

Steven J. Bellino
Traffic Accident Reconstructionist

California Traffic Specialists

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California Traffic Specialists

- California Traffic Specialists is a company that has integrated a wide variety of complex automotive, human, and biomechanical disciplines into a distinctive professional service. We specialize in the many technical aspects of traffic accident investigation, analysis, and reconstruction. Our highly distinctive professional services include:

California Traffic Specialists

Traffic Accident Reconstruction

Occupant Kinematics / Biomechanics

Vehicle & Occupant Dynamics

Human Factors

Vehicle Deformation Analysis

Motorcycle Accident Reconstruction

Bicycle / Pedestrian Reconstruction

On-Scene Accident Investigation

Criminal Vehicular Manslaughter Cases

Fraud / Staged Accident Investigation

Collision Scene Diagramming - CAD

Collision Scene Photography / Video Taping

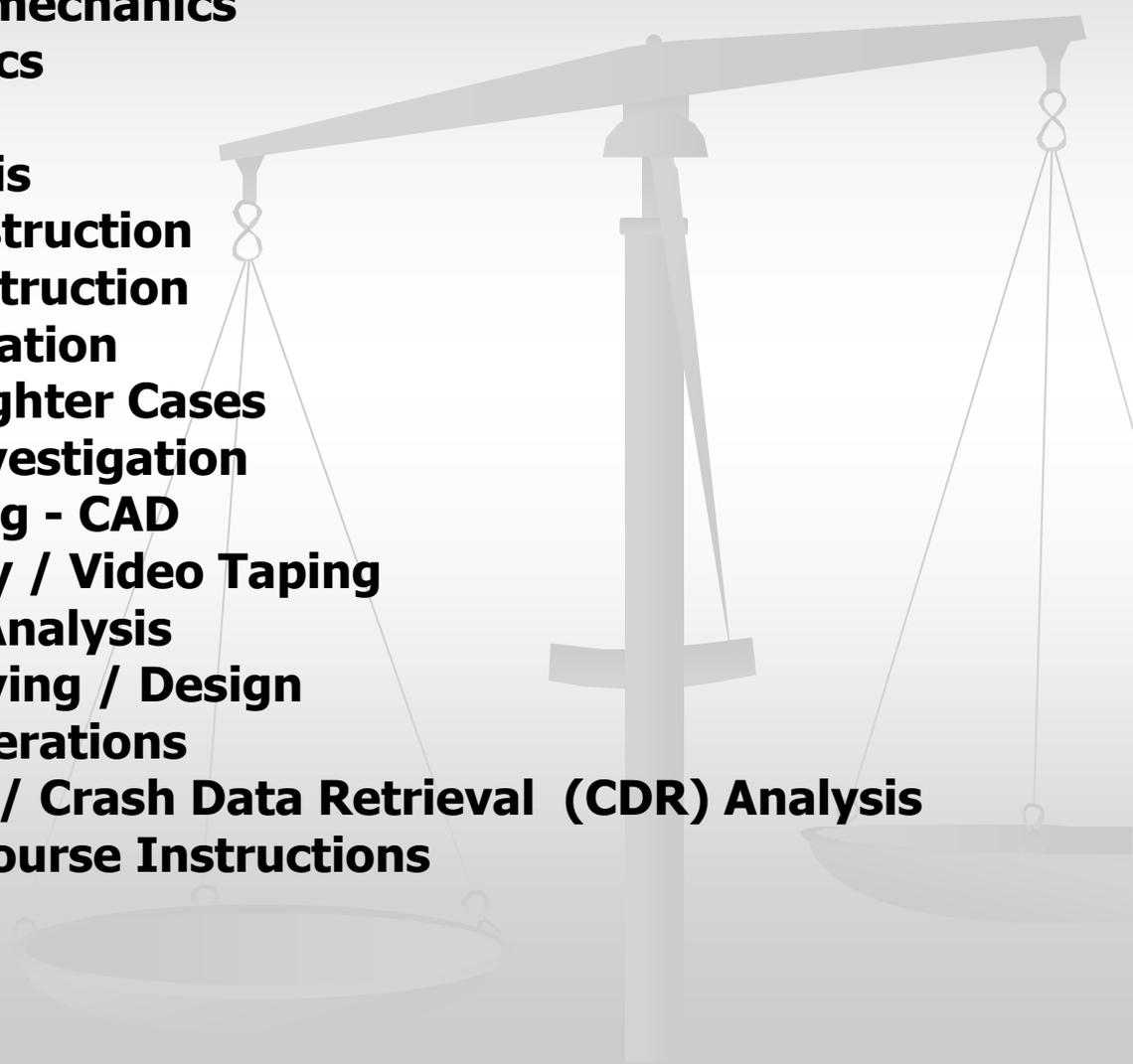
Seat Belt / Child Restraint Analysis

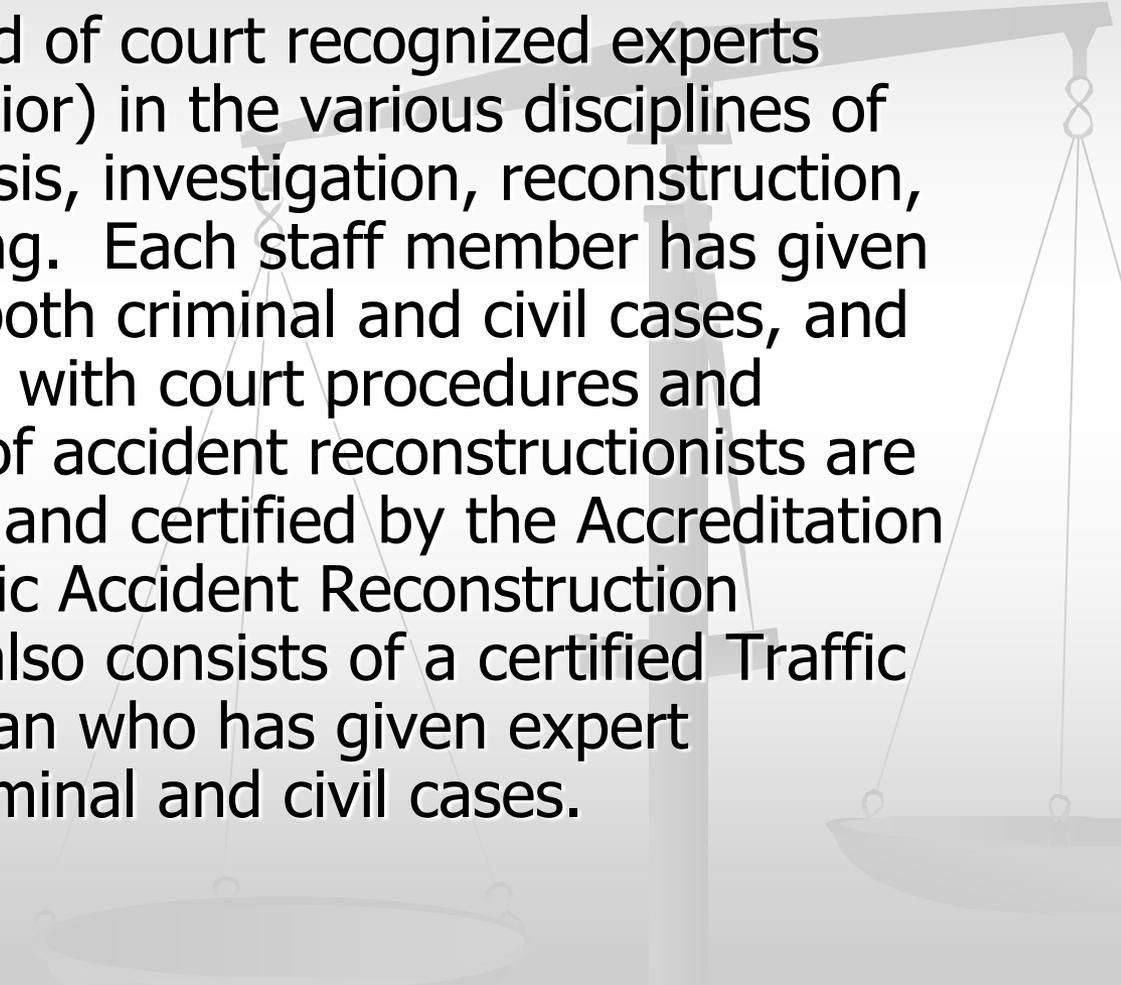
Traffic Engineering / Surveying / Design

Speed Surveys / RADAR Operations

Event Data Recorder (EDR) / Crash Data Retrieval (CDR) Analysis

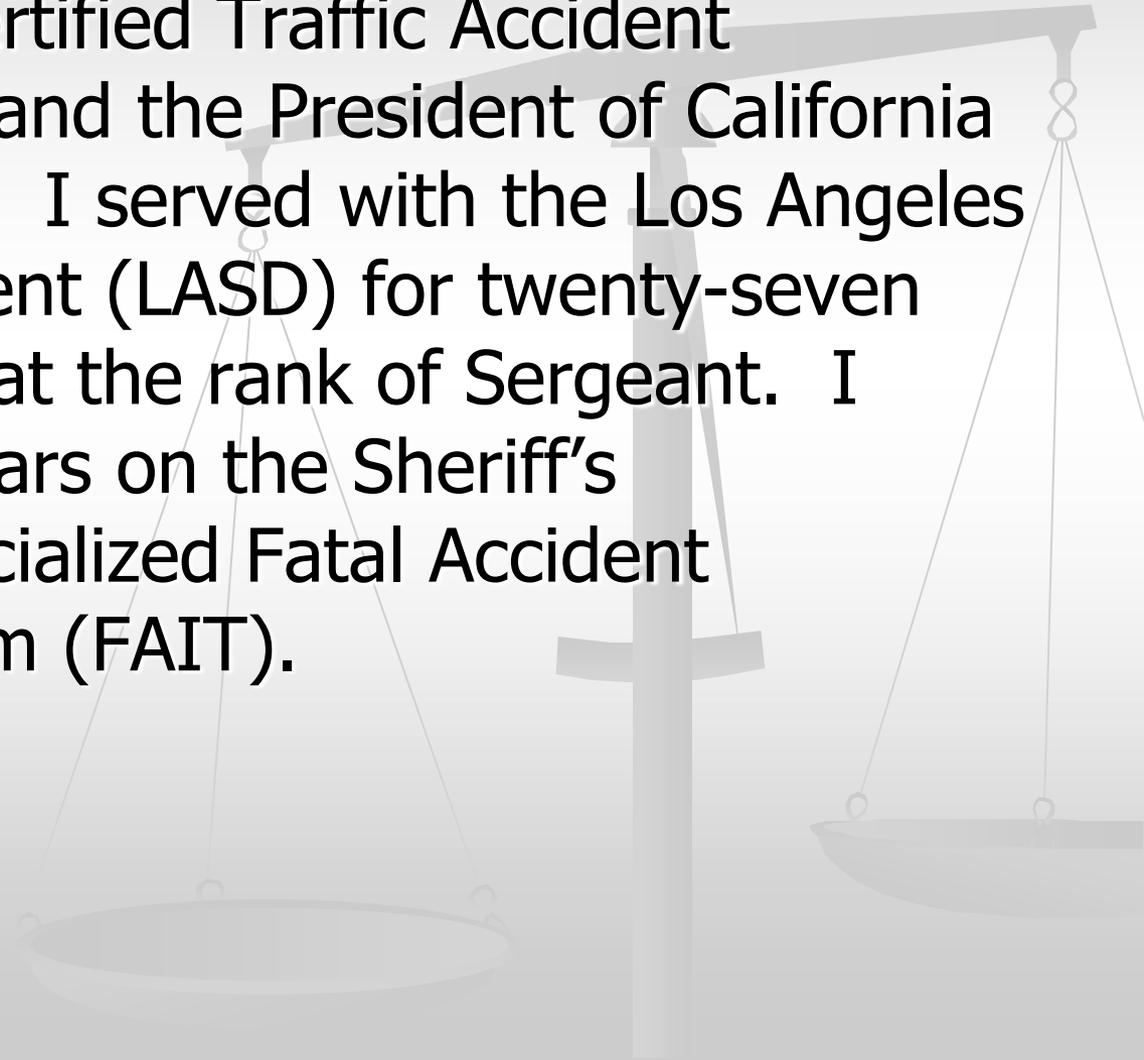
Defensive Driver Training Course Instructions

