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PELES AND ANDERSON REGULARLY UNDERESTIMATE DELTA V 50%

Joseph Peles, PhD and Robert Anderson are the two biomechanists/accident reconstructionists used most frequently by insurance companies in Arizona to defend low speed impact cases. They typically prepare reports which conclude that the Delta V (change in vehicle velocity) was in the range of 4-6 mph and that no one could have sustained anything more severe that a minor transient muscle strain as a result.

This forensic examiner in the past ten years has qualified as an expert in Arizona superior courts on almost fifty occasions as an expert in biomechanics based on training received in Chiropractic College and as an expert in accident reconstruction based on training received at Texas A&M University. No Arizona judge has ever refused to accept Dr. Immerman as an expert in either field. In the past ten years, Dr. Immerman has reviewed 102 reports written by Dr. Peles and 87 reports written by Mr. Anderson. In each and every report, according to engineering studies, the defense experts have underestimated Delta V by as much as 50%.

This is highly significant because when Dr. Peles or Mr. Anderson concludes that the Delta V is, for example, 5 mph, that level is often considered to not be in the injury-producing realm. However, if the true Delta V were double that amount or 10 mph then it would be considered by most to be within the injury-producing realm. When comparing the severity of a Delta V 10 mph impact to a Delta V 5 mph impact using an energy analysis, it is first necessary to square the numbers, i.e., 10 squared compared to 5 squared means that a Delta V 10 mph impact is 4 times more severe than a Delta V 5 mph impact.

Peles and Anderson rely on crash tests performed by the Insurance Institute for Highway Safety (IIHS) or the federal government. However, this data is based on rigid barrier-to-car impacts, not vehicle-to-vehicle impacts as occurs in real life accidents. Rigid barrier-to-car tests are not substantially similar to vehicle-to-vehicle impacts and this causes an underestimation of Delta V.

A prescribed level of Delta V produces a longer acceleration pulse duration following a vehicle-to-vehicle impact than a rigid barrier-to-vehicle impact. Therefore, a prescribed level of Delta V will cause less damage in a vehicle-to-vehicle impact than a rigid barrier-to-vehicle impact. An article from the Society of Automotive Engineers (SAE) stated:

"DELTA V COMPARED TO BARRIER EQUIVALENT IMPACT VELOCITY"

"When performing an accident reconstruction, often it is necessary to express the severity of a collision with a consistent and definable severity measure. Historically, Delta V has been used due to its importance for impact speed determination. Additionally, Delta V serves as a measure of potential injury exposure. Quantifying Delta V, therefore, is one of the major objectives when performing an accident construction . . . the following definitions are to be assumed for this analysis:

Delta V: The actual change in velocity, during the impact phase of a collision, that a vehicle experiences. Generally considered as a severity measure of a car to car impact, Delta V can also refer to the total change in velocity experienced during a rigid barrier impact.

Barrier Equivalent Velocity (BEV): This is the equivalent impact velocity of a vehicle into a fixed rigid barrier that would result in the same magnitude of crush as observed on a subject vehicle under analysis. The BEV and the Delta V will generally not have the same magnitude for a subject vehicle in a car to car collision, except under certain circumstances."

The study continues: “The bulk of publicly available crash test data is rigid barrier government compliance tests. A utilization of this data can allow the reconstructionist to determine the BEV for a given accident vehicle. Although the nature and shape of the crush may differ in the car to car impact, the magnitude of the absorbed crush energy between the rigid barrier and the subject vehicle is the same at the matching BEV. Once the BEV is calculated, the Delta V may then be computed using Conservation of Momentum and Conservation of Energy methods.

As seen in the car to car staged collision, the crush energy is shared mutually but not necessarily equally, between the two vehicles. This differs from a rigid barrier impact which directs all of the crush energy into the one test vehicle. The impulse or acceleration pulse in the two vehicle collision will have different characteristics than the rigid barrier test. The car to car impact will generally have a longer acceleration pulse duration when compared to a similar Delta V rigid barrier impact . . . If the accelerations are lower, crushing forces will be lower, resulting in lower overall vehicle crush.” (Kerkhoff et al, 1993)

A 2001 SAE article assessed four classes of vehicular impact testing: “vehicle to vehicle, vehicle to infinitely massive rigid barrier, vehicle to infinitely massive compliant barrier and vehicle to finite mass movable rigid barrier.” The author concluded: “For a prescribed level of vehicular dynamic deformation, it is possible to have a 100% variation in the change in vehicle velocity (Delta V), depending upon the structural dynamics of the testing involved . . . As has been shown, a wide variation in the change in vehicle velocity (Delta V) can be developed for a given level of dynamic deformation, depending upon the type of test utilized by a researcher.” (Burkhard, 2001)

The Delta V required to cause a prescribed amount of damage to the subject target vehicle as a result of a vehicle-to-vehicle collision is significantly greater than the Delta V required to produce the same amount of damage to an identical vehicle as a result of a rigid barrier-to-vehicle impact. It is possible to have a 100% variation.

Burkhard, PM: “Delta V, BEV and Coefficient of Restitution Relationships as Applied to the Interpretation of Vehicle Crash Test Data,” SAE 2001-01-0499, 2001.

Kerkhoff JF, Husher SE, Varat MS, Busenga AM and Hamilton K: “An Investigation into Vehicle Frontal Impact Stiffness, BEV and Repeated Testing for Reconstruction,” SAE 930899, 1993.

To order a copy of these articles, simply contact the Society of Automotive Engineers at www.sae.org.

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