NAFE Winter Meeting Technical Program – Saturday, January 13, 2018 – Phoenix – Expected Presentations:

MORNING TRACK 1: CIVIL/STRUCTURAL

Author: Rune Storesund, PhD, PE

Title: FE Evaluation of Hillside Excavation for a Construction Contract Dispute **(9-9:40 am)**

Abstract: A forensic engineering evaluation was performed on a construction contract dispute for a residential construction project in Napa County, California. Specific evaluation elements included: the allegation of presence of a fault and/or landslide in the new roadway embankment that resulted in changed conditions that required extra work outside the contracted scope of work; evaluation of erosion and sediment control work and if that was or was not part of the original scope of work; and reasonable value of work completed by the contractor at the work site.

Author bio: Dr. Storesund has 16 years of planning, design, engineering, and construction experience in all aspects of civil, geotechnical, water resources, ecological, restoration, and sustainability projects. He has more than 10 years of forensic consultation/expert witness experience on more than $1 billion in litigation claims. He is the Executive Director of UC Berkeley's Center for Catastrophic Risk Management.

Author: Edward Fronapfel, PE

Title: FE Analysis of Residential Underdrain Design Methodologies, Performance and Failures **(9:40-10:20 am)**

Abstract: In 2014, the basement of a single-family home in a residential subdivision flooded. The homeowner's insurance company engaged an engineer to conduct forensic investigations, which ultimately determined that the resultant flooding was caused by blockage of an underdrain system. This system included the portion in the street and a lateral that connects the underdrain to the home's foundation drain. Subsequent to this event, additional basements and crawlspaces were reported to have flooding at other homes in the subdivision. The author was engaged by the subdivision homeowners' association (HOA). The HOA's Declarations and recorded documents contained no information regarding the existence of the underdrain system. In addition, there was no clear information on the ownership or maintenance responsibility. The author's field investigation determined the drain was not constructed to standards, and the developer did not provide adequate flow capacity to the homes served by the underdrain. The HOA entered into litigation against the developer, and the author evaluated issues associated with the design, construction, transition, and maintenance of the underdrain system.

Author bio: Mr. Fronapfel is owner of SBSA, Inc., in Golden, Colorado. A registered engineer in 33 states, he has been a practicing forensic engineer nationally for more than 20 years. His background is comprised of geohydrology, hydraulics, hydrology, site design, civil and structural engineering. This experience includes: new design, repairs and rehabilitation and quality assurance for industrial, commercial and residential properties. His experience also includes more than 500 deposition testimonies, more than 65 trial testimonies, and hundreds of mediations/arbitrations. He is a Fellow Member of the NAFE and ASCE as well as a Board-Certified Building Inspection Engineer with NABIE.

Author: William Walker and Paul Carr, PhD, PE

Title: FE Evaluation of Lost Labor Productivity Claims on Construction Projects **(10:20-11:00 am)**

Abstract: This paper describes two case studies where the application of the Mechanical Contractors Association of America (MCAA) Impact Factors in the Forensic Engineering assessment of Lost Labor Productivity Claims on Construction Projects was used to accurately explain losses and resolve disputes among the parties. The issue of lost labor productivity is a subject that creates great controversy on construction projects, since the labor component is a major element within a contractor's bid. Generally speaking, in the vertical (building) construction market, the labor portion of the bid can be approximately 35% to 45% of the total price. When preparing a bid, all contractors performing their quantity take-off will carry approximately the same quantity of material and installed equipment. However, the labor productivity to install these elements is a judgment of each contractor, while these factors are guided by standard (published) labor productivity rates. When changes occur on a project, whether scope or schedule changes, this can have a disruptive impact on the contractor's planned performance, thus an impact on the labor resources required to perform the contract work. Often these changes result in claims and disputes. This paper presents two case studies of the forensic engineering evaluation of the impacts to labor productivity using the MCAA Impact Factors to resolve project claims and disputes.

Author bio: Dr. Carr was the founder, CEO and Chairman of the Board of an architectural and engineering practice that provided the planning, design and construction management of educational facilities, municipal water and sewage treatment plants, bridges, municipal buildings, public housing projects, hospitals and libraries. As a diplomate of the National Academy of Forensic Engineers, Dr. Carr focuses his current forensic engineering consulting practice on failure assessment and prevention in public building projects and infrastructure capital programs. His experience encompasses architect and engineer errors and omissions claims, design and construction review, construction delay claims and disputes as well as code compliance matters.