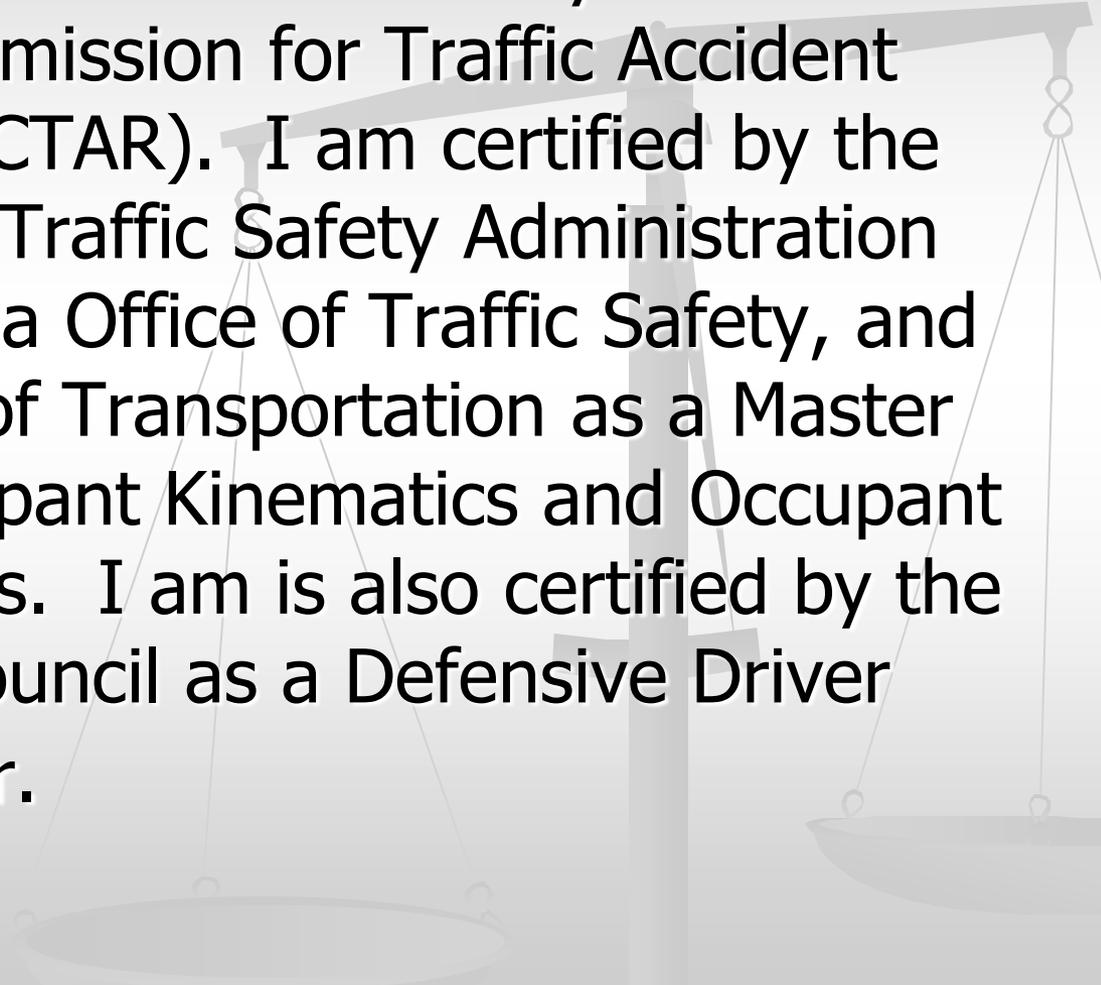


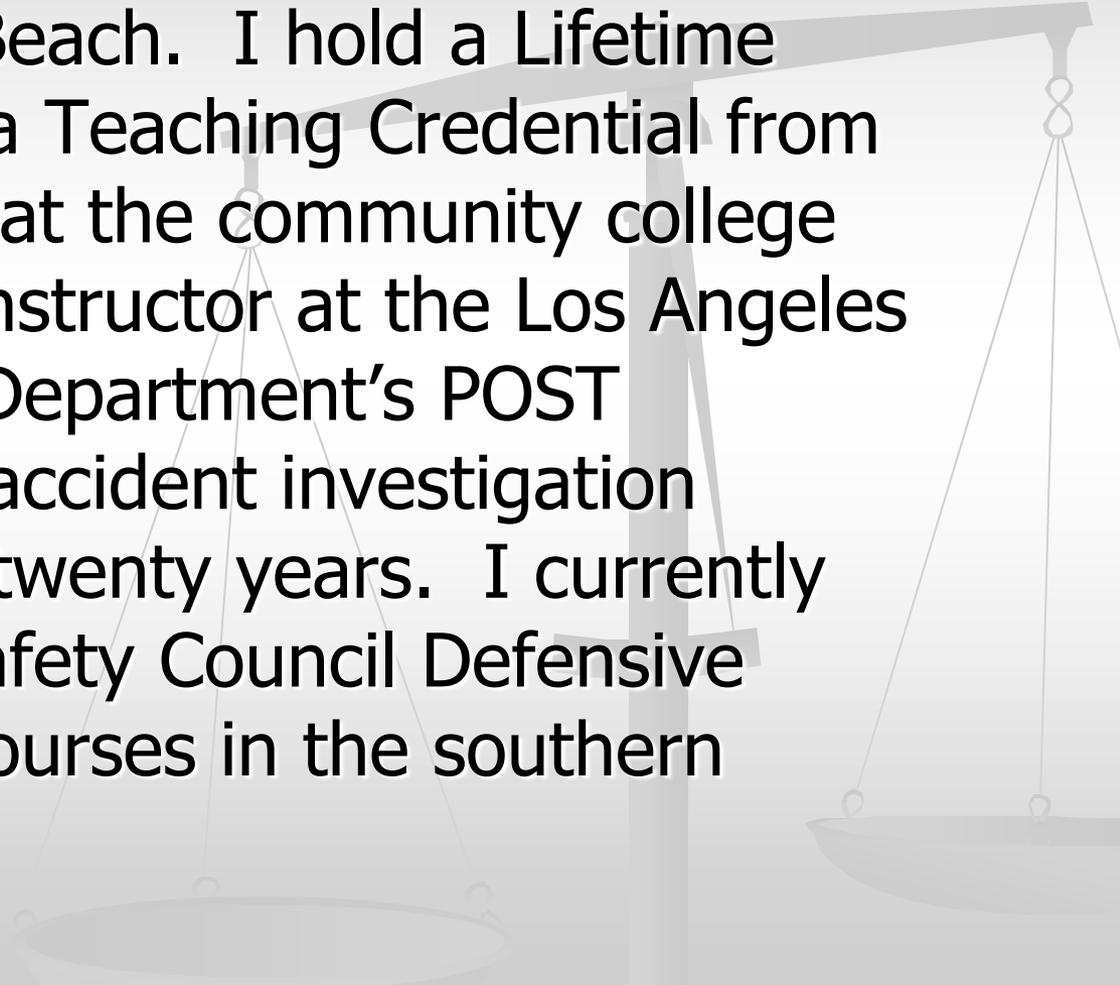
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- Our primary objective is to provide our clients with the highest quality of professional support in civil litigations, criminal litigations, and insurance claim investigations.
 - Our staff is comprised of court recognized experts (Municipal and Superior) in the various disciplines of traffic accident analysis, investigation, reconstruction, and traffic engineering. Each staff member has given expert testimony in both criminal and civil cases, and is thoroughly familiar with court procedures and decorum. Our staff of accident reconstructionists are nationally accredited and certified by the Accreditation Commission for Traffic Accident Reconstruction (ACTAR). Our staff also consists of a certified Traffic Engineering Technician who has given expert testimony in both criminal and civil cases.

STEVEN J. BELLINO
TRAFFIC ACCIDENT RECONSTRUCTIONIST

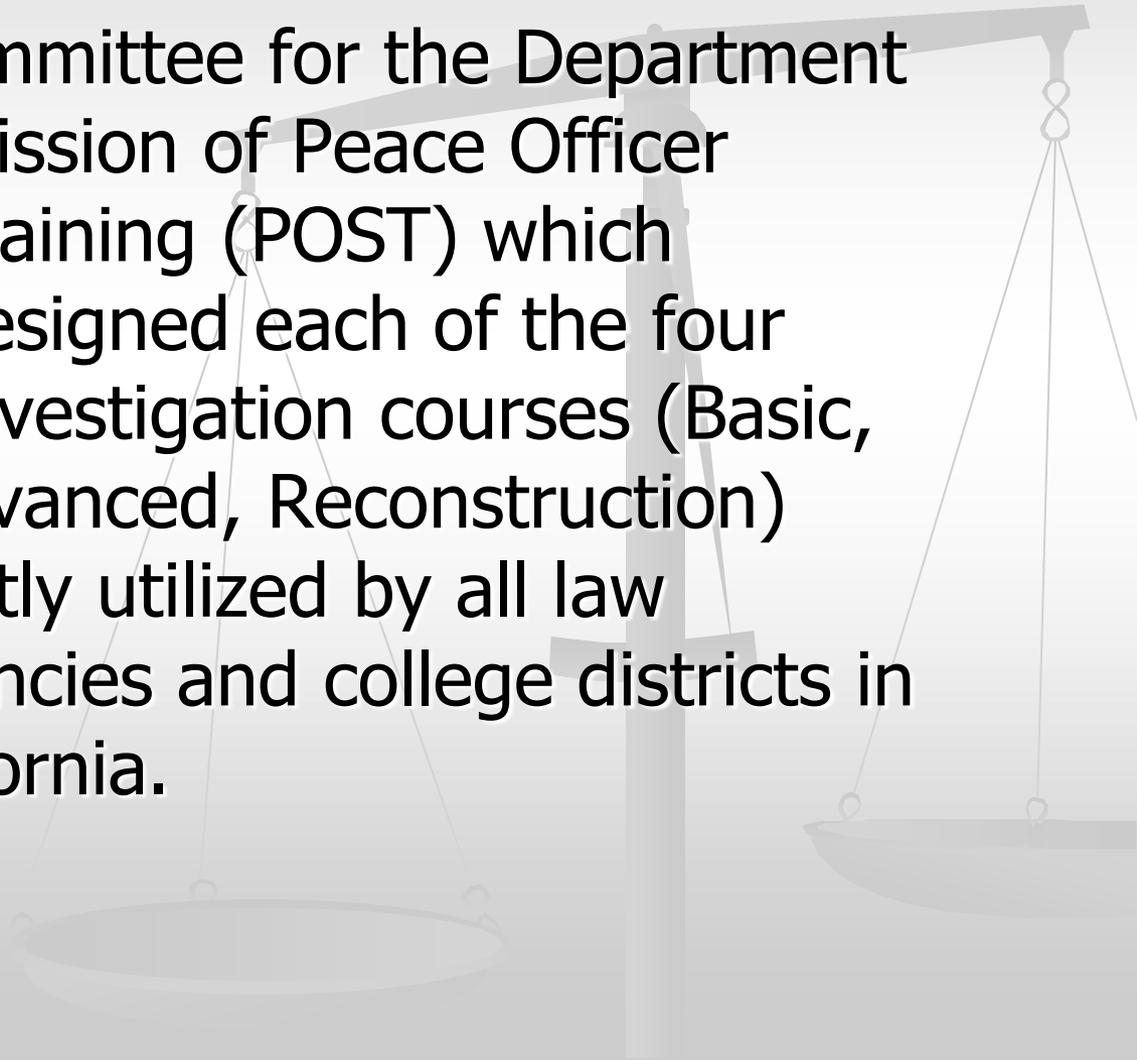
- I am Nationally certified Traffic Accident Reconstructionist and the President of California Traffic Specialists. I served with the Los Angeles Sheriff's Department (LASD) for twenty-seven years and retired at the rank of Sergeant. I served for four years on the Sheriff's Department's specialized Fatal Accident Investigation Team (FAIT).



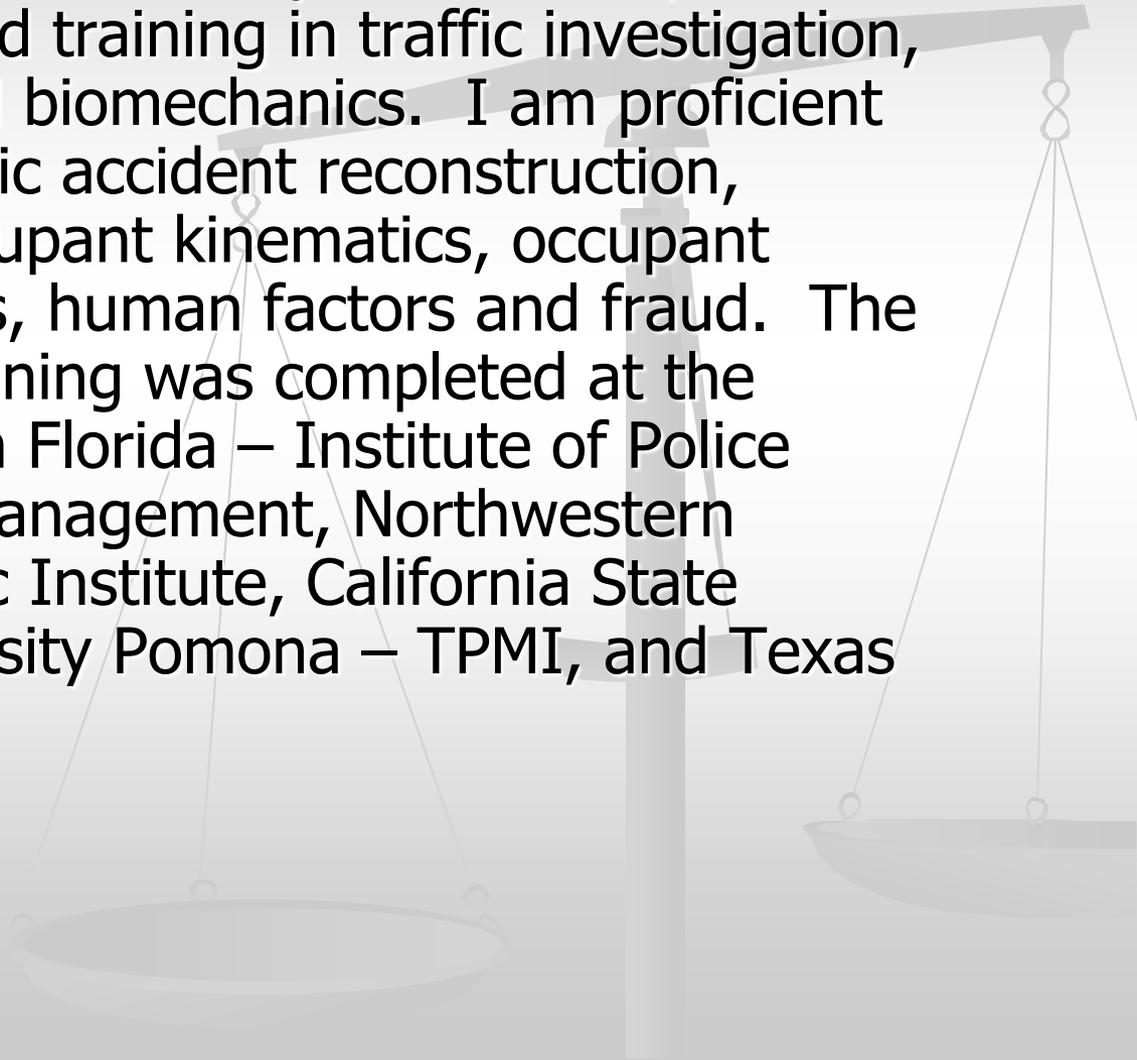
- I am nationally accredited and certified as a Traffic Accident Reconstructionist by the Accreditation Commission for Traffic Accident Reconstruction (ACTAR). I am certified by the National Highway Traffic Safety Administration (NHTSA), California Office of Traffic Safety, and U.S. Department of Transportation as a Master Instructor in Occupant Kinematics and Occupant Protection Systems. I am is also certified by the National Safety Council as a Defensive Driver Training Instructor.
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- My formal education includes a Bachelor of Science degree from California State University Long Beach. I hold a Lifetime State of California Teaching Credential from U.C.L.A. I teach at the community college level. I was an instructor at the Los Angeles County Sheriff's Department's POST advanced traffic accident investigation courses for over twenty years. I currently teach National Safety Council Defensive Driver Training courses in the southern California area.
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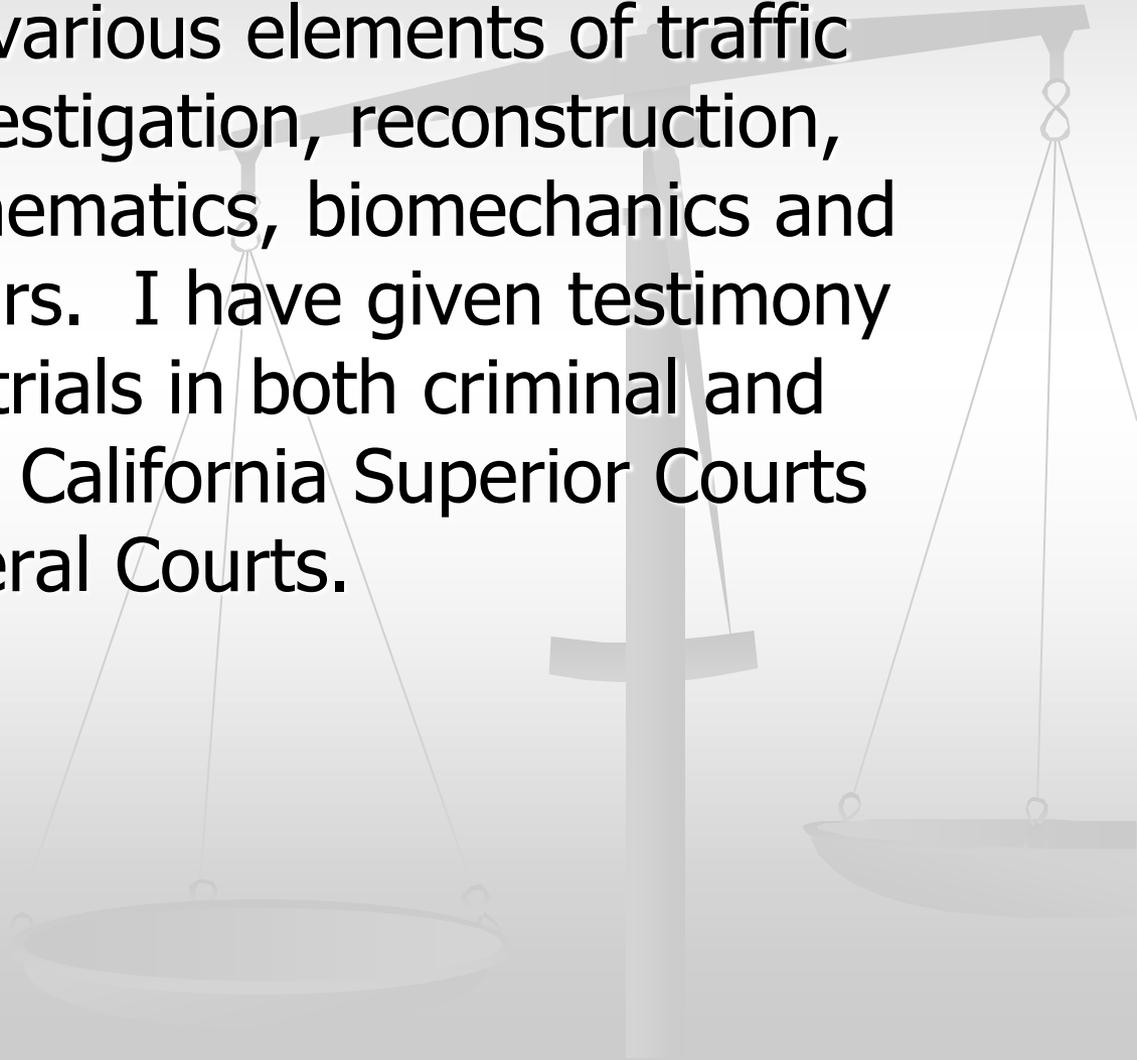
- In 1986, I was selected as a member of the Statewide Traffic Accident Review and Development Committee for the Department of Justice, Commission of Peace Officer Standards and Training (POST) which developed and designed each of the four traffic accident investigation courses (Basic, Intermediate, Advanced, Reconstruction) which are presently utilized by all law enforcement agencies and college districts in the State of California.



