

Profiteering in Red-Light Camera Engineering

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A red-light camera is mounted on a pole facing a signalized traffic intersection. When a vehicle enters an intersection on a red light, the camera photographs the vehicle and its license plate number. The computer system behind the camera looks up the license plate number in the State's DMV vehicle registration database and mails a ticket to the vehicle owner. The vehicle owner is expected to pay the ticket. This article addresses the engineering relationship between red-light cameras and traffic signals, and engineering malpractice which generates billions of dollars in profits for red-light camera companies and the governments with whom they partner.

To understand engineering malpractice in the context of red-light cameras, one must understand introductory physics and how it relates to the problem of the yellow traffic signal light. Introductory physics textbooks begin with Isaac Newton's laws of motion. Newton's second law, $F = ma$, relates distance, time, velocity and acceleration. One equation derived from $F = ma$ is *rate $\times$ time = distance*. The first duty of engineers, employed by governments and red-light camera companies, is to conform

their practices to the laws of physics. Conformance is embodied in engineering practice statutes, articles, codes and regulations. If the traffic signal's yellow light duration conflicts with Newton's second law, even when those conflicts are industry standards and/or federal regulations, it is engineering malpractice and a breach of an engineer's professional responsibility. As a general rule, violating a state statute imposes civil or criminal liability in every state. All state engineering statutes embody the indisputable laws of physics, and therefore, an engineer's breach thereof is unequivocally engineering malpractice.

Red-Light Camera Industry Exploits Math in Opposition to Newton's Laws of Motion

Billions of dollars in tickets around the country are the outcome of enforcing red-light camera violations where the traffic signals' yellow light durations are too short according to Newton's second law. When drivers see a light turn yellow, they must have the *distance* to stop comfortably or *time* to travel toward the intersection and enter the intersection before the light turns red. But traffic engineers systematically calculate yellows that are too short to provide this stop-or-go option for all reasonable vehicle motion. Traffic engineers create a dilemma zone¹ – a segment of roadway upstream from the intersection, such that if drivers are in it when the light turns yellow, the drivers are consequently forced into running a red light. Red-light camera companies intentionally and knowingly install their red-light

photo-enforced cameras on intersection approaches where yellow-light durations are furthest from conformity to the aforementioned Newton's law.

Drivers run red lights mostly because of engineering malpractice, not because they intend to do so. For example, with 15 red-light cameras and 8 years of enforcement, the Town of Cary, North Carolina issued more tickets than its population. That is 136,957 tickets². At \$50 per ticket, the revenue was about \$7 million dollars. Larger cities make far more money. The City of Chicago has made over \$1 billion.³ Suffolk County, New York—at the east end of Long Island--made \$31 million per year.⁴ Nassau County, New York—at the west end of Long Island, makes \$48 million in one year.⁵ The State of California makes \$160 million per year.⁶

Differences in revenue result from variations in the misapplications of Newton's law of physics and how much a municipality charges per violation. As for the latter, in North Carolina, each violation is \$50 with no insurance points. In California, each violation is about \$490 and applied insurance points.⁷

ITE Yellow Change Interval is Always a Dilemma

Violating Newton's universal laws of physics⁸ is carried out by engineers intentionally, knowingly, recklessly or negligently, by using the Institute of Transportation Engineers' (ITE) yellow change interval practice⁹. ITE began publishing the practice in 1965.

