SCHAEFER ENGINEERING

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FEATURED

FORENSIC FEATURES

Photographing Vehicle Crash Damage

With advances in film photography, camera and lens design, and digital photographs, automobile damage documentation has increased in both speed and efficiency. The inspection of a motor vehicle for damage should be a methodical process following specific protocols that allow the investigator to examine every aspect of the vehicle, inside and out, to determine how much energy was dissipated in permanently deforming the structure and components of the vehicle.

The tools and methods used to actually measure damage to a vehicle vary widely but the use of photography cannot be under stated. Often an oversight, the undamaged areas of a vehicle should be photographed as well as those areas that clearly show contact or induced damage, since there are often issues that arise later that may not be anticipated during the initial assessment of damage. To avoid controversy and to ensure a complete and thorough evaluation, the investigator is always better-off taking more photos, rather than less. By utilizing the concept of **"on-center" or centered photographic technique and taking photos from "general to specific" perspectives,** investigators can minimize the number of photos needed to document vehicle damage. One of the few times that photos taken at angles, other than "on-center", are useful is when they are taken at oblique or quartered view, showing two sides of the vehicle simultaneously to document what areas *are not damaged*.

The use of overhead photos taken from a ladder, pole camera or other elevated perspective are also tremendously useful to investigators attempting to measure permanent deformation or crush. **The "birds-eye-view" from an elevated perspective can show the amount of crush** in a manner consistent with how the data is entered into various reconstruction software programs and, therefore, is useful in documenting the extent of intrusion or bowing in severe crashes.

The use of standards in macro or close-up photography is essential. There is no way to regain perspective in a photograph without a standard or scale reference in close-up photography. The scale should be in the same photo plane as the item that is being memorialized. Photography using a fine scale or standard is essential in cases involving crush analysis, and for close-ups of lamp examinations, blood, hair or fiber evidence, and paint transfers.

All of these techniques are important and useful when investigating vehicle crash damage. It could be the difference between taking photographs that help you answer the important questions or leave you guessing.

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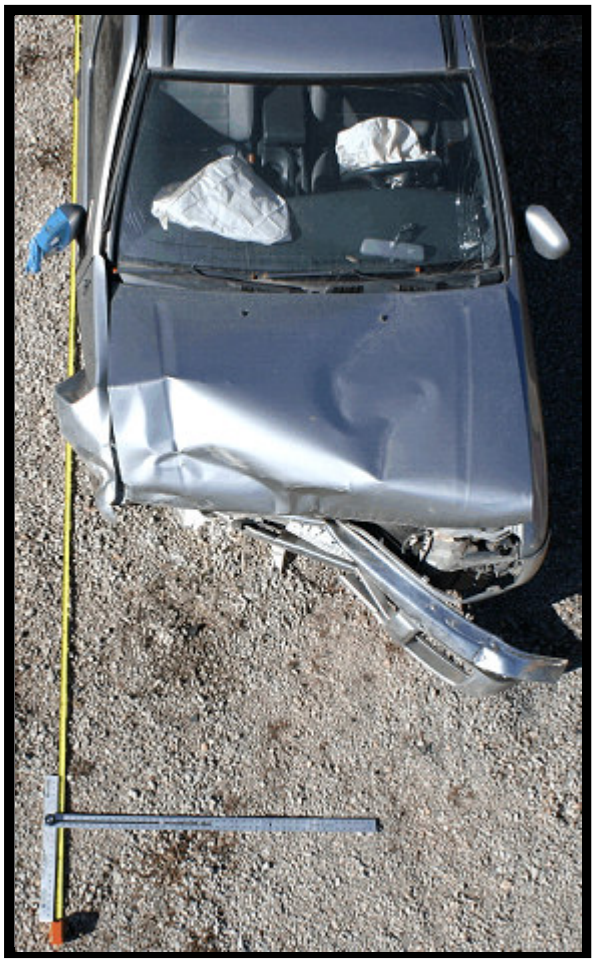

Centered, Over-head Shot Including a Photo Standard or Scale Reference

Low Speed Vehicle Collisions

Accident Reconstructionists are often asked to determine the severity and injury potential of low speed vehicle collisions where there is little or no vehicle damage. This article discusses the basic approaches used to reconstruct these types of collisions.

Quantifying the Collision Severity

The first step in an accident reconstruction is to quantify the severity of the collision. The severity is defined in terms of vehicle speed change, often referred to as Delta V, or in terms of vehicle acceleration. In a typical bumper-to-bumper low speed impact, this speed change occurs in about one tenth of a second. The damage sustained by the vehicles involved can be determined from an examination of the vehicles or by reviewing photographs and repair estimates. The determined damage, or lack of damage, is then compared to damage sustained in low speed crash tests performed with the same make and model of vehicle.

