

Mr. McALPIN. Yes. We would like to present to you the results of our barrier research. We would like to give you a few introductory remarks concerning the substance of this research program. We have a copy of our most recent movie and then, if acceptable, we would like to follow that with a brief statement with regard to performance of our new barriers, on the basis of accident data that have been accumulated. Then a brief statement on the general subject of implementation of research findings, as they apply to our barrier work.

If that is acceptable, Mr. Graham will give our introductory remarks concerning the research project and we will follow that with the movie, Mr. Chairman.

Mr. GRAHAM. Our research program has extended over a period of 7 years. It has resulted in the complete revision of standard designs for guardrail, median barrier, and bridge railing, as specified by the New York State Department of Public Works.

Our project started in 1959, and we more or less built upon the prior work that had been done principally in the State of California. In all, we have run 48 full-scale tests, but in the beginning of our project we wanted to approach it a little bit differently. We wanted to analyze mathematically the barrier vehicle reaction. We tried to write an equation as to what happens when a barrier strikes a vehicle. By doing this, we were convinced that we could minimize the amount of full-scale testing required.

Our full-scale testing program would first of all assist us in developing these equations, and then finally would verify the equations that were developed.

This mathematical program was successful. We were able to write these equations, which are solved on a computer and they have been very useful in assisting us in our barrier development.

The first 14 full-scale tests and the mathematical analysis were formed by Cornell Aeronautic Laboratory of Buffalo under contract to our department. During this time the bureau of physical research of the public works department performed tests, full-scale tests, on the various posts used in guardrail systems.

Finally, after the Cornell contract, the bureau of physical research took over the entire program, and ran the remaining 29 full-scale tests and completed verification with the mathematical models. Throughout our program we have been firmly convinced that the objectives of a guardrail or median barrier could best be fulfilled by a system that yields and, in yielding, absorbs some of the energy of the system, and cushions the impact of the vehicle.

So our entire program is directed toward yielding systems.

One of the most difficult aspects of the barrier design is the posts. With stout posts as you form the rail, you catch the wheel on the first post it comes to and if this is a stout post you get a violent deceleration and possibly a pitching and rolling of the car. There are two ways you can get around this. One is to offset the rail from the posts, so that the wheel does not contact it, as you have seen in the California tests. The other is to make the posts small enough so that when the car does strike it, it can bend it down without these violent decelerations.

All of our work has been directed toward the use of a lightweight post. It gives us sufficient strength in the lateral direction to support