The yellow change interval is the engineer's term for the duration of time the steady yellow light appears on a traffic signal. The practice is an algebra equation with a couple of input constants for human factors. But the algebra is wrong. The algebra conflicts with Newton's second law. And the input constants are wrong. The value for a driver's perception-reaction time when seeing a yellow light is wrong. And the value for a driver's comfortable deceleration is wrong. ITE sets these two human factors to 50th percentiles. The 50th percentiles exclude *half* the driving population. When an engineer finishes using the ITE practice, he causes entire city populations of drivers to run red lights. If the engineer further shortens yellows, he quickens the pace in which populations run red lights. Because the ITE practice contains simple misapplications of physics, anyone, including red-light camera company employees, can manipulate and predict which intersections will generate the most money.¹⁰

Red-Light Cameras Target Safe drivers, Not Unsafe Drivers

The red-light camera sector markets red-light camera tickets as being issued to unsafe drivers and pushes the notion that cameras improve driver behavior. However, red-light cameras target safe drivers and do not improve driver behavior. 70% of red-light violations are sub-second incursions into the red.¹¹ These violations are safe and occur so soon after the light turns red, that no human observer

can discern whether the vehicle ran a red light.¹² Also, Suffolk County reported that for every 100,000 red-light violations, 99,888 are safe.¹³

As for improving driver behavior, the data does not bear it out. Red-light running rate continues at red-light camera intersections unabated, which is why cameras remain at the same intersections for decades. When traffic engineers make no adjustments to traffic signals and traffic patterns remain constant during the operation of the red-light cameras, the cameras continue to add dozens of rear-end collisions while possibly preventing a couple of T-bones. Drivers react to the presence of a camera by slamming on their brakes more often in order to avoid a ticket.

Flawed Red-Light Camera Safety Reports

Published reports by red-light camera companies and governments about the safety effectiveness of red-light cameras foster engineering malpractice by ignoring the scientific method. The scientific method provides a structured and objective approach to conducting research, minimizing bias and ensuring the reliability and reproducibility of results. Red-light camera reports, in contrast, begin with the biased hypothesis that bad driving causes crashes, the assumption that crashes are the same thing as red-light violations, and follow with a specious statistical analysis based on the falsehood that the sole cause of red-light running is random driver behavior. The reports disregard control variables

such as the yellow change and all-red clearance intervals which radically affect red-light running and crashing. The only consistency among red-light camera safety reports is their inconsistency. Inconsistency is a red flag in the scientific method. It means that the hypothesis is false. Accurate reporting would recognize the inconsistency, acknowledge that bad driving is not causing red-light running and propose a new hypothesis that bad engineering is to blame. The authors of red-light camera reports neither recognize nor follow through on a new hypothesis.

Three Controlling Statutes

The trifecta of statutes which bind Newtonian physics to man-made laws begins with the Manual of Uniform Traffic Control Devices. The MUTCD is an engineering requirements specification book published by the Federal Highway Administration (FHWA). The MUTCD is also a federal regulation: 23 CFR 655 Subpart F. MUTCD section 4D.26-03 *requires* that the “yellow change interval must be determined by engineering practices”. Next in the trifecta are state vehicle and traffic laws. State vehicle and traffic laws make the MUTCD legally binding in the state. The last part of the trifecta is the state’s engineering practice statute. The statute defines an *engineering practice* as the application of the mathematical and physical sciences.^{14,15}

Every DOT uses the ITE practice, but the ITE practice we addressed earlier, conflicts with the requirements of the trifecta. The ITE practice is *misapplications* of the mathematical and physical sciences, and therefore is not an engineering practice. Traffic engineers breach the engineering practice statute by adopting the ITE practice, and consequently breach state vehicle and traffic law and the federal MUTCD by using the ITE practice to determine yellow change intervals. When a licensed professional engineer derives math or adopts incorrect math from any source--private, public or government, intentionally or even unwittingly--and writes it on his certified plans or reports, he becomes legally liable for its errors and omissions. Those who hire and employ engineers, whether it be the red-light camera company, the municipality or the state department of transportation, facilitate the engineers' malpractice.

