PLICK
Plick and Associates, Forensic Engineers

Forensic Engineering Newsletter

Volume II, Issue III June 2007

Past Editions of the newsletter now available on the web at www.plickandassociates.com

This Edition's Joke

A mechanical engineer, an electrical engineer and a software engineer are traveling in an car when all of the sudden the car backfires and comes to a halt.

The mechanical engineer says "Ah! It's probably a problem with the valves, or the piston!"

The electrical engineer says "Nonsense! It's most probably a problem with the spark plugs or the battery!".

The software engineer says "How about we all get out of the car, and get back in again".

Inside this issue:

Automotive Electronic Stability Programs

ESC is a generic name for an electronic dynamic stability control program designed to improve a vehicle's handling characteristics, when the driver may "run out of ability/talent" to control the vehicle.

ESC evaluates the driver's intended direction in steering via steering sensor(s) and braking inputs with regard to the vehicle's response, lateral acceleration sensor lateral rotation/yaw (yaw is rotation around a vertical axis) and wheel speeds. ESC enables brake pressure to be applied to the front or rear wheels . In certain vehicles it may, in addition to applying the brakes, reduce excess engine power to help minimize the effect of under steer (vehicle will not respond to steering input) or over steer (car responds too much to steering input or "fishtailing"). ESC cannot override the car's physical limits or alter the accepted laws of physics. If a driver pushes the physical limit of the vehicle and ESC too far, ESC cannot/will not prevent a crash. It is designed to help the driver maintain control. ESC is the implementation of two vehicle systems, the anti-lock braking system and traction control system, already utilized in today's vehicles.

Various research and studies conducted by the National Highway and Traffic Safety Administration (NHTSA) have confirmed the effectiveness of ESC in helping the driver maintain control of the car, help save lives and reduce the severity of crashes. In the fall of 2004, NHTSA concluded that ESC reduced crashes in equipped vehicles by 35%. The Insurance Institute for Highway Safety (IIHS) concluded; approximately 10,000 motor vehicle fatalities could be avoided annually if every vehicle on US roadways were equipped with ESC. If the IIHS research is accurate, ESC would be the greatest safety innovation for vehicles since the introduction of seat belts.

The opinions regarding the benefits of ESC vehicles among safety advocates are varied. Some feel it may instill a false sense or an enlarged perception of safety, possibly encouraging more dangerous driving.

continued on page 5

Do you have a matter requiring forensic investigation or a question about your case which can be answered by a professional engineer, architect or industrial hygienist? Call us anytime at 610-747-0675 or email us at experts@plickandassociates.com

Plastic Plumbing Products

The dramatic increase in the cost of copper products over recent years has prompted building contractors to find ways to reduce costs. This has increased the use of non-copper plumbing products such as lower cost plastic tubing and piping to replace similar copper commodities in commercial buildings and residential homes. When plastic plumbing products are used in the approved manner they perform with few problems. When the wrong plastic materials are used and are installed incorrectly, they can malfunction the resulting in excessive water damage.

Water mains, hot and cold water distribution, drain, waste, and vent (DWV), sewer, gas distribution, irrigation, conduit, fire sprinkler and process piping use plastic piping systems throughout many buildings. According to the Plastic Pipe Institute, underground piping is the largest part of the plastic plumbing products market. The primary plumbing applications in which plastic piping is used are non-pressure applications (Building Drain, Waste and Vent (DWV) and Building Sewers and Drains) and pressure applications (Water Service and Hot and Cold Distribution).

The majority of the pertinent plumbing codes sanction plastic piping for the above applications. The plumbing codes typically specify the type of plastic for the allowable application. There are five major categories of plastics: ABS (Acrylonitrile Butadiene Styrene), CPVC (Chlorinated Polyvinyl Chloride), PE (Polyethylene), PEX (Cross-linked Polyethylene), and PVC (Polyvinyl Chloride). Each type of plastic has specific physical characteristics and is selected based on the intended and applicable code.

However, each type of plastic tubing and/or pipe has very similar overall dimensions and visually look identical except for the required American Standard Testing Materials (ASTM) markings stamped on the tubing or piping to distinguish the different plastic materials. These materials are not interchangeable. For instance, most water service for hot and cold distribution require "CPVC" not "PVC". The difference between the two is the letter "C," but in one recent investigation the consequence of using the wrong material spelled disaster. Photo 1 shows defectively installed PVC piping that was unable to handle hot potable water. The PVC piping became soft, melted and failed causing extensive water damage.