- I have investigated and reconstructed over 8,000 traffic collisions. I have completed over 2,000 hours of specialized training in traffic investigation, reconstruction and biomechanics. I am proficient in all areas of traffic accident reconstruction, biomechanics, occupant kinematics, occupant protection systems, human factors and fraud. The majority of my training was completed at the University of North Florida – Institute of Police Technology and Management, Northwestern University – Traffic Institute, California State Polytechnic University Pomona – TPMI, and Texas A&M University.



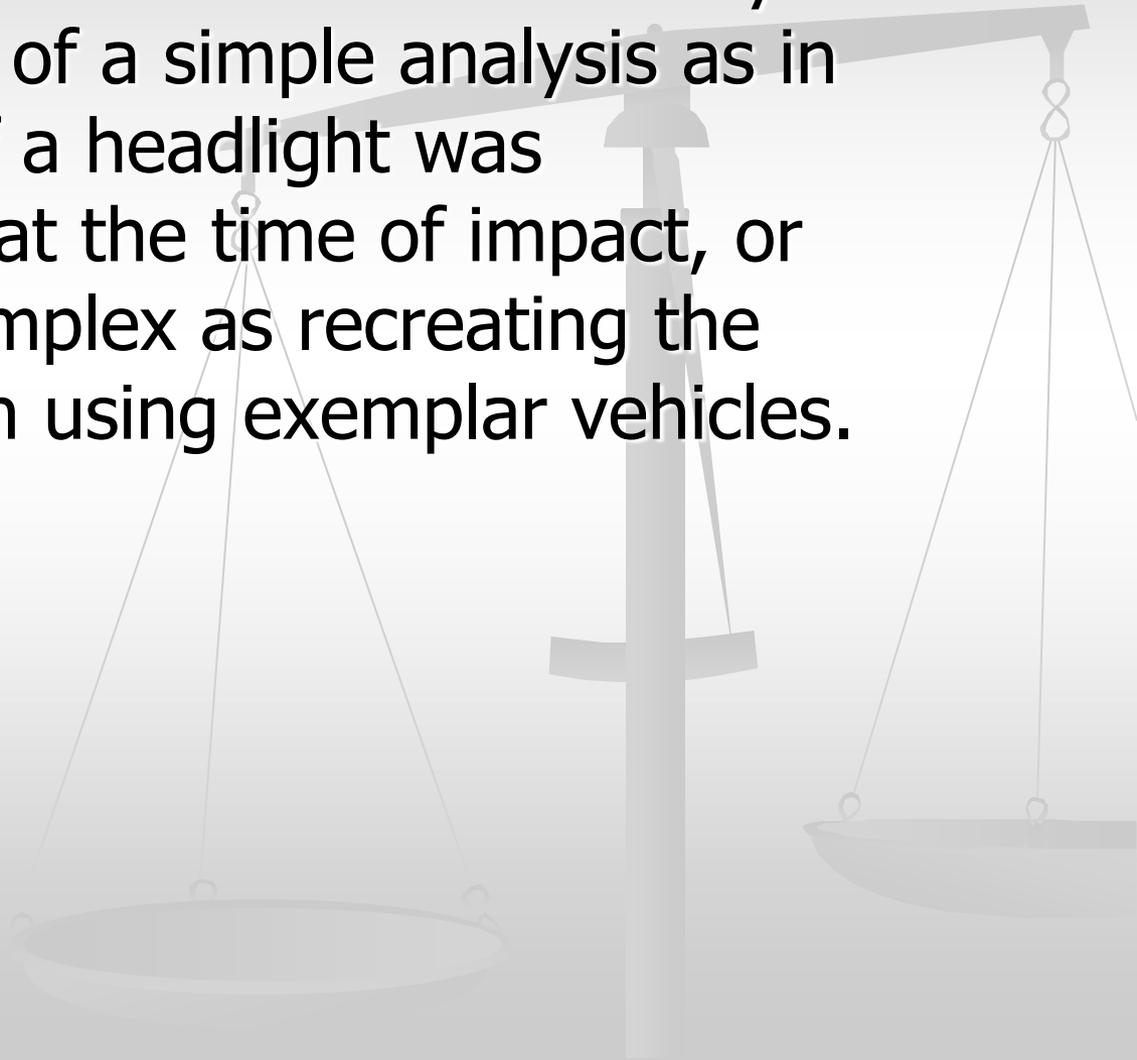
- I am a court recognized forensic expert in all of the various elements of traffic accident investigation, reconstruction, occupant kinematics, biomechanics and human factors. I have given testimony in over 300 trials in both criminal and civil cases in California Superior Courts and US Federal Courts.



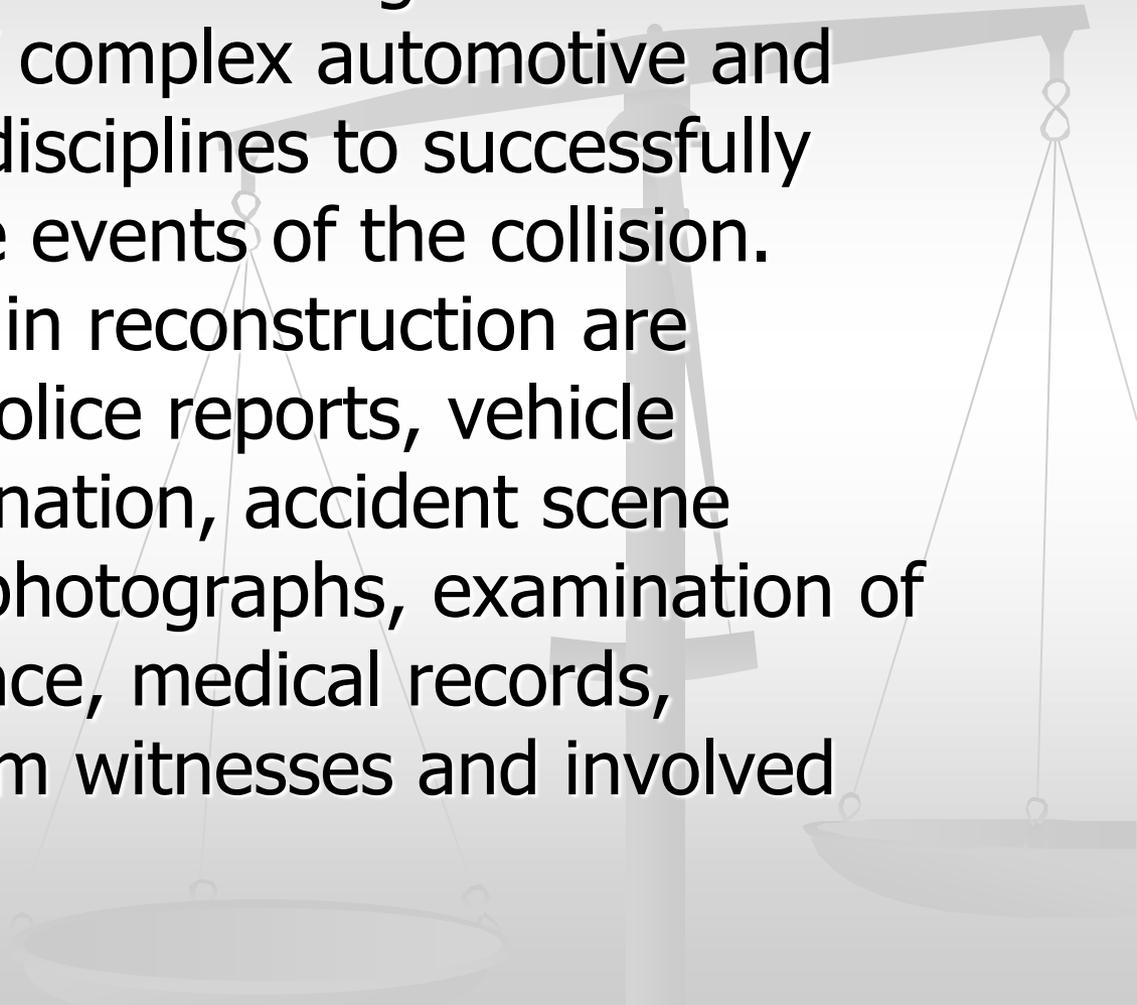
TRAFFIC ACCIDENT INVESTIGATION & RECONSTRUCTION

- Traffic accident reconstruction is the process of gathering and analyzing available data pertaining to a specific traffic collision and determining the events which occurred immediately before, during, and after the collision. The traffic accident reconstruction is only limited by the amount of data, physical evidence and information which is available or provided.

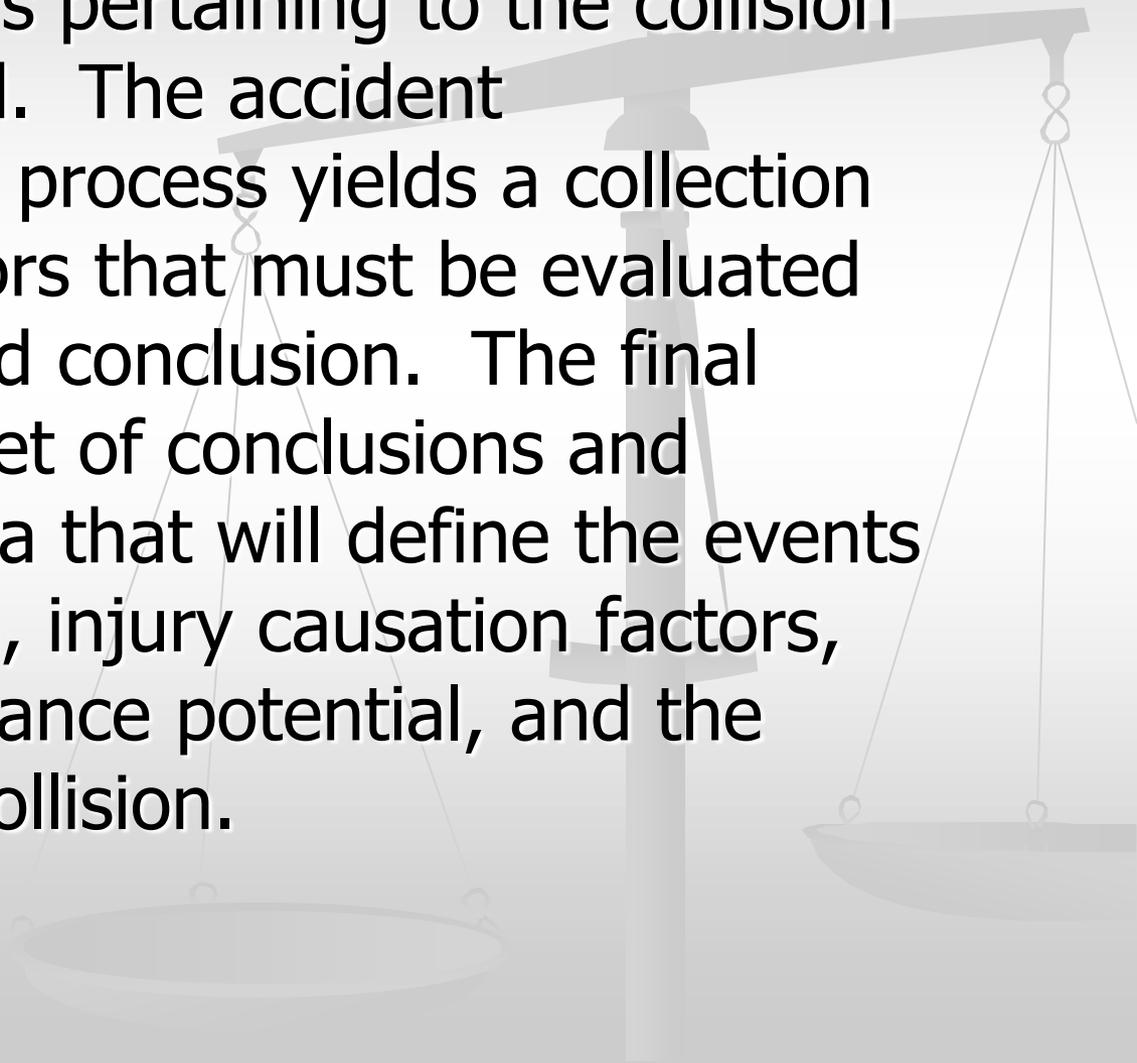
- Each traffic accident reconstruction is very unique. The reconstruction may take the form of a simple analysis as in determining if a headlight was incandescent at the time of impact, or may be as complex as recreating the actual collision using exemplar vehicles.



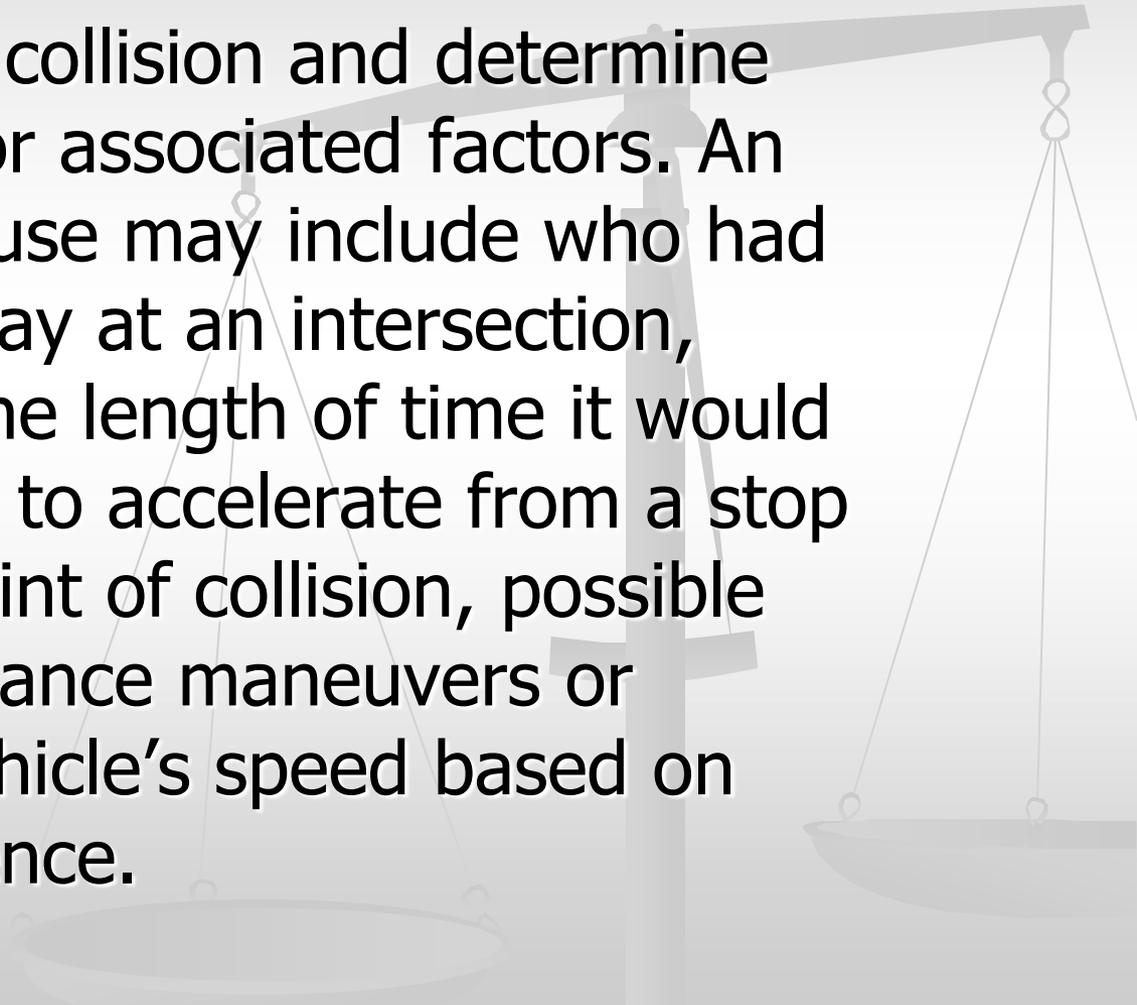
- The traffic accident reconstruction generally requires the integration of a wide variety of complex automotive and mathematical disciplines to successfully reconstruct the events of the collision. The data used in reconstruction are derived from police reports, vehicle damage examination, accident scene investigation, photographs, examination of physical evidence, medical records, statements from witnesses and involved parties.



