



# *Speed-Measuring Device Operator Training*

*Participant Manual*

**CORE**



## CORE Course Overview

The purpose of the Core Module is to provide the student with the knowledge and skills necessary to perform speed enforcement activities.

- Learning Objectives
  - Discuss the need for speed enforcement
  - Discuss the benefits of effective speed enforcement
  - Discuss absolute and basic speed laws
  - Discuss the safety considerations as they apply to speed enforcement
  - Explain the elements of a speed enforcement tracking history
- Guided discussion to assess learning

## Materials

- Instructor manual, participant manual, presentation slides
- Copy of agenda/schedule, flip-chart, markers

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# COURSE INTRODUCTION

Estimated time for Chapter 1: 30 Minutes

**C O R E**

» Objectives

» Contents

Welcome .....	5
Introductions and Expectations .....	6
Facilities and Logistics .....	8
Course Goal .....	12
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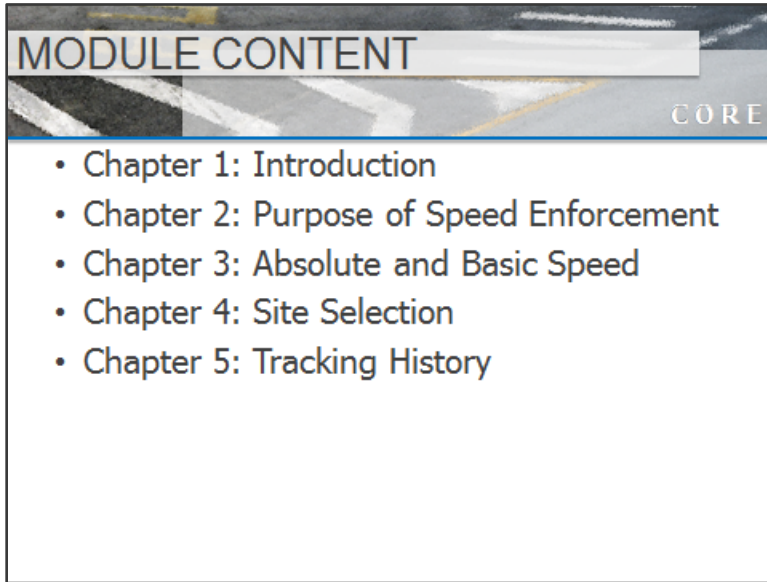








## MODULE CONTENT



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Slide 10.

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The purpose of the Core Module is to provide the student with the knowledge and skills necessary to perform speed enforcement activities.

In addition to the Introduction, this module contains four other chapters:

- Purpose of Speed Enforcement
- Absolute and Basic Speed
- Site Selection
- Tracking History

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# PURPOSE OF SPEED ENFORCEMENT

Estimated time for Chapter 2: 40 Minutes

**C O R E**

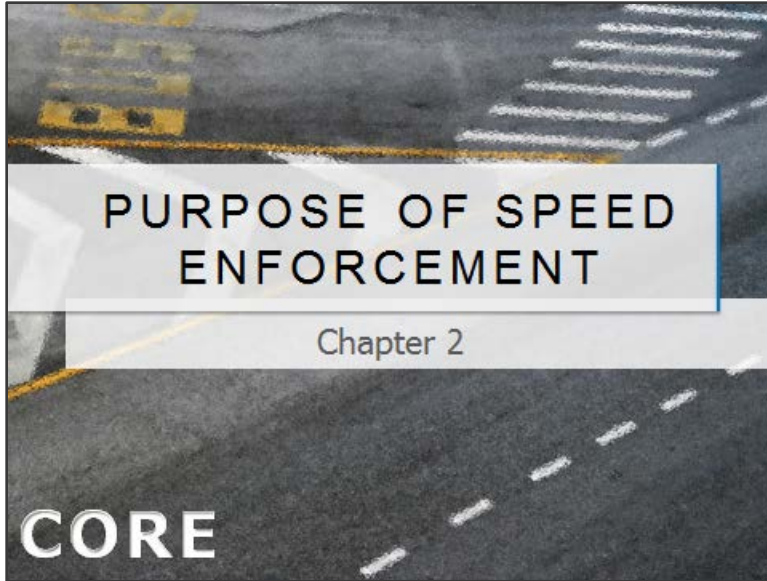
## » Objectives

By the end of this chapter, you will be able to:

- Discuss the need for speed enforcement
- Discuss the benefits of effective speed enforcement

## » Contents

Driving Continuum.....	17
Speeding-Related Fatalities by Roadway Function.....	22



Slide 11.

