

NAFE Summer 2015 meeting Technical Program – July 18, 2015 – Seattle

GENERAL SESSION: MORNING

9-9:30 am

Author: Bill Jones, PE (NAFE 778 Fellow)

Title: Forensic Analysis of Wind Power Generator Tower Cracking

Abstract: Generators that produce electricity for modern wind farms are mounted atop large steel towers. The hollow cylindrical towers, typically over 250 feet in height, are fabricated from mild steel plates approximately 1 inch thick and 10 to 12 feet in diameter. Cracks measuring over 4 feet long were observed in such a tower. The author was retained to determine the cause of the cracking and to determine if the cause was due to incorrect design (owner designed) or poor fabrication quality (contractor). Laboratory examination of the crack morphology and finite element analyses techniques were used to characterize the root cause of the failure. Cyclic loading on the tower was developed from wind rose data for the site. It was ultimately shown that the cause of the cracking was due to flow-induced vibrations resulting from von Kaman street vortex shedding and not the fore-aft loads of the direct wind forces on the blades.

Author bio: Dr. Jones has extensive experience in thermal analysis, dynamic analysis, nonlinear analysis, and the design and fabrication of pressure vessels to ASME code. He has served as White House Fellow in 2002-03. He is a Fellow of NAFE, ASME and IAE. He holds a BS, MS, and a PhD -- all in mechanical engineering -- and has published six books.

9:30-10 am

Authors: Ben Railsback, PE (NAFE 713 Senior Member) and Richard Ziernicki, PE (NAFE 308 Fellow)

Title: Forensic Engineering Evaluation and Testing of Horizontal Intrusion Protection Equipment for Stand-Up Forklifts

Abstract: In 2004, a report issued by the National Institute of Occupational Health and Safety (NIOSH) evaluated a fatal stand-up forklift accident where a warehouse forklift operator was crushed against a rack beam after the rack beam intruded into the operator's compartment. One of the recommendations of the report was that "Manufacturers of standup reach forklifts should include vertical framing or posts at the rear corners of their machines, from the operator's console to the overhead guard, to protect the operator from horizontal components entering the operator's station." Other published studies have also recognized the risk associated with the hazard of a horizontal rack beam entering the operator's compartment of a stand-up forklift. It has been previously reported that there have been at least 250 incidences of horizontal intrusion as of June 2008. The ANSI B56.1, "Safety Standard for Low Lift and High Lift Trucks," has recognized such guarding as permissible since 1993, and almost all stand-up forklift manufacturers have made such guarding standard equipment. The evaluation is related to the fatal horizontal intrusion incident involving a stand-up lift truck (forklift), operated by a 44-year-old male. This paper evaluates the performance of the horizontal intrusion protection system, or posts, through a series of four low-speed collisions with a rack system. The four tests were conducted at increasing kinetic energy levels to first evaluate whether or not the posts were compliant with ANSI B56.1, and at higher speeds and loading to assure that the operator of the forklift in the subject incident would have been protected by the posts. During this testing, the performance of the horizontal intrusion protection was evaluated based on deflection of the guarding system after a collision, at low speed, with a typical racking system, consistent with the test methodology outlined in ASME/ITSDF/ANSI B56.1. Testing performed shows that the posts are compliant with the ANSI B56.1 testing requirements and that the forklift operator would not have been crushed in the low-speed collision in the subject incident, had the forklift been equipped with the optional horizontal intrusion protection posts.

Author bio: Ben Railsback, MS, PE is Director of Mechanical Engineering at Knott Laboratory in Centennial, Colorado. He is a mechanical engineer that practices in the areas of accident reconstruction, product safety, and safety engineering. Mr. Railsback began to pursue a career in mechanical engineering because of his interest in cars and machine design and continues to develop experience in vehicle dynamics, automotive engineering and manufacturing. Mr. Railsback is an avid snowboarding, cycling and running enthusiast and loves the outdoor lifestyle that Colorado can provide.

