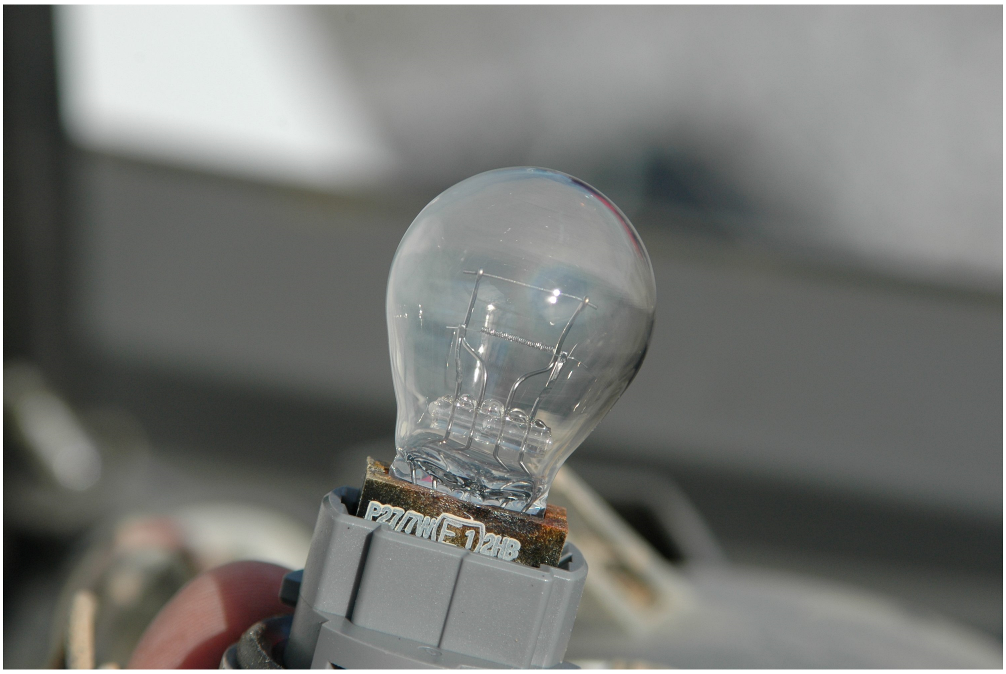
Technical SolutionsLet VCE's experience work for you

Archive for the 'Motor Vehicle Accidents and Accident Reconstruction' Category

Valuable Evidence Collected from Vehicles

Wednesday, March 10th, 2010



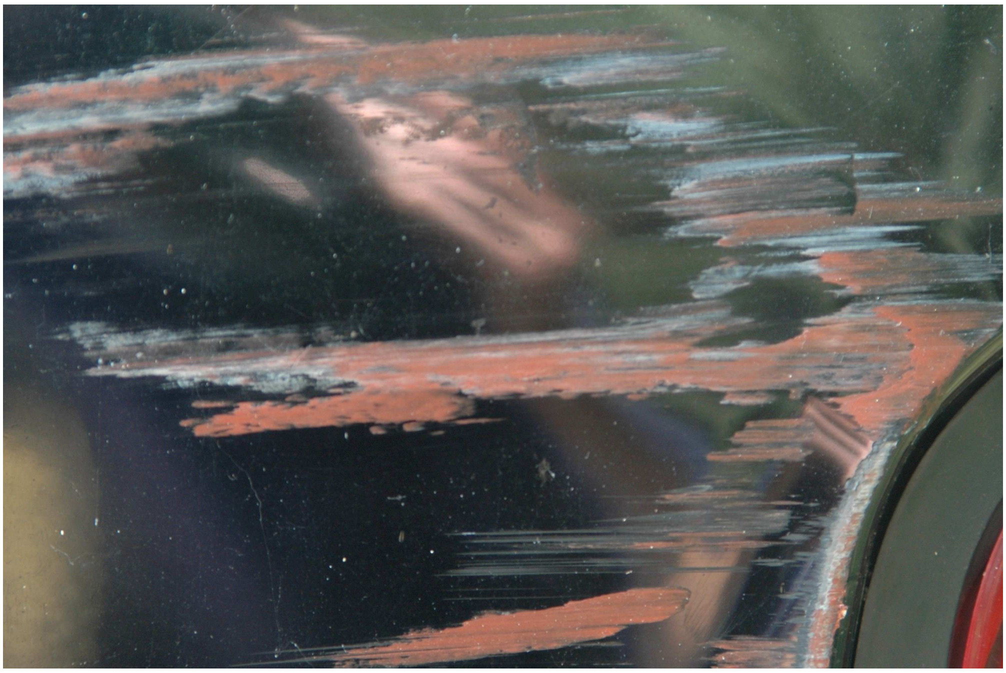
As part of a thorough vehicle examination we will first look at the evidence that can be collected from the various lamps on the vehicle. Many times the question arises in an accident about whether or not someone had their headlamps on low or on high beam. Were they using their turn signal? Or were other basic indicator lights illuminated? Sometimes as a result of the collision there may be scientific evidence that may be collected from a bulb or even its remnants that could help answer these question

Second let's consider the vehicle's tires. Depending on the circumstances surrounding the accident there may be questions about tire failure. Valuable evidence regarding this can be collected from a careful inspection. Also the tires could be overly worn or improperly inflated and lead to a hydroplaning incident. Or maybe the tires are unevenly worn indicating a possible alignment issue. Also it is important for accident reconstruction purposes to know if the wheels became pinned or locked due to the collision because this affects the post-impact energy-speed calculations.

