupied by parked vehicles or other obstructions such as parapet walls, bridge piers and abutments, utility poles and guardrails.
3. Extent of shoulder use by parked vehicles.
4. Relation between shoulder width and type and motor vehicle accidents.

The following is a brief statement as to the extent of research work already completed and what needs to be done on each of the foregoing items:

1. From extensive studies in 15 states it was found that speeds and lateral positions of moving vehicles are not affected by the width of shoulder, provided the shoulder is clear and at least 6 ft wide. There is no substantial effect if the shoulder is at least 4 ft wide. Bituminous-treated shoulders, 4 ft or more in width, adjacent to two-lane concrete roads 20 ft or less in width, increase the effective surface width approximately 2 ft. It is believed that research on this phase of the problem is quite complete and no further work is indicated for the time being.

2. From studies of driver behavior on sections of highway with and without vehicles or other objects on the shoulder, it was found that for traffic not to be influenced substantially, a clear distance of 4 ft is needed between the pavement edge and the parked vehicle or other obstructions such as parapet walls and bridge piers.

It should be borne in mind that the capacity of a highway is reduced by inadequate shoulders. For shoulders less than 6 ft wide, the capacity is affected inversely to a higher degree as the shoulder width becomes narrower. Furthermore, without a place of refuge outside the traffic lanes, one disabled vehicle can reduce the capacity of a highway by more than the capacity of one lane.

3. Perhaps one of the simpler problems to solve (for which there are as yet very little data available) is the extent to which shoulders on rural highways are used by parked vehicles. Since a vehicle parked too close to the pavement edge causes a lateral shift in the position of vehicles traveling in the lane adjacent to the shoulder, the role of the shoulder becomes very important especially on narrow pavements where an indiscriminately parked vehicle can cause hazardous conditions in addition to the reduction in highway capacity.

One preliminary study in an eastern state showed that there is one emergency stop for each 7,500 vehicle-miles of travel and one stop (for any purpose) for each 300 vehicle-miles of travel. The observation for the emergency stops was at a location where there were no shoulders and stops were possible only on the roadway.

Information of this type is needed to determine the frequency of parked vehicles per mile of highway at various traffic volumes and on different types of highways. How is the frequency of parking related to trip length and to distance from urban areas? Do turnouts on a highway decrease the frequency of shoulder use? Do drivers take advantage of wider and better stabilized shoulders to a greater extent than they do narrow and unpaved shoulders? Can the parked vehicle be ultimately related to accident causation? These are some of the questions that need to be answered before a really clear evaluation can be made of the role of shoulders on traffic operations.

4. Intensified research has been conducted in the past two years to determine the relation between highway shoulders and motor vehicle accidents. Several states have

developed some very interesting and even challenging results. One study indicates that with gravel shoulders property damage accidents vary inversely with shoulder width. Earlier studies produced almost opposite results. Additional research on this phase of the problem is definitely needed and it is being undertaken in two or three states.

From this brief statement it is clear that although highway shoulders play an important role in traffic operation, there is still much to learn.