- Once the formulation is completed, all possible factors pertaining to the collision are considered. The accident reconstruction process yields a collection of critical factors that must be evaluated to reach a valid conclusion. The final results are a set of conclusions and supportive data that will define the events of the collision, injury causation factors, accident avoidance potential, and the cause of the collision.

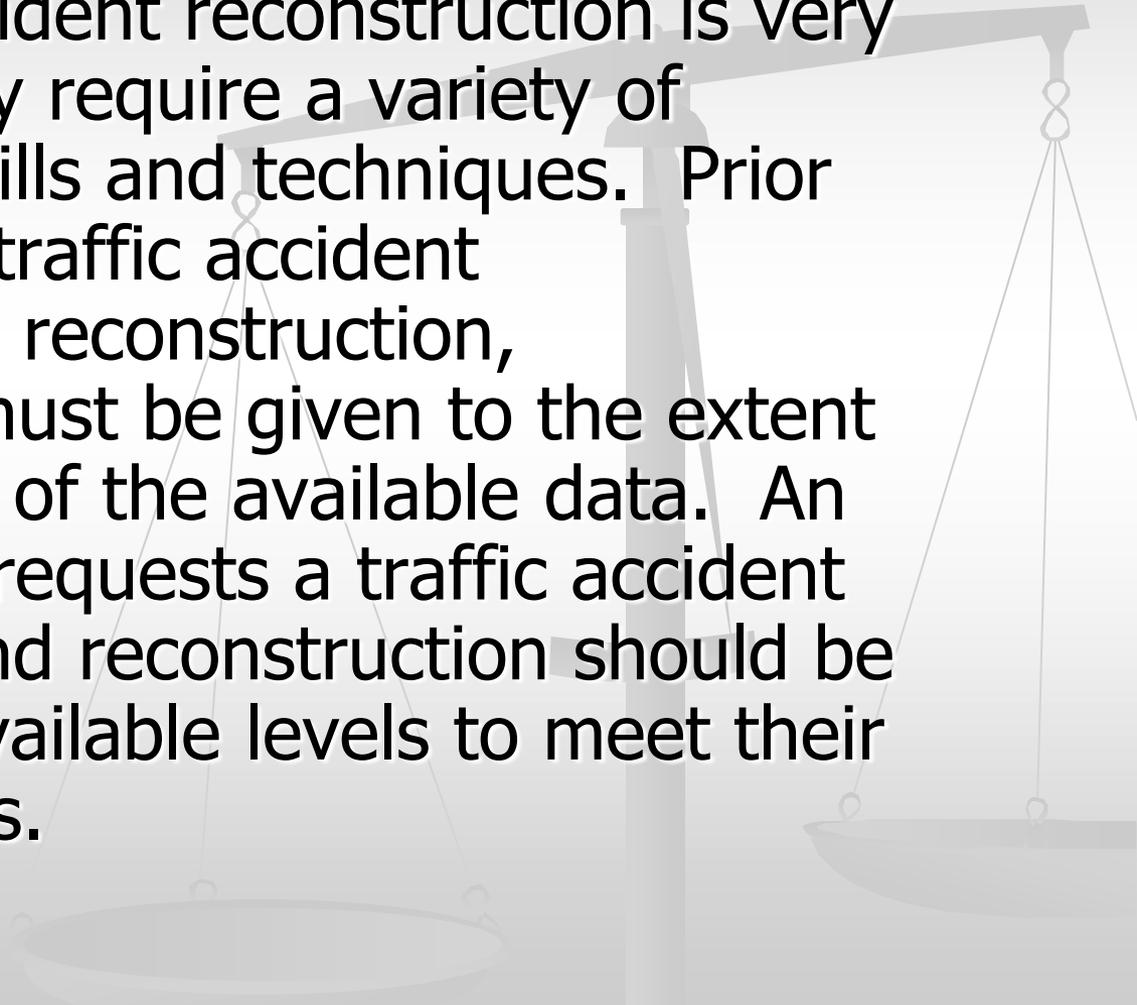


- The traffic accident investigator is also required to determine the causation factors of the collision and determine comparative or associated factors. An analysis of cause may include who had the right-of-way at an intersection, establishing the length of time it would take a vehicle to accelerate from a stop sign to the point of collision, possible collision avoidance maneuvers or calculate a vehicle's speed based on physical evidence.



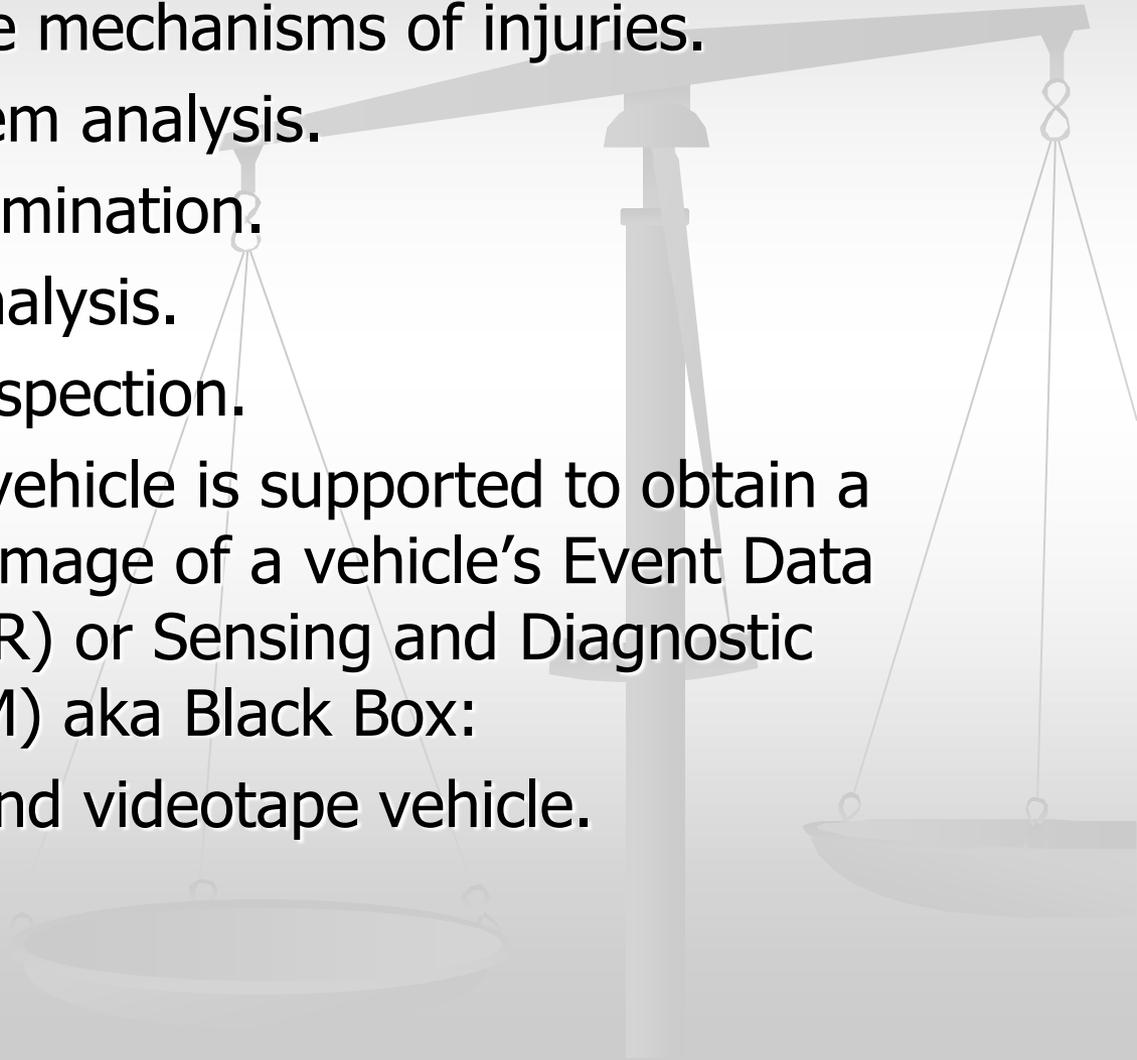
THREE PHASES OF ACCIDENT INVESTIGATION & RECONSTRUCTION

- Each traffic accident reconstruction is very unique and may require a variety of investigative skills and techniques. Prior to beginning a traffic accident investigation or reconstruction, consideration must be given to the extent and complexity of the available data. An individual who requests a traffic accident investigation and reconstruction should be aware of the available levels to meet their individual needs.

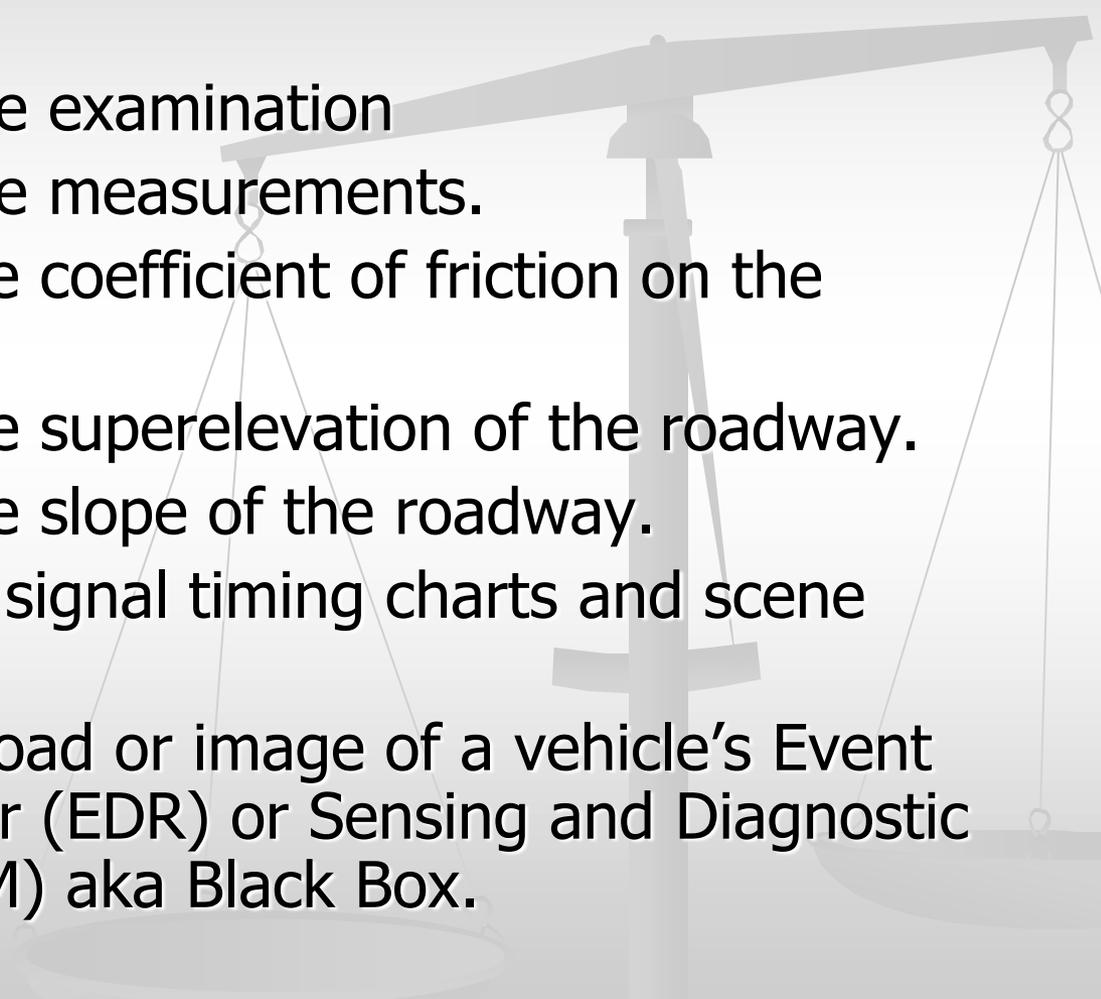


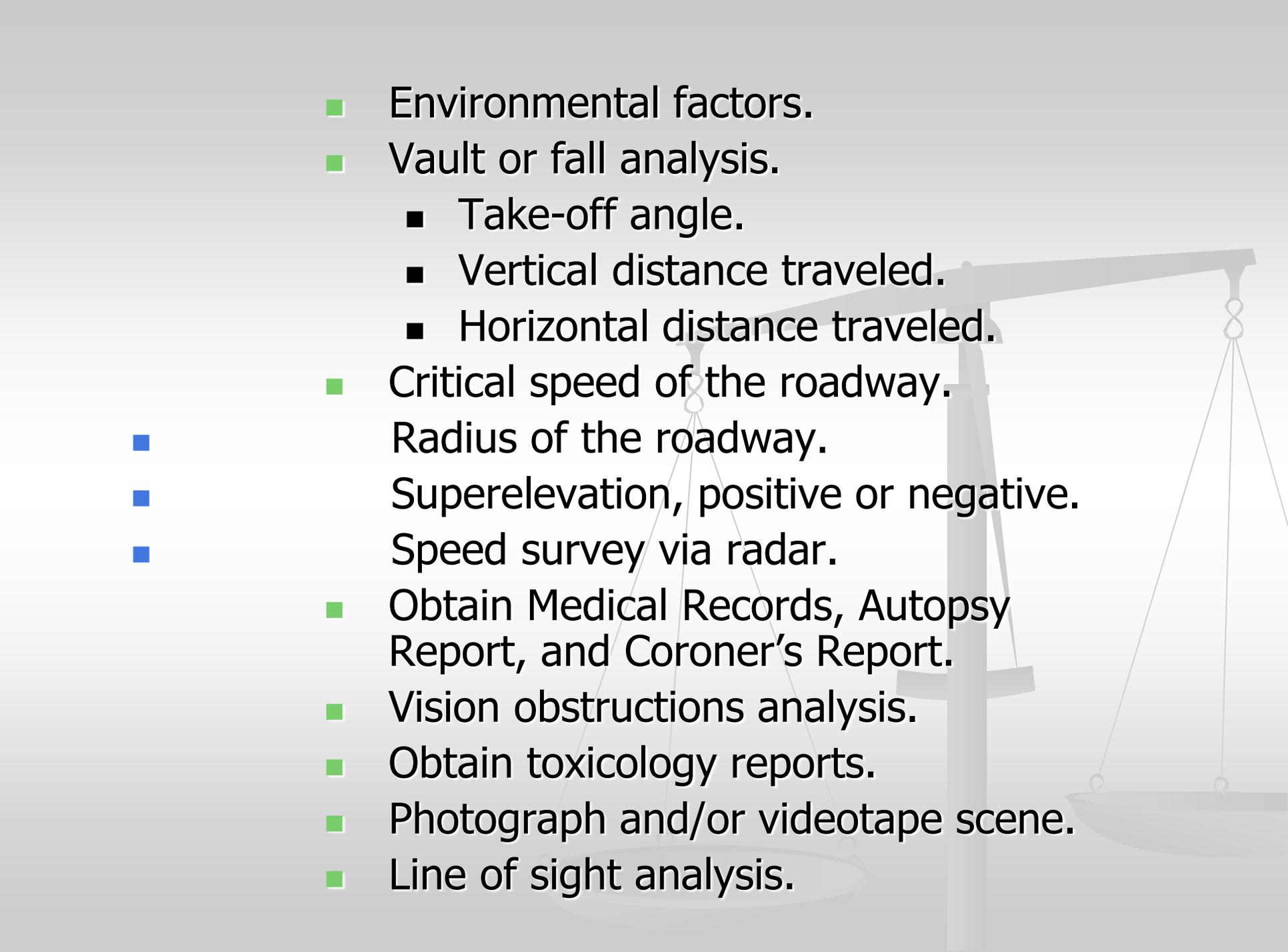
VEHICLE INSPECTION

- Damage and/or deformation analysis.
- Determine the mechanisms of injuries.
- Seatbelt system analysis.
- Headlight examination.
- Tire failure analysis.
- Mechanical inspection.
- Determine if vehicle is supported to obtain a download or image of a vehicle's Event Data Recorder (EDR) or Sensing and Diagnostic Modules (SDM) aka Black Box:
- Photograph and videotape vehicle.



