C43 Forensic Evidence on Highway Hardware in Accident Reconstruction and Analysis

Russell L. Anderson, MS, PO Box 7185, Tempe, AZ 85281; Matthew A. Ivory, BS*, and Carley C. Ward, PhD, Biodynamics Engineering, Inc., 3720 East La Salle Street, Phoenix, AZ 85040*

After attending this presentation, attendees will understand the design and performance criteria by which highway hardware is designed. A background on Federal Highway Crash Testing will be presented, as well as how to use these tests in accident reconstruction.

This presentation will impact the forensic science community by examining forensic evidence found on highway hardware after motor vehicle impacts. Currently, the performance of highway hardware is often ignored or misinterpreted during an accident reconstruction.

According to the Fatality Analysis Reporting System (FARS), roadway departure crashes account for 53 percent of all fatal crashes in the United States. A roadway departure crash is defined as a non-intersection crash in which a vehicle leaves the traveled roadway. Highway hardware, such as longitudinal barriers, crash cushions, luminaire, and sign supports, are installed along roadways to help mitigate the dangers of these roadway departures.

This presentation examines forensic evidence found on highway hardware after motor vehicle impacts. Currently, the performance of highway hardware is often ignored or misinterpreted during an accident reconstruction. After attending this presentation, attendees will understand the design and performance criteria by which highway hardware is designed. A background on Federal Highway Crash Testing will be presented, as well as how to use these tests in accident reconstruction

The American Association of State Highway Transportation Organization (AASHTO) Manual on Uniform Traffic Control Devices dictates the dimensions and hardware requirements of highway hardware, while the National Co-operative Highway Research Project (NCHRP) 350 dictates the crash test requirements that highway hardware must meet. NCHRP 350 requires testing by different sized vehicles and at various speeds and impact angles. The exit angle of the impacting vehicle must be less than 60 percent of the entrance angle. The hypothetical occupant's impact velocity should be below 12 meters per second and their ride down acceleration must remain under 20 g's.

Many accident reconstructionists rely upon National Highway Traffic Safety Administration (NHTSA) crash tests, but are unaware that the Federal Highway Administration (FHA) requires crash tests of their highway hardware and that the results of these tests are publicly available in a test database, which is a useful resource. This presentation will demonstrate how to apply these crash test results as an accident reconstruction tool. Understanding the damage caused to both the impacting vehicle and the highway hardware itself at varying speeds and impact angles can help the reconstructionist in the analysis of their case accidents.

An examination of several cases studies will be presented. In one case, the investigating officer opined that the vehicle had become airborne as a result of an impact, spun around in the air and came to rest further down the road. Forensic evidence confirmed that the vehicle in fact contacted a bridge rail. In another case, the accident reconstructionist was able to determine the orientation of the vehicle as it passed through a cable barrier based on striations left by the cables as they contacted the vehicle. Another case study revealed that vehicle damage, originally attributed to contact with another vehicle, was actually caused by contact with a guardrail.

Highway Hardware, Contact Evidence, Roadway Departures

 ** Presenting Author*