The TDLA Annual Meeting will be held at the beautiful and historical **Peabody Hotel on September 20-22, 2017**. Co-Chairs **Nathan Shelby** of Rainey Kizer Reviere and Bell and **Hank Spragins** of Hickman Goza & Spragins are planning an amazing CLE program and Past President’s reception in Memphis. The general format of the meeting will begin on Wednesday night with a Past President’s reception, education will be Thursday and Friday mornings, the conference will end Friday at noon. Golf will be Wednesday afternoon at The Links at Galloway. In addition, **Nan Steer** of Leitner, Williams, Dooley & Napolitan and **Chris Frulla** of Rainey Kizer Reviere and Bell are planning a **Young Lawyers Boot Camp** for Thursday afternoon of the conference, which is guaranteed to be the best young lawyers boot camp in the state!

**To reserve your room**, call **1-800-PEABODY** and mention the TN Defense Lawyers Association rate of $210. Deadline for group rate is August 30, 2017. Watch for our conference mailer coming soon!
In this article, traffic intersection expert, Gordon Meth, P.E. discusses traffic signals within the context of motor vehicle crashes. His discussion includes a short history of signalized intersections, ways in which signal technology can reduce accidents, and issues with traffic signals that sometimes contribute to the cause of crashes.

INVESTIGATING TRAFFIC SIGNAL PERFORMANCE IN MOTOR VEHICLE CRASHES

Traffic signals are a significant part of our transportation infrastructure. A 2012 report estimates there are 311,000 signalized intersections in the United States\(^1\). Although signalizing an intersection often reduces some types of vehicle crashes, shortcomings in signal technology and errors in design and implementation sometimes contribute to the cause of intersection crashes.

Pedestrians and cyclists represent two of the groups that are most frequently injured in signalized intersections. Of the more than 2,600 fatalities per year\(^2\), nearly one third involve these vulnerable groups.

Driver error; the failure of signal equipment to adequately detect vehicles, bicycles, or pedestrians; and signal desynchronization are all leading causes of crashes in signalized intersections. To understand the scope of these issues, it is necessary to first understand the evolution of signal technology.

The Evolution of Signal Technology

The first traffic signal in the United States was installed in 1914 to replace a police officer who directed traffic. Recognizing its origins as a replacement for a police officer, the first purpose of a traffic signal is to assign the right of way to specific vehicles or pedestrians.
Traffic signals were initially controlled by an electro-mechanical controller with a dial (similar to old style residential light timers). In the 1970s, these began to be replaced by computerized traffic controllers. With this change, a device called a conflict monitor was introduced to ensure that cross-streets do not see green simultaneously (if that happens, the conflict monitor causes the signal to go into flash mode). Although some electro-mechanical signals are still in operation, particularly in older cities, most signals now have computerized controllers and conflict monitors.

As traffic signals evolved, detection technology was added so that cycle lengths could be adjusted to improve traffic flow and reduce wait times. Detection was originally achieved via pressure plates in the roads, but this technology began to be replaced in the late 1960’s with loops in the roadway that created electro-magnetic fields. Today, many agencies have replaced loops with video detection, microwave detectors, infra-red detectors, or other technologies. When vehicle detection was introduced and signal timing became variable, it became necessary to detect pedestrians waiting to cross. This was accomplished by adding push buttons.

As a result of the advanced technology, the cost of constructing a typical signalized intersection is now in the hundreds of thousands of dollars. Given this high cost, traffic signals of all ages and vintages can still be found in active use today, leading to a great disparity of features and technology. Not only have design standards evolved over time to improve safety and efficiency, but there are substantial differences between the minimum standards and optimal design of intersections.

**Safety Issues at Signalized Intersections**

Traffic signals add an additional layer of complexity to roadway safety. The combination of varying technologies, the reliance on uninterrupted power supply, and the failure of many systems to adequately recognize pedestrians and cyclists frequently contributes to the cause of crash events.

**Driver Error at Signalized Intersections**

Driver error is a contributing circumstance in many traffic crashes at signalized intersections. Intersection factors that can increase the frequency of driver error include poor placement of traffic signal heads, poor alignment of lanes through intersections or crosswalks, complex traffic signal phasing, environmental factors that make it difficult to judge gaps in on-coming traffic, and distractions in and around the intersection. Where roadway alignment/geometry is poor or traffic signal phasing is complicated, providing positive guidance to users of the intersection is crucial.
Signal Timing – Vehicle Clearance Interval

The term ‘vehicle clearance interval’ refers to yellow and all red time (the time after one direction goes red and before the other direction goes green). Yellow times are meant to tell traffic that a conflicting phase is about to start. The time should be set based on the speed of traffic. The function of the all red time is to allow traffic to clear the intersection before releasing other traffic. Considerations include the size of the intersection and the speed of traffic. Improperly timed clearance intervals lead to many crashes. Since 2009, it has been required that yellow and all red times be set based on engineering practices.

Maintenance Issues at Signalized Intersections

Although rare, the maintenance state of traffic signals can be the cause of traffic crashes at signalized intersections. Traffic signals rely on electrical power and sometimes the power is out at intersections, leaving them dark. At other times, individual signal indications may have burned-out. Damage caused by weather events or un-reported strikes by trucks or buses can cause traffic signals can be “turned”.