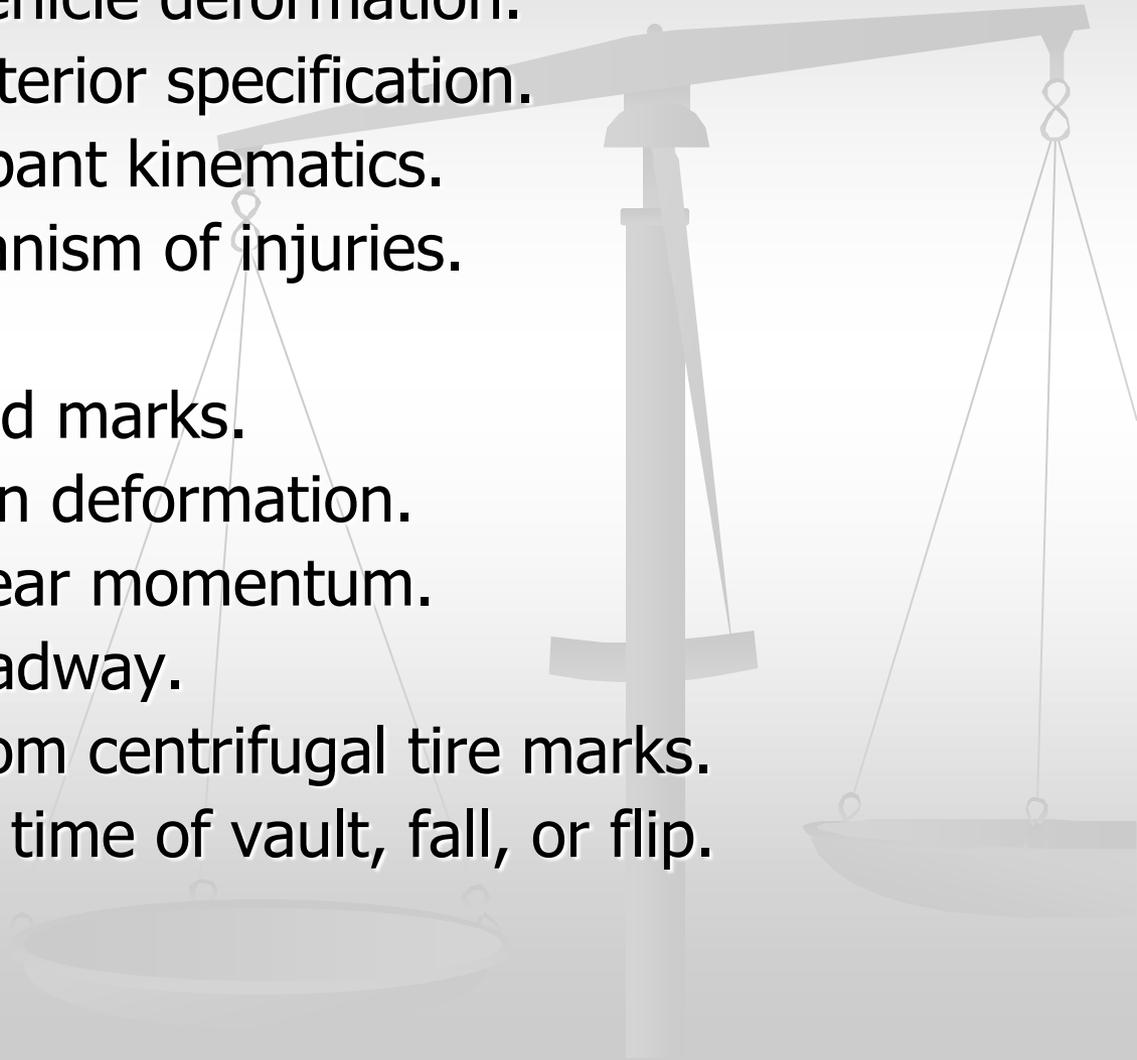
ON-SCENE INVESTIGATION AND COLLECTION OF DATA

- Obtain Traffic Collision Report, depositions and statements.
 - Collision scene examination
 - Collision scene measurements.
 - Determine the coefficient of friction on the roadway.
 - Determine the superelevation of the roadway.
 - Determine the slope of the roadway.
 - Obtain traffic signal timing charts and scene diagrams.
 - Obtain download or image of a vehicle's Event Data Recorder (EDR) or Sensing and Diagnostic Modules (SDM) aka Black Box.
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- Environmental factors.
 - Vault or fall analysis.
 - Take-off angle.
 - Vertical distance traveled.
 - Horizontal distance traveled.
 - Critical speed of the roadway.
 - Radius of the roadway.
 - Superelevation, positive or negative.
 - Speed survey via radar.
 - Obtain Medical Records, Autopsy Report, and Coroner's Report.
 - Vision obstructions analysis.
 - Obtain toxicology reports.
 - Photograph and/or videotape scene.
 - Line of sight analysis.

RECONSTRUCTION OF DATA

- Scale diagram of collision scene.
- Scale diagram of vehicle deformation.
- Scale diagram of interior specification.
- Illustration of occupant kinematics.
- Substantiate mechanism of injuries.
- Speed analysis.
- Speed loss from skid marks.
- Speed loss based on deformation.
- Conservation of linear momentum.
- Critical speed of roadway.
- Speed of vehicle from centrifugal tire marks.
- Speed of vehicle at time of vault, fall, or flip.

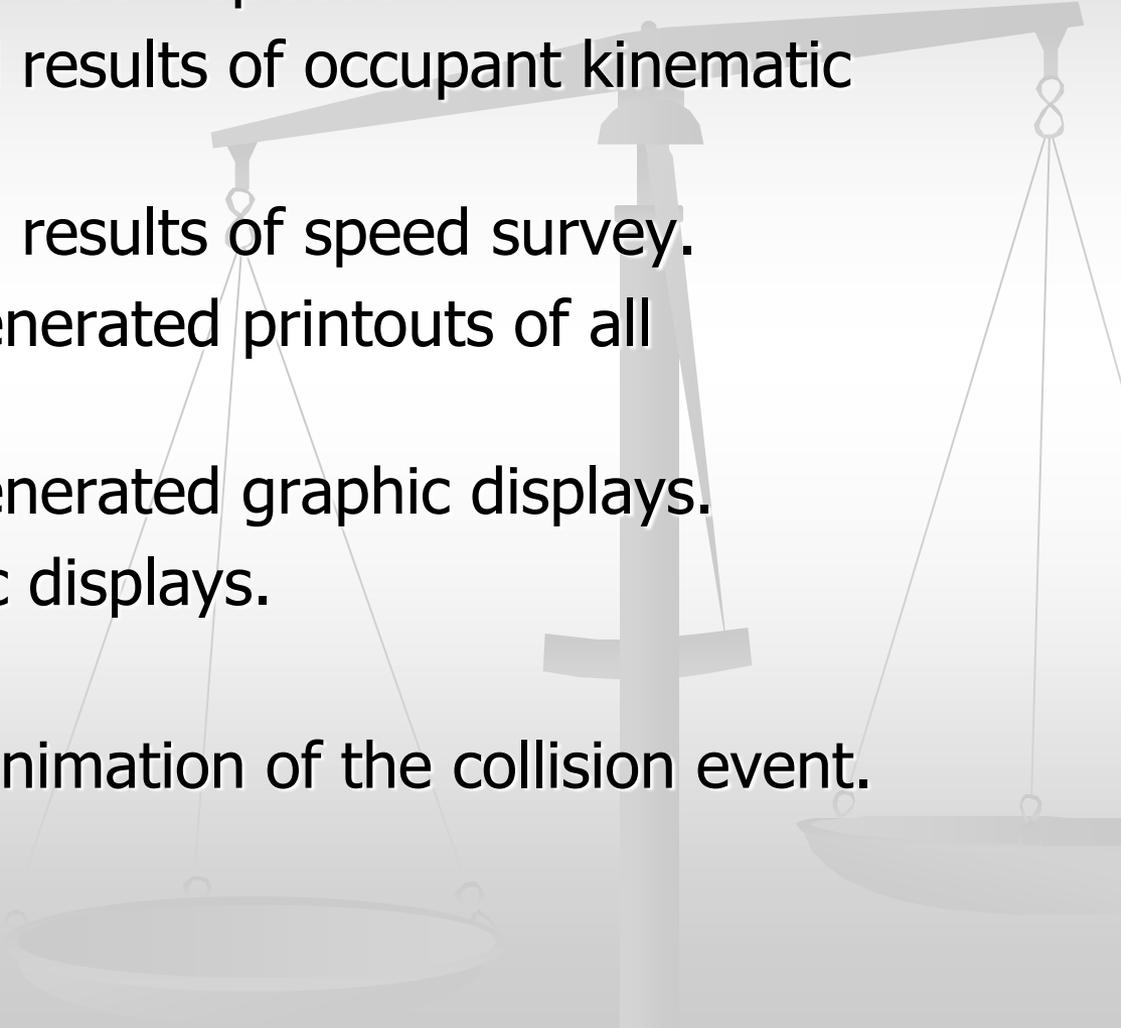


■ Human Factors analysis.

- Evaluation of detection, perception & reaction
- Line of sight analysis
- Components of collision avoidance

■ Time and distance analysis.

- Determine the detection, perception & reaction time
- A plot of each vehicle's or pedestrian's approach to the point of impact in 1/10th of seconds.
- Applicable collision avoidance techniques.
- Recreation of the collision events using exemplar vehicles.
- Results of headlamp examination.
- Vehicle tests: stopping distances, reaction time, maneuverability, acceleration.

- 
- Results of seatbelt analysis.
 - Results of tire examination.
 - Results of vehicle inspection.
 - Diagram and results of occupant kinematic analysis.
 - Diagram and results of speed survey.
 - Computer generated printouts of all calculations.
 - Computer generated graphic displays.
 - Photographic displays.
 - Videotapes.
 - Prepare an animation of the collision event.

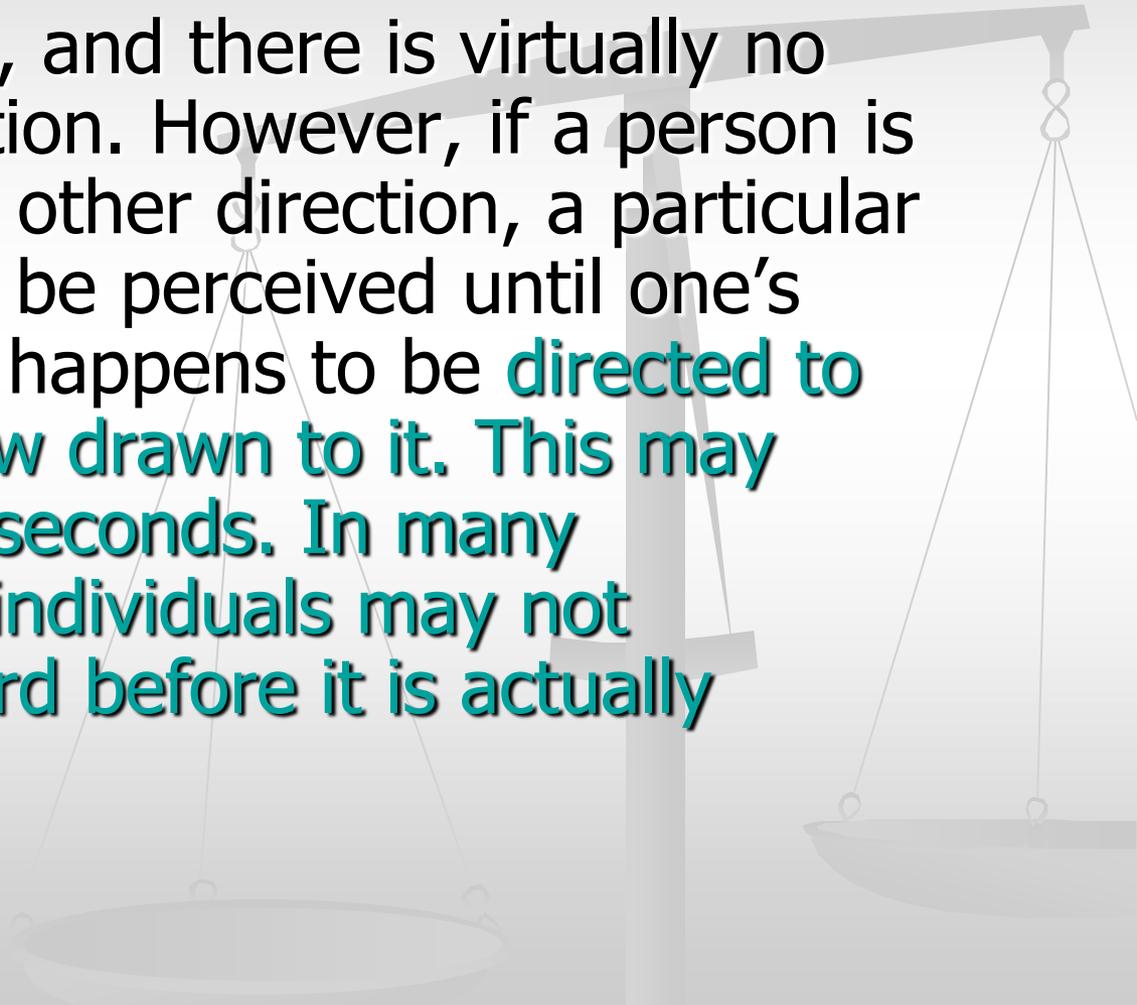
Human Factors

Detection, Perception, & Reaction Time

- While performing a task, reaction time in response to the appearance of a particular potential hazard is the time required from the point of initial detection of the hazard in one's field of view, through various stages of evaluation and decision making, to the time that responsive action is taken, which may, depending on circumstances, include either general or attempted precise movement of the hands, feet, or whole body to prevent or control potential impending injury. Such response may also involve the attempted manipulation or engagement of the physical environment, such as the attempted operation of machine controls, the reaching for a handrail, or the positioning of the body or its parts in an attempt to cushion impending impact.

- **Perception** involves the process of not only **detecting** an object in a general sense, but also **comprehension of its significance**. Perception must occur before reaction can take place. Most objects perceived in one's environment do not receive specific attention. That is, while attention is given to one object, others are not seen with the same clarity. Likewise, an object may be *seen* but its meaning may not be immediately perceived. **Perception delay** is the interval between the time that a hazard is reasonably available to be seen and when it is actually seen and fully understood.