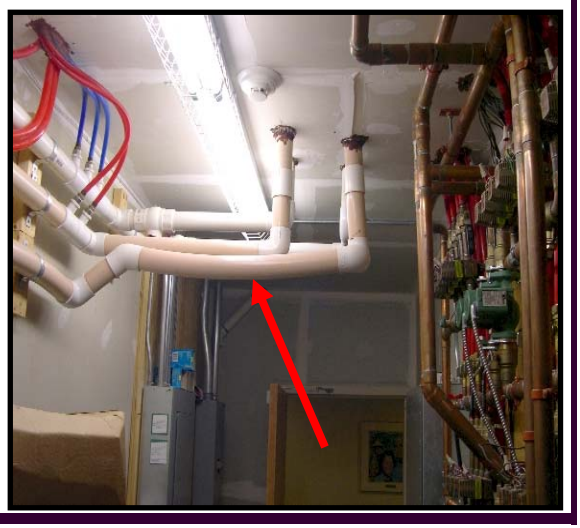

Photo 1 – View showing incorrectly used PVC piping that is distorted

Risk Management from the Forensic Engineering Perspective, Part 2 of 2

The first part of this article discussed the usefulness of data collected from forensic engineering investigations to risk management. Also discussed was the different type of risks presented by different types of facilities. Part I ended by noting the risk presented by an older facility being affected by deteriorating electrical and mechanical systems.

Deterioration of equipment, such as furnaces, for which no spare parts are available or with deferred maintenance, pose potential risks.

Similarly, an older facility is more likely to have been renovated. Renovations pose potential mechanical, electrical, structural and geotechnical risks.

A loss in a large commercial office building presents a different, and likely much broader array of causal factors and influential circumstances. If for instance, an engineer is investigating a fire in a 350 unit office building with an apparent electrical cause, his or her analysis may reveal the fire was caused by a malfunction of a major piece of electrical equipment such as a switchgear or transformer.

The forensic engineering report can provide data regarding the risks and potential malfunctions associated with such equipment,

The risk manager could also consider the owner, management company, tenant relationships, and assess how fire, smoke, water could have substantial consequences including property damage, personal injury, loss of life and business interruption.

A fire in an industrial facility further presents different loss scenarios. Industrial facilities are more closely regulated and monitored than residential or commercial facilities but have greater potential for increased property damage and loss of life.

Unlike variable incident settings, forensic investigation methodology must remain consistent. Each investigation should be conducted using a systematic analytical process to yield independent data and analysis. All possible causes should be identified.

The methodology consists of defining the problem and the collection and analysis of data. Until all data has been collected and analyzed in an investigation, no specific cause can be presumed. After the analysis and all other possible causes are eliminated, an opinion is developed based on the facts observed and applicable standards. These investigations, including the data collected and opinions developed, can provide the risk manager with valuable information to assess and mitigate risk.

Another important aspect of risk management concerns the consequences of failures. Engineers, through scientific, methodology and investigation, collectively provide risk managers with a virtual bank of information. While the consequences of losses are often obvious, damage to residences, properties, business interruption, personal injury and loss of life, the investigations into what caused the consequences can provide vital information to the risk manager.

For example, if conditions which cause a furnace to produce soot, a pressure relief valve to unsafely discharge water, or ground water to accumulate against a foundation wall are not corrected, the loss will continue to occur with more catastrophic consequences. To reduce risk and loss to acceptable minimums, risk managers must be provided with the fundamental data and details of loss - the data and details forensic engineers can provide.

Risk, the measure of combined probability and severity of potential harm can be more fully assessed, controlled and valued by utilizing the engineering and/or scientific principles underlying that risk.

Professional understanding among risk managers and forensic engineers has practical benefits. The two fields, ultimately, have similar professional focuses, function, purpose and work-products. Recognizing this fact can only serve to help both professions.

Plastic Plumbing Products Continued From Page 2

The International Building Code (IBC) building code required the pipe and fitting to be CPVC meeting ASTM D2846 Standard Specification for CPVC Plastic Hot-and-Cold-Water Distribution Systems and ASTM F438 Standard Specification for Socket-Type CPVC Plastic Pipe Fittings, Schedule 40.

Plastic plumbing products designed for potable water applications are designated with either "NSF-PW" or "NSF-61" to indicate the product complies with the health effects requirements of NSF/ANSI Standard 61 for materials designed for contact with potable water. If the plastic pipe is not coded with one of these designations or if it is designated, with an alternative code such "NSF-DWV," it is not meant for potable water applications and should not be used for such purposes.

PE tubing is not an acceptable material for potable water. However, we have found the water supply line for the connecting the ice maker on refrigerators using this wrong type of plastic material. Photo 2 shows a "brittle crack" of a water supply line that leaked excessive water causing major damage to a home.

