Cost and Benefit Problems of Highway Shoulders

FRED B. FARRELL, Chief, Highway Costs Section
National and Administrative Research Branch, Bureau of Public Roads

What do highway shoulders cost? After decades of building and maintaining highways, and keeping cost records, this question should be easy to answer. But it isn't. The fact is that construction records simply don't show the total amount of work chargeable to shoulders. Maintenance records are somewhat better, but frequently the expense is combined with the surface work, it includes extraneous items, or it is so loosely reported as to be of doubtful value.

Construction records may show certain costs chargeable to shoulders, such as stabilization and surfacing work. However, these are only part of the costs. They do not show the added expense of right-of-way, of excavation, or of drainage structures properly attributable to shoulders. The extent to which such costs are chargeable to shoulders should be covered by a standard definition. Such a definition does not now exist. One is needed.

But let a standard definition be assumed. If, then, all construction costs were analyzed for a given 2-lane road, it might be shown that 15 percent of the total job costs was assignable to shoulders. Would this be too much, too little, or just about right? To answer this question, it would be helpful to place a dollar value on the many benefits which shoulders provide. Then direct comparisons of benefits and costs could be made.

Consider, for example, just one phase of the shoulder problem — over-all width. Shoulder widths of 4 to 10 ft are in common use in present day design practice. But why does the width vary? The answer lies in the value of the benefits obtained. For example, a 10-ft shoulder in mountainous terrain for a low traffic volume road might involve such high cost as to be unjustified; hence less shoulder width is used. On the other hand a 4-ft shoulder in flat terrain for a high traffic volume road would be absurd in view of the added benefits to traffic that could be obtained at nominal added cost; thus shoulder widths tend to be wider in flat country. Considerations of cost versus benefits underlie each condition.

The shoulder problem involved in rehabilitating and widening old pavements on narrow rights-of-way warrants special comment. Here the situation can become quite awkward, because of the developed nature of the bordering right-of-way and delays in acquiring relatively small parcels. The construction cost can also be quite expensive. On one road section recently, the work of widening shoulders and constructing new ditches required 75 percent more excavation than was required in the whole road when it was first built 27 years earlier. In such instances as this, resistance can be expected to spending money for building shoulders along with pavement widening and re-surfacing, because the most apparent deficiency in the road is the poor pavement condition, yet a substantial part of the expense goes, not to the pavement, but to the shoulders. Again, it would be helpful if a price tag could be placed on the value of the benefits received.

Further, shoulders give lateral support to the surface and base. Perhaps 2 to 4 ft of good shoulder would accomplish this at a certain cost. Such cost might be more properly chargeable to surface and base work than to shoulders. At any rate, this same 2 to 4 ft would also provide a measure of safety to the occasional vehicle which runs off the edge of the pavement. Some additional structural strength may be required for this circumstance. This, too, costs money. It has been suggested that any additional width, beyond the initial 2 to 4 ft next to the surface, constitutes the real shoulder. This additional width, amounting to as much as 8 ft, is needed for emergency use and accommodation of stopping or stopped vehicles. Stabilization and strengthening must be provided where necessary. Costs continue to mount, but so do such benefits as better drainage, added traffic capacity, fewer accidents, and time savings.

The engineer is aware of these problems. Much valuable research has already been done in providing him with the information needed to arrive at correct solutions. But there is still great opportunity for further research in many areas. The problem of developing better cost data and evaluating benefits in dollars and cents terms is one such area.