Engineering Accountability

Holding those accountable for red-light camera profiteering based upon engineering malpractice is challenging. In *Ceccarelli v. Town of Cary, 10-CVS-19903*, traffic engineers pointed out that they were just following the North Carolina Department of Transportation's (NCDOT) standards. The NCDOT points to ITE's or the Federal Highway Administration's (FHWA) guidelines. The FHWA points its finger back at ITE. It is a vicious circle. In the end, the licensed professional engineer is ultimately responsible for

properly applying engineering principles. By law, the licensed professional engineer has taken “responsible charge” for his own engineering plans and reports. When he avoids the responsibility of checking the math and science, he violates the state's rules of professional conduct. It is submitted that engineers carry out the red-light camera scheme on behalf of the red-light camera companies and government, all of whom are complicit in a revenue-generating bonanza.

Standard of Care v. Standard of Practice

Cases are lost when an attorney does not know how to rebut the defense’s assertion that the government’s traffic engineer is “merely adopting the standard of care”. The standard of care assertion is usually correct for judging the acts of licensed professionals, but the argument fails when applied to the ITE practice. The ITE practice is *not* a standard of care. It is a standard of *practice*.¹⁶ This is a crucial distinction. The ITE practice does not rise to the minimum requirements of a standard of care under engineering law. One cannot use $2 + 2 = 3$ as a standard of care. An engineering practice must be a correct application of mathematics, not a collection of math mistakes. Even ITE itself does not declare its own practice as an engineering practice.

Unlicensed Practice of Engineering

Unlicensed practice of engineering by red-light camera companies is common in the photo-enforcement industry. Practicing engineering without a license is as wrong as practicing medicine without a license. In *Luke v. Francesco Guilietti and Michael Anslem*, Index No 610732/2015 and *Fearrington v. City of Greenville*, 19-CVS-1217, we discovered that because red-light camera installation plans contain engineering structures which affect public safety, the plans must be signed, sealed and dated (that is, certified) by a professional engineer licensed in the State where the red-light cameras are to be installed.^{17,18} Most states also require the red-light camera company to have a license or certificate of authority to practice engineering. However, we found that in New York, North Carolina, Colorado and Louisiana, that red-light camera companies, engineering subcontractors¹⁹ and “engineers” did not have licenses, or had licenses yet did not sign the plans or signed the plans but did not have responsible charge.

Suffolk County Red-Light Camera Program Ends

Suffolk County’s red-light camera program began in 2009 and ended on December 1, 2024. Citizens objected to the program’s many injustices including the program’s impact on increasing crashes, the program’s unlicensed practice of engineering, the program’s obligation to meet ticket quotas and the program’s unlawful collection of administrative fees. Litigation resulted in a legal judgement against

Suffolk County (*Robert McGrath v Suffolk County*–Index #608155/2016) and the end of Suffolk County’s red-light camera program.

North Carolina Red-Light Camera Programs End

At one time, North Carolina boasted 20 red-light camera programs. In July 2025, North Carolina’s last red-light camera program ended. When it was demonstrated that the programs conflict with the state’s engineering practice law or the state’s fines-and-forfeiture requirements, the cities ended the programs. The final blow came from the NCDOT itself. In 2023, NCDOT wrote an effective piece of legislation that restricts red-light camera programs to ticket only unsafe drivers. “But that prevents a RLC program from issuing enough citations to recover program operating cost”, wrote Raleigh’s city manager in March 2024, who then immediately terminated Raleigh’s red-light camera program.²⁰

Future Litigation

Personal injury law and the law enforcement approach to auto collisions is to attribute fault to drivers. However, red-light running collisions at the outset should also be investigated as the result of traffic engineers and red-light camera companies neglecting fundamental engineering principles. A departure from accepted standards of care, including basic engineering principles in the context of traffic

signal timing and red-light camera photo enforcement, can lead to serious personal injuries and wrongful death. At the early stages of an investigation, while eliminating all triable issues of fact, the attorney must consider the engineering malpractice for the reasons discussed herein.

It is our hope that in bringing attention to red-light camera profiteering, personal injury and class action law firms will challenge red-light camera programs and short yellow lights based upon engineering malpractice. The proper foundation is math²¹ which attorneys and engineers need to learn to combat red-light camera injustices and profiteering.

Notes: You may download the references from <https://ceccarelli-pe.com>

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