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Biomechanics Case Studies

by

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Introduction

The field of biomechanics is still somewhat of an unknown in the forensic engineering/expert witness business and, as such, many claims professionals and attorneys are not sure how and when a biomechanics expert can help them. FORCON Consultant Michael Romansky has been a member of FORCON's consulting and expert witness team for 16 years. During that time he has used his background and training in biomechanics, engineering, medical physics, occupational safety and health, physiology, and other related disciplines in a variety of cases and subject areas. We thought that by providing a brief description of a sampling of those cases, our readers would gain a better understanding of how an expert with Michael's expertise might be able to help them.

WORKPLACE ACCIDENT: FALL OF A WORKER FROM A SCAFFOLD. (Work performed on behalf of the defendant.) An "employer-worker" fell 19 feet from the working surface of a scaffold and struck the floor below. The employer had no fall protection in place, i.e., no personal fall arrest system and no guardrails around the perimeter of the scaffold. One of the predominant issues was whether or not an owner of the premises, a single family dwelling under construction, is ultimately responsible for safety of contractors, subcontractors, and their employees in the workplace.

The plaintiff had a workplace safety expert in the case to counter Dr. Romansky's findings and conclusions.

An examination and analysis of the case facts were performed in conjunction with an interpretation of applicable OSHA 29 CFR 1926 and 29 CFR 1910 safety regulations, provisions of the OSHA Act of 1970, Section 107 of the Contract Work Hours and Safety Standards Act (Construction Safety Act), OSHA Letters of Interpretation, OSHA's Multi-Employer Citation Policy and the "Controlling Employer" doctrine, and a decision of the Occupational Safety and Health Review Commission. One of the major conclusions was that an owner of a house under construction has no affirmative duty, obligation, or responsibility to ensure the safety of contractors and/or subcontractors and/or their respective employees in the workplace, irrespective of the owner having been a licensed general contractor with knowledge, training, and experience in construction safety.

A deposition/trial notebook (detailed analysis summary) was prepared by Dr. Romansky. His deposition was not taken. The judge delayed start of the trial by one day so that the contents of the notebook could be examined by all parties (the plaintiff and two remaining co-defendants), including the judge. The following morning the case was settled on terms reported to be favorable to the defendant. The settlement was confidential, but less than what the client feared having to pay if it lost in court.

WORKPLACE ACCIDENT: FALL OF A WORKER FROM A BROKEN UTILITY POLE. (Work performed on behalf of the defendant.)

An employee for a subcontractor (working on behalf of a cable-TV company) was "wrecking-out" abandoned telecommunications cables from atop a wooden utility pole when the pole broke-off at its base (due to below ground rot) and fell to the ground. The worker was fatally injured. The pole was owned by a major northeastern utility company. The cable-TV company leased a section of the pole for attachment of its cables. One of the major issues was whether or not the utility company had breached its duty for inspecting the structural integrity of the pole and, thus, was responsible for the collapse of the pole and the death of the employee of a subcontractor. The plaintiff had a workplace safety expert in the case to counter Dr. Romansky's findings and conclusions.

An examination and analysis of the case facts in conjunction with, among other things, applicable OSHA enforced safety and health regulations, and utility tariffs were performed. One of the principal conclusions was that the utility company, as the owner of the wooden pole, had no affirmative duty, obligation, or responsibility to provide for the safety of the deceased employee of a subcontractor.

Dr. Romansky's deposition was taken. Two days after the deposition, the case was reportedly settled for less than what the client had expected to pay for a settlement.

ALLEGED SLIP AND FALL ON A SIDEWALK. (Work performed on behalf of the defendant.) Analysis was done of both intrinsic and extrinsic variables. Intrinsic variables are those involving the claimant, and extrinsic variables (analyzed by FORCON engineer John Leffler) are those involving the claimant's surroundings. Among other things, it was determined that the plaintiff's descriptive account of the fall was inconsistent with the kinematics, mechanics, and mechanism of an accidental slip and fall. Likewise, the sustained injury, i.e., left humeral mid-shaft fracture, was inconsistent with what would be expected to occur in an accidental slip and fall. The plaintiff presented an injury that is unexpected and inconsistent with an accidental slip and fall. Likewise, the plaintiff failed to present any injuries that are expected and consistent with an accidental slip and fall. Causation of the fall was attributed to intrinsic variables involving a sudden and unexpected loss of body balance and upright postural stability while moving in an hurried manner to catch a dog that ran out of a house.