Author bio: Richard Ziernicki, PhD, PE is Chairman and CEO of Knott Laboratory, and he 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 over sixty publications, primarily in the fields of mechanical engineering, and vehicle accident reconstruction. His accident reconstruction expertise has been featured over thirty times on local and national television including

the Discovery Channel, Dateline NBC, Dr. Oz Show, MSNBC, FOX News Channel and National Geographic Channel on accidents such as the Princess Diana accident, on the Air France Flight 447 accident and more. Dr. Ziernicki was a member of several past SAE Standards Committees. He is Past President and current Board Member for the National Academy of Forensic Engineers and also serves on many Committees for the organization. Dr. Ziernicki has testified in court a few hundred cases and has been deposed over 500 times. He has testified on behalf of clients such as US Department of Justice, US Department of Defense, State of Colorado Attorney General's Office, District Attorneys, and Public Defenders.

10-10:30 am

Author: Todd Springer, PE (NAFE 422 Correspondent)

Title: Forensic Evaluations of Storm Damage Claims and the Appraisal Process

Abstract: Severe weather is a regular occurrence in the American Southwest, and includes more than high temperatures and haboobs (dust storms). Severe thunderstorms, often accompanied by high winds and hail, are regularly experienced, and have the potential to cause damage to roofing systems and other exterior building components. Insurance claims for storm damage, both legitimate and unwarranted, have come under increasing scrutiny due to indistinct and altered dates-of-loss, the amending and broadening of damage causes, and the offering of technically unsupportable opinions by less-qualified consultants. Further, these claims often end in appraisal hearings, which are decided by umpires for whom there are no minimum educational or experiential requirements.

Author bio: Mr. Springer has practiced forensic engineering for approximately 7 years. He has more than four years of experience investigating building envelopes with respect to storm damage for homeowners, insurance carriers, and attorneys, and has provided sworn testimony in this area. He is recently a new father (4/7/15) and enjoys competing in triathlons, competing in his first Ironman this November.

10:30-11 am

Author: Bill Jones, PE (NAFE 778 Fellow)

Title: Forensic Engineering Analysis of Toilet Connector Failures in a Class-Action Lawsuit

Abstract: A major manufacturer of water supply lines that connect flushable toilets to house water piping was the object of a class-action lawsuit. The author personally examined a large number of failed and exemplar connectors, complete fill lines, and similar injection-molded products and visited failure sites with the goal of ascertaining the root cause of the failures. Forensic work included strength tests and finite element analyses to determine the expected life of the nuts, including single overload failure strength and creep analysis to predict life. Tightening tests using random subjects were conducted. A statistical analysis of the failures was also performed. The products of competing firms were evaluated for comparison of similar designs. The conclusions were that the design of the connector was not defective and met relevant industry standards.

Author bio: Dr. Jones has extensive experience in thermal analysis, dynamic analysis, nonlinear analysis, and the design and fabrication of pressure vessels to ASME code. He has served as White House Fellow in 2002-03. He is a Fellow of NAFE, ASME and IAE. He holds a BS, MS, and a PhD -- all in mechanical engineering -- and has published six books.

11-11:30 am

Author: Christopher Shiver, PE (NAFE 661 Senior Member)

Title: Forensic Engineering Evaluation of Utility Compressor Truck Explosion/Fire

Abstract: Compressed air system installed as a package on a utility company truck experienced a pressure boundary rupture in service, resulting in burning lubricant ejection onto an employee. Alleged were numerous design and component defects, and a series of expert group exams of the truck, compressor system, and components occurred over approximately three years. The author was retained by a component supplier. Key issues included design of the compressor system and individual components in the pressure boundary, control system, and cooling system. Based on inspection and analysis, there were several causes for this accident involving individual component and system design deficiencies, installation deficiencies, and operator training inadequacies.

Author bio: An ME/EE since 1981, Mr. Shiver worked as a generating plant engineer for a major electrical utility for seven years. He also served as principal of a design, testing, and forensic engineering consulting firm for 22 years. For the last five years, he has been a sole practitioner as a forensic engineer. Shiver has conducted approximately 3,000 engineering incident evaluations and has given sworn expert testimony in nearly 200 appearances. He has also served on eight codes and standards committees.

