

When we started out, we used retired highway division cars which are lighter cars, in the Ford and Chevrolet class, and they are 4 or 5 years old. Later, and now, as you saw in this picture, we used retired highway patrol cars, which are only slightly over a year old when we get them. They are heavier, they are higher powered than the average vehicle on the road and therefore we feel that they put our barriers to somewhat more severe tests than actually occur in the field. These cars are driven into collision under their own power through a radio remote control by a driver in the following car, as you probably noted. The driver's seat is occupied by an anthropometric dummy who has become very dear to our hearts and we call him Sam because he has been through so much.

He is instrumented with accelerometers in his chest cavity. In almost all tests he is merely retained by a seat belt. However, we have tested practically every other type of restraining device, primarily in cooperation with our highway patrol. Actually, we rely almost entirely on high-speed photographic coverage to obtain our technical data as well as our documentary information for these pictures.

Mr. CONSTANDY. What speed and angle of impact do you use in your live tests?

Mr. BEATON. We use the approach angles and the speeds recommended by the highway research board for testing of guardrails, except that for highway barriers, such as median barriers and bridge rails, our final testing will usually be at a 25° angle of approach and speeds ranging around 65 to 70 and some as high as 80 miles per hour. The HRB standards are two approach angles of 7° and 25° and speeds not in excess of 60 miles per hour. Our tests are all performed on an unused airstrip located near Sacramento.

Mr. CONSTANDY. Could you tell us the evolution of the barriers and guardrails currently used?

Mr. BEATON. Yes; I would like to.

I will follow my presentation with a short filmstrip or excerpts from various moving pictures that we have made during our various tests that will depict some of the comprehensive work we have done in this field. That will illustrate the good points as well as the problems involved in most current barrier designs. I am sure the committee realizes the perfect barrier has not yet been designed and that there is no substitute for a great deal of open space.

We started our program in 1952 by making a series of tests of concrete bridge curbs of various shapes and heights. This series was rather rudimentary in character in that we used a live test driver and for that reason were limited as to severity of collision. This series did prove, however, that an undercut curb was the most efficient and also furnished basic information as to the effect of curbs on vehicle response.

This we followed by a series of tests in 1955 to develop the most efficient height and contour for bridge curbs and the lowest effective height for bridge rails both when they were mounted on curbs and not. We also found that if it was necessary to set a curb in front of a rail, then the lowest effective height of the rail was directly related to its setback until a maximum height of 4 feet above the curb was reached.

Mr. CONSTANDY. Four feet?

Mr. BEATON. Four feet.

Mr. CONSTANDY. Versus your norm, which is 27 inches?