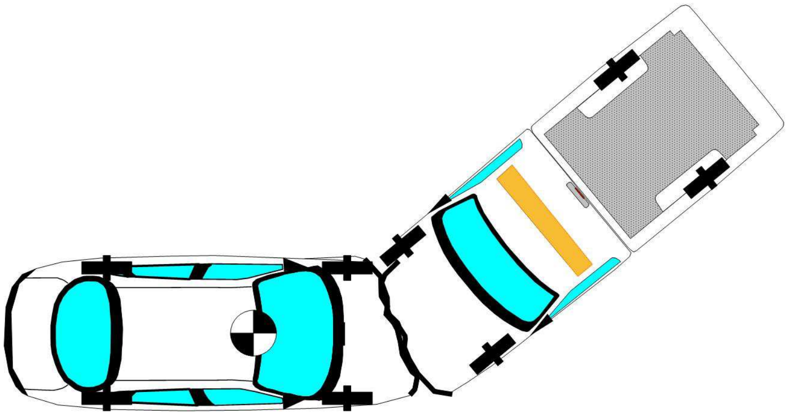
Next we can look at the damaged areas. When considering vehicle damage it is important to distinguish between contact damage and induced damage. As the terms imply, contact damage is damage to a vehicle caused directly by contact with another vehicle or object. Induced damage is damage that is produced by the collision forces but did not directly make contact with any outside object. Some items of evidence that can be collected from damaged areas include surface abrasions, windshield damage, imprints, tire prints, and paint transfer. Also we want to measure the crush profile and determine the principle direction of force.

Surface abrasions usually result when a vehicle overturns but can result when a vehicle scuffs up against an object or rigid body such as a median wall. When the vehicle slides over a surface it will produce scratches in the vehicle's paint. The orientation of these scratches can be helpful in determining the movement of the vehicle as the marks are being made.

With windshield damage it is important to distinguish between induced and contact damage. It is also important to note that some windshield contact damage can result from the deployment of vehicle airbags. If it is determined to be contact damage not from an airbag, it could be from an object outside the vehicle such as a motorcycle or bicycle rider. In this case it would indicate the movement of the rider after the impact with the striking vehicle. The windshield damage could also result from an occupant or some other object inside the vehicle. This information can help determine occupant position and the direction of the collision forces.
Tire prints are similar to imprints however they do not typically leave an impression but a different kind of distinct marking. Sometimes during a collision the tires of one vehicle will rub up against the body of the other leaving a rub mark or tire print. In the case where the front wheel of a semi-tractor rubs up against a vehicle, the lugs can produce circular tears in the metal along with the tire rub mark.



Another bit of evidence that can be helpful in determining the orientation of the vehicles or even which vehicle hit another vehicle at different points in a multi-vehicle accident is paint transfer. Many times paint from one vehicle will be transferred onto the other vehicle where they make contact. Although many times this evidence may be obvious there are other times where it is very miniscule and requires careful examination.



Finally by looking at and taking measurements of the damaged vehicle we can produce a scale diagram of the vehicle and its deformation. This is helpful like the tire prints and paint transfer in determining the way the vehicles came together in the collision. Also it can sometimes be used with crash test data to determine an impact speed for the striking vehicle. Also we can look at different components of the vehicle that were displaced during the collision and take note of the direction of their displacement from their original placement to get an idea of the principle direction of force that was applied to the vehicle. This can be helpful in confirming other calculations and in understanding occupant kinematics.

This article is not exhaustive but serves to highlight the fact that a lot of valuable evidence and data can be obtained from a careful vehicle inspection. This information can assist in answering questions that arise when investigating the causes of vehicle accidents.

Jonathan McGehee

Tags: accident reconstruction, evidence, forensics, motor vehicles
Posted in Jonathan McGehee, Motor Vehicle Accidents and Accident Reconstruction | 1 Comment »

Speed Calculation in a Motorcycle Accident

Friday, December 18th, 2009

"I never saw him, he came out of nowhere, he must have really been flying" are common familiar sayings in motorcycle accidents. This article deals with the vault formula and slide to stop method for calculating the speed of a motorcycle involved in a crash where another vehicle pulls out in front of an oncoming motorcycle. In crashes where the front of the motorcycle impacts into the front or rear sections of an automobile, pickup or some object that allows the rider to vault over the handle bars and continue flying through the air until it impacts the ground, the vault formula method may be used.

In cases where the motorcycle impacts into a large vehicle where the occupant does not clear the collision area such as when it impacts into a semi tractor or trailer, the formula can not be used. An example of the type of impact where the vault formula can be used is seen in diagram 1.

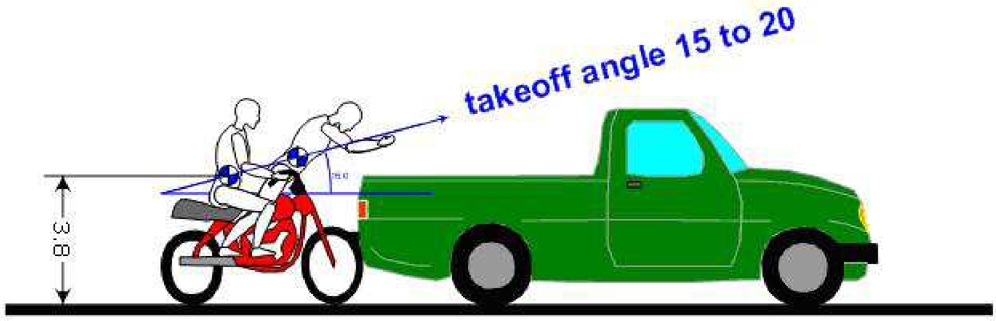


Diagram 1

In order to calculate the departure speed of the motorcycle operator several bits of information are needed:

- The horizontal distance that the operator travels from the point of impact to the first touch point on the roadway and the final rest location
- The departure/takeoff angle of the motorcycle operator
- The height of the center of mass of the motorcycle operator above the first touch point
- The coefficient of friction between the operator's clothing and roadway surface