TRACK 1 – CIVIL / STRUCTURAL ENGINEERING: AFTERNOON

2-2:30 pm

Author: William Bracken, PE (NAFE 605 Fellow)

Title: Forensic Investigations of Misdiagnosed Masonry Block Wall Cracking

Abstract: Given that masonry block walls are subject to shrinkage throughout their service life, cracking is to be expected. However, after masonry block walls have been placed into service originally anticipated cracking is often perceived as a serviceability issue and in other cases misdiagnosed as a structural defect. Such misdiagnoses typically end up resulting in litigation and unnecessary structural remediation. This paper begins by introducing the most common types or configurations of cracking found in masonry block walls followed by a discussion on the process of identifying the type, causes and significance. From here, the paper highlights actual cases of misdiagnoses by outlining the inappropriate methods used and flawed logic employed. This paper concludes with a discussion on the resulting litigation and consequences faced.

Author bio: Mr. Bracken is President & Principal Engineer of Bracken Engineering. His career has centered on the practice of structural engineering while specializing on its application in the fields of codes, fire rescue, and standards of care. His practice has encompassed design, analysis, research, publishing, instruction, and forensics. He has published and routinely presents on topics of forensic engineering, structural rehabilitation, and innovative use of current technology. In addition, he works closely with the University of South Florida and serves on both a state and federal level as an Urban Search & Rescue Structural Specialist. Bracken is a recognized Fellow within the Structural Engineering Institute (SEI) and a board-certified diplomate of the National Academy of Forensic Engineers (NAFE). He has also been recognized by local organizations, the State of Florida's Fire Chiefs Association, and FEMA for his efforts.

2:30-3 pm

Authors: Damon Kress, Esq. (NAFE 882 Correspondent) and Steven Morris, PE (NAFE 883 Senior Member)

Title: Forensic Engineering Interpretation of Hand-Held Resistance Moisture Meter Measurements in Appraising Decay Hazard within Completed Buildings

Abstract: Forensic investigators frequently use hand-held resistance moisture meters to evaluate the existence of water leaks in building systems. This paper suggests standards for interpreting resistance meter results in order to predict the existence of leaks in building systems and associated decay hazards in completed construction in New Jersey. The standards are based upon our review and analysis of accepted industry standards and published documentation from prominent organizations and practitioners in the wood and construction industries. The methods proposed can be used to develop similar standards for other regions in the United States.

3-3:30 pm

Author: Kevin Ouellette (NAFE 867 Senior Member)

Title: Forensic Engineering Analysis of the Standard of Care in Construction Claims

Abstract: The analysis of construction claims is rarely a singular issue between two parties. Construction claims inherently possess multiple issues of fact involving multiple parties. The initial analysis involves reviewing the engineering/construction components to identify potential deficiencies. However, in order to determine the responsibility of the parties, the analysis must include the application of engineering principles to assess the standard of care responsibilities of the parties. These responsibilities will differ with each deficiency and their chronology within the project schedule. This article reviews the engineering methodologies used to assess standard of care responsibilities in an actual construction claim.

3:30-4 pm

Author: Kami Farahmandpour, PE (NAFE 854 Fellow)

Title: Forensic Investigation of Water Leakage Issues into Buildings, Recreating the Leaks Versus Determining the Cause

Abstract: Forensic investigations of building leaks often involve complex investigation techniques and testing. In many cases, forensic investigators perform testing to re-create leaks and determine whether design and/or construction defects resulted in leaks under controlled test conditions. However, many construction-related litigation involves complex lines of contractual responsibility and multiple parties. This presentation provides an overview of typical construction defect case lines of contractual obligations and how they can impact the scope of investigation by a forensic engineer. As a case history, forensic engineering investigation of leaks in a building that was less than five years old will be reviewed.

Author bio: Kami Farahmandpour is the Principal of Building Technology Consultants, PC. He has been involved in the evaluation, testing, and repair of construction materials and building envelope performance since 1984. Kami is a Fellow of RCI, and has served on many technical committees and Boards of Directors of various organizations. His involvement with the building envelope industry has earned him many awards, both for his contributions to the industry and for his work on several projects.

4-4:30 pm

Authors: George Merlo, PE (NAFE 142 Senior Member) and Anthony Merlo, PE (NAFE 646 Senior Member)

Title: Development of a Computer Model to Predict Curling of Poured Concrete Slabs on Grade

Abstract: This paper addresses the causative factors associated with curling of concrete slabs poured on grade. The study was initiated when the owner of a newly constructed warehouse brought legal action against the designer/contractor for excessive concrete slab curling. Subsequent to settling with the owner, the designer/contractor brought legal action against the subcontractors who poured the slab and prepared the subgrade. A computer model was developed to evaluate the effect various parameters have on curling of the concrete slab on grade. The parametric study was utilized to evaluate the most probable causes of the curling, which led to settlement of the case.

