THE RECONSTRUCTIONIST
AN ACCIDENT RECONSTRUCTION NEWSLETTER

W Poplin Engineering **September 2014**

Three Common Errors in Accident Reconstruction

When vehicles collide with significant engagement, the contact areas achieve the same "common velocity".

Reviewing reconstruction reports and calculations, there are some errors that occur relatively frequently. This newsletter will address three types of errors that you should keep in mind when reviewing accident reconstruction reports.

1. Exceeding the Friction Circle

Look for this error in situations where calculations were made on a curve or with a swerving vehicle. There is a limit to the friction forces that can be created between an automobile tire and the road surface. For dry asphalt or concrete pavement this is typically approximately 80% of the weight on the tire. On a horizontal surface, this friction can create a stopping force that will be 80% of the vehicle weight. For a brake to stop calculation, this value 80% of 1 g (0.8 g) is the deceleration or the "drag factor" as some reconstructionists refer to it.

A tire can also develop the same frictional force sliding sideways or at any angle in between. The friction circle is a term used to represent the relationship of this force to the footprint of the tire.

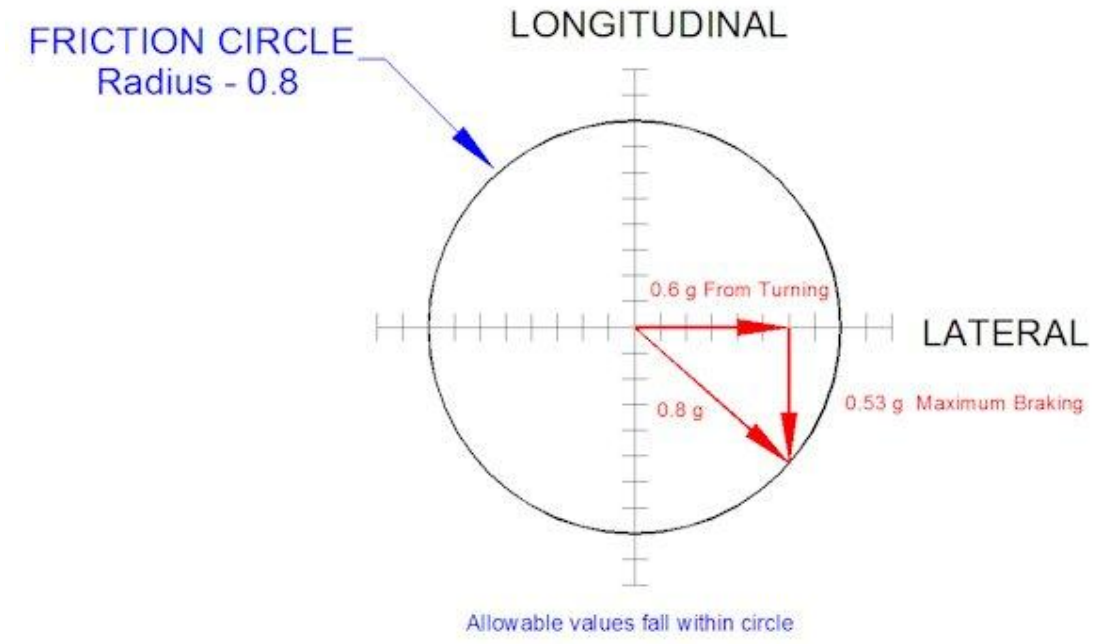
It also takes friction to travel in a curved path. A vehicle that is braking in a curve or swerving while braking is using some of the available friction to remain on the curved path. The **friction circle** represents the total frictional force that is available. **If some friction is used for turning, the amount available for braking is reduced.** It is an error to assume that a vehicle that is traveling around a sharp curve can develop the full friction force for braking.

2. Common Velocity Assumption

When two vehicles collide with significant engagement, the colliding surfaces interact and reach the same velocity, that is, the colliding surfaces achieve a ***"common velocity".*** Unless the collision is a sideswipe or one with significant rotation **both the magnitude and the direction of the post impact motion should be similar**. The velocity for the vehicle as a whole after the collision will be close to the velocity of the area in contact with the other vehicle. Some rotation and "rebound" can make the numbers slightly different but for most rear end and angled collisions with significant engagement, the post-impact velocities of the vehicles should be similar. For many of these accidents, a technique called a "momentum analysis" is used to analyze the collision. The momentum analysis technique does not care if the post impact speeds or directions are wildly different even though it violates the common velocity requirement. Look for this error in a momentum analysis if the post-impact velocities differ significantly in magnitude or direction.

3. Mismatch Between Two Methods of Reconstruction

As outlined in the **web article** **Vehicle Accident Reconstruction "An Exact Science"**, there are six basic approaches to the evaluation of speed in a motor vehicle accident. Ideally an evaluation should be based on as many as possible and answers provided by each should be similar. If not, the differences should be readily accounted for as a method or a data limitation. **Many investigators use one method and stop or do not even notice the discrepancy between two methods.** As an example, the change in velocity or "delta V" for each vehicle is available from the momentum analysis but it is not usually calculated. If the delta V is available either from the collision damage or airbag module download, it should reasonably match the delta V of the momentum analysis. If not, it can indicate a problem with the analysis. **Any analysis that was conducted with only one technique should be reviewed to determine if it is in agreement with the evaluation from other techniques or data.**



If some friction is used for turning then the amount available for braking is reduced.

W Poplin Engineering LLC | www.wpoplin.com | 843.559.8801 | wp@wpoplin.com