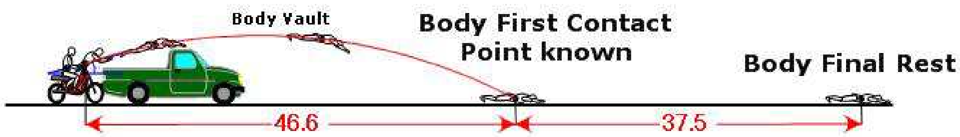
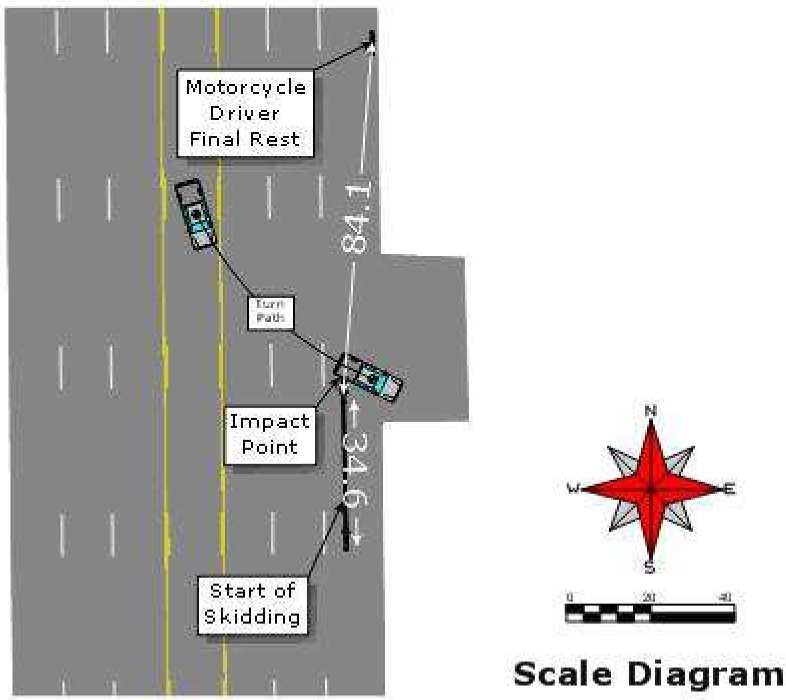


Diagram 2

The distance needed for the vault portion of the calculation is the horizontal distance from the location where the motorcycle operator is located at the point of impact with the car, pickup truck or object to the point on the roadway or grass where the driver or rider lands. The distance needed for the slide to stop portion of the calculation is the horizontal distance from the location where motorcycle operator first touches the ground to its final rest position. Sometimes there is good evidence on the roadway apparent at the scene investigation of where the motorcycle operator impacted the ground and many times there is not. A thorough scene inspection at the earliest time after the accident by a trained eye will have the best opportunity to find this evidence. A scale diagram will normally be made to document the impact point, final rest locations and other pertinent information from which measurements can be made to determine the proper distances for the calculations.



Scale Diagram

The takeoff angle for a motorcycle operator is generally between 10 to 20 degrees. The takeoff angle for the passenger varies depending on the type of motorcycle and operator position of the particular accident and can be as low as 18 to 20 degrees and as much as 45 degrees.

When making the field measurements with total station technology or other methods, (steel tape and level) elevation changes between the roadway at the point of impact and the landing point need to be made. This will allow an accurate measurement of the vertical distance that the operator traveled from the point of impact to the first touch point.

Adding the height of the center of mass of the driver (located usually at the belly button point) from the top of the seat height of the motorcycle will give the starting height at the point of impact. Subtracting the elevation change to the ground level and then adding ½ the thickness of the body will give the height above the ground distance needed in the calculation. An estimate can be made by bracketing the distance if the exact height is not known.
The formula is as follows:

Where:

V = feet per second
g = acceleration due to gravity (32.2 feet per second squared)
d = total horizontal distance
A = components of 15º departure angle
Y = vertical height of driver or rider (negative value if below takeoff point)

Formula

```
V = Sqr(g / 2 * X^2 / (Cos(A)^2 * (X * Tan(A) - Y))

V = Sqr(32.2/2*46.6^2/(Cos(15)^2*(46.6*Tan(15)-(-3)))

49.1902 = Sqr(16.1*2171.56/(.933*(46.6*.2679-(-3)))

33.5387 M/H
```

Be sure to convert the feet per second calculated value to miles per hour by dividing feet per second by 1.467. After calculating the vault speed, the next calculation checks the calculation by calculating the slide to stop speed from the first touch point to the final rest point. Measure the distance from the first touch point to the final rest of the operator. Use the measured distance in the slide to stop formula and compare the answer with the vault speed. If the two speeds are roughly the same it's a good indication that the answer is valid.

Slide to stop formula:

$S = \sqrt{(30df)}$

$S = \sqrt{(30*37.5*1)}$

$S = \sqrt{1125}$

$S = 33.54$ mph

Where:

S = miles per hour
d = total horizontal distance of motorcycle driver or rider slide
f = coefficient of friction of motorcycle driver or rider (either sliding or tumbling based on injuries and scene data)
g = gravity (32.2 feet per second squared)

Studies show that the coefficient of friction between the operator's clothing and the roadway surface for cotton/ wool and polyester is between .7 to .85 g's and for leather is between .6 to .7 g's. When a body does not slide but tumbles the coefficient of friction is approximately 1.0 or higher. There may be a combination of sliding and tumbling so the slide to stop coefficient of friction may vary.

By using this method a calculation can be done with the vault formula and then the slide to stop calculation can be done to check the vault speed. If the distance used in the vault formula produces a speed that is consistent with the speed from the slide to stop formula then that speed is how fast the motorcycle was traveling at the point of impact. If the speed from the vault formula is to high to produce a speed low enough to match the slide to stop speed then use a shorter distance for the vault and a longer distance for the slide to stop formula. Narrowing in on the right distance by trial and error, the investigator will be able to find the solution that fits both equations and that is the approximate speed that the motorcycle was traveling when the impact occurred.

After calculating the motorcycle's impact speed then use the skid to stop formula using the pre-impact skid distance of the motorcycle to obtain the skid-to-stop speed for the pre-impact skidding of the motorcycle. Then take that answer and combine that speed with the impact speed of the motorcycle by using the combined speed formula to calculate the start of skid speed of the motorcycle. The combined speed formula is as follows:

The combined speed formula

$S = \sqrt{(S1^2+S2^2)}$

Example: Motorcycle pre-impact skid distance is 34.6 feet. The coefficient of friction used in the calculation is .7 g's. Assume that the motorcycle is able to obtain 100% of the coefficient of friction.

Slide to stop:	Combined Speed:
$S1 = \sqrt{(30*34.6*.7)}$	$S = \sqrt{(33.5^2+26.9^2)}$
$S1 = \sqrt{726.6}$	$S = \sqrt{(1122.25+723.6)}$
$S1 = 26.95$	$S = 42.96$ mph

The start of skid speed of the motorcycle in this case is approximately 43 mph.