Author bio: Anthony Merlo, P.E., earned a B.S.C.E. degree from the Colorado School of Mines in May 1990 and an M.S.C.E. majoring in structural engineering from Arizona State University in December 1991. He began his professional career as a structural engineer with Arizona Public Service Company, providing engineering support for the operations, maintenance, and design modifications of the three units at the Palo Verde Nuclear Generating Plant. In 1995, he joined Merlo Consulting Engineers, LLC and presently is a partner in the firm responsible for forensic investigation associated with structural failures due to improper construction, fire and storm related damages, and Code deficient design.

Author bio: George Merlo, P.E., earned a B.S.C.E. degree from Lafayette College in 1960 and an M.S.C.E. majoring in structural engineering from Lehigh University in 1961. Throughout his career, Mr. Merlo has been involved in a wide range of civil projects, including industrial, petrochemical, educational, and a variety of numerous facilities. He founded Merlo Consulting Engineers, LLC in 1984, serving as a forensic consultant to attorneys, insurance companies and private clients involving structural damage due to improper construction on expansive soils, construction-related accidents, and structural failures.

TRACK 2 – VEHICLE / TRANSPORTATION ENGINEERING: AFTERNOON

2-2:30 pm

Author: David Porter, P.Eng (NAFE 466 Correspondent)

Title: Forensic Engineering Review of the Rotating Sideslip Formula in Vehicle Accident Reconstruction

Abstract: This paper reviews the application of two methodologies that are currently used by police forces in the United States and Canada to calculate the speed loss of a vehicle that is simultaneously rotating and translating. Both methods are based upon the assumption that the slowing at the center of mass of the vehicle is proportional to the “sine” of the sideslip angle. The strengths and deficiencies of each method are considered and compared to other popular methods of calculating the speed of the vehicle in these situations. The limitations of and considerations for the application of these methods are also indicated.

Author bio: David has focused on collision reconstruction since 2004. His experience encompasses all aspects of collision reconstruction, although he has specialized in nighttime collisions, computer-aided simulation, and animation of vehicle collisions. David has been qualified as an expert in collision reconstruction in both civil and criminal courts in Canada.

2:30-3 pm

Author: Jerry Ogden, PE (NAFE 561 Fellow)

Title: Forensic Engineering Applications of the GDaTADV™ System of Equations to Real-World Collisions

Abstract: The Generalized Deformation and Total Velocity Change Analysis, or G-DaTA Delta-V System of Equations, is a suite of algorithms that determine the total velocity change levels for a vast array of vehicle-to-vehicle collision events. The G-DaTA Delta-V System of Equations will be applied to real-world collisions with passenger vehicles, light trucks, SUVs, and motorcycles to show their utility in determining collision severity levels for a wider array of impacts than current damage analysis methods.

Author bio: Jerry S. Ogden, PE is the principal engineer with OEC Forensics in Littleton, Colorado, having a multi-disciplinary focus in vehicular collision analysis, component failures, and highway design issues during his +25 years of forensic practice. Mr. Ogden will present a follow-on paper as part of his Engineering and Applied Sciences PhD dissertation development at the University of Colorado Denver.

3-3:30 pm

Author: Michael Kravitz, PE (NAFE 451 Fellow)

Title: Forensic Engineering Analysis of Vehicle-Pedestrian Impact Using EDR Data and Visualization Software

Abstract: This paper will analyze the pedestrian impact with a 2010 Ford Fusion in a criminal matter. The airbag module of the Ford Fusion was downloaded by the prosecution expert. The speed, steering, longitudinal, and lateral accelerations for a time period of 5 seconds prior to algorithm enable when the side airbags of the Ford Fusion were deployed was recorded. The recorded data was input into Virtual Crash and PC-Crash (accident reconstruction software programs) using Newton's Laws of Motions, and a time-distance-speed path was visualized. The driver of the vehicle lost control of the vehicle and struck a pedestrian before crashing into a chain-link fence and tree. The driver of the vehicle was arrested and charged with vehicular homicide and DWI. The question was...Where was the pedestrian standing when the vehicle struck her? The prosecution expert opined that the pedestrian was struck on the sidewalk where she had come to rest. The author was retained by the defense to determine the pedestrian's position; either in the roadway or on the sidewalk.