Federal bumper standards were introduced in 1973 to reduce the damage sustained by the front and rear ends of cars due to low speed collisions. Cars made during the 1980-82 model years were only allowed to sustain minor cosmetic damage to the bumper itself in a 5 mph barrier test. In 1982, the federal government decreased impact test requirements from 5 mph to 2.5 mph for 1983 and later model cars. The 2.5 mph standard also allows unlimited damage to the bumper and attachments. This federal bumper requirement only applies to passenger cars. There are no federal bumper standards for vans, pickup trucks, or SUVs.

Some investigators assume that a vehicle equipped with a '2.5 mph bumper' or a '5 mph bumper' will sustain damage if it hits a barrier at a speed even slightly greater than what it is rated for. Results from low speed crash tests indicate that many vehicles will meet and exceed their bumper standard. Therefore, it cannot be assumed that the bumper damage threshold is just above the bumper standard. Low speed crash tests provide a better insight into how a vehicle performs in a low speed collision.

Several other methods can be used to help determine collision severity. Information regarding the events prior to the collision can sometimes be used. For example, if a vehicle stops behind another vehicle and then accelerates forward and rear-ends the vehicle in front, a reasonable range of distance and acceleration values can be used to determine collision severity.

Another useful source is data retrieved from vehicle crash data recorders (CDRs). Most GM vehicles (1994 onwards) and some Ford vehicles (2001 onwards) are equipped with CDRs. These CDRs can record data during a collision even if the airbags are not deployed. This crash data can be downloaded using the Vetronix Crash Data Retrieval System and used to determine collision severity.

Determining Injury Potential

The second step in the analysis of a low speed collision is to relate the determined collision severity to an injury potential. This is often done by comparing the determined collision severity to results from amusement park bumper car, human volunteer, and real-life impact studies.

There have been several studies where human volunteers have been subjected to low speed vehicle collisions. These studies provide a useful insight into injury potential. However, caution must be used when using the results from these studies to determine the injury potential of a reconstructed accident. Individuals with health problems are usually excluded from participating in these studies, so the subjects tested are not representative of the general population. Also, unlike real world impacts, the test subjects are typically not in a totally unprepared state prior to impact. Using real-life impact studies to determine injury potential avoids many of the problems associated with human volunteer studies.

To determine the injury potential of a low speed collision the severity level at which people start to sustain injuries needs to be known. A vehicle speed change of 5 mph is often quoted by some investigators as the 'injury threshold' for a rear-end impact. However, in a well documented 1998 rear impact study with 42 test subjects, the largest group ever tested, 29 % of the subjects had injury symptoms after vehicle speed changes of only 2.5 mph. The median and maximum duration of these symptoms were reported to be 6 hours and 2 days, respectively. This study suggests that a sizable minority of occupants will sustain short duration symptoms in rear-end impacts where the vehicle speed change is only 2.5 mph.

When the determined collision severity is above the level required to cause injury, there is often a question regarding expected injury duration. A 2002 study investigated the correlation between the severity of real-life rear impacts and the duration of occupant symptoms. The severity of the impacts was downloaded from onboard crash data recorders. In this study, no occupant sustained symptoms for more than one month when the vehicle speed change was less than 5 mph.

The answer to the question of whether or not a particular low speed collision would have caused injuries often cannot be answered with a simple yes or no. The answer will often be that, at the determined collision severity, about X % of the general population would have symptoms lasting for an average and maximum of Y and Z hours/days/months.

A detailed analysis of a low speed collision is often difficult due to a lack of physical evidence. However, by using the methods presented in this article the severity and injury potential can often be successfully determined.

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Accident Reconstruction Training

The Accident Reconstruction Team participates in valuable training and research exercises!

Schaefer Engineering's Accident Reconstruction Team conducted an internal mini-conference and training session to exchange information, collaborate with associates, and elaborate on each member's background and area of expertise. This information-packed two-day conference was held at the Schaefer Engineering Portland office. Various technical issues and the use of equipment important to accident reconstruction specialists was covered.

This type of peer-to-peer collaboration and cross-training is not available to the sole practitioner and almost never utilized by other companies. At our next conference we want to include you by providing an opportunity to observe a staged vehicle-to-vehicle crash test or some other exciting research project in which we are involved. If you or your company has an issue or problem that needs testing, research or evaluation, we may be able to help you. The Schaefer Engineering Accident Reconstruction Team is proud to be a part of a diverse and interactive group of experts.

Look for Us at these Events

Oregon Trial Lawyers Association
Motor Vehicle Accidents CLE Day
November 30, 2005 ❖ Portland, OR

Colorado Trial Lawyers Association
Auto Blockbuster
February 2 & 3, 2006 ❖ Denver, CO

White and Steel Conference
February 10, 2006 ❖ Aurora, CO

Washington Defense Trial Lawyers
Construction Law Seminar
February 24, 2006 ❖ Seattle, WA

Washington Defense Trial Lawyers
Construction Law Seminar
March 31, 2006 ❖ Vancouver, WA

Watch For The Upcoming Announcement Of Our Name Change

CASE FORENSICS

Same Ownership. Same Great Service. New Name.