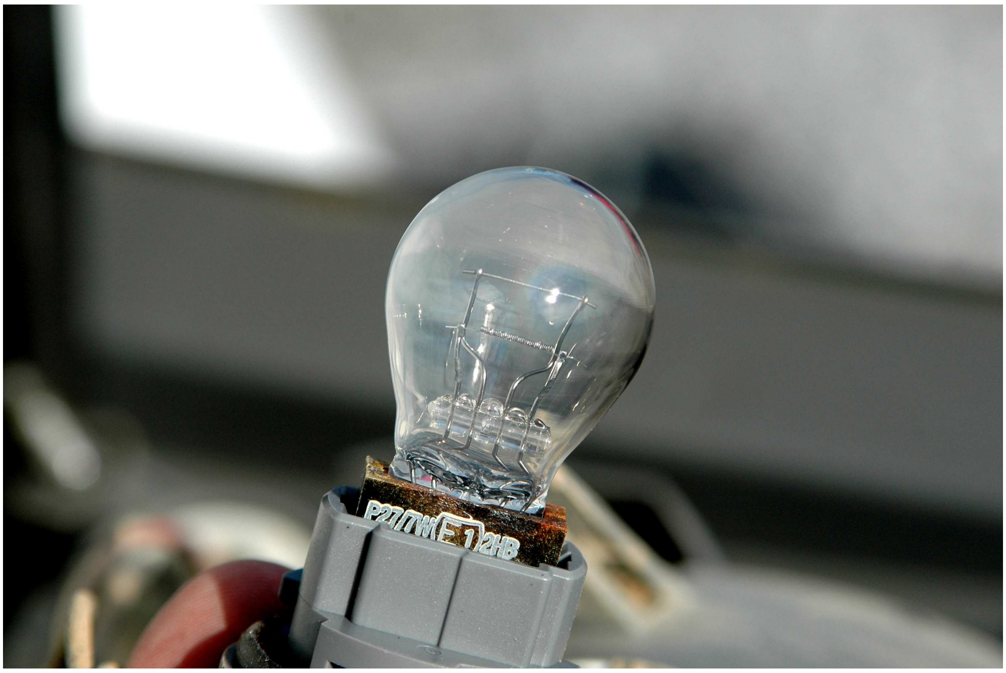
Todd Hutchison

Tags: accident reconstruction, motorcycle, speed formula, vault formula
Posted in Motor Vehicle Accidents and Accident Reconstruction, Todd Hutchison | 12 Comments »

The Value of Demonstrative Evidence

Thursday, September 3rd, 2009

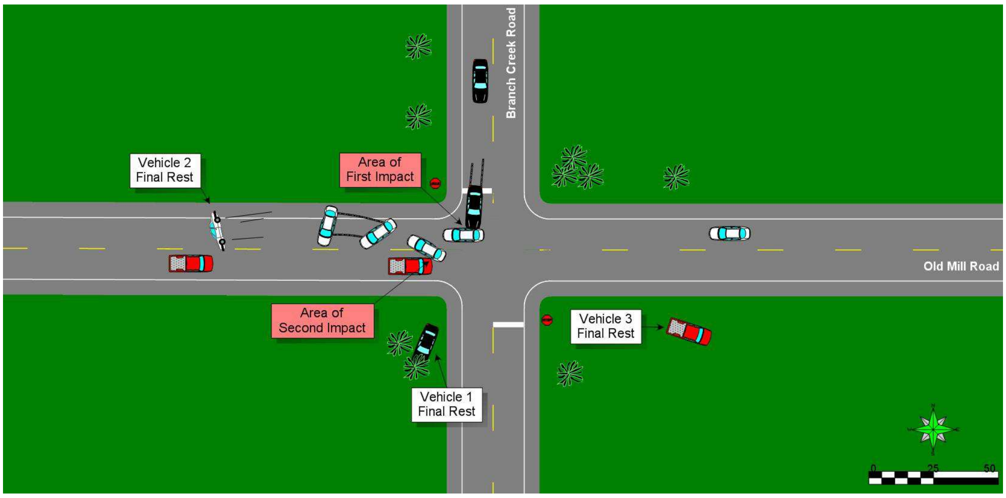
Quality Photographs



As the saying goes, a picture is worth a thousand words. Well a picture serving as demonstrative evidence is equally powerful. It enables the investigator to document all aspects of the scene, vehicles, and any other valuable evidence for future reference and analysis. Additionally it enables others such as claims adjusters, lawyers, other investigators, juries, and judges to examine the scene, vehicles, or other evidence for themselves.

In regard to this last point, it must be emphasized that the photographer needs to be knowledgable about how to take accurate photographs that are true representations of the evidence. Care must be taken in the use of special lenses or filters that may distort the perspective or appearance of the shot. However, as long as proper equipment and techniques are used, a photograph generally tends to be considered irrefutable evidence.

Scale Diagrams



A scale diagram is another useful piece of demonstrative evidence. Assuming it is based on accurate measurements of the scene and vehicles, it can be used to very accurately depict locations and speeds of vehicles at different times as the vehicles approach and depart from the area of impact. Also line of sight or other important characteristics of the particular accident can be represented graphically to enhance understanding. These diagrams are helpful to the reconstructionist for doing analysis and calculations. They are useful to other interested parties to be able to visualize how the accident occurred and to understand the reconstructionists conclusions.