Author bio: Mr. Walker practices as a forensic consultant with a focus on economic recovery claims; specifically related to labor productivity, change orders and their cumulative impact, contractual issues including delays and time extensions, and building code review for compliance of various building components. His application of contractor experience, architecture & engineering firm experience, and onsite construction management experience brings a comprehensive perspective to construction claims evaluation, as well as all associated phases of construction projects.

Author: Curt Freedman, PE

Title: Utilization of Solar Insolation Parameters for HVAC, Building Freeze Damage, Vehicle/Pedestrian Solar Glare Accidents, Roof & Siding Damage, and Solar Panel Performance FE Applications **(11-11:40 am)**

Abstract: The position and intensity of sunlight, also referred to as solar insolation, can be used as an effective tool for forensic engineering applications. Solar insolation can be modeled using ASHRAE Clear Sky Equations (American Society of Heating Refrigeration and Air-Conditioning Engineers) to determine the intensity and position of the sun at any time of day, day of the year, and any location on the planet. The presentation includes detailed documentation of solar angle identities using geometric and trigonometric mathematical principles. The mathematical principles were then inserted into original computer algorithms using Excel to allow convenient analysis and detailed graphical output. The

combination of solar insolation with weather modeling provides a valuable tool for the following applications: performance evaluation of thermal and photo-voltaic solar panels; determination of detailed heating and cooling loads; determination of fuel consumption for building freeze incidents; detailed daylighting design for buildings; snow melting along sidewalks and other pedestrian surfaces causing ice accumulation for slip and fall investigations; fading of interior building surfaces; solar glare from direct sunlight or reflection from windows or other objects for evaluations of vehicle accident reconstruction; hot car incidents, the overheating of passengers in parked cars; evaluation of roof temperatures; evaluation of damage to vinyl siding from reflected sunlight; fires contributed by sunlight; and shadowing/glare contributing to slip and fall incidents. Case study examples have been documented to demonstrate the specific methods of approach for actual forensic engineering investigations.

Author bio: President of CMF Engineering Inc., Mr. Freedman is an engineering consultant specializing in forensic engineering, mechanical systems design, and energy conservation. He holds a bachelor of science degree in mechanical engineering from Lehigh University, Bethlehem, PA, and a master of science in engineering management degree from Western New England College in Springfield, Mass. A member of Tau Beta Pi, an engineering honor society, he is a registered professional engineer in the following states: CT, MA, MD, ME, NH, NJ, NY, OH, PA, RI, & VT. He is a certified energy manager, certified energy auditor, and a LEED AP (Leadership in Energy & Environmental Design, Accredited Professional).

MORNING TRACK 2: MECHANICAL/PRODUCTS

Author: Daniel Couture, PEng

Title: FE Investigation of Furnace Oil Supply Line Fitting Leak **(9-9:40 am)**

Abstract: A basement oil leak was reported to a service company, which immediately replaced a supply line SAE 37-degree fitting while leaving the flared copper lines in place. An environmental remediation claim was later made against this service company, alleging improper installation of new supply lines within the prior year. Fuel delivery records and heating degree-day records were analyzed, revealing a consumption rate discrepancy versus the homeowner's narrative. An experimental apparatus was designed to evaluate leak rates for flared fittings in tightened and partially loosened states. The modelled expected consumption rate results inferred tampering with the fittings several days prior to the leak report. The experimental technique and consumption rate analysis withstood a Daubert challenge for relevance at the mediation conference.

Author bio: Mr. Couture, a Materials Science graduate of University of Western Ontario, holds an M.Sc. in Metallurgical Engineering from Queen's University at Kingston. He is licensed as a Peng. in both Ontario and Quebec and is designated as a Consulting Engineer in Ontario. Since 2003, he has been a Principal in Mechanical and Metallurgical disciplines and Vehicle Collision Reconstruction with Arcon Forensic Engineers in Toronto. He became the first full Canadian member of NAFE in 2016, and serves with ASTM E58. He remembers when the NHL's Flames were based in Atlanta, and has the "flaming A" fridge magnet to prove it.

Author: Anthony Sasso, PE

Title: FE Analysis of Common Failures and Inspection Procedures for Residential and Commercial Chairs **(9:40-10:20 am)**

Abstract: Chairs have been designed, manufactured, and used by humans for thousands of years. Eventually, all chairs wear out and fail. When someone is injured due to this failure, costly litigation can ensue. Forensic engineers are consulted to investigate the root cause of failure — and whether the mechanism of failure could have been detected prior to the accident to avoid injury. Materials used in chair manufacturing and several examples of failures are discussed. Industry safety standards are used as a basis for a proposed inspection and maintenance program for chair owners when the manufacturer's guidelines for care and maintenance are not available.