Speeding is defined as exceeding the posted speed limit or driving too fast for conditions. Speeding is one of the most prevalent factors contributing to traffic crashes.

The purpose of this section is to provide an understanding of how speed enforcement helps reduce crashes and their severity in addition to reducing the number of fatalities and injuries caused by speeding.



**RESOURCE:** Traffic Safety Facts 2014 Data:

<https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812265>

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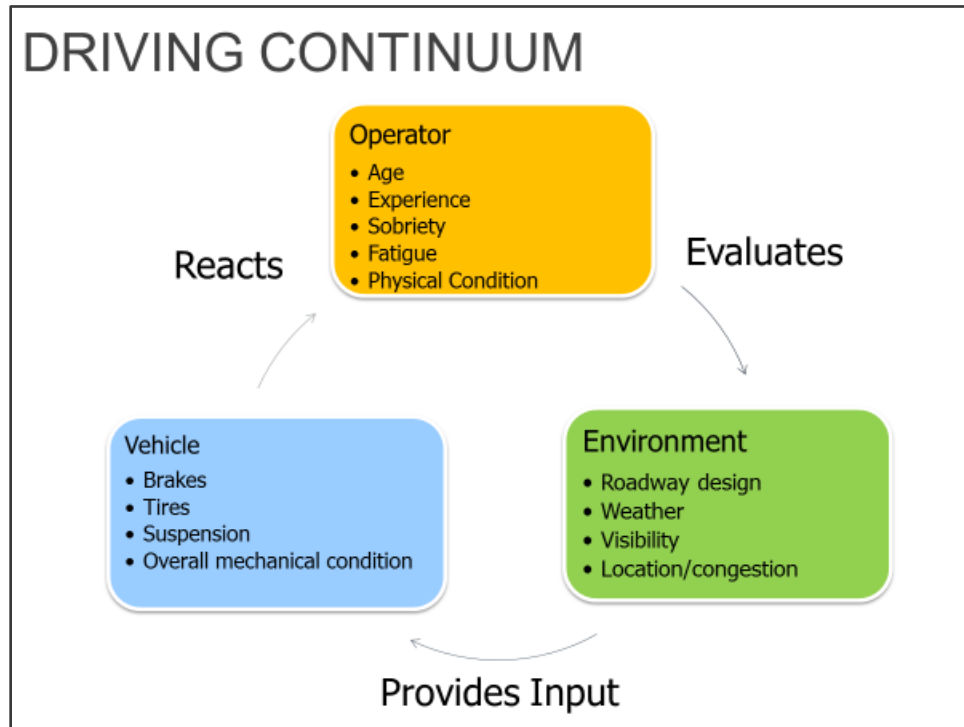
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## DRIVING CONTINUUM



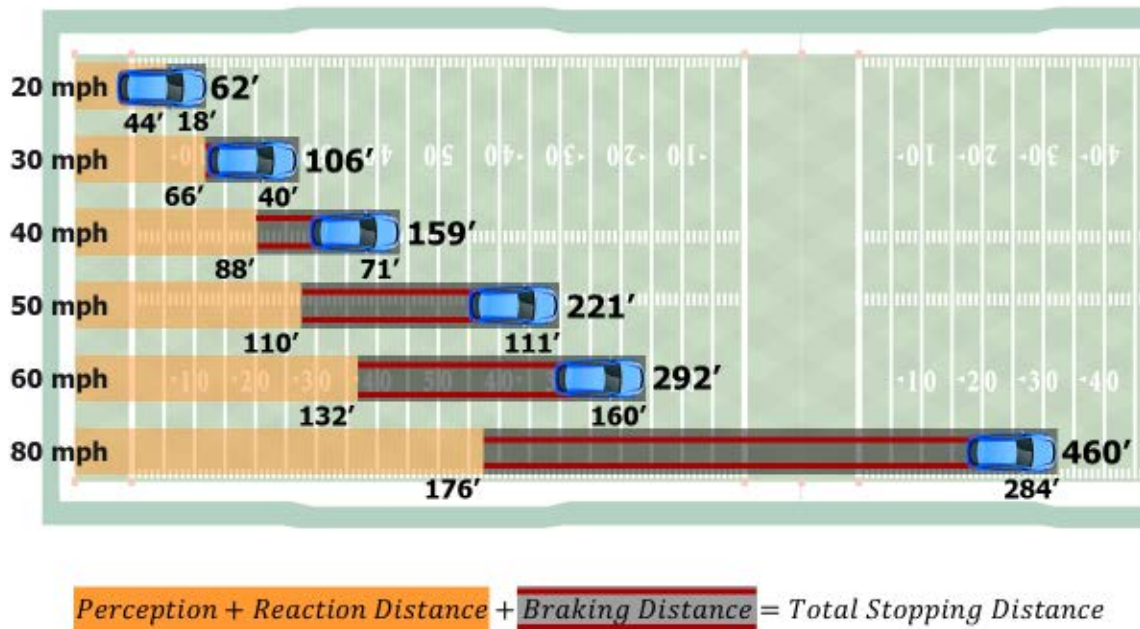
Slide 12.