- If a person, by chance, is looking at the exact place where a *simple* hazard appears, it will be seen and understood almost instantly, and there is virtually no delay in perception. However, if a person is looking in some other direction, a particular hazard may not be perceived until one's attention either happens to be **directed to it, or is somehow drawn to it. This may require several seconds. In many circumstances, individuals may not perceive a hazard before it is actually encountered.**



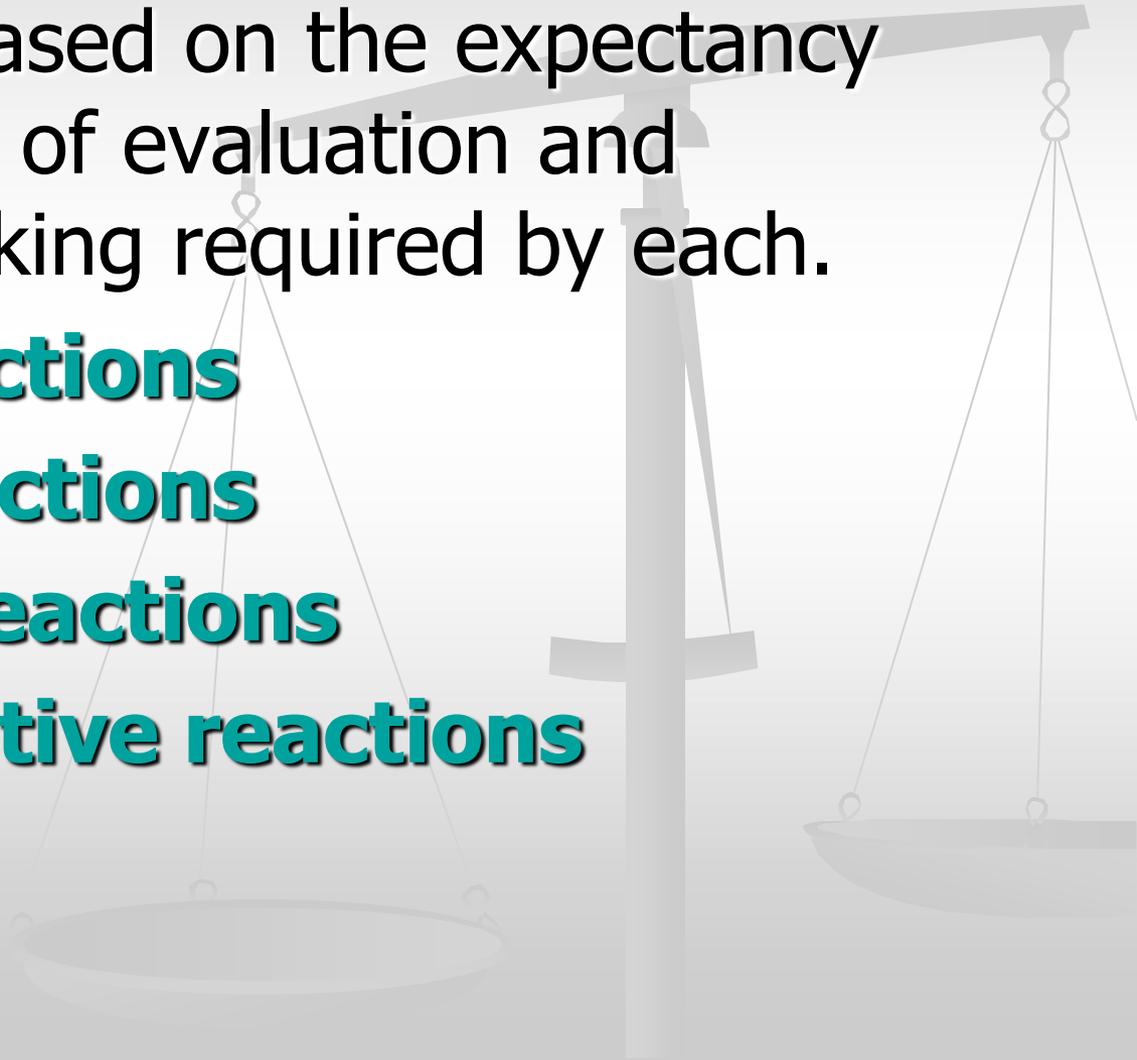
- Four different kinds of reaction time have been recognized in the literature, based on the expectancy and amount of evaluation and decision making required by each.

- **Reflex reactions**

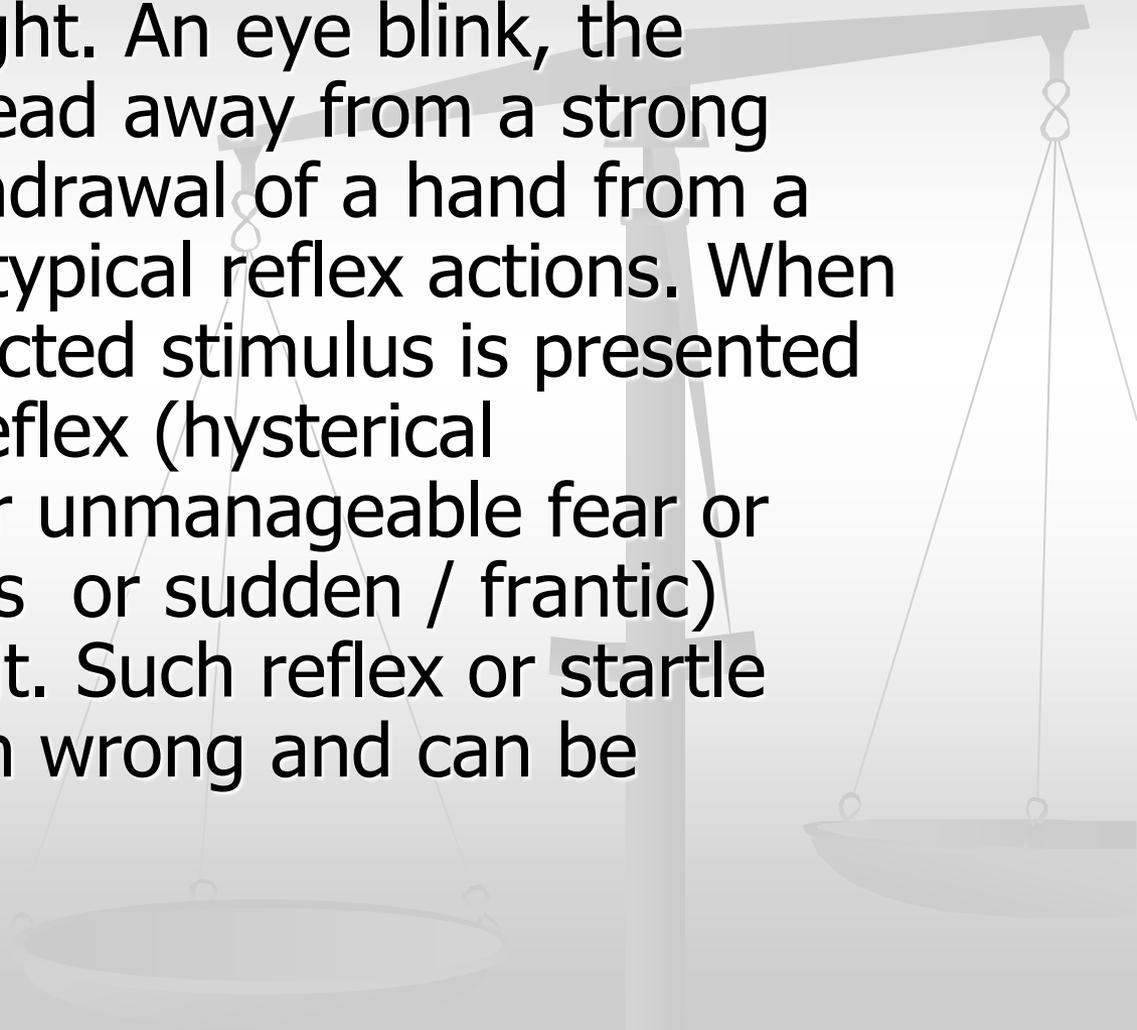
- **Simple reactions**

- **Complex reactions**

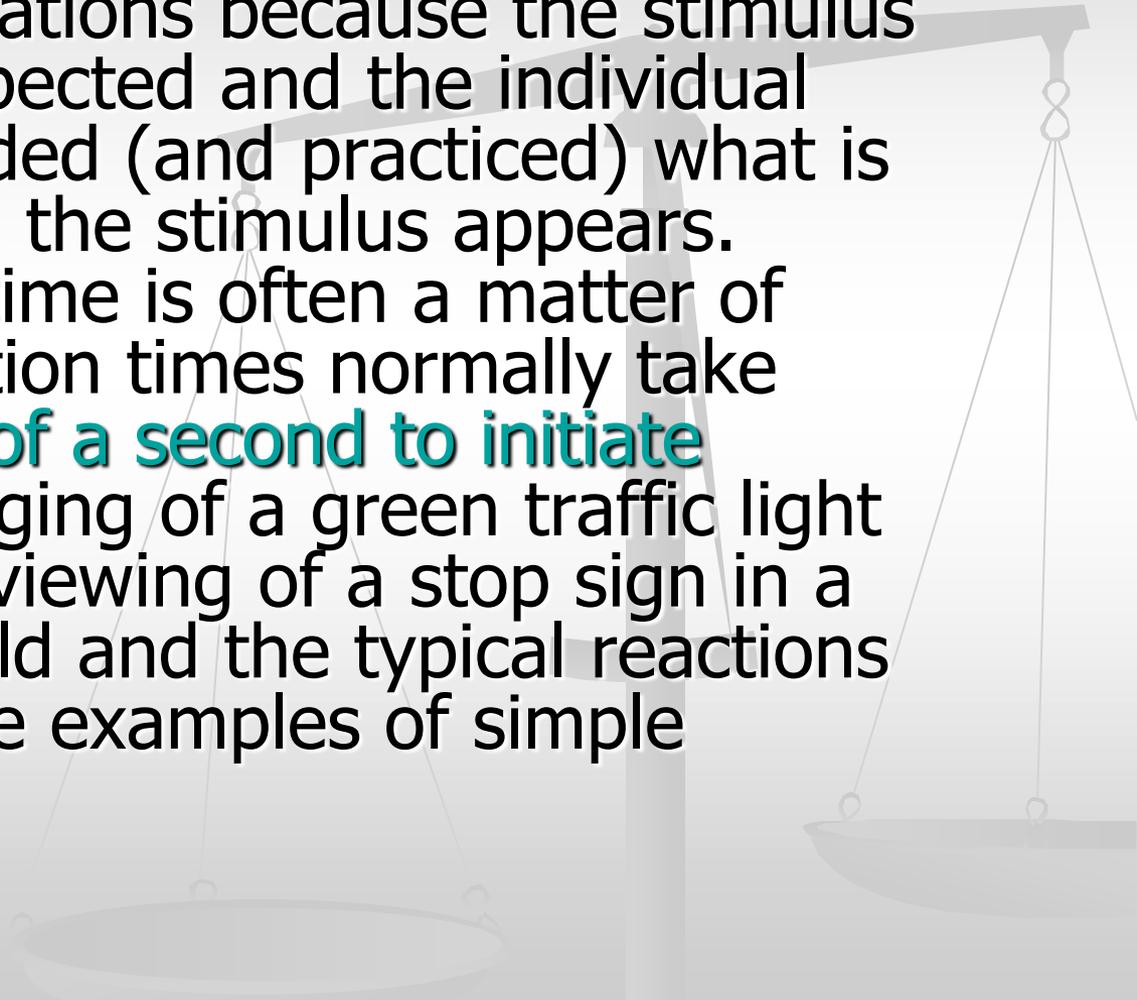
- **Discriminative reactions**

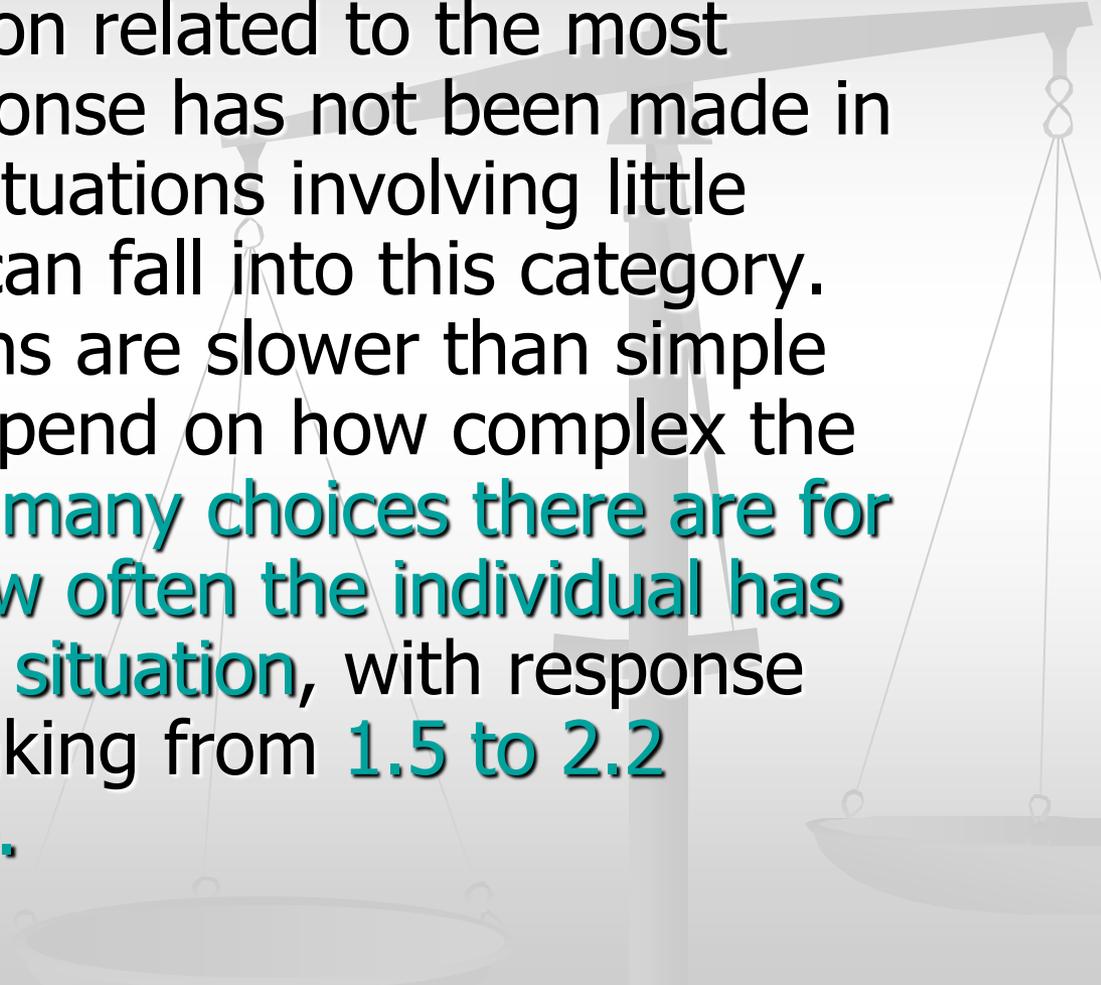


- Reflex reactions are instinctive or mostly so and require the shortest time because they involve no thought. An eye blink, the turning of the head away from a strong light, or the withdrawal of a hand from a hot surface are typical reflex actions. When a strong unexpected stimulus is presented to a person, a reflex (hysterical overwhelming or unmanageable fear or emotional excess or sudden / frantic) action may result. Such reflex or startle actions are often wrong and can be disastrous.



- **Simple reactions** (and simple reaction times) are the most common of human responses to ordinary or routinely encountered situations because the stimulus is reasonably expected and the individual has already decided (and practiced) what is to be done when the stimulus appears. **Simple reaction** time is often a matter of habit. Such reaction times normally take about a **quarter of a second to initiate action**. The changing of a green traffic light to yellow or the viewing of a stop sign in a driver's visual field and the typical reactions to them would be examples of simple reaction.