Animations and Simulations

Finally we will look at animations and simulations. Due to the advances in computer technology we are now able to generate these pieces of demonstrative evidence that are arguably the most advanced and self explanatory available. Although it may be self-evident we will define the difference between an animation and simulation. Both are videos generated from a series of either two-dimenisional or three-dimensional shots that show the vehicles moving through space and the accident sequence. However, the movement of an animation is completely directed by the animator whereas the movement of a simulation is generated by a computer program designed to replicate how a vehicle would move, react, and deform in an accident scenario in the real world. This algorithm is of course then based on general principles of engineering and physics. The animation allows the reconstructionist to put together his entire analysis, calculations, and measurements into one package and via this video show how the accident occurred. Simulations, assuming the algorithm is sound and propertly applied, are useful for testing theories and analysis. Click below for an example of each:

Animation

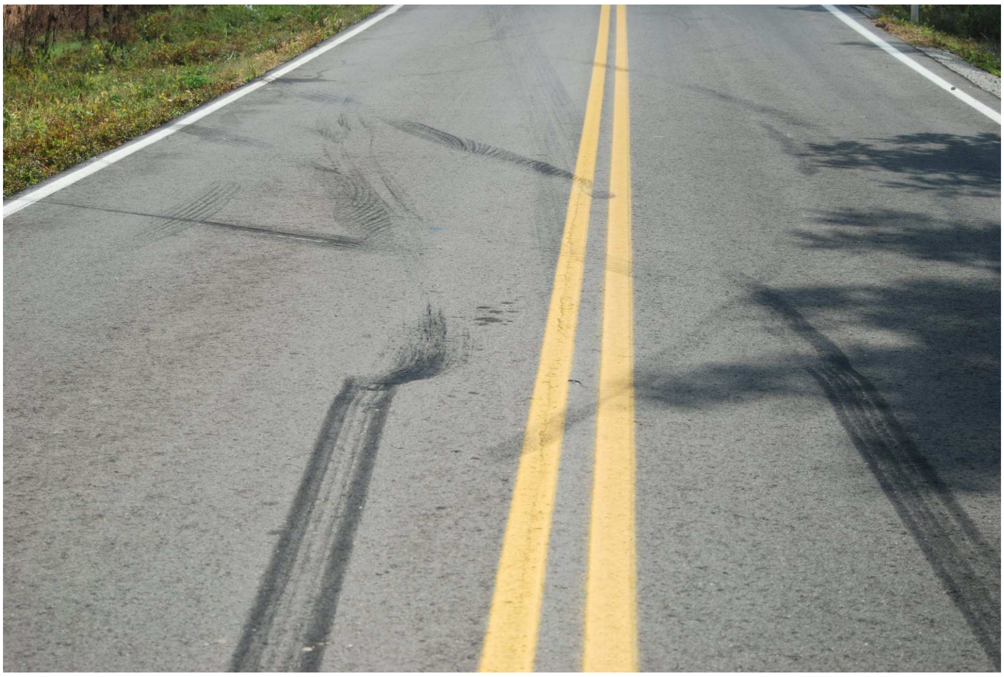
Simulation

Jonathan McGehee

Tags: accident reconstruction, animation, evidence, photography, scale diagram, simulation
Posted in Jonathan McGehee, Motor Vehicle Accidents and Accident Reconstruction | No Comments »

Conservation of Linear Momentum

Friday, July 24th, 2009



The Conservation of Linear Momentum method is a well established scientific too utilized by the reconstructionist to determine the impact speeds of vehicles involved in collisions. It is one of the many useful techniques that an accident reconstructionist has at their disposal. Others include Conservation of Energy, Critical Speed Analysis, and the Crush Factor Method. Conservation of Linear Momentum utilizes several inputs that require careful evidence collection and analysis. Additionally, some of these inputs are more sensitive than others depending on the particular situation. Next we will list the inputs and discuss some of the methods used for determining the proper value to use.

Needed Inputs:

- Angle at Start of Post Impact Rotation
- Angle at End of Post Impact Rotation
- Lock-up value per Wheel
- Weight distribution per Wheel

- Post Impact Drag Factor
- Post Impact Travel Distance
- Grade in Area of Post Impact Travel
- Approach Angle
- Departure Angle
- Total Weight

Accurate documentation of the vehicles, roadway, and crash scene markings is necessary. This can be done with total station technology or some other accurate method of measurement. A drag sled can be used to determine drag factors on various surfaces. Other methods such as skid tests or drag factor tables in certain instances are necessary. This documentation which is used to make an accurate scale diagram is then utilized to obtain values for the above variables. Data from the vehicle and crash scene markings will be used to determine the inputs for the lock up factor which in turn will be used for the departure speeds. Other values like the weights of the vehicles are normally obtained from professional databases like expert auto stats and then combined with the estimated weights of the occupants and cargo.

Conservation of Linear Momentum analysis, which is a scientifically sound method used by reconstructionists for calculating impact speeds and other information about crash vehicles, yields good information when proper data is inputted. The method requires several inputs some of which may be sensitive. Consequently, it is imperative that a detailed analysis and an experienced professional evaluation of the data be performed to obtain accurate results.

Todd Hutchison

Tags: accident reconstruction, documentation, evidence, linear momentum
Posted in Motor Vehicle Accidents and Accident Reconstruction, Todd Hutchison | No Comments »

Contributing Factors: The T-Bone

Friday, November 7th, 2008

There are a wide variety of contributing factors associated with vehicle accidents, and careful analysis is required to fully and accurately determine fault because of these many factors. For instance, let's consider the case of a "T-Bone" type collision.

In this hypothetical collision, there is a Chevrolet traveling south on Hwy 11 when a Nissan pulls out from a side road into the path of the Chevrolet, and the Chevrolet impacts into the passenger side of the Nissan. Who is at fault in this collision? That can depend on several factors. Below is a partial list of possible contributing factors for each vehicle.

Nissan	Chevrolet
Disregarded a Stop Sign	Speeding
Failed to Yield the Right of Way	Inattentiveness
Headlights Not Illuminated	Headlights Not Illuminated

Only through a careful and thorough investigation can fault be accurately assigned. Our accident reconstructionists can typically confirm or disprove which of these were in fact the cause(s) of the accident. The following are various questions about contributing factors that you might have and the corresponding methodology we have available to answer those questions.

Question: Did the driver disregard the stop sign?
Answer: Based on impact speed and acceleration calculations we can determine whether it is reasonable for a vehicle to reach its speed after stopping at the stop sign.
Question: Was the vehicle speeding?
Answer: We can do various calculations to determine speed based on damage patterns, departure angles, and final rest locations. Also, we may be able to download crash data recorder information that can answer this question.
Question: Was the driver paying attention?

Answer: Based on speed/time/distance calculations, we can determine the approximate location where and the time when the driver perceived the hazard of the other vehicle and began to react. Then, we can attest to whether or not this information is consistent with a typical and attentive perception and response.