Author bio: Mr. Sasso grew up in Florida and attended Florida State University, where he graduated with a master's degree in Mechanical Engineering in 1997. Early in his career, he worked for several manufacturers as a product design engineer in the automotive, emergency fire apparatus, and commercial laundry/dry cleaning industries. He began his forensic engineering work in accident reconstruction and product failure analysis in 2003. He currently works at Sasso Engineering LLC and lives with his wife and family in Tallahassee, FL.

Author: Bart Kemper, PE

Title: Misuse of Pressure Vessel Codes in Forensic Applications **(10:20-11 am)**

Abstract: Engineering codes are a key method to guide designs to safe and reliable outcomes. Many such codes have "cookbook" portions where the user is guided to provide specific inputs in a series of calculations, often using charts or tables to get specific outputs. The design margins, units, and underlying theory are not always apparent. Engineering codes may not be suitable for reverse engineering an incident. This article examines a murder case in which an initial forensic analysis incorrectly applied the ASME Pressure Vessel Code to use Finite Element Analysis of a failed pressure vessel. The flaws in the analysis are revealed by applying conventional stress calculations and understanding basic material science, emphasizing the need to understand the underlying theories with both engineering codes and numerical modeling. Subsequent Finite Element Analysis provided an accurate analysis report that was successfully used in court.

Author bio: Mr. Kemper is a Louisiana-based mechanical engineer with more than 25 years of industrial and forensic experience with a civil background through the U.S. Army Corps of Engineers. Kemper's expertise in pressure vessels, piping, marine and subsea engineering, plastics, life-safety applications, medical devices, human factors, and numerical modeling led to his membership in the ASME Codes and Standards Committee for Pressure Vessels for Human Occupancy and its various subcommittees. His current Army Reserve duties include infrastructure assessment, forensic post-blast analysis, blast effects modeling, and protective structure engineering. He supports NAFE as one of the Journal's vice chairs.

Author: R. Vasu Vasudevan, PE and Jeremy Britton, PE

Title: FE Analysis of a Failed Clamp on a Pool Filter Housing **(11-11:40 am)**

Abstract: In 2004, a homeowner performed routine periodic maintenance of his swimming pool equipment. He assembled the reinforced plastic filter housing and engaged the steel retainer clamp as he had done on prior occasions. He then turned on the pool pump and the ~2-year-old filter housing's upper section and the retainer clamp were ejected. The ejected clamp struck the homeowner in the head, fracturing his skull and causing severe brain trauma. The police department found the homeowner deceased near the pool equipment, and observed the upper half of the pool filter housing and the retainer clamp more than 20 feet away from the pool equipment. This paper discusses the incident and the forensic engineering analyses performed to determine the cause of the failure. The electrical equipment and mechanical components were examined. Metallurgical analyses and functional tests were performed on the ejected retainer clamp and an exemplar clamp. A Finite Element Analysis model of the subject clamp and filter housing was synthesized with non-linear material (steel) elements and geometry (contact and slip surfaces). Various installation states/conditions were analyzed to determine the best-fit (most probable) for the observed failure mode and witness marks. It was determined that proper installation in conformance with the manufacturer instructions allowed the clamp to misalign on the housing/collar and filter housing.

Author bio: Mr. Vasudevan received his MS in engineering from UCLA in 1972 and worked in small engineering companies until he ventured out on his own in 1987. In 1971, he started to perform failure and risk/hazard analyses, and in 1979 he performed fire analysis of a large oil storage/handling facility. Since then, he has performed fire and explosion analyses ranging from wildland, industrial/manufacturing facilities, vehicles, appliances, and single/multiple family dwellings. He has performed analytical analyses of fires/explosions using FPETOOL, Hazard I, CFAST and FDS (Fire Dynamics Simulator by NIST) and has testified in court.

AFTERNOON TRACK 1: FIRE INVESTIGATION

Author: John Certuse, PE

Title: Fire Caused by Control Failure due to Intentional Manufacturing Deviation from Tested Design **(2-2:40 pm)**

Abstract: A fire in a multi-unit condominium complex occurred, causing the building to be a complete loss. The origin was traced to a recently drained hot tub's electric heater. Examination of the heater found it was manufactured in a manner inconsistent with its original patent design drawings in a way that would have impeded the performance of the control for what appears to be cost of manufacturing considerations. This intentional manufacturing defect also brought into question as to whether the control that was tested at The Underwriters Laboratory was one to the patent design specifications or of the type the control was manufactured to for sale to the public. Additionally, the company had since discontinued use of the control for subsequent installations.

