



## TIRE FAILURE INVESTIGATIONS

**Ed Sebak, B.E.**, is a retained consultant with expertise in the areas of tire design, development, production, testing and evaluation.

*Mr. Sebak brings over forty years of experience from General Tire where he was an engineer specializing in the design, development, production, and evaluation of truck, passenger, light truck and aircraft tires. He has also written specifications for off-road tires, farm machinery tires and industrial tires.*

*At General Tire, Mr. Sebak performed failure analysis and verified product performance, analyzing specific failures with respect to conditions and product. He assisted with litigation issues and provided expert testimony.*

*Mr. Sebak holds a Bachelor of Engineering from Youngstown University. He also studied accident reconstruction at Kent State University and Northwestern University.*



Did the tire fail before the accident or as a result of it? If the tire failed before the accident, did a manufacturing defect, improper handling, installer negligence or consumer misuse cause the failure? Only an investigator who has specialized expertise in tires and their interaction with the road, wheels and vehicle can provide the answers.

To determine when the failure occurred, every abrasion, score, and cut mark on the tire must be examined, in addition to the failure area. Tire pressure and tread depth should be measured and recorded.

The condition of the valve assembly should be evaluated. Deterioration of the rubber can cause cracks and splits in the stem, potentially resulting in air loss.

Ideally, the tire should be examined in conjunction with the wheel. The wheel and rim may exhibit scuff marks, scratches, dents and even wear marks that provide valuable clues in determining the cause of the failure. Even balance weights can contribute to the total accumulation of evidence.

The tire/wheel assembly needs to be examined in the context of vehicle and scene evidence. For example, abrasions to the tread shoulder or the sidewall of the tire can be indicative of a vehicle in yaw. Irregular tire marks can indicate that the tire was flat prior to the crash and not as a result of it. Cuts on the tire can be matched to sharp edges of bodywork on the vehicle.

It is important to note that cases with a potential tire failure issue must be investigated promptly and the condition of the tires documented photographically. Spoliation of evidence is a real concern in tire failure cases. The condition of the tire can be affected by towing the vehicle, by improper storage of the tire and vehicle, or by improper examination of the tire by other parties.

In one instance, the only evidence the tire expert had to work with were the photos taken at the scene by the investigator. The vehicle had been dragged by the tow truck, creating abrasions to the tire that effectively ended its use as evidence.

Once the examination of the tire is completed, a qualified tire investigator can determine whether the tire was a causal factor of the accident or was damaged as a result of the collision. If it is determined that tire failure was the cause of the accident, then it is necessary to look at potential causes of the failure.

One possible cause of failure is an error in the manufacturing process. Tires are made up of several components, consisting of various compounds and materials. These components are then vulcanized in a curing mold with heat to become a single unit.

Some potential manufacturing errors include improper assembly or storage of the components, contamination of the components, or improper curing (vulcanization) of the tire. Belt failures in radial tires and bead failure can also be due to improper manufacturing.

A thorough examination of the tire is needed to find evidence of manufacturing defects. The exam relies heavily on experience and knowledge, since the initial exam is primarily visual and tactile. Non-intrusive methods such as x-ray or holographic testing are also used. Destructive testing such as sectioning or testing which requires sampling of the tire requires special permission.

Tires can also fail because of improper installation. In one case, the installer mounted a 14" tire on a 14.5" wheel; the tire failed, resulting in a fatal injury.

Some manufacturers specify a size and type of tire that is to be used on their vehicles. These specifications are often ignored, sometimes with fatal results. In other instances, different sized tires are



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installed on the same vehicle or speed rated tires are mixed with non-speed rated tires. Both of these conditions affect the handling of the vehicle.

Tire mounting is another area of the installation process that needs to be explored. Tires, especially in the bead area, can be damaged by tire mounting machines. This damage could cause tire failure at a later date. The tire mounting process itself, performed incorrectly, is dangerous. Bursts or explosions during tire mounting result in horrific injuries or death to the installer or bystanders.

Improperly done repairs are another cause of tire failure. A poorly applied patch or plug may allow the tire to continue to leak air. Plugs and patches when used alone can leave areas where water and other contaminants can enter the body of the tire. The steel belts in the tire can rust and weaken. Improper cleaning or buffing of the punctured or damaged area can weaken the tire and potentially lead to tire failure.



*One of the tires on the steer axle of this tractor-trailer had a blow-out. When the tire failed, the driver lost control. The subsequent accident resulted in multiple fatalities.*

Medium and heavy truck tires fail due to the same manufacturing, maintenance and repair errors as passenger car tires. However, they have additional areas that need to be examined.

One of those areas is retreading. Heavy vehicle tires are often retreaded to extend the life of the tire. If not done properly, the retreading process can lead to tire failure. Before it is retreaded, the tire must be checked carefully for any abuse or damage. A damaged tire should not be retreaded.

The retreading process begins by buffing off the existing tread. Not buffing off enough old tread causes problems because the retreaded tire will not have enough clean rubber to adhere to. Buffing too deeply can expose and damage the plating or the belt itself. Retreads are also subject to some of the same contamination and improper curing problems as new tires.

People commonly think of retread failures as tread carcass separation. However, retread tires have other failures as well that can be as catastrophic as those of original tread tires.

Another factor to consider is duals, a pair of tires on either end of an axle. Maintenance of proper air pressure in dual tires is very important because of the amount of heat duals generate. Excessive heat buildup due to over or underinflation can lead to tire failure. Tire sidewalls that touch each other in the area of deflection (kissing) are another cause of excessive heat. The friction created by the dual tire sidewalls rubbing against each other can ultimately lead to tire failure or to a tire fire.

Determining the cause of tire failure is a complex task. It requires someone with training and experience in the area. Ed Sebak, with over forty years experience in the tire industry, is Ruhl Forensic's tire technician. Mr. Sebak can be contacted by calling (800) 355-7800 or by e-mail at [ruhl@ruhl.com](mailto:ruhl@ruhl.com).