Question: Were the vehicle's lights on?
Answer: In most cases this can be determined by forensic evidence that can be documented and collected.
Other questions that we consider and have the ability to analyze and address include:
· Was fog present creating a sight distance and headlight issue?
· Did sun glare obstruct or limit the view of the driver?
· Were the ambient light conditions such that the vehicle would have been visible?
· Were the proper traffic controls in place and appropriately located?
· Did the environmental conditions call for a reduction in the reasonable speed to be traveling?
As you can see, it is not a simple matter to say one or the other party is at fault. It takes a conscientious consideration of many possible factors.
Jonathan McGehee

Tags: accident, accident reconstruction, contributing factors
Posted in Jonathan McGehee, Motor Vehicle Accidents and Accident Reconstruction | No Comments »

Preserving the Accident Scene

Monday, July 7th, 2008
Consider yourself in the following scenario: You contact us to investigate an accident that occurred a year ago. We arrive at the scene. We attempt to gather evidence, but there appears to be no evidence to collect. There are no skid marks, no gouge marks, no fluid spills and the road is repaved. Trees may have been cut down or trimmed. Road signs have been moved. The vehicles are gone, nothing was marked, and the police did not take any photographs. We attempt to locate the vehicles to inspect their damage and find that they have been repaired or salvaged. As you can imagine, our ability to replicate this incident has become increasingly difficult.

The previous example is extreme, but nevertheless emphasizes the importance of preserving evidence as soon as possible. In accident reconstruction, our analysis can only be as accurate as the evidence we gather. As time goes on the evidence degrades, and as the evidence degrades so does the ability to determine what happened with certainty. This fact puts us continually fighting against the clock because a significant amount of scene evidence is short-lived and fleeting. For instance, impending skid marks, ABS skid marks, debris patterns, and paint transfers are typically moved or nowhere to be found within a few hours or days.

After Longer Periods of Time the Following Can Also Be Altered or Removed:

- Roadway Signs (especially in construction areas)
- Roadway Drag Factor (further traffic degradation or re-pavement)

- Sight Distance Obstructions (embankments, trees, parked vehicles, etc.)

This is just a partial list but it stands to emphasize the point.

When an accident occurs, consider the benefits of taking timely action. Ideally we would be able to respond to the scene immediately after the original incident, especially if there is any indication that a comprehensive, professional investigation may be required. This gives us the opportunity to document the scene thoroughly and accurately.

We utilize various methodologies and technologies to document the scene including:

- Quality Digital Photography
- D.A.R.T. LX-2 Drag Sled
- Crash Data Retrieval System
- Sokkia Total Station
- Nikon Reflectorless Total Station

VCE has been utilizing the Sokkia Total Station to measure accident scenes with great accuracy and precision for over 10 years. This instrument allows you to measure points at the scene in a three-dimensional framework based on distances and angles to produce X, Y, and Z coordinates that can be used with our software programs to create precise two-dimensional and three-dimensional scale diagrams, animations, and simulations. Just recently we have expanded our services to include a Nikon Reflectorless Total Station that allows measurements to be taken without the necessity of a reflector pole. This is a great asset when attempting to take measurements of a busy intersection or interstate where it would be impractical to stand in the roadway with a reflector pole. Furthermore it is ideal for measuring damage profiles of vehicles.

With our thorough scene investigation complete, the scene and evidence are recorded and saved. The facts of the particular case can be preserved for whatever future analysis might be necessary. With this information, you can make an informed decision about the requirement of further investigation based on our initial findings without the additional pressure of capturing the evidence before it is gone.

Jonathan McGehee

Tags: accident, accident reconstruction, evidence
Posted in Jonathan McGehee, Motor Vehicle Accidents and Accident Reconstruction | No Comments »

The Skid Mark / Crush Factor Method

Thursday, February 7th, 2008

When investigating an accident a common question that arises is, “How fast were the vehicles going?” If the skid distance of the striking vehicle and the maximum crush depth of the target vehicle are known, a simple estimate of the speed of the striking vehicle can be made. This is done by determining the impact speed of the striking vehicle by measuring the maximum crush depth of the target vehicle and inputting the distance in the Crush Factor Formula.

Crush Factor Formula

$$S_2 = \sqrt{(30)(d_2)(cf)}$$

The Minimum Speed Formula uses the pre-impact skid distance of the striking vehicle and the roadway drag factor.

Minimum Speed Formula

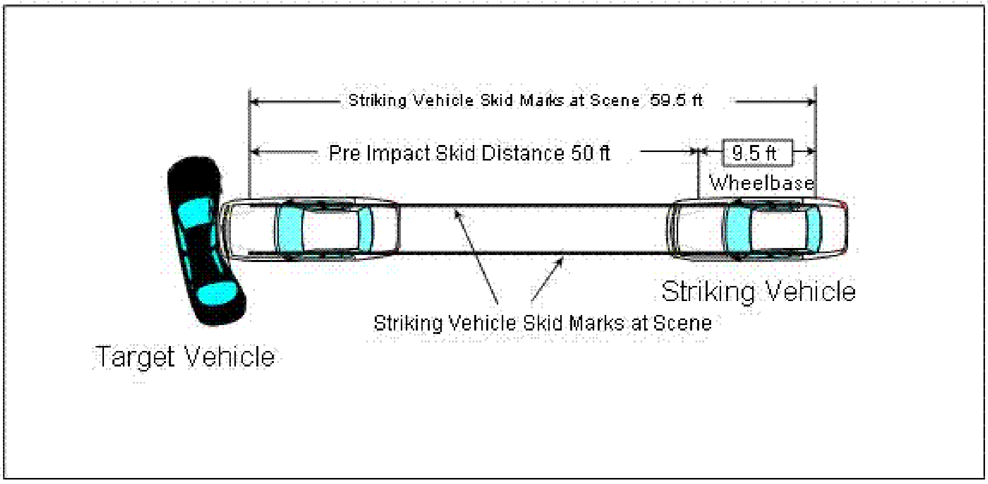
$$S_1 = \sqrt{(30)(d_1)(f)}$$

Both the Crush Factor Formula and the Minimum Speed Formula are then combined in the following way to determine the Striking Vehicle Start of Skid Speed.

