

it even more important that we develop median barriers that would minimize injuries to the occupants of colliding vehicles.

Our work, therefore, was to develop devices that would serve as positive barriers and yet minimize secondary effects on the occupant. This we did by developing a cable barrier for wide medians and a blocked out metal beam barrier for narrower medians. Within a year—1959–60—we had installed more than 100 miles of the cable barrier and 50 miles of the metal beam barrier in the most critical areas of the State, and since that time another 300 miles of median barrier has been added. Operational studies of both types of barriers indicated that the blocked-out beam barrier was serving as designed; however, the cable barrier at first needed refinement as to details and in addition had created certain unanticipated operational problems.

A series of additional tests was then started so as to improve design details of the barrier itself and in addition to determine the effects of the geometry of various roadsides on the action of the cars as they approached the barrier. The effect of these tests was to more clearly define the design considerations for each type of barrier. The flexible barrier system consisting of a cable on light collapsible posts and with a chain-link fence or expanded metal mesh to act as a glare screen proved itself to be remarkably efficient in both stopping an invading car and in minimizing possible injury to the occupants of such a vehicle.

Unfortunately, however, due to its flexible character it proved to be sensitive to the variety of changes in the geometry of the approach roadway and shoulders or to dikes or curbs placed in front of it. In other words, any excessive irregularity of the surface approaching such a barrier could result in the vehicle striking the cable too high or too low which would result in penetration.

Another problem that developed was that the slightest contact with the barrier caused damage which had to be repaired. Maintenance repair trucks positioned to perform these repairs often made it necessary to close the high-speed lanes. This results not only in a loss in efficiency of the freeway but also causes accidents. We have, therefore, found it necessary to restrict this type of barrier to medians that are relatively flat between the adjacent roadways and also where we have a width of at least 22 feet so as to allow sufficient room to park the truck and utilize this equipment during the repair.

The blocked out metal beam has shown no problem so far as placement is concerned and due to the fact that repairs are necessary only after a very heavy collision, closure of lanes during repairs can be held to a minimum. During our testing program, while it was evident sustained decelerations on the occupants of vehicles colliding with the blocked out metal beam were relatively low, we were concerned that the disorientation of the driver due to a rapid change in direction of travel could result in severe secondary collisions. Interestingly, this problem has not developed. In all, our overall median barrier program has been quite successful.

Mr. CONSTANDY. Relative to that program, you have a paper given recently by Mr. J. C. Womack, California State highway engineer, do you not?

Mr. BEATON. Yes; I have.