All of these factors can contribute to users misunderstanding indications. Establishing the maintenance condition of an intersection at the time of a crash is of vital importance.

Pedestrian Strikes at Signalized Intersections

Crashes involving pedestrians at traffic signals often involve pedestrians not crossing on walk indications, or pedestrians not being seen by turning vehicles. Poor street lighting can also be a contributing factor to pedestrian crashes at intersections. Many signalized intersections are not designed to accommodate pedestrians on one or more approaches, thus further complicating the situation.
Over time, the addressing of pedestrian needs at traffic signals has evolved, particularly with respect to disabled individuals. The Americans with Disability Act Access Guidelines (ADAAG), which were first implemented in 1990, imposed some requirements on traffic signals. These have been substantially updated and replaced in the proposed Public Rights of Way Access Guidelines (PROWAG), which has not been officially adopted at the time of this writing (6 years after introduction). Even though PROWAG has not been adopted as of yet, approximately 43 states have already incorporated them into their standards. Talking push buttons for the visually impaired are a key requirement of PROWAG. Other pedestrian enhancements over time have been: push button evolution, increased crossing time requirements, and count-down pedestrian signals.

Vehicle-Bicycle Collisions at Signalized Intersections

Cyclists at signalized intersections are a particularly vulnerable group. Similar to pedestrian incidents, crashes at intersections involving cyclists often involve turning vehicles or cyclists not respecting traffic signals. The complicating factor is that cyclists are typically in the roadway rather than the crosswalks. Given the proliferation of mini-vans, sport utility vehicles, and pick-up trucks, drivers’ view of cyclists is frequently obstructed by larger vehicles leading up to the time of impact; combined with the fact that traffic signal times are not always adequate for cyclists to clear the intersection, makes intersections a particularly hazardous place for cyclists.

In response to the high frequency of cycling incidents in intersections, California implemented rules in 2014 that require traffic signals to set green times to be adequate for cycles at all times if cycles cannot be separately detected at traffic signals. Other states are likely to follow suit.

Forensic Investigation of Crashes at Signalized Intersections

When conducting a forensic investigation of a crash at a signalized intersection, obtaining and reviewing the police report is typically the starting point, as it will provide several details regarding the crash. Most states have adopted standard crash reports that provide a large amount of information that is fed into traffic safety management systems. Environmental information such as time of day, weather, lighting conditions, visibility, roadway surface condition, and intersection operation can all be found on the police report, as well as witness statements and collision diagrams.
Inspection of the site as soon as possible is ideal. While tools such as Google Earth/Street view are useful, it may not be possible to read every traffic sign or see every detail. Further, these tools have associated image dates, and the information contained in the system may not reflect incident conditions at the time of the crash.

Obtaining intersection plans and traffic signal timing directives (the order and durations of greens, yellows, and all reds) is important information when the operation of the signal is in question. It is also important to establish if the traffic signal timing directive was actually in effect at the time of the crash, and whether changes have been made since the time of the crash.

If there is a suspected defect in the traffic signal design, it may be important to determine the date that the traffic signal installation was last modified, so that the design standards and requirements in effect at that time can be reviewed.

**AUTHOR**

Gordon Meth, P.E.

Civil Engineer & Highway Engineering Expert

Gordon is a recognized authority in the design of intersections with traffic signals. He has designed over 350 such intersections, served as resident engineer in the construction of over 50 such intersections, and developed signal timing plans for over 800 such intersections. As an expert at Robson Forensic, Gordon applies his expertise to the investigation of motor vehicle crashes and other transportation infrastructure disputes.

**SOURCES**


Membership News and Upcoming Events

- TDLA welcomes all of our returning Members!
- **TDLA Renewal invoices** have been emailed to you. If you need a paper invoice mailed to you, please send an email to office@tdla.net.
- TDLA Employment & Workers’ Compensation section will present a webinar on August 22, 2017. Employment Law Section Co-Chair Marcia McShane, employment law mediator and attorney at Constangy, Brooks, Smith & Prophete, LLP, will present next month’s webinar: "The Maddening Defense of Mental Health Claims - Diagnosing the Malady & Dissecting the Methods" on Tuesday August 22nd, at 12pm CST/1pm EST. Marcia will provide valuable tools for use while defending cases involving mental health claims. Webinar topics will include:
  - Must-Have information for an effective defense;
  - Spotting an improper mental health diagnosis;
  - The criteria and proper method(s) for the assessment of impairment; and
  - Identify strong points of attack for use during expert depositions.

**Upcoming Events:**

**TDLA Employment & W/C Section webinar**- August 22, 2017 [click here to register!]
**TDLA Annual Meeting**- September 20-22, 2017 - The Peabody Hotel, Memphis, TN - reservations may be made by calling 1-800-PEABODY and mentioning the TDLA group rate. Deadline for group reservations is August 30.
**DRI Annual Meeting** - October 4-7, 2017 - Sheraton Downtown, Chicago, IL
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