Photo 2 – Failed water supply line for an refrigerator ice maker

The installation of plastic and tubing typically requires using fittings, couplings and/or primers and solvents. Each type of plastic material has a corresponding designed fitting primer and cement specifically for the type of plastic material. Recent investigations revealed failed plastic piping installations with the wrong plumbing couplings which were designed for PE pipe but not used on PVC. Further cases have found incorrect primers and solvent cements used to join plastic piping together.

In conclusion, plastic plumbing products when used correctly can be a huge cost saver, but when erroneously used can be a huge liability or present an avenue for recovery.

"Vodka Lady"

On December 13, 2005, a fire erupted in the master bedroom of a one story home where firefighters found the body of the 41 year old female tenant. Due to the suspicious nature of the fire and the fact that a fatality occurred, the District Attorney's office became involved. Since various electrical components were found in the vicinity of the fire's origin, Plick and Associates, Forensic Engineers was requested to examine the electrical items to determine if they were involved in the cause of the fire.

The electrical components were typical of what would be present in a bedroom; namely some outlets, wiring, a light switch, an electric and a floor lamp. These items were in the custody of the state trooper and so were examined at their facility under their supervision to preserve the chain of custody of the evidence. Our electrical engineer's investigation revealed that none of the components exhibited evidence of abnormal electrical activity and were attacked by a fire already in progress.

With the only other possible cause of the fire eliminated, authorities proceeded with a criminal case of arson. Their investigation revealed that the victim had a friend visiting her on the date of the fire. After a night of drinking, the friend hit the victim with a vodka bottle, knocking her unconscious. She then doused her with vodka and set her on fire. Nail polish remover was poured around the bedroom to spread the fire. The "friend" ultimately confessed to the murder and arson and was sentenced to life in prison.

This case provides an unusual example of the importance of preserving evidence and that eliminating potential causes of a fire can be as critical as identifying the actual cause.

Automotive Electronic Stability Programs continued from page 1

Others believe it may lead to issues due to the fact that the vehicle is being actively controlled (driven) by computers, overriding the human input. One issue regarding ESC is the ability to turn it off. This may result in safety issues when there are multiple users of the same vehicle; one driver may turn it off for their own use and another driver uses the vehicle thinking the ESC is active, when its not. A limitation of the ESC is found in the case of an inexperienced high-speed driver, the vehicle has the ability to be pushed further (and faster) before the physical limits of the vehicle and ESC are reached, meaning that should the driver lose control of the vehicle it most likely will happen at higher speeds, leading to potentially more severe crashes.

ESC is the technological foundation for advances of vehicle equipment that will help prevent crashes and lower the fatality rate on US roadways.

NHTSA research has resulted in a mandate that will have every vehicle produced for the U.S. market be equipped with ESC by September 2011, model year 2012.

Plick and Associates, Forensic Engineers loves to hear from its newsletter readers. Please call or e-mail us at experts@plickandassociates.com with article suggestions or feedback.

Engineer Spotlight

Randy R. Patarcity, P.E., Civil/Environmental Engineer

Randy Patarcity has over 21 years of engineering experience. He has worked in heavy civil construction and also has extensive experience in environmental investigation and remediation. He has performed projects in Pennsylvania, New Jersey, Delaware, Maryland, and overseas in the former Yugoslavia.

Randy has practiced with Plick and Associates, Forensic Engineers since 1998 and has conducted hundreds of engineering investigations including failures of structures, buildings, chimneys, and silos due to weather, construction deficiencies, fire, vehicle impact, insect infestation, and water infiltration. Randy has provided engineering support to fire investigations related to manufactured fireplace/flue pipe installations. He has also performed investigations related to incidents of environmental and mold contamination as well as sewer system failures. Additionally, Randy has provided valuable assistance to clients by completing repair scopes, cost estimates and cost control analysis for the reconstruction of damaged structures.

Randy graduated from Pennsylvania State University in 1984. He is a licensed Professional Engineer in the state of Pennsylvania, and has testified as an expert witness.

Randy and his wife Laura have three children and live in West Chester, PA.

Plick and Associates, Forensic Engineers On The Road!

Plick and Associates, Forensic Engineers, just returned from the annual Property Loss Research Bureau conference in Orlando, Florida and the response was better then ever. Plick and Associates have become staples at this wonderful conference, attended by a variety of insurance and legal professionals. It was a great opportunity to see old acquaintances and make new ones.

The Plick and Associates, Forensic Engineering Newsletters are now available online! Go to http://plickandassociates.com/newsletters to have access to all of the previous editions.

PLICK
Plick and Associates, Forensic Engineers

221 Woodbine Avenue
Narberth, PA 19072
Phone: 610-747-0675
Fax: 610-747-0677
www.plickandassociates.com