Author bio: Mr. Certuse is a licensed professional engineer and director of engineering at ISE Engineering in Attleboro, MA. ISE Engineering performs forensic engineering examinations for the insurance industry with a large concentration based upon heating system failures.

Author: Jerry Tindal, PE

Title: FE Analysis of a Fire Origin and Cause Allegedly Involving an Overfilled Propane Cylinder **(2:40-3:20 pm)**

Abstract: Analyzing the origin and cause of fires or explosions for purposes of legal proceedings requires the smooth integration of a reliable fire investigative methodology with sound engineering principles and practices. The origin of one particular fire was first examined based on the methodology outlined in NFPA 921, *Guide for Fire and Explosion Investigations*. Engineering analysis was applied to witness observations, arc mapping, fire dynamics and the evaluation of fire patterns. The fire cause was then evaluated in light of NFPA 921 and integrated applied engineering analysis and calculations. The allegations of an overfilled propane cylinder as the cause of the fire were considered. Spoliation issues, poor investigation methodology, and the lack of applied sound engineering principals (resulting in unreliable opinions) are also contrasted and discussed.

Author bio: Mr. Tindal is a licensed professional engineer in 20 states. He holds both a Bachelor of Science and Master of Science in Mechanical Engineering from the University of South Carolina. Jerry is a Certified Fire and Explosion Investigator by the National Association of Fire Investigators and was also a Certified State Fire Marshal while employed with the South Carolina State Fire Marshal's Office. He currently serves as a governor-appointed board member on the South Carolina Liquefied Petroleum Gas Board.

Author: David Icove PhD, PE and Thomas Lawton

Title: Forensic Identification and Cause of Hot Socket Problems in Electrical Meters **(3:20-4 pm)**

Abstract: Electric meters play a critical role in electrical utility distribution systems, particularly with residential customers. Due to the low frequency of occurrence, forensic engineers may not be fully aware of a condition known as a "hot socket," where the blades of the electric meter fail to make sufficient electrical contact with the socket jaws. This condition is due to spreading, corrosion, or other abnormalities, resulting in high-resistance contacts that cause excessive heating, occasional fires, and risk of injury to individuals maintaining these meters. This paper reviews methods to forensically examine, diagnose, and explain the hot socket phenomenon while exploring the potential for future incident trends involving smart meters.

Author bio: The Underwriters Laboratories (UL) Professor of Practice, Dr. Icove is an internationally recognized forensic fire engineering expert with more than 40 years of experience. As a retired federal law enforcement agent, Dr. Icove served over his career as a criminal investigator on the federal, state, and local levels. Dr. Icove holds B.S. and M.S. degrees in electrical engineering and a Ph.D. in engineering science and mechanics from The University of Tennessee. He also holds a B.S. degree in fire protection engineering from the University of Maryland-College Park. He is presently a professor in the department of electrical and computer engineering at The University of Tennessee, Knoxville; an adjunct faculty member at the department of fire protection engineering, University of Maryland; and is a registered professional engineer.

Author bio: Mr. Lawton, BSME, is President of TESCO - The Eastern Specialty Company, located in Bristol, Pa. A graduate of the Massachusetts Institute of Technology (MIT), he holds a bachelor of science degree in mechanical engineering and has been working in the electric metering industry since 1984. Intimately involved with several national advanced metering infrastructure (AMI) deployments, he possesses a unique knowledge of the AMI issues, pitfalls and solutions.

Author: Jeffrey Lange, PE

Title: FE Analysis of a Cloned Ignition Coil Pack **(4-4:40 pm)**

Abstract: While being driven, a 2004 Volkswagen began to shake followed by smoke from under the hood. After opening the hood, the driver observed a small fire in the center of the engine. The subsequent examination established that the fire was caused by a malfunction of the number 2 cylinder ignition coil pack for which a manufacturers safety recall existed. Noted however, was an absence of manufacturing characteristics associated with an original factory component. The subject coil pack was found to be an aftermarket replacement component with the defect that the factory component was recalled for, thus establishing that the aftermarket component design was not engineered but "stolen," thus creating a defective clone. The paper will use the case study to discuss engineering issues with automotive aftermarket components.

