classes of barriers. Vehicle position is computed for each millisecond of collision until the corresponding barrier deflections agree. The computer then prints out vehicle position, speed and deceleration, and barrier deflection. With this mathematical approach, the effects on vehicle reaction can be predicted when rail and post strengths, post spacing and impact conditions are changed.

This curve (illustrated) represents the measured trajectory of the vehicle center of gravity as the car hit the barrier and was redirected. This blue, dotted line was the trajectory predicted before the test.

Vehicle center of gravity decelerations are plotted in this curve. The predicted decelerations agree with those measured within one g.

Because we could not predict the reaction of posts in soil, we conducted dynamic tests on all eight types then in use. Test conditions simulated a car striking a barrier at fifty miles an hour and twenty-five degrees. None of the existing posts consistently provided the desired reactions. They were, therefore, unsatisfactory for our use. We then tested new designs.

Our new post has nearly the same resistance in all soils and under all impact conditions. Yielding occurs at ground level, and post reaction can be predicted.

The imbalance of post strength and barrier rail is shown in this first of forty-eight tests we conducted. The barrier, a then standard cable design, was supported on heavy 6B8.5 posts spaced ten feet apart. The car hit the barrier at forty miles an hour and thirty-five degrees. With little redirection, it continued into the barrier twelve feet, knocked one post over, cut into one cable, and separated the second cable at a splice. The splice caught in a post offset, and stopped the car abruptly, causing a violent pitch, and yaw. The car stopped, or pocketed, within the barrier, astride the posts which had not yielded under impact.

An improved cable design, using our light posts and end anchors, was tested seven times. In the guiderail finally developed, posts are spaced sixteen feet apart, and cable are supported, by ¼ inch J bolts. These bolts release the cables as the posts are pushed down. The cables thus maintain contact with the vehicle as they deflect to absorb the impact. The car hit the barrier at forty-five miles an hour and twenty-five degrees, deflected ten feet, and was redirected and returned to the roadway. When released from the posts, the cables bunched together to control redirection. Average deceleration during impact was only 2 gs. Posts were replaced and the barrier was used in a subsequent test.

This recent installation of our box beam and cable barriers shows the effective use of the two, evidently so placed because of differing allowable deflections. This end treatment of the box beam shows how it is turned away from the roadway. The cable and anchor was designed to eliminate the severe impact that would be caused by an anchored end post. Our new cable barrier is designed for deflections up to twelve feet. The cable barrier should be used only where there are no fixed objects or hazards within the twelve feet of allowable deflection.

The second test in our series was performed on a conventional W section barrier, a ten gauge rail supported on 6B8.5 posts spaced twelve and one half-feet apart. Impact conditions were fifty-five miles an hour and twenty degrees. The car deflected the barrier six feet, pocketed within the barrier, and stopped twenty feet from the point of impact. The high deceleration, in addition to the violent pitching and rotation would probably have been fatal for driver and passengers. The performance of this barrier illustrates the need to have all barrier components operate as a system.