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TIRE FAILURE INVESTIGATIONS

During the course of accident or insurance claims investigations it is often necessary to determine the cause and origin of a tire failure. If a vehicle accident includes a tire failure the question usually arises:

Did the accident cause the tire to fail or did a tire failure cause the accident?

This question is important to the insurance adjuster as it may provide opportunities for subrogation or it may mean denial of a claim. As such, the cost of an engineering investigation may pay for itself. If a manufacturing defect is discovered, the tire manufacturer may be proven to be responsible. Tires have been found to have been contaminated by everything from chicken bones to live shotgun shells. Wrenches, gloves, screws, bolts, small wires, wood, water and sunflower seeds have been found cured into tires. Also, installation errors can also be identified in which case the company that sold and mounted the tire may be at fault. Improper maintenance by the user may also be the cause of tire failure.

To answer to this question the investigator must determine the cause of the tire failure. Sometimes it is obvious what caused the tire to fail, particularly when a road hazard is involved. For instance perhaps a large screw, nail or other readily identifiable object has punctured the tire. A piece of sheet-metal or pipe may be lying near the accident scene and can readily be compared to the tire damage shape. In this case the on-scene investigator can take pictures and measurements to document the cause of tire failure. There may obstacles at the accident scene which the tire has contacted which are not road hazards such as curbs, berms, speed bumps, dividers and rails which are parts of the roadway design. It is therefore necessary to take pictures of the accident scene and its surroundings. One well-known cause of tire failure is the pothole. Another is curbing, where the tire is damaged by impact with a curb. Yet another cause of failure which is readily identifiable is when a part of the vehicle is displaced by the accident and forced into the tire such as a crumpled fender.

The classic case of tire failure is a blowout, or sudden, violent loss of air. In this case, the tire may be so badly damaged that it is not possible to determine the immediate cause of failure. The location of the tire on the vehicle should be documented and the tire and rim removed from the vehicle as evidence to be analyzed in a laboratory setting.

If a tire failed due to a manufacturing defect, this can be determined in the laboratory by close inspection of the tire materials including rubber, belts and beads. The catastrophic failure of a radial tire is sometimes a separation of the tread and outer steel belt from the tire casing and inner steel belt. The appearance of the outer skin surface of the inner steel belt after a tread separation is well-documented and can be identified through microscopic analysis. Fortunately these types of failures are rare and are usually covered under warranty. One of the most common causes of tire failure is improper maintenance of tires such as under-inflation. This can be detected by evidence of fatigue failure in the belts. The deterioration of rubber due to aging or contact with damaging solvents can also be determined by close inspection. Other failures caused by worn or damaged vehicle suspensions can be identified by uneven tread wear.



There are many other possible causes of tire failure to such as excess loading, high speeds, reckless driving, re-treading defects, mechanical failures of the automobile, high temperatures, improper tire ratings for that particular vehicle,

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TIRE FAILURE INVESTIGATIONS

vandalism, etc. The DOT serial numbering system molded into the sidewall of a tire can provide a wealth of information that is essential in determining if a particular tire is suited for the service conditions for which it is performing. For example there are specific tires for use with trailers—special trailers (ST), passenger cars (P) or light trucks (LT). The use of a passenger or light truck tire on a trailer would constitute a tire mis-application or installation error. Passenger and light truck tires do not have the thick beefy sidewalls and other components necessary to provide stability and withstand the stress and dynamics imposed by a trailer load. A trailer tire has thicker cords than a P or LT tire and therefore can withstand higher tensile forces. The DOT numbering system also contains the maximum load limit and inflation pressure. The speed rating of the tire is given as well as whether it is a tube type or tubeless tire. A tube type tire with-

out a tube is an installation error.

The list of possible causes of failure is quite extensive. Uniroyal/Goodrich's list of manufacturing defects and service failure conditions is seven pages long with over 300 categories.

This article deals briefly with non re-treaded passenger tire concerns. Retread tires and commercial truck tires have additional issues and considerations.

Investigative Engineers Inc., has one of the most comprehensive libraries on tire failure in the area. We are also part of a nation-wide network of engineers who perform investigations and have access to a large data base of previous tire failure cases and known tire defects and tire recall notices. As such, you can call on us to provide analysis beyond the normal scope of the insurance adjuster.

Investigative Engineers, Inc., is located in Vista, CA, and is serving San Diego and Orange Counties. The principal investigators are Rob Greiner, P.E., and Mark Becker, P.E., both registered professional engineers with over 60 years combined experience in mechanical and electrical systems design and analysis. The firm is a member of the Investigative Engineers Association, I-ENG-A. The association has over 65 member offices nationwide with more 200 engineering experts in nearly every field imaginable. We are able to bring this vast depth of expertise to our clients in every investigation. Our local affiliated offices also provide Civil, Structural, and Geotechnical expertise.