Author bio: Mr. Lange is president of Lange Technical Services, Ltd and has been performing forensic vehicle analysis for more than 28 years. Jeff is a licensed professional engineer in New York as well as an ASE Certified Master Automotive Repair Technician, Master Collision Repair Technician, Certified Vehicle Fire Investigator and Certified Forensic Locksmith. He has performed more than 5,000 vehicle examinations and analysis for the purposes of determining system malfunction, fire origin and cause determination, damage causation, products liability and fraud-related issues. He has published numerous articles related to various aspects of vehicle examination and analysis and has lectured to many peer organizations.

AFTERNOON TRACK 2: VEHICLES & TRAFFIC

Author: Richard Ziernicki, PhD, PE , William Pierce, PE and Angelos G. Leiloglou

Title: FE Analysis of Projectile Thrown from Phantom Vehicle **(2-2:40 pm)**

Abstract: A case analysis utilized many of the latest forensic technologies to reconstruct the events that occurred during a shooting incident in which a police officer fatally shot a fellow police officer. Accident reconstruction utilized 3-D high-definition laser scanning, matchmoving police video footage from infrared radar camera mounted on a police helicopter, motion capture, photogrammetry, 3-D interactive virtual environment and Virtual Reality display systems. This paper also outlines how the trajectory of bullets and sequence of bullets were reconstructed, and how position and posture of the shooting officer and victim officer were determined. Finally, federal judge rulings on various Daubert motions (e.g. 509 U.S. 579 [1993]) to exclude or limit testimony of expert witnesses are presented.

Author bio: Dr. Ziernicki, chairman and CEO of Knott Laboratory, has evaluated several thousand industrial and vehicular accidents. He has presented papers and lectured at technical conferences in the United States, Europe, and South America. He is the author of more than 60 publications, primarily in the fields of mechanical engineering and vehicle accident reconstruction. Dr. Ziernicki was a member of several past SAE Standards Committees. He is past president and current board member for NAFE. Dr. Ziernicki has testified in court a few hundred cases and has been deposed more than 500 times. He has testified on behalf of clients such as U.S. Department of Justice, U.S. Department of Defense, State of Colorado Attorney General's Office, District Attorneys, and Public Defenders.

Author bio: Mr. Pierce is a forensic engineer employed by Knott Laboratory, LLC, a forensic engineering and animation company founded in 1982. Pierce has a bachelor's of science degree in mechanical engineering from Purdue University (West Lafayette, IN) and is a licensed professional engineer. He gained interest in forensic engineering while interning with Rimkus Consulting Group, Inc. After graduating in 2009, Pierce began working full-time for Rimkus Consulting Group, Inc., where he gained experience developing and testing tribometers and investigating motor vehicle accidents and product failures. In 2012, he began working at Knott Laboratory, LLC where he has investigated a variety of motor vehicle accidents involving pedestrians, motorcycles, cars, and heavy commercial vehicles.

Author bio: Mr. Leiloglou, M. Arch., is the Director of Visualization at Knott Laboratory. He has a bachelor of environmental design degree and a Master of Architecture degree from Texas A&M University, College Station, TX. Before joining Knott Lab, Angelos was a contract forensic animator and freelance graphic artist, and an assistant lecturer in the Department of Architecture at Texas A&M.

Author: Jerry Ogden, PhD, PE and Mathew Martonovich, EI

Title: FE Analysis of Commercial Vehicle Air Brake System Performance **(2:40-3:20 pm)**

Abstract: The braking systems for heavy commercial vehicles differ greatly from the design for light-duty motor vehicles. 49 CFR 571.121 and 49 CFR 393.52 require loaded buses, single unit commercial vehicles and vehicle-trailer combinations equipped with air brake systems to generate sufficient braking force to meet stopping distance, stopping acceleration rate, and brake force-to-weight percentage performance criteria. The combination of unique design, mechanical complexity, maintenance issues characteristic to air brake systems also pose difficulty in the analysis of air brake system performance if the forensic engineer has limited familiarity with how an air brake system functions, and the elements that can affect brake performance. This paper provides insight into the evolution of air brake system standards, and the applicable performance criteria for heavy commercial vehicles. The methods presented allow the forensic engineer to mathematically analyze and determine the effects of brake size, mismatched components, brake adjustment and system air pressure upon the overall braking force and stopping capabilities of air brake equipped commercial vehicles.