The case was reportedly settled for less than what the client had expected to pay for a settlement, and less than the cost of a trial.

ALLEGED SLIP AND FALL INSIDE A CAR DEALERSHIP. (Work performed on behalf of the defendant.) A customer claimed that she slipped and fell on water that dripped to the floor from a leak in the roof. The plaintiff presented four (4) contradictory and inconsistent descriptive accounts of her fall, each being incompatible and illogical with having resulted from an accidental slip and fall. Her body kinematics and fall mechanics/mechanism were inconsistent with an accidental slip and fall. The plaintiff presented an injury that is unexpected and inconsistent with an accidental slip and fall. Likewise, she failed to present any injuries that are expected and consistent with an accidental slip and fall. The plaintiff suffered from "morbid obesity" at the time of her fall.

The case went to trial where Dr. Romansky explained to the jury why the plaintiff would not have experienced an accidental slip and fall and how

the condition of the floor (extrinsic variable) played no causative role in the fall. He also demonstrated to the jury that fall causation was the result of intrinsic variables involving preexisting osteoarthritis of the knees and a sudden and unexpected collapse or flexion contracture of the leg during the single limb support phase of walking. The jury awarded a verdict for the defendant.

ALLEGED TRIP AND FALL INSIDE A SUPERMARKET. (Work performed on behalf of the defendant.) The plaintiff alleged that she experienced an accidental trip and fall inside a supermarket after allegedly tripping over a shopping cart bumper rail that was positioned at the base and around the perimeter of a frozen food cooler. Of particular importance was the testimony of the plaintiff who maintained that she was standing in place and not walking at the time of her alleged trip and fall. She maintained that she fell to her left side and was lying and resting laterally or sideways on her left hip in a final resting position on the floor. She sustained a fracture to her left hip. The plaintiff's described body kinematics and fall mechanics/mechanism were inconsistent with an accidental trip and fall. Likewise, her primary and secondary body impact points on the floor were inconsistent with an accidental trip and fall. The plaintiff had an expert to counter Dr. Romansky's findings and conclusions.

Dr. Romansky prepared a deposition/trial notebook and a written report. Dr. Romansky's deposition was taken. Defense counsel prepared and submitted to the court a motion for summary judgment. The court granted summary judgment for the defendant.

ALLEGED SLIP AND FALL INSIDE THE LADIES RESTROOM OF A MAJOR PHARMACY CHAIN STORE. (Work performed on behalf of the plaintiff.) An elderly woman claimed to have slipped and fallen while entering a restroom. The floor of the restroom was wet with water from a leaking toilet; this was confirmed by several store employees. Upon review of the plaintiff's discovery deposition, the plaintiff's demonstrated body kinematics and fall mechanics/mechanism were consistent with an accidental slip and fall. The body primary and secondary impact points, i.e., both buttocks and right hand, are consistent with an accidental slip and fall. The injuries that occurred were consistent with the injury maxim for an accidental slip and fall.

Dr. Romansky prepared a deposition/trial notebook. No deposition was taken of Dr. Romansky. Later, he prepared and submitted an affidavit of his analysis of the fall and its causation. The case reportedly settled for the amount that plaintiff's counsel had been initially seeking at the start of the case.

FATAL FALL OF A CONSTRUCTION WORKER INTO A WET WELL THAT WAS UNDER CONSTRUCTION. (Work performed on behalf of the plaintiff.) An employee of a construction subcontractor was fatally injured when he fell approximately thirty (30) feet into a wet well / lift station while constructing a temporary wooden lid or cover from a position atop the wet well (or lift station). The examination and analysis of the case issues revealed that the deceased worker had no prior training or experience with the carpentry task he had been assigned. Among other things, he had no prior training in workplace safety nor ready access to personal protective equipment. The deceased had no experience or safety training in any aspect of wet well construction. He was specifically hired for his training and experience in operating heavy construction equipment.

Dr. Romansky was tasked with performing a deliberate intent analysis (a five pronged test) to establish that a specific unsafe working condition existed in the workplace which presented a high degree or risk and a strong probability of serious bodily injury or death. The specific intent of the analysis was to defeat the affirmative defense of Workers' Compensation immunity.

Dr. Romansky prepared a deposition/trial notebook. He also gave a deposition in the case. Later, he prepared and submitted an affidavit of his analysis. A settlement was reached in the case by the parties. The personal representative of the estate of the deceased employee reportedly received what was described as "the million dollar" settlement.