Author bio: Michael Kravitz, PE is a sole practitioner in forensic engineering consulting with attorneys on personal injury cases involving civil engineering and accident investigation, analysis, and reconstruction. Mr. Kravitz graduated from the City College of New York with a Bachelors of Civil Engineering and New York University Graduate School of Film and Television with a Master of Fine Arts. He began his forensic practice in 1991 after working with various consulting engineering firms where he gained experience in highway and bridge construction and rehabilitation; building column and beam design; surveying; foundation excavation of high-rise office buildings. Mr. Kravitz has also had a movie, television and advertising career producing films, video and media. He has served as the Secretary of the NAFE and is Past President of the NAFE.

3:30-4 pm

Author: John Nawn, P.E.

Title: Forensic Engineering Use of Traffic Engineering Standards

Abstract: In the realm of Forensic Engineering, the practitioner regularly references and the law relies upon the "reasonable and customary standards of the industry." In highway design and traffic engineering, the standards of the industry are the AASHTO "Green Book," the MUTCD and the Highway Capacity Manual. This presentation explores why these three references are the standards of the industry and how they apply to the forensic engineer's work. Additionally, the presentation explores these references as the foundation of the law, particularly with regard to traffic control devices such as signs, stripes, and traffic signals. The presentation finishes by exploring the interrelationship of all three references.

Author bio: John A. Nawn, P.E., has 30 years of design, management, and construction experience in highway, traffic and municipal engineering, including 20 years of forensic practice. A licensed professional engineer and certified Professional Traffic Operations Engineer, Mr. Nawn is an NSPE Fellow and Adjunct Professor at Temple University in Philadelphia in Transportation Engineering & Transportation Systems Management courses.

4-4:30 pm (Note: this is a backup presentation, and is not vehicle-themed)

Author: Richard Ziernicki, PE (NAFE 308 Fellow) and William H. Pierce, P.E. (NAFE 846 Correspondent)

Title: Forensic Engineering Investigation of Above-Ground Pool Submersion Accidents

Abstract: Approximately 35 children under the age of 5 years old access above-ground pools via a ladder and drown each year in the United States. Consumer Product Safety Commission (CPSC) data also shows that approximately 140 additional children sustain submersion injuries associated with ladder access in such pools each year. CPSC data shows further that in many cases, these events occurred during brief lapses of adult supervision. This presentation focuses on potential product defect issues related to child submersion accidents, including the role of user manuals, alternative designs, warnings, instructions, and child behavior testing.

Author bio: Richard Ziernicki, PhD, PE is Chairman and CEO of Knott Laboratory, and he 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 over sixty publications, primarily in the fields of mechanical engineering, and vehicle accident reconstruction. His accident reconstruction expertise has been featured over thirty times on local and national television including the Discovery Channel, Dateline NBC, Dr. Oz Show, MSNBC, FOX News Channel and National Geographic Channel on accidents such as the Princess Diana accident, on the Air France Flight 447 accident and more. Dr. Ziernicki was a member of several past SAE Standards Committees. He is Past President and current Board Member for the National Academy of Forensic Engineers and also serves on many Committees for the organization. Dr. Ziernicki has testified in court a few hundred cases and has been deposed over 500 times. He has testified on behalf of clients such as US Department of Justice, US Department of Defense, State of Colorado Attorney General's Office, District Attorneys, and Public Defenders.

Author bio: William H. Pierce, P.E., a senior engineer with Knott Laboratory, has a bachelor's of science degree in mechanical engineering from Purdue University and is a licensed professional engineer. Pierce gained interest in forensic engineering while interning with Rimkus Consulting Group, Inc. over two summers during college. After graduating in 2009, he 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, Pierce began working at Knott Laboratory, LLC where he has investigated a variety of motor vehicle accidents involving pedestrians, motorcycles, cars, and heavy commercial vehicles. He has also investigated numerous product liability claims involving consumer products, heavy commercial vehicles, and material handling equipment.
