

SAE 2008-01-0168 Crash Pulse and DeltaV Comparisons in a Series of Crash Tests with Similar Damage (*BEV*, *EES*)

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ABSTRACT

Nine crash tests were conducted at various speeds on three vehicles in three locations under conditions that resulted in similar damage. The objective was to study the differences in crash pulse, *deltaV*, crush depth, and impact location with change in closing velocity from 20 to 55 mph. Three equal-weight Nissan Sentra vehicles were impacted in the front, rear, and side by an associated narrow object impact device. The three impactors were identically shaped, flat-faced, one-foot wide, and rigid; but each was designed to have a different weight (light, moderate, and heavy weight). The heavy, moderate, and light weight impactors collided with their associated test vehicle at low, medium, and high impacting speeds, respectively, in order to produce damage corresponding to a 20 mph *BEV* (Barrier Equivalent Velocity) in all nine tests.

Impacts at the same location on the three vehicles produced nearly identical damage yet substantially differed in *deltaV*. Corresponding crash pulses vary widely in time duration while demonstrating similar deceleration magnitude.

A description of the crash physics behind these observed differences and similarities in the crash pulses provides a basis for pulse shape analysis applicable in biomechanical injury analysis. These tests may also be helpful in explaining the basis for deployment or non-deployment of safety systems.