Striking Vehicle Start of Skid Speed

$$S_c = \sqrt{[(30)(d_1)(f)] + [(30)(d_2)(cf)]}$$

30 - Mathematical Constant in the formula
d1 - Striking Vehicle's Pre-Impact Skid Distance (measured in feet). Note: Measure the skid marks from the start to the point of impact (offset in the mark) and then subtract the wheelbase (front to rear axle distance of the skidding vehicle) from the skid distance.
f - The adjusted drag factor of the vehicle leaving the skid marks on the roadway surface. Note: if the vehicle is a passenger car, van, SUV or pickup truck and all four wheels left skid marks and the roadway was level, the roadway coefficient of friction is the vehicles drag factor. For a dry traveled asphalt surface the coefficient of friction is usually within the range .6 to .8 g's. If the roadway surface is wet or has gravel on it, the coefficient of friction can be significantly less.
d2 - The target vehicle's maximum crush depth (measured in feet from the normal undamaged position to the maximum permanent crushed position) of either the side or rear surface. Note: this calculation can not be used for head on collisions. This may only be used for t-bone or rear end collisions.
cf - The crush factor of the target vehicle is vehicle specific, but the average crush factor for the side and rear surface is 27. The crush factor values are based upon statistical analysis of 1000 vehicles involved in accidents where the speeds of the vehicles were verified by independent means.
The following example illustrates how the combined speed formula works:



The striking vehicle left 59.5 feet of pre-impact skid marks and had a wheel base distance of 9.5 feet. Subtracting the wheelbase distance from the total skid mark distance gives a pre-impact skid distance of 50 feet. The skidding occurred on a roadway that was level, dry asphalt. The drag factor was measured to be .7 g's. The vehicle impacted into the side of another car and left 18 inches (1.5 feet) of permanent crush damage.

The combined formula was used to determine the start of skid speed.

$$S_c = \sqrt{[(30)(d_1)(f)] + [(30)(d_2)(cf)]}$$
$$S_c = \sqrt{[(30)(50)(.7)] + [(30)(1.5)(27)]}$$
$$S_c = \sqrt{1049.76 + 944.94}$$
$$S_c = \sqrt{1994.70}$$
$$S_c = 44.66 \text{ mph}$$

This formula works as an approximation of the start of skid speed for situations where one car, van, SUV or pickup truck impacts into the side or rear of another car, van, SUV or pickup truck. This is a relatively easy way to determine if the vehicle was traveling in excess of the speed limit and to decide whether or not a more detailed accident reconstruction would be helpful. This simple estimate of the striking vehicle speed and the speed of the target vehicle can be confirmed by the conservation of linear momentum method. In collisions that involve vehicles that impacted either head-on or head-on at an angle, this skid mark / crush factor method can not be used. In those cases either conservation of linear momentum or some other method needs to be used to determine the speed of the vehicles.

Todd Hutchison

Tags: accident, accident reconstruction, crush damage, skid marks
Posted in Motor Vehicle Accidents and Accident Reconstruction, Todd Hutchison | No Comments »

Tractor / Trailer Turning Maneuvers and Turn Times in Night-Time Accidents

Wednesday, November 7th, 2007
Tractor trailers usually take three times as long or longer to accelerate as a regular passenger car. That coupled with the large bulky structure of a tractor trailer unit makes for a very long acceleration time to clear an intersection once the tractor trailer starts to pull out onto a roadway. The fact that the trailer wheels do not track directly behind the tractor wheels when a turn is being made means that a wider then normal turn has to be made in many circumstances. This can lead to the tractor going partially off of the roadway as it's making the turn before straightening up in its intended lane. All of

these factors need to be considered when trying to analyze just how the accident occurred and just what would be visible to the oncoming motorist during night time accidents. The following discusses the approximate turning times and tractor paths throughout the turn and the headlight visibility and orientation to the oncoming motorist through the turn.

Studies show that average acceleration factor for a tractor trailer is approximately .05. That is an acceleration rate of 1.6 feet / second / second. This means that the first second the truck accelerates a distance of 0.8 feet, after 2 seconds it has accelerated a distance of 3.22 feet and after 3 seconds it has accelerated a distance of 7.25 feet. This shows that as times goes on the vehicle is accelerating to a higher speed and is gaining speed and covering a greater distance each second. So as seen in the table below if a truck accelerates for 10 seconds from the time that it starts until it reaches the point of impact it travels a total distance of 80.5 feet. The first 3 seconds it only travels 7.25 feet but the last 3 seconds it travels a distance of 41.06 feet.

Sec.	**Distance Covered**	**Distance Total From Start**
1 =	0.805	0.805
2 =	2.41	3.22
3 =	4.03	7.25
4 =	5.63	12.88
5 =	7.25	20.13
6 =	8.85	28.89
7 =	10.46	39.44
8 =	12.08	51.52
9 =	13.68	65.2
10 =	15.13	80.5

Depending on the roadway configuration and the amount of available sight distance the oncoming motorist may only see a portion of the truck's total turn time prior to the impact occurring. What is important to know, in an accident where the oncoming vehicle runs into the side of a trailer, is where the oncoming motorist is located and where the tractor / trailer is positioned when the motorist could first see it. For instance if at a certain speed the motorist can see the tractor / trailers acceleration for the last 6 seconds from the time it travels from 12.88 feet to 80.5 feet, the motorist should be able to see that a tractor / trailer is entering the roadway and should start to slow down and be more attentive to the roadway. If, however, the sight distance limits the oncoming motorist's view to only seeing the last 3 to 4 seconds of the tractor / trailer acceleration, the angle of the headlights might be such that the glare could veil the side of the trailer so that it might not be very conspicuous. It may appear to the oncoming motorist that there is just another vehicle approaching in the opposite direction not realizing the impending danger of a trailer angled across the their lane just beyond the headlights. This is where a thorough investigation determining the roadway geometry, the tractor / trailer acceleration characteristics, and the approaching motorist speed becomes necessary in properly analyzing this type of accident.