- **Complex reactions** (and accompanying complex reaction time) generally call for a **choice among several possible responses**, where the decision related to the most appropriate response has not been made in advance. Even situations involving little ultimate choice can fall into this category. Complex reactions are slower than simple reactions and depend on how complex the stimulus is, **how many choices there are for reaction**, and **how often the individual has been in a similar situation**, with response times typically taking from **1.5 to 2.2 seconds or more**.
- 

- Discriminative reactions (and associated discriminative reaction time) occur when a person is required to make **a choice between two or more actions that are not habitual or practiced**. Here, there is a great need to gather information regarding available alternatives, the nature (positive and negative aspects) of each alternative, probabilities regarding the appropriateness (dangers vs. successful hazard avoidance) related to each alternative, as well as the possible moral issues of the alternatives. **This is the slowest of all the reactions and may require as much as five seconds to a minute** if the situation is complicated and the urgency slight. When the situation is urgent, there is a high probability that the response will be inappropriate or no response will be initiated before it is too late to respond at all.

TIME & DISTANCE ANALYSIS

Perception/Reaction & Braking Times and Distances

<u>SPEED</u> <u>(mph)</u>	<u>FPS</u>	<u>Perception/</u> <u>Reaction</u> <u>TIME</u>	<u>REACTION</u> <u>DISTANCE</u>	<u>BRAKING</u> <u>DISTANCE</u>	<u>BRAKING</u> <u>TIME</u>	<u>TOTAL</u> <u>STOPPING</u> <u>DISTANCE</u>	<u>TOTAL</u> <u>STOPPING</u> <u>TIME</u>
35	51.34	1.50	77.01	56.80	2.20	133.81	3.70
40	58.68	1.50	88.02	74.20	2.50	162.40	4.00
45	66.00	1.50	99.00	93.90	2.80	192.90	4.30

TIME & DISTANCE ANALYSIS

Perception/Reaction & Braking Times and Distances

<u>SPEED</u> <u>(mph)</u>	<u>FPS</u>	<u>Perception/</u> <u>Reaction</u> <u>TIME</u>	<u>REACTION</u> <u>DISTANCE</u>	<u>BRAKING</u> <u>DISTANCE</u>	<u>BRAKING</u> <u>TIME</u>	<u>TOTAL</u> <u>STOPPING</u> <u>DISTANCE</u>	<u>TOTAL</u> <u>STOPPING</u> <u>TIME</u>
35	51.34	2.0	102.68	56.80	2.20	159.48	4.20
40	58.68	2.0	117.36	74.20	2.50	191.56	4.50
45	66.00	2.0	132.00	93.90	2.80	225.90	4.80

HUMAN FACTORS IN TRAFFIC CRASHES

Jeffrey W. Muttart

Volume 1: Determining the Time Available to the Driver

Walking Speeds, Vehicle Acceleration, Sight Lines & Nighttime Analysis



Eccentricity

- A mathematical constant that for a given conic section is the ratio of the distances from any point of the conic section to a focus and the corresponding directrix.
- **Conic Section**: a plane curve, line, pair of intersecting lines, or point that is the intersection of or bounds the intersection of a plane and a cone with two nappes which is one of the two sheets that lie on opposite sides of the vertex and together make up a cone .
- **Directrix**: a fixed curve with which a generatrix (a point, line, or surface whose motion generates a line, surface, or solid) maintains a given relationship in generating a geometric figure; : a straight line the distance to which from any point of a conic section is in fixed ratio to the distance from the same point to a focus.

PATH INTRUSION

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5. Hazard & Appro Response Unknown ***DEFAULT***

Pedestrian Isabel Pablo

4. Road/Hi Fidelity Sim

DEFAULT

Check if using Mobile Phone

1. Response to one object

Offset @ start of Intrs

7.4

1. Driving

CALCULATE ECCENTRICITY

Dist to Intruder

127.8

0. SV Not Turning

1. Straight Road

Eccentricity

3.3

1. Day

3. Full Response (250 ms veh delay)

1. Subj did not discern other unit stop

Check if hovering brake

RESPONSE TO PATH INTRUSION

Officer Boulerice

Primary Driver

Initial Speed 35.0 mph

Braking Respon

3.0

Avg. Deceleration factor 0.8 gs

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$$\text{Braking Adj} + (413 \times \text{Tr}) + 30E + 224\text{Lt} + 716O - 496\text{Tp} - 164M + 261\text{Tn} + 350(D - 1) + 7 \quad \text{eq.1}$$

$$0 + (413 \times 3) + 30 \times 3.3 + 224 \times 1 + 716 \times 1 - 496 \times 1 - 164 \times 1 + 261 \times 0 + 350 \times (1 - 1) + 7 \quad \text{eq.2}$$

85th percentile response

AVERAGE PRT 1.7 sec 2.3 sec Individuals

Equation 1.6 sec

A2B studies 1.8 Sec 1.4 Sec 2.1 Sec Scenarios

Resp to Vehicle 1.8 Sec 1.5 Sec 2.0 Sec

Resp to Ped. 1.8 Sec 1.5 Sec 2.1 Sec

Resp to Object 1.8 Sec 1.4 Sec 2.0 Sec

$$\text{Response Distance} = \sim 1.7 \times 35 \times 1.467 \quad \text{eq.3}$$

$$\text{Distance to Stop} = (35 \times 1.467)^2 / (2 \times 32.2 \times 0.8) \quad \text{eq.4}$$

$$\text{Total Stopping Distance} = 88 \text{ feet} + 51 \text{ feet} \quad \text{eq.5}$$

$$\text{Time to Brake} = \text{SQRT}(2d / g \times f) = 2 \text{ sec} \quad \text{eq.6}$$

TOT. STOPPING DIST. 139 feet eq.5

AVG. Response Dist. 88 feet eq.3

85th percentile response Dist. 119 feet

Stopping Dist. 51 feet eq.4

85th percentile respo

85th %ile STOPPING DIST. 170 feet

PATH INTRUSION

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5. Hazard & Appro Response Unknown ***DEFAULT***

Pedestrian Isabel Pablo

4. Road/HI Fidelity Sim ***DEFAULT***

Check if using Mobile Phone

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7.4

1. Driving

CALCULATE ECCENTRICITY

Dist to Intruder

127.8

0. SV Not Turning

1. Straight Road

Eccentricity

3.3

1. Day

3. Full Response (250 ms veh delay)

1. Subj did not discern other unit stop

Check if hovering brake

RESPONSE TO PATH INTRUSION

Officer Boulerice

Primary Driver

Initial Speed 40.0 mph

Braking Respon

3.0

Avg. Deceleration factor 0.8 gs

S bELLINO © CSS, LLC

$$\text{Braking Adj} + (413 \times \text{Tr}) + 30\text{E} + 224\text{Lt} + 716\text{O} - 496\text{Tp} - 164\text{M} + 261\text{Tn} + 350(\text{D} - 1) + 7 \quad \text{eq.1}$$

$$0 + (413 \times 3) + 30 \times 3.3 + 224 \times 1 + 716 \times 1 - 496 \times 1 - 164 \times 1 + 261 \times 0 + 350 \times (1 - 1) + 7 \quad \text{eq.2}$$

85th percentile response

AVERAGE PRT 1.7 sec 2.3 sec Individuals

Equation 1.6 sec

A2B studies 1.8 Sec 1.4 Sec 2.1 Sec Scenarios

Resp to Vehicle 1.8 Sec 1.5 Sec 2.0 Sec

Resp to Ped. 1.8 Sec 1.5 Sec 2.1 Sec

Resp to Object 1.8 Sec 1.4 Sec 2.0 Sec

$$\text{Response Distance} = \sim 1.7 \times 40 \times 1.467 \quad \text{eq.3}$$

$$\text{Distance to Stop} = (40 \times 1.467)^2 / (2 \times 32.2 \times 0.8) \quad \text{eq.4}$$

$$\text{Total Stopping Distance} = 100 \text{ feet} + 67 \text{ feet} \quad \text{eq.5}$$

$$\text{Time to Brake} = \text{SQRT}(2d / g \times f) = 2.3 \text{ sec} \quad \text{eq.6}$$

TOT. STOPPING DIST. 167 feet eq.5

AVG. Response Dist. 100 feet eq.3

85th percentile response Dist. 136 feet

Stopping Dist. 67 feet eq.4

85th percentile respo

85th %ile STOPPING DIST. 203 feet

Officer Boulterice

Lateral Acceleration [fy] (gs)	0.20	
Lateral distance to avoid feet		σ
Expected Deceleration [fx] (gs)	0.80	0.08
Initial speed mph	35.00	5.00
Actual Deceleration [fx] (gs)	0.85	
Pre-Impact Maneuver Dist feet	58.60	
Final Speed necessary to avoid mph	0.00	
Time available (seconds)	1.87	
Perception-response time (seconds)	1.70	0.59
Time remaining (Available - PRT) (sec.)	0.17	
Additional Time necessary? (sec)	0.79	

STEER

This driver could steer 0 feet right or left before impact.

Time to steer = 0 seconds

$$T_{steer} = \text{SQRT}(2x / (32.2 \times 0.2))$$

STOP

1.4%

Driver was approx. 95.8 feet from impact at onset and could NOT stop in that distance

Time to stop = 2 seconds

$$T_{stop} = (35 \times 1.467) / (32.2 \times 0.8)$$

Total stopping distance = Resp. Dist. + Stop Dist. = 138.3 +/- 41.1 feet

$$\text{Avg. Resp. Dist.} = 1.697 \times 35 \times 1.467 = 87.1 \text{ feet}$$

$$\text{Avg. Stopping Dist.} = (35 \times 1.467)^2 / (2 \times 32.2 \times 0.8) = 51.2 \text{ feet}$$

Total 85TH% Stopping Dist. = 85th% Resp. Dist. + 85th% Stop Dist. = 174.5 feet

$$85\text{th\% Resp. Dist.} = 2.29 \times 35 \times 1.467 = 117.6 \text{ feet}$$

$$85\text{th\% Stopping Dist.} = (35 \times 1.467)^2 / (2 \times 32.2 \times (0.8 - 0.08)) = 56.9 \text{ feet}$$

SLOW

Slowest possible speed in time remaining = 32 mph

$$d = 35 \times 1.467 \times 0.168 - 0.5 \times 32.2 \times 0.8 \times 0.168^2 = 8.3 \text{ ft}$$

$$S_f = \text{SQRT}((35 \times 1.467)^2 - 2 \times 32.2 \times 0.8 \times 8.3) / 1.467$$

Slowest possible speed with the additional time = 18.2 mph

$$d = 35 \times 1.467 \times 0.958 - 0.5 \times 32.2 \times 0.8 \times 0.958^2 = 37.4 \text{ ft}$$

% who Could Slow

$$\text{Avg. Total Slowing Dist.} = 124.5 \text{ feet +/- } 30.5 \text{ feet}$$

0.6%

This driver could not slow to 0 mph in time remaining.

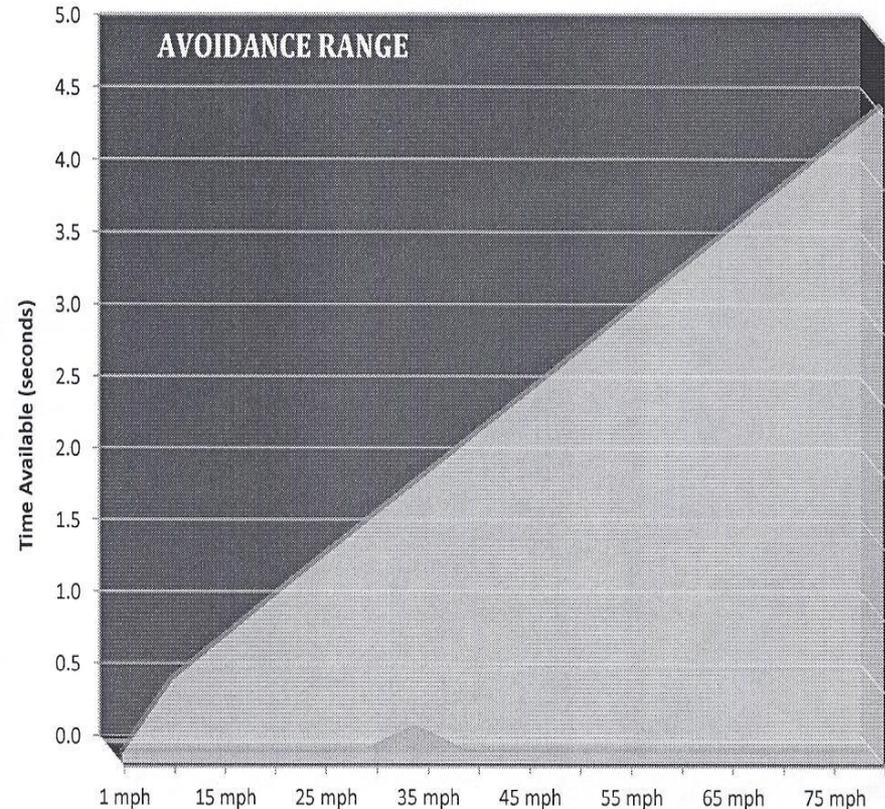
This driver could not slow enough to travel -152.6 feet in 0.958 sec.

Time to slow from 35 mph to 0 mph = 2 seconds

$$T_{slow} = (35 - 0) \times 1.467 / (32.2 \times 0.8)$$

AVOIDANCE

WITH FINITE DIFFERENCE ANALYSIS



BRAKING

STEERING

AVOID

~ DRIVER

fx = 0.8 Driver's Range fy=0.2

Officer Boulterice

Lateral Acceleration [fy] (gs)	0.20	
Lateral distance to avoid feet		σ
Expected Deceleration [fx] (gs)	0.80	0.08
Initial speed mph	40.00	5.00
Actual Deceleration [fx] (gs)	0.85	
Pre-Impact Maneuver Dist feet	58.60	
Final Speed necessary to avoid mph	0.00	
Time available (seconds)	1.87	
Perception-response time (seconds)	1.70	0.59
Time remaining (Available - PRT) (sec.)	0.17	
Additional Time necessary? (sec)	0.79	

STEER

This driver could steer 0 feet right or left before impact.

Time to steer = 0 seconds

$$T_{steer} = \text{SQRT}(2x / (32.2 \times 0.2))$$

STOP 0.5%

Driver was approx. 109.4 feet from impact at onset and could NOT stop in that distance

Time to stop = 2.3 seconds

$$T_{stop} = (40 \times 1.467) / (32.2 \times 0.8)$$

Total stopping distance = Resp. Dist. + Stop Dist. = 166.4 +/- 45.9 feet

$$\text{Avg. Resp. Dist.} = 1.697 \times 40 \times 1.467 = 99.6 \text{ feet}$$

$$\text{Avg. Stopping Dist.} = (40 \times 1.467)^2 / (2 \times 32.2 \times 0.8) = 66.8 \text{ feet}$$

Total 85TH% Stopping Dist. = 85th% Resp. Dist. + 85th% Stop Dist. = 208.7 feet

$$85\text{th\% Resp. Dist.} = 2.29 \times 40 \times 1.467 = 134.4 \text{ feet}$$

$$85\text{th\% Stopping Dist.} = (40 \times 1.467)^2 / (2 \times 32.2 \times (0.8 - 0.08)) = 74.3 \text{ feet}$$

SLOW

Slowest possible speed in time remaining = 37 mph

$$d = 40 \times 1.467 \times 0.168 - 0.5 \times 32.2 \times 0.8 \times 0.168^2 = 9.5 \text{ ft}$$

$$S_f = \text{SQRT}((40 \times 1.467)^2 - 2 \times 32.2 \times 0.8 \times 9.5) / 1.467$$

Slowest possible speed with the additional time = 23.2 mph

$$d = 40 \times 1.467 \times 0.958 - 0.5 \times 32.2 \times 0.8 \times 0.958^2 = 44.4 \text{ ft}$$

% who Could Slow

$$\text{Avg. Total Slowing Dist.} = 144 \text{ feet +/- } 34.9 \text{ feet}$$

0.3%

This driver could not slow to 0 mph in time remaining.