If you have any questions about this article or related subjects, contact Mark Becker, P.E. at 760-512-4333 or by e-

INVESTIGATIVE ENGINEERS, INC. (IEI), I-ENG-A MEMBER (SAN DIEGO) FIRM FEATURE

Investigative Engineers, Inc. (IEI), has been a member of the Investigative Engineers Association (I-ENG-A) since October, 2007, serving the San Diego, CA region. Its two primary engineers have over 30 years experience each in design and investigations. Mr. Robert Greiner, P.E., has designed and delivered electrical power distribution, electrical controls, machines, consumer and industrial products, risk limiting devices and developed risk reduction procedures. Mr. Mark Becker, P.E., has designed and delivered numerous automated mechanical systems, consumer product and has extensive experience in technical analysis (stress, strain, materials, etc). Our firm associates provide many years of experience in structural studies and fire investigations.

IEI investigations have served the auto, residential, property and commercial adjuster. Investigations include mechanical and electrical failures, engine failure, tire failure, product liability, fire cause and origin, water damage, erosion and contractor performance. IEI has saved its clients millions of dollars through subrogation, accurate investigations and loss prevention analysis.

IEI is able to provide an extremely wide variety of technical expertise. As a member of I-ENG-A, IEI takes full advantage of the highly specialized expertise of the membership and the association's extensive library.

Investigative Engineers, Inc. is located at 2308 La Mirada Dr, Vista, CA 92081, San Diego County. Their phone number is (760) 512-4333.

COMEDY RELIEF CORNER DUMBEST INSURANCE CRIME WINNER FROM FALI!

A Charlotte, NC, man having purchased a case of very rare, very expensive cigars, insured them against fire, among other things. Within a month, having smoked his entire stockpile of cigars and without having made even his first premium payment on the policy, the man filed a claim against the insurance company. In his claim, the man stated the cigars were lost 'in a series of small fires'. The insurance company refused to pay, citing the obvious reason that the man had consumed the cigars in the normal fashion. The man sued...and won! In delivering the ruling the judge agreeing that the claim was frivolous, stated nevertheless that the man held a policy from the company in which it had warranted that the cigars were insurable and also guaranteed that it would insure against fire, without defining what it considered to be "unacceptable fire," and was obligated to pay the claim. Rather than endure a lengthy and costly appeal process, the insurance company accepted the ruling and paid the man \$15,000 for the rare cigars he lost in 'the fires'. After the man cashed the check, however, the company had him arrested on 24 counts of arson. With his own insurance claim and testimony from the previous case being used against him, the man was convicted of intentionally burning his insured property and sentenced him to 24 months in jail and a \$24,000 fine!



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A WORD ABOUT SELF INTEREST AND ETHICS FROM AN ENGINEER

Integrity is a strict adherence to a set of core values; it is what a person does when no one is watching. Integrity comes from within and is closely associated with the character of a person. It is being honest with oneself and with others.

Ethics is defined as conformance to the principles of conduct as generally accepted by a specific profession. Ethics provides a framework of rules that govern right and wrong when applied to everyday practice on the job.

It is at this juncture that the nonprofessional misses the opportunity to be exposed to the ethics in the workplace. The professional is taught ethics through continuing education courses and publications offered by professional organizations such as NSPE and ASCE.

In the workplace, the main concepts relating to ethics include fairness, conflict of interest, honesty, and sometimes, morality. The players are owners, employees, supervisors, managers, customers, and suppliers.

How many times have you as a professional engineer had to tell a client that you cannot sign a drawing prepared by someone who was not under your supervision? Most engineers would say many times. How many times have you had a client come to you with a certification form given to them by the county/city with instructions to, "Just have your engineer sign it?" Oftentimes, county/city personnel conveniently forget to tell the client about the vast amount of work that must be completed by the engineer before the document can be signed. The client expects you "to just sign it." It would be unethical to "just sign it" without verifying the information the form required.

Ethical problems often surface when conflicts arise between the interests of the parties involved. An example is a disgruntled employee walking away from a company and attempting to steal clients from his former employer. The employee may justify this by convincing himself that he deserves the client or has some special rights to the client. This employee is acting unethically.

A person without integrity cannot perform ethically in the workplace. Ethics and integrity are closely related concepts. You cannot have ethics without integrity. Integrity is deciding what is right in a given situation and then doing what is right.

When one's focus on self-interest is paramount, that person may abandon his or her integrity and code of ethics. However, experience has proven that, in the long run, an individual's personal interests are best served by doing the right thing despite misguided perceptions.