RECONSTRUCTION AND ANALYSIS OF TWO (2) SEPARATE AND DISTINCT COLLISIONS. The first was a high speed lateral or "T-bone" collision with ejection and the second was a low speed, front-end collision. (Work performed on behalf of the defendant involved in the low speed, front-end collision.) The plaintiff was involved in two (2) different motor vehicle collisions separated by several years. She claimed that three (3)

herniated cervical discs and a left shoulder impingement injury were the direct result of a low speed, front-end collision that occurred when a vehicle backed-up and struck the front bumper of plaintiff's vehicle. At issue in the case was which of the two collisions would have caused the plaintiff's claimed injuries. Dr. Romansky performed a reconstruction of the "Second Collision" for both collisions and performed a comparison and contrast of the two collisions with respect to their respective injury producing potential. Among other things, this entailed an analysis of occupant kinematics, restraint system use/non-use and the resulting effects, body orientation at the time of the collision, injury causation, mechanics, and mechanisms, and tissue loading of the body and body segments. Dr. Romansky provided findings from his analysis to establish that the "T-bone" collision and not the low speed front-end collision provided the requisite conditions that were consistent with the plaintiff's claimed injuries.

The case went to trial where Dr. Romansky explained to the jury the differences between the two collisions, focusing on resulting body kinematics and injury mechanics and mechanism for plaintiff's claimed injuries. The jury awarded a verdict for the defendant.

RECONSTRUCTION AND ANALYSIS OF A TRACTOR-TRAILER/MOTOR VEHICLE SIDESWIPE COLLISION. (Work performed on behalf of the defendant.) The plaintiffs were a husband (driver) and wife (front seat passenger) in a motor vehicle sideswipe collision. At issue in the case were the injuries claimed by the plaintiffs, and whether or not such injuries resulted from the collision. The husband claimed that he sustained bilateral avascular necrosis of the femoral head, necessitating left and right hip replacements, and an L5-S1 disc herniation. His wife claimed that she sustained a SLAP lesion of the left shoulder, a bulging L5-S1 disc, and a herniated L1-L2 disc.

Dr. Romansky performed a "Second Collision" reconstruction of the collision, taking into consideration that a sideswipe event typically produces insignificant accelerations and inconsequential loadings on body segments. This was confirmed by a reconstruction of the "First Collision" by another expert for the defendant. Among other things, Dr. Romansky examined occupant kinematics, injury mechanics/mechanisms (for the claimed injuries), and body segment loading. Dr. Romansky also examined the respective vocations and avocations of the plaintiffs. The husband was actively involved in the martial arts for at least 30 years as a student and instructor. This included place kicks to the hips and floor impacts on the hips, both of which provided the requisite mechanics and mechanism for the long term development of avascular necrosis of both femoral heads and the pathology for low back disc herniation. The wife spent 12 years performing janitorial and cleaning services work for institutions that subjected her to ergonomic stressors that provide the requisite mechanics and mechanism for producing musculoskeletal disorders involving the claimed injuries to the back and shoulders.

The case went to trial where Dr. Romansky explained his analysis and presented his findings and opinions to the jury. The jury awarded a verdict for the defendant.

RECONSTRUCTION AND ANALYSIS OF A LOW SPEED, REAR-END COLLISION. (Work performed on behalf of the defendant.) The plaintiff was the restrained driver of a vehicle that was struck in the rear in a low speed collision. The plaintiff claimed a right knee anterior cruciate ligament tear and medial meniscus tear.

Dr. Romansky performed a reconstruction of the "Second Collision", focusing on the plaintiff's kinematics, body segment loading, and injury mechanics and mechanism. The plaintiff described that her body was first forcefully propelled forward into the windshield with her right knee striking the instrument panel. Among other issues examined, the body kinematics in a rear-end collision are first rearward, away from the windshield, not forward into the windshield. And any rebound from the seat back is effectively mitigated by the three-point restraint system. The collision provided no mechanism or mechanics for the plaintiff's claimed injuries.

The plaintiff was actively involved in sports. She reportedly jogged 6 to 8 miles per day, seven days a week. She played tennis regularly. In addition, she regularly snow skied each year in Colorado. The plaintiff's aggressive activities of jogging, tennis, and snow skiing provide the requisite mechanics, mechanism, and causation for an anterior cruciate ligament tear and a meniscal tear, both of which would had to have preexisted the subject collision.

A deposition/trial notebook was prepared. No deposition was taken of Dr. Romansky. Approximately two years later, the case was settled for a reported amount that was less than the cost of a five (5) day trial.