Higher speed overwhelms a driver's capabilities. Although vehicles and roadways can be designed to withstand high-speed traffic, human beings cannot be redesigned to handle increasingly higher speeds. A driver's capability is limited by speed. The faster a vehicle is driven, the less control the driver has over it. No matter how good a driver may be, some loss of control over the vehicle will be the result if the driver goes too fast. Safe vehicle operation is directly related to the "Driving Continuum", an interaction of operator, environment, and vehicle. Each element has different concerns which affect the others.





# PERCEPTION-REACTION TIME



Slide 13.



## SUPPLEMENT 1: Stopping Distance Worksheet (10 Minutes)

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A critical factor affecting an operator's capability is perception-reaction time:

**Perception** is the individual's recognition of a hazard, or the need to react.

**Reaction** is the individual's ability to respond to avoid the hazard.

**Perception-reaction time** can determine whether a crash will occur, or not. The shorter the perception-reaction time, the sooner the operator provides input to the vehicle and starts maneuvering to avoid the hazard.

The vehicle continues moving at the same speed toward the hazard during the time it takes the driver to perceive and react. Perception-reaction time becomes critical as speed increases. At slower speeds, the vehicle does not travel much distance during the time it takes the driver to react. At higher speeds, the vehicle will travel more distance during the same time interval placing it closer to the hazard before the driver starts providing the necessary inputs. Therefore, even fractions of a second are important.

The affect perception-reaction time and speed have on a driver's capability can be illustrated by braking. The average driver requires approximately 1.5 seconds to perceive, react, and apply the brakes. The brakes are not being applied and the vehicle continues to move at the same speed and on the same path toward the hazard during this 1.5 seconds. The distance the vehicle travels during the 1.5 seconds depends upon the speed. Perception-reaction time is only the beginning of the problem. Once the brakes are applied, time elapses before the vehicle comes to a complete stop. The faster the vehicle is moving, the longer it will take to stop. Vehicles moving at higher speeds have more momentum than vehicles at lower speeds. More braking force must be applied to vehicles traveling at high speeds:

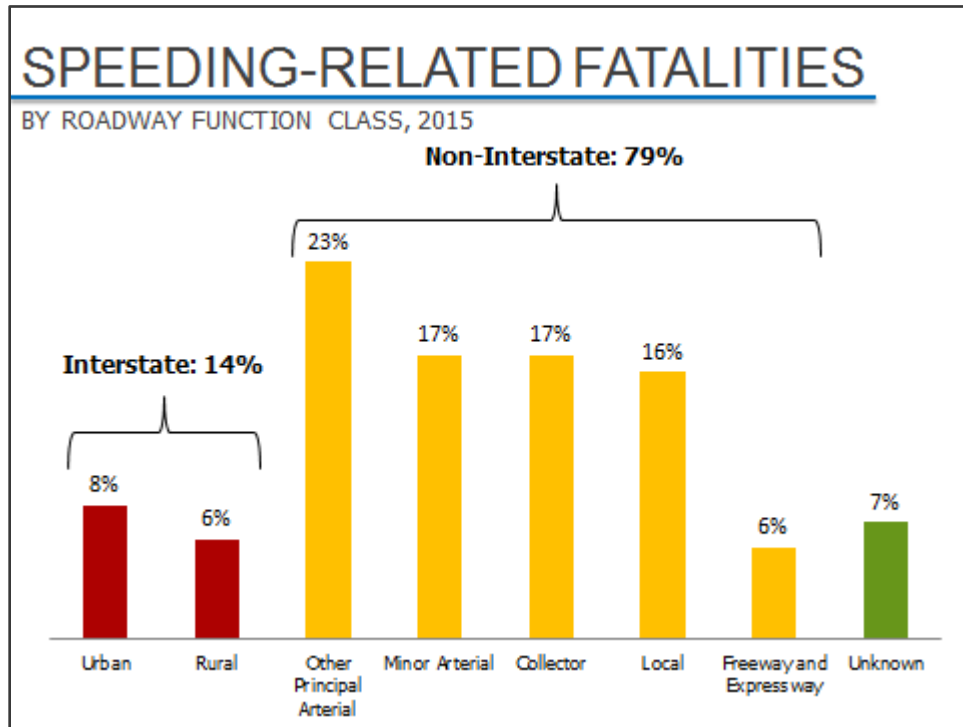
- At 20 mph, the average vehicle will travel an additional 18 feet after the brakes are applied for a total stopping distance of 62 feet
- At 50 mph, the vehicle will travel an additional 111 feet for a total stopping distance of 221 feet
- At 80 mph, the vehicle will travel an additional 284 feet for a total stopping distance of 460 feet

The total stopping distance increases greatly with just a slight increase in speed. The stopping distance at 60 mph (292 feet) is more than 44 percent longer than the stopping distance at 50 mph (221 feet) even though 60 mph is only 20 percent faster than 50 mph.

Hazards that can be avoided at low speeds may be unavoidable at higher speeds.



# SPEEDING-RELATED FATALITIES BY ROADWAY FUNCTION



Slide 14.



**RESOURCE:** Traffic Safety Facts 2015, A Compilation of Motor Vehicle Crash Data from the Fatality Analysis Reporting System and the General Estimates System:  
<https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812384>

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# SPEED LAWS

Estimated time for Chapter 3: 25 Minutes

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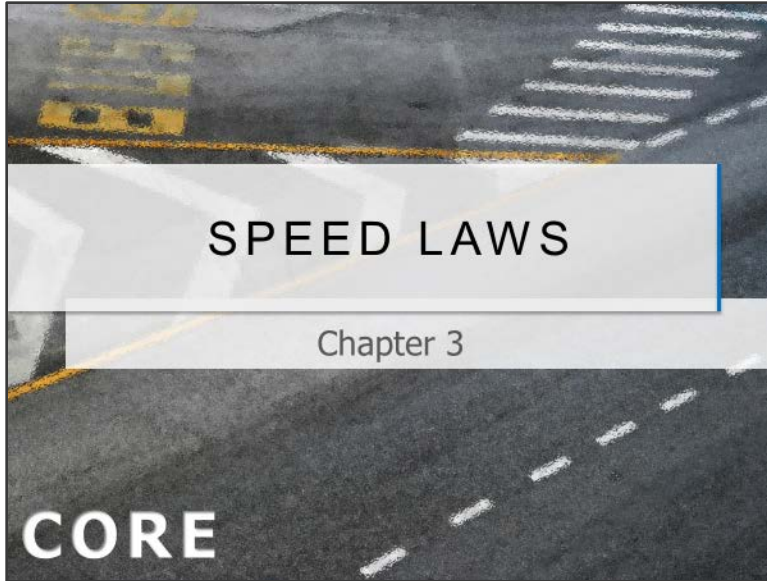
## Objectives

By the end of this chapter, you will be able to:

Discuss absolute and basic speed laws

## Contents

Speed Laws .....	26
Criminal v. Civil Violations .....	28



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Slide 16.

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### **The Foundation of Speed Laws and Rules**

The *basic speed law* establishes the familiar “reasonable and prudent speed for existing conditions” standard.

The *statutory speed law* establishes specific posted maximum – and sometimes minimum – speed limits.



### **SUPPLEMENT 2: Speed Limit Worksheet (15 Minutes)**

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