An individual who believes that unethical behavior is in his or her best interest will ultimately discover that his or her thinking is misguided.

The industry's client community wants to work with honest and ethical people. As soon as a client discovers a professional's dishonesty and unethical behavior, the client will begin to look over his or her shoulder whenever this person is involved in a common project. The client community in this industry is small, and word spreads quickly about a person's character.

Misguided self-interests are driven by greed, impatience, seeking a shortcut, ego, fear, and selfish ambitions. Driven by greed, an individual may steal from the company. If a person will steal pencils, he or she will steal clients. If a person steals clients, he or she will steal from clients.

Many engineers provide expert witness services in their field of expertise. Expert witnesses are the only people that can express an opinion in a court of law. This is a special privilege and is one of many reasons why ethics are important for engineers.

Trust, respect, and credibility are essential elements in the life of a professional engineer. The business world is extremely competitive, and it is looking for people to lead in their professions. These business leaders must be trustworthy, respected, and credible in their business and in their community.

The road to unethical behavior is a slippery slope. Often a small unethical decision leads to a bigger unethical decision, and ultimately, to an even bigger unethical decision. The professional engineer should stay away from even the appearance of dishonesty and unethical behavior because an engineer's reputation is critical.

The state boards for professional engineers take ethics very seriously and investigate all claims of unethical behavior.

I urge every professional engineer to read the Code of Ethics and take continuing education courses on ethics. Additionally, discuss ethics within your firm, especially with non-licensed individuals. This could be the best investment you will ever make to your profession.

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HAIL DAMAGE CLAIM INVESTIGATIONS

Every year insurance companies pay out approximately \$ 1 billion for repairs to insured property for damages caused by the impact of hail.

"Neighboritis" is a term coined by the insurance industry to describe a human disease that breaks out in epidemic proportions when a community experiences a severe hail event. If one(1) building owner is awarded a new roof by their insurance adjuster due to damage sustained during a hail storm, the neighbors believe they should also get a new roof. When an adjuster comes off the roof and reports there is little or no damage, the person with an acute case of "Neighboritis" will normally demand a re-inspection by someone else.

The majority of the hundreds of hail claims investigation assignments that I have handled in recent years have been the result of this "Neighboritis" scenario and they have either involved asphalt or wood shingled roof cover. From personal experience, I have found that the following approach to conducting an investigation works best for me:

- Obtain available background information regarding the storm including wind velocity and direction. There are also hail reports available for a fee. These reports provide useful information regarding the path of the storm and size of the hail within the storm.
- Based on the background information, make a preliminary assessment of the areas of the building and roof with the greatest exposure to the hail.
- Conduct a ground level walk-around inspection of the property noting any damage to windows, siding, gutters and downspouts, deck materials, garden plants, etc.
- Access the roof and initially make note of any damage to vent and chimney covers as well as any other vulnerable rooftop accessories. Be sure to have your camera, tape and chalk with you.
- Do a walk-around inspection of the roof documenting the general condition of the roof.



MEMBER FIRM NAME
 CONTACTS:
 ADDRESS
 CITY, STATE ZIP



FOR FORENSIC ENGINEERING SERVICE TO THE PROPERTY AND CASUALTY INDUSTRY SINCE 1991

COMPLIMENTS OF YOUR
 LOCAL MEMBER FIRM

HAIL DAMAGE CLAIM INVESTIGATIONS (CONT'D)

I-ENG-A OF TERRITORY

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 ADDRESS
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 FAX
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 WEBSITE

- Lay out 1 or more 100 sf (10' x 10') test squares on each significant exposure of the roof and carefully examine the entire surface area within the test square marking each hail bruise with chalk. Remember that real hail damage will be random, irregular and will always leave a dent or depression in the shingle material. Hail less than 1" diameter will seldom cause major damage to asphalt or wood roofing material. Another indicator of possible hail related damage are loosened granules which may expose the core material of an asphalt shingle. The core material of the shingle will not have had time to take on a weathered look. Splits on wood shingles caused by the impact of hail will always have a bruise or depression at the upper part of the split and the fractured face of the shingle will not be weathered.
 - Count the number of hail bruises within each test square. Photograph the entire square and each individual hail bruise within the square. Also photograph other forms of damage within the square. Include the number of hits per square in your report.
- You may have to adapt this approach to the conditions that you encounter. When a roof is too steep to walk on I have used a variety of ladders and lifts to get to where I can get many good photographs of the roof. I then download the photos and make my evaluation using the photos.

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The commentary contained in The Forensic Engineering Report is not intended, nor should it be relied upon, to replace specific professional advice. We recommend that readers consult their professional advisors regarding issues raised in this publication.

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