RECONSTRUCTION OF AN ACCIDENT WHERE AN OPERATOR WAS OVERRUN BY A FARM TRACTOR. (Work performed on behalf of the defendant.) The operator of a farm tractor with attached mower was fatally injured when he was overrun by the tractor and mower. The tractor was owned by the owner of the orange grove. He had hired the deceased worker to cut grass in the grove. At issue in the case was the claim that the deceased worker had fallen off the tractor while mowing, and that the fall was the direct result of the tractor having been defective and unreasonably dangerous inasmuch as the owner had not retrofitted it with a seatbelt (for the operator to use) and a Roll Over Protective Structure (ROPS).

Dr. Romansky (assisted by John Leffler) performed an analysis and reconstruction of the accident focusing upon the interaction and involvement of the operator with the tractor and its controls from the perspective of biomechanics and human factors. A human surrogate was used to facilitate the analysis. The plaintiff's expert testified that the deceased had fallen from the tractor while mowing, and that the fall would have been prevented if a seatbelt had been available for use at the time.

Dr. Romansky concluded from his analysis that the deceased did not fall from the tractor while mowing. Instead, the likely cause of the accident was a fall by the deceased that occurred while he was in the process of mounting or dismounting the tractor while it was stopped. During this fall, attempts at recovery likely led to the decedent accidentally grabbing the nearby shift lever for support. In so doing, the lever would pull the tractor into first gear, causing it to suddenly jerk and drive forward over the decedent. The accident occurring in such manner would preclude the use or need of a seatbelt to have been worn, even if one were available at the time. Consequently, the absence of a seatbelt and ROPS cab was irrelevant and presented no causal connection whatsoever to the accident.

The case went to trial where Dr. Romansky explained his analysis and presented his findings and opinions to the jury. The jury awarded a verdict for the defendant.

ABOUT THE AUTHOR

Dr. Romansky earned his engineering degrees from West Virginia University including a Bachelor of Science, Master of Science, and Doctorate (Ph.D.). His Ph.D. program included two years of training in Basic Medical Sciences in the School of Medicine. He also received a Law Degree from Duquesne University.

Dr. Romansky has undertaken extensive professional continuing education and specialized training in the field of biomechanics. His other credentials include being certified by the American College of Forensic Examiners as a Medical Investigator: CMI-V Certification #20809 Level 5 - Highest Level, by written examination. His full resume is available at www.forcon.com under the Pennsylvania office.

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FORCON's Biomechanics Team

In addition to Dr. Romansky, FORCON is proud to have as part of our Biomechanics Team the following individuals:

Jeffrey A. Pike

Mr. Pike retired from Ford Motor Company as a Senior Technical Specialist in Injury Mechanisms and Biomechanics. He has been a Society of Automotive Engineers (SAE) Instructor on Automotive Safety for 23 years and has authored 3 SAE textbooks on injury mechanisms and forensic biomechanics. He has been a consultant to the National Academy of Sciences, NHTSA, CDC, and state and local governments. He is also an Adjunct Professor of Biomedical Engineering at Wayne State University. He is an SAE Fellow and has been a consultant to the National Academy of Sciences, NHTSA, CDC, and state and local governments. His full resume is also available at www.forcon.com under the Michigan office.

Mr. Pike has presented a 2 to 3 hour seminar on The Effective Use of Biomechanics Consultants to the Georgia and Kansas Defense Lawyer organizations. The seminar introduces the specialty of biomechanics and provides examples of topics addressed by biomechanical testimony including whiplash, intervertebral discs, carpal tunnel, rotator cuff and anterior cruciate ligament (ACL) complaints. The seminar concludes with a discussion of how and when to utilize a biomechanical consultant. If you would like to have this seminar presented to your organization, please contact Bill Ver Eecke at bvereecke@forcon.com.

John P. Leffler, P.E.

Mr. Leffler is a licensed Professional Engineer (Mechanical) in six states and a Board Certified Diplomate in Forensic Engineering through the National Academy of Forensic Engineers. He is a member of several ASTM Technical Committees, including F13 (Pedestrian/Walkway Safety & Footwear), and speaks frequently on slip resistance testing and other extrinsic analysis methods. He also specializes in codes/standards compliance analysis and technical literature research. Mr. Leffler has extensive product design experience, teaches product design at Georgia Tech, and is an ASE Certified Automobile Technician. His full resume is also available at www.forcon.com under the Atlanta office.

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