Author bio: Dr. Ogden is on the Board of Directors of the NAFE as Treasurer. He received a BS from Eastern Oregon University and an MS in Civil Engineering and PhD in Engineering and Applied Science (Civil and Mechanical) from the University of Colorado Denver. Dr. Ogden is the principal engineer of OEC Forensics (a division of Ogden Engineering & Consulting, LLC) in Littleton, Colo., having a multi-disciplinary focus in vehicular collision analysis, mechanical failures, highway work zone traffic control analysis, and highway design issues during his more than 25 years of forensic practice. Much of Dr. Ogden's work involves the analysis of commercial vehicle collision events to include the download and interpretation of data extracted from the Electronic Control Modules (ECM) and Anti-Lock Braking System (ABS) of heavy vehicles.

Author bio: Mr. Martonovich is a senior analyst and associate with OEC Forensics in Littleton, Colo. He received a BS from Metropolitan State University of Denver in mechanical engineering with a minor in mathematics, and is currently completing his MS in civil engineering with additional studies in mechanical engineering at the University of Colorado Denver. Mr. Martonovich has a multi-disciplinary focus in vehicular collision analysis and mechanical failures, and has been with OEC Forensics for more than seven years. He specializes in the analysis of commercial vehicle collision events,

braking system, and mechanical failures — and the download and interpretation of data extracted from the Electronic Control Modules (ECM) and Anti-Lock Braking System (ABS) of heavy vehicles.

Author: Richard Ziernicki, PhD, PE , Angelos Leiloglou, Taylor Spiegelberg, and Kurt Twigg

Title: The Application of Match Moving for FE Analysis **(3:20-4 pm)**

Abstract: This paper presents a methodology that uses the process of match moving for analyzing objects (vehicles, pedestrians, etc.) visible in video captured by moving cameras. Match moving is an established scientific process that is used to calibrate a virtual camera to "match" the properties and movement of the real-world camera that captured the video. Using high-definition 3D laser scanning technology makes it possible to accurately perform the match moving process and to evaluate the results. Once a virtual camera is accurately calibrated, moving objects visible in the video can be tracked or matched to determine their dynamic position, orientation, path, speed and acceleration. Specific applications of the match moving methodology are presented and discussed in this paper and include analysis performed on police officer body-worn camera footage, video taken from a police helicopter, and race track video footage captured by a drone. In all cases discussed, the match moving process yielded highly accurate camera matches and allowed forensic investigators to accurately determine and evaluate the dynamics of moving objects depicted in the video.

Author bio: See prior listing.

Author bio: See prior listing.

Author bio: Mr. Spiegelberg has a Bachelor of Fine Arts degree from the University of Colorado Denver. Before joining Knott Laboratory, he was a freelance animator assisting in creating industrial visualizations.

Author bio: Mr. Twigg has a Bachelor of Science, Information Technology degree from Colorado Technical University and a Bachelor of Fine Arts, 3D Animation degree from Rocky Mountain College of Art and Design, Denver, CO. He has worked with developing interactive virtual reality experiences, animation and video analysis methods, and 3d software plugins.

Author: Robert Peruzzi, PhD, PE

Title: Forensic Engineering Analysis of the Alleged Failure of an Emergency Vehicle Traffic Light Preemption System **(4-4:40 pm)**

Abstract: A police officer on a high-speed chase ran a red light and crashed into a vehicle in an intersection whose traffic light controller included an emergency vehicle preemption system. The driver of the vehicle was mortally injured and died the next day. The estate of the deceased driver sued the police officer driver, the municipal police department, and the manufacturer of the emergency vehicle preemption system. The author was retained by council for the estate of the deceased to review: documentation and manuals for the preemption system and traffic light controller, controller event logs leading up to the time of the crash, and Department of Transportation regulations, police reports, witness depositions, videos and photos. The preemption system begins with an infrared strobe light "emitter" mounted on emergency vehicles. Infrared "detectors" mounted on traffic light supporting structures at equipped intersections detect

the infrared pulse signals. If the coding of the pulsed signal is a match to one or more stored patterns, an “interrupt” signal is sent to the traffic light controller. The traffic light controller cycles through the sequence following required minimum timing, to present a green light to the emergency vehicle in the shortest allowable time. In the subject case, the evidence showed that the preemption system worked properly, but that the police officer was driving too fast for the traffic light controller to cycle through its sequence before the officer reached the intersection. A maximum speed was calculated at which a preempted green light for the driver would be assured.

Author bio: Dr. Peruzzi is an associate member of NAFE. He is a self-employed electrical engineering consultant at R. Peruzzi Consulting, Inc. The specialties of his expert witness practice are circuit analysis, intellectual property, patent analysis and infringement, product requirements and specifications, and product liability, involving ICs, modules, and electro-mechanical systems.
