Accident Reconstruction At Traffic Signal Intersections

A Manual for Law Enforcement Personnel, Accident Reconstruction Professionals, Traffic Engineers, and Forensic Engineers

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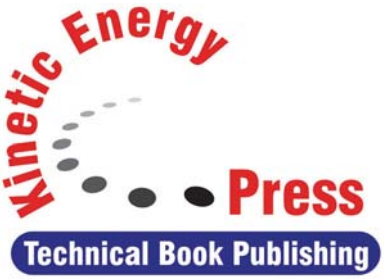

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1. INTRODUCTION

An attorney once asked me if the process of reconstructing an accident at an intersection with a traffic signal was any different than reconstructing one at an intersection controlled by a stop sign. My answer was immediate — yes! While it is true that many of the typical accident reconstruction concepts and terms are the same for both signalized intersections and unsignalized intersections, there are just as many that are unique to signalized intersections.

Traffic signals are complex electrical devices that provide visual indications to drivers, thereby indicating who has to yield the right-of-way at an intersection. The decision-making processes that are needed at stop sign controlled intersections in order to proceed — such as paying attention to who arrived first, vehicles approaching on the other streets, or who is turning in which direction — are removed from the driver's list of duties at a signalized intersection. It would seem that a traffic signal simplifies the decision making task.

Yet while the list of decisions may seem to be shorter on the surface, I would argue that the list actually becomes longer. Some of the decisions have even become more complex. For example, at stop signs the driver must stop. Period. At traffic signals, a driver can receive a yellow signal, forcing the driver to make a judgment call whether to stop or continue through the intersection. It is these judgment calls that often lead to collisions. And it is these collisions that need to be reconstructed to understand the actions at the scene.

This text is **not** intended to be an exhaustive book on the precise details that go into traffic engineering. It **is** intended to serve as a manual for reconstructing traffic accidents that occur at intersections controlled by traffic signals. Understanding how signals operate and the framework that likely was considered in their design is crucial for reconstructing collisions that occur at signalized intersections.

Chapter 2 leads the reader through an introductory discussion on roadway design with a focus on intersections. Traffic signals operate at roadway intersections, and thus roadway design and signal design share many common terms. Therefore, a basic

understanding of types of roadways and an explanation of key roadway design terms will be useful in later discussions about traffic signals.

Chapter 3 dives right into how traffic signals work. This section takes the reader through a quick course on applied traffic engineering for non-signal engineers. It provides definitions and descriptions of signal terminology and theory. Chapter 3 also discusses the standards by which traffic signals in the United States are designed.

Chapter 4 leads the reader into traffic signal timing. During an accident reconstruction it usually becomes necessary to create a timeline of pre-crash events. Traffic signal controllers often contain the base data needed to form such a timeline, provided the investigator understands how to use the data.

Chapters 5 through 9 present additional topics including traffic signal detection by traditional in-pavement methods and by video, as well as a discussion of signal preemption for emergency vehicles, transit, and railroads. Video monitoring at intersections is presented, and centralized computerized signal systems are discussed. As an aid to anyone not familiar with public engineering agencies, Chapter 9 also details how a typical agency might be staffed. This should guide you to the appropriate person who could assist with interpreting the operation of a traffic signal when an accident case needs to be investigated.

Chapter 10 presents the core of this manual. While Chapter 3 provides a solid foundation about signals, and chapters 4 through 9 present additional supporting materials, Chapter 10 applies this traffic engineering knowledge to reconstructing accidents. It is assumed that the reader has already completed basic accident reconstruction coursework and has some hands-on field experience. Chapter 10 takes a step-by-step approach to explaining the reconstruction process. The goal of this approach is to aid the reader when called to testify on his or her reconstruction by providing fast references to appropriate supporting material.

The methodologies used in Chapter 10 involve no computer simulations or animations. They make use of good, old-fashioned pencil and paper, and a simple calculator. People tend to understand concepts best when they aren’t required to stretch their imaginations too far outside their current circle of knowledge. Concepts

need to “feel” believable to them. If you can convince your audience that your opinions are based on principles and analysis that can be done on one or two sheets of paper and are in alignment with things they see in everyday life, the audience is more likely to understand and appreciate your opinions.

Chapter 11 puts into practice the ideas presented in Chapter 10. Learning new concepts and practices is helpful, but being able to actually apply the new knowledge is where the time you have invested in the learning process really begins to pay off. Case studies are an excellent transition from “book knowledge” to real life applications of the knowledge. The case study in this text often references materials in preceding chapters. This means that you as the investigator have a ready resource to support the methodologies you are using.

This is the first edition of this text. The reconstruction methods and traffic engineering explanations presented here are reliable and time-proven. As any experienced investigator knows, however, more than one way to solve any given case usually exists.

In this text, I have presented common “alternate” explanations for issues in the cases that are discussed. It would be foolhardy to think that I have been able to imagine and share with the reader every possible solution or explanation for every situation. It is here that I ask for your insight and help: if you discover something that has been missed, please let me know. I will consider it for inclusion in a subsequent edition of this text. My contact information is at the end of this book.

This text focuses on what takes place in the United States. International readers will need to take into account that this text may contain a few discrepancies from actual conditions in international locations.

Throughout the book, the reader will find italicized words. The first appearances of phrases, technical terms, and words with a special meaning in traffic engineering have been italicized for identification. These words and their meaning are listed in the Glossary at the back of the book. In addition these special words are indexed.

Finally, I would like to close this introduction with a word of caution. Many of us have encountered people who tell us "they may do it like that where you come from, but that's not how we do it around here." Traffic signal design concepts across the United States originate from one source: the Federal Highway Administration's *Manual on Uniform Traffic Control Devices* (MUTCD). Sometimes state and local jurisdictions follow the federal Manual for every detail, or they might have additional specifications unique to their locale. It is important for the investigator to build a relationship with a local public agency traffic signals engineer or technician. Asking a few questions now about "how we do it around here" will lead to a very smooth investigation later on.

Acknowledgements

At this point it is appropriate to offer sincere thanks to those who did the real work on this book. Janet Doughty, my editor, is responsible for making my rambling lecture-style drafts into a readable text. Her talent and dedication have been very much appreciated. Thanks go to Mark Dunzo and Fred Burchett for believing that I could, and actually would, stop working on accident and signals projects long enough to write this book. Their support has been invaluable.

Ashley Odom deserves huge thanks for interpreting my many sketches and for then producing all the illustrations that fill this book. Her sense of ownership in this project has been wonderful. A silent partner in this book project has been Bruce Friedman. Bruce is a former Chair of the National Committee on Uniform Traffic Control Devices (NCUTCD) Signals Technical Committee, and graciously agreed to be my "does this make sense" editor.

In closing, I wish to thank my original partner in this book. Many years ago Al Williford, my mentor, and I searched in vain for an authoritative manual on reconstructing accidents at signalized intersections. Every year Al and I talked about putting time aside to write this book. Every year we became busier serving clients and growing the forensics business, and we never wrote the book. In May of 2005 Al died suddenly. Al may not be here to put the words on the paper, but rest assured that many of these words you are about to read are his thoughts as much as they are mine.