A scene investigation using a total station or some other acceptable means of measurement to make a scale diagram is needed along with information concerning the acceleration characteristics and speeds of the involved vehicles. An acceleration test with the same or similar type of tractor / trailer and load that was involved in the accident can help determine the acceleration rate of the vehicle involved. A speed calculation can usually be done of the approaching vehicles speed by either crush damage analysis, speed from skidding or a combination of the two. Remember the important factor is what each of the motorist could see and at what point they could see it.

Todd Hutchison

Tags: accident reconstruction, commercial vehicles, compiscuity, night, visibility
Posted in Motor Vehicle Accidents and Accident Reconstruction, Todd Hutchison | 2 Comments »

Accident Reconstruction: The Scene Investigation

Friday, August 17th, 2001

Accurate measurements mean accurate answers. If the at-scene investigation is done in a proper manner, it will assist the accident reconstructionist in determining the contributing factors to the accident. That is why the investigator who gets to the scene early on, while the physical evidence is fresh, is so important to the overall process of determining who is at fault. If the accident is serious enough it is best to have the accident reconstructionist do the at-scene investigation. If not, it is sometimes necessary to have adjusters or accident technicians to gather and record the physical evidence. In the event someone other than the accident reconstructionist gathers the scene evidence, that person may be needed to testify if the case goes to court. Since the majority of smaller dollar value cases do not go to court, the scene evidence gathering may be effectively done by someone other than the accident reconstructionist.

The first people on the scene include police officers, emergency technicians, special investigative units and in a perfect world, the accident reconstructionist. If the accident involved a fatality or had serious injuries the police investigators may be more thorough in their documentation of the scene data. This is usually the best opportunity to see the roadway markings while they are fresh. Some evidence such as debris patterns and anti-lock skid marks, etc. are short lived and is best seen at this time. During this part of the investigation the traffic is stopped and the investigator has time to log more information.

The second type of investigator that arrives on the scene, including insurance adjusters, private investigators, and accident reconstructionists, can still gather much useful evidence. Even though some evidence might be gone, other evidence can be gathered and used together with the police measurements and at-scene photographs to determine what happened.

Types of evidence that can be gathered include the location of pre-impact skid marks, offset marks and gouge marks. If gathered properly, these can help the accident reconstructionist to determine the pre-impact direction and speeds of the vehicles, the types of evasive action used by the drivers and ultimately who was at fault in the accident.

The Scene Investigation

"Safety First" is the phrase that needs to occupy the thoughts of the investigator the entire time the investigation is being done. Even though this slows down the investigation, obviously it is a necessary component to being available for the next assignment. Though the scope of this paper is not to show
methods to follow when conducting a scene investigation in a safe manner, it is a reminder to use proper safety methods. Remember the investigator is out there to gather evidence and not to cause another accident. When arriving at the scene be sure to park completely off of the roadway and as far off the
shoulder as possible. Be visible with proper safety equipment, including safety vests and always be thinking **"Safety First"**.

Once at the scene and after remembering **"Safety First"**, size up the scene and decide what needs to be logged and preserved. The physical evidence can be extremely helpful in assisting the accident reconstructionist in his job. This evidence includes pre-impact skid marks, which will show the
direction of travel and assist in determining the speeds of the vehicles and offset skid marks and

gouge marks, which help to show where the impact occurred. Other useful information includes scratch marks, oil or fluid spills, which can be helpful in determining the vehicles final rest positions. When using
conservation of linear momentum calculations to determine vehicle speeds, the impact and departure angles and distances are necessary. A good scene investigation will help with this. This field data will then be put on a scale diagram and through computer analysis, angles and distances can accurately be made.

In addition to taking good photographs that visually recording the physical evidence, there are two methods
most commonly used to log the data on a field sketch. These are the **coordinate method** and the **triangulation method**. These methods utilize either electronic measuring equipment, steel tapes, or in some cases roll tapes.

The **coordinate method** uses one reference point, such as a utility pole or fire hydrant and a reference line such as an edge of pavement or painted line. It also uses the direction the measurement is taken from
using north, south, east or west. A field sketch is useful as a picture to show what items were logged and what measurements were made. Be sure and put on the sketch what reference point and reference line were used for the measurements and what direction is north. Once the reference point, reference line, and the north direction are established, and once the pertinent marks are put on the field sketch, the measurements can be made and logged on that sketch. These marks will be logged in relationship to the point on the reference line that is perpendicular to the reference point. Each point being located will have two
measurements. Each point needs to be measured to determine how far it is north, south, east or west from the zero point measured along the reference line and how far north, south, east or west it is away from the reference line. Record all measurements in feet and tenths of feet.

The other method used to log roadway markings is the **triangulation method**. This involves locating two
reference points and making measurements from each reference point to the point that is being located. In using this system, it is necessary to have two points that are separated and in an area that can best log all of the marks. These reference points need to be far enough away from each other longitudinally down the road and latitudinal across the road to give the best results. Since this type of method is done by using some form of electronic measurement device or two people, each holding one end of the tape, it is usually
more practical to use the coordinate method.

Todd Hutchison

Tags: accident reconstruction, accidents, evidence
Posted in Motor Vehicle Accidents and Accident Reconstruction, Todd Hutchison | No Comments »

- Search for: Search

- You are currently browsing the archives for the Motor Vehicle Accidents and Accident Reconstruction category.

- **Pages**
  - Welcome

- ## Archives
  - April 2010
  - March 2010
  - December 2009
  - September 2009
  - July 2009
  - June 2009
  - November 2008
  - July 2008
  - February 2008
  - November 2007
  - February 2005
  - August 2001
  - January 2001
- ## Categories
  - Authors (17)
    - Carl Hudson (1)
    - Dominick Amari (1)
    - Eric Grigoryan (1)
    - Herb Stewart (1)
    - Jim Waller (1)
    - Jonathan McGehee (5)
    - Todd Hutchison (5)
    - Wade Hutchison (2)
  - Subjects (17)
    - Blasting and Blasting Damage Claims (4)
    - Flooding and Flood Damage (1)
    - Motor Vehicle Accidents and Accident Reconstruction (9)
    - Roof Damage Claims (1)
    - Slip or Stumble Fall Claims (1)
    - Structural Investigations (1)