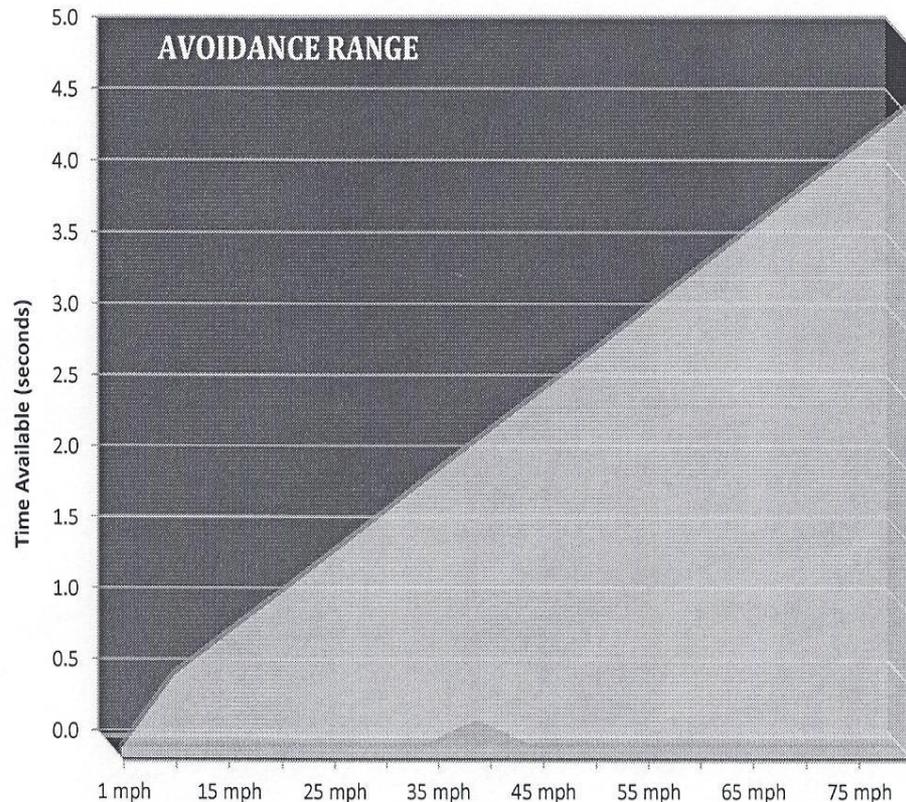
This driver could not slow enough to travel -182.8 feet in 0.958 sec.

Time to slow from 40 mph to 0 mph = 2.3 seconds

$$T_{slow} = (40 - 0) \times 1.467 / (32.2 \times 0.8)$$

AVOIDANCE

WITH FINITE DIFFERENCE ANALYSIS



BRAKING STEERING AVOID ~ DRIVER

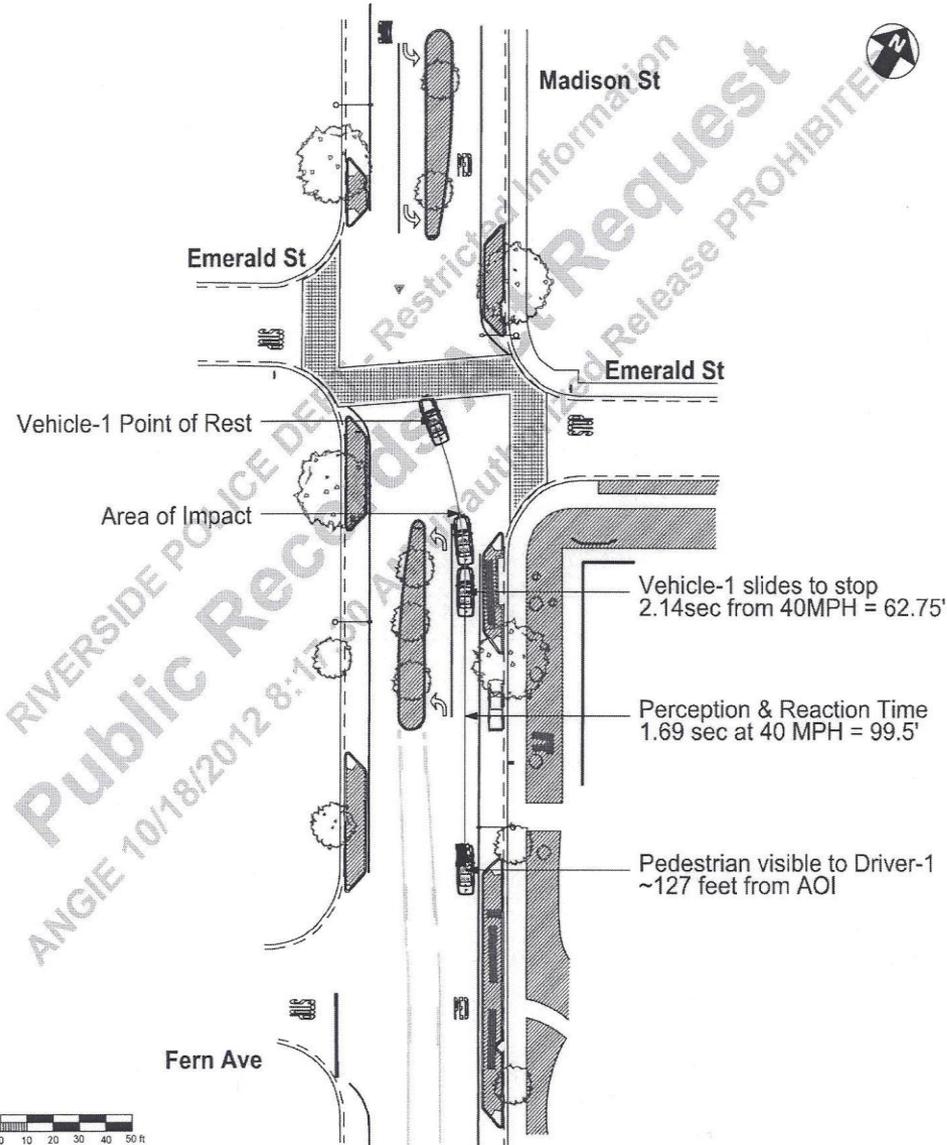
STATE OF CALIFORNIA
TIME AND DISTANCE ANALYSIS DIAGRAM #1 - 40 MPH

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DATE OF INCIDENT 05-13-2012	TIME 0749	NCIC NUMBER 3313	OFFICER I.D. 1475	NUMBER P12-067271
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ALL MEASUREMENTS ARE APPROXIMATE AND NOT TO SCALE UNLESS STATED (SCALE =)



PREPARED BY Ofcr. Greg Matthews	I.D. NUMBER 0648	DATE 06-22-2012	REVIEWER'S NAME	DATE
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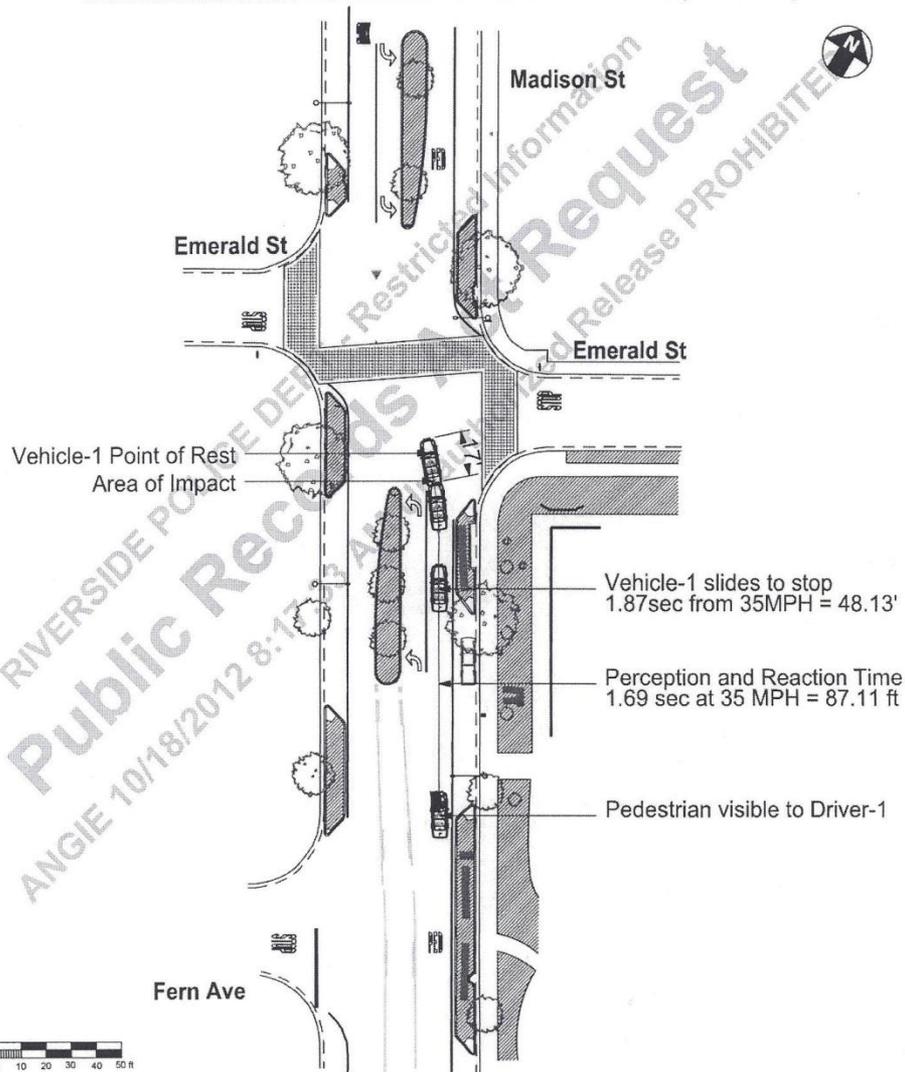
STATE OF CALIFORNIA
TIME AND DISTANCE ANALYSIS DIAGRAM #2 - 35 MPH

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DATE OF INCIDENT 05-13-2012	TIME 0749	NCIC NUMBER 3313	OFFICER I.D. 1475	NUMBER P12-067271
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ALL MEASUREMENTS ARE APPROXIMATE AND NOT TO SCALE UNLESS STATED (SCALE =)

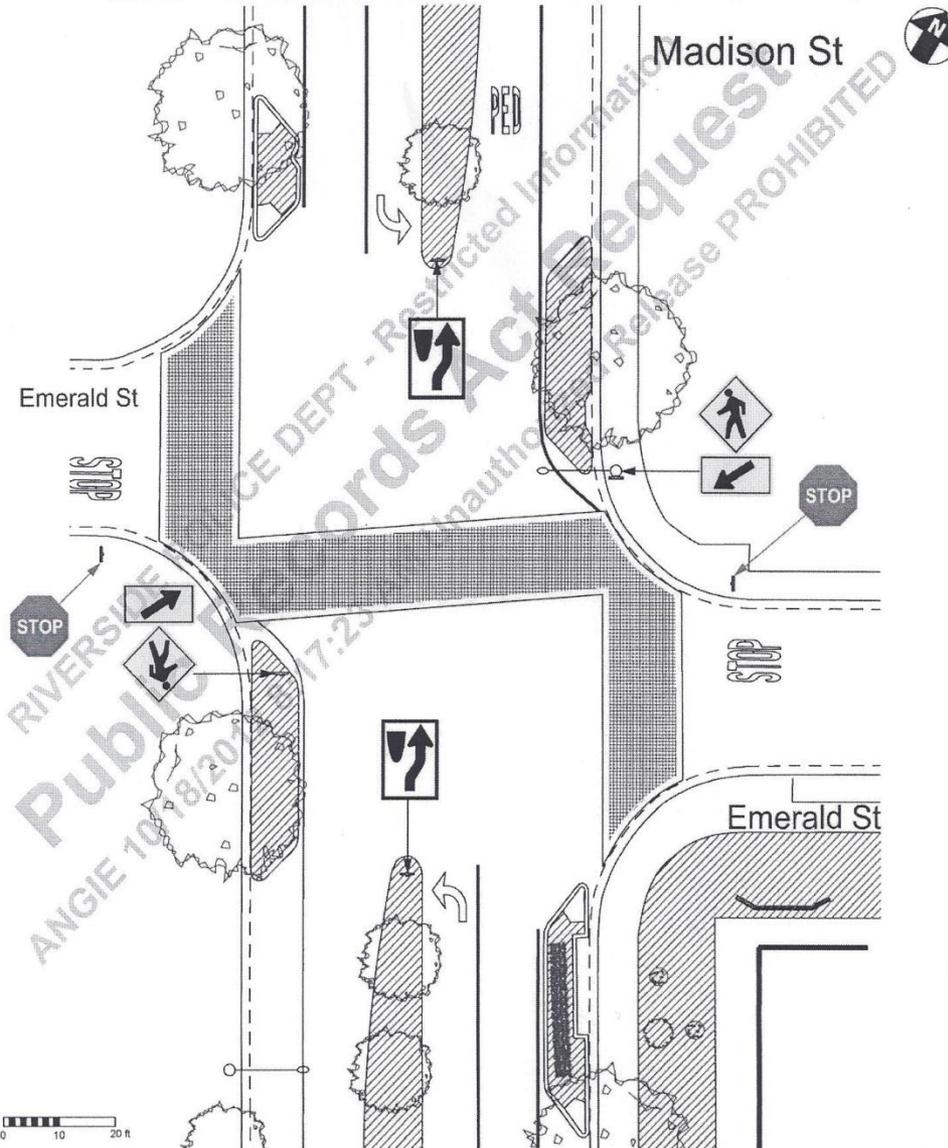


PREPARED BY Ofcr. Greg Matthews	I.D. NUMBER 0648	DATE 06-22-2012	REVIEWER'S NAME	DATE
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SIGNS DIAGRAM

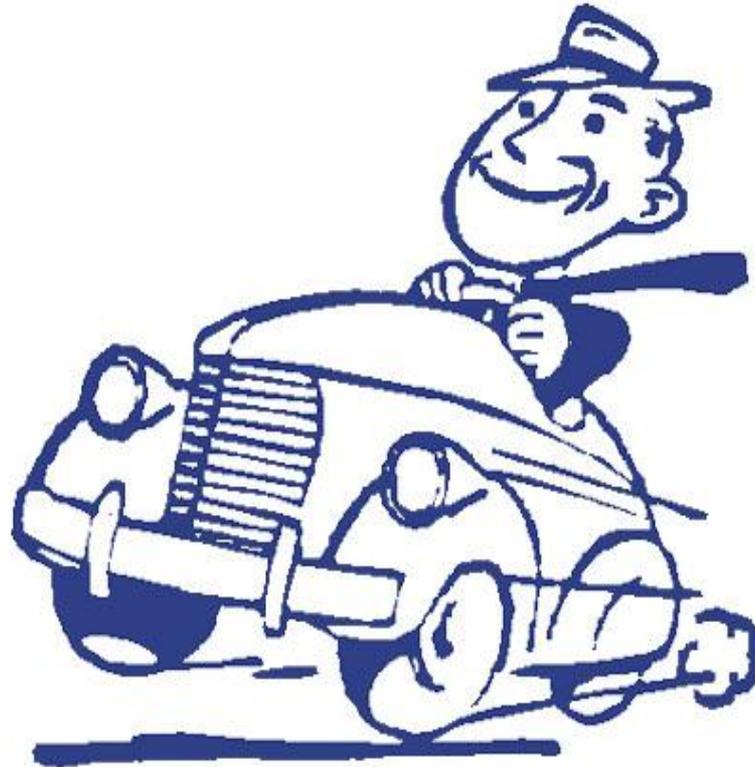
DATE OF INCIDENT 05-13-2012	TIME 0749	NCIC NUMBER 3313	OFFICER I.D. NUMBER 1475
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ALL MEASUREMENTS ARE APPROXIMATE AND NOT TO SCALE UNLESS STATED (SCALE =)



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Thank you!



Please drive safely

POLY-BACKED FLOOR MAT - FOR MAXIMUM PROTECTION

