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Mr. BLATNIK. Mr. Cleveland.

Mr. CLEVELAND. I just want to ask, did you have any breakdown as to how many accidents were caused by trees and how many other obstacles off the highway?

Dr. BENSON. Mr. Congressman, it is in the report. I do not have it with me. We could send it to you.

Mr. CLEVELAND. Thank you.

Dr. BENSON. This particular section of highway was built in the 1930's, and incorporated many of the features advocated by the General Motors engineering staff at the hearing of yesterday, June 27. The roadway had high shoulders, flat ditch slopes, and wide flat ditch. Drivers leaving the roadway had an excellent opportunity to regain control of the vehicle when an obstruction was not encountered. Texas has been using the flat slopes and wide rounded ditches advocated by the General Motors staff for some 30 years.

Mr. Gilchrist inaugurated these practices during his term as State highway engineer prior to 1937. Many of the trees involved in the accidents were more—and I repeat, “more”—than 30 feet from the pavement edge.

A later study, which was supported by the Automotive Safety Foundation, and covering the years 1954–58, was made of approximately 10,000 accidents on 54 miles of freeway in the cities of Dallas, Houston, Fort Worth, San Antonio, and Austin. Prof. C. J. Keese and B. F. K. Mullins were the investigators. This study also showed that collisions with fixed objects along the roadway, particularly at night, were responsible for many of the fatalities and serious injuries. Whereas only 12 percent of the accidents studied were of this type, they caused 38 percent of the injuries and 65 percent of the fatalities. This study was completed in 1960.

It seemed evident to us that studies were needed of ways and means of avoiding such accidents or of reducing their severity. The general principle was obvious—the edges of the roadway should be kept as free as possible of fixed objects. Because of the severity of the accidents involving vehicles striking heavy sign supports, the idea was advanced that such supports could be built to fail under vehicle impact. The first formal proposal was developed in 1960 but lacked external support, so the work was carried on until 1963, with limited funds provided by the university and the institute.

In 1963, the program became a part of our cooperative research effort with the Texas Highway Department. The first field installation of “breakaway” signs was made beginning in September 1965 in Orange, Jefferson, and Chambers Counties of the Beaumont district. The first sign was struck on November 4, 1965, without injury to the driver and with only minor damage to the vehicle.

After 1963, the program was extended to include breakaway design for lighting standards and this problem we think has been successfully solved. Currently we are working on procedures for providing impact attenuation devices of fixed objects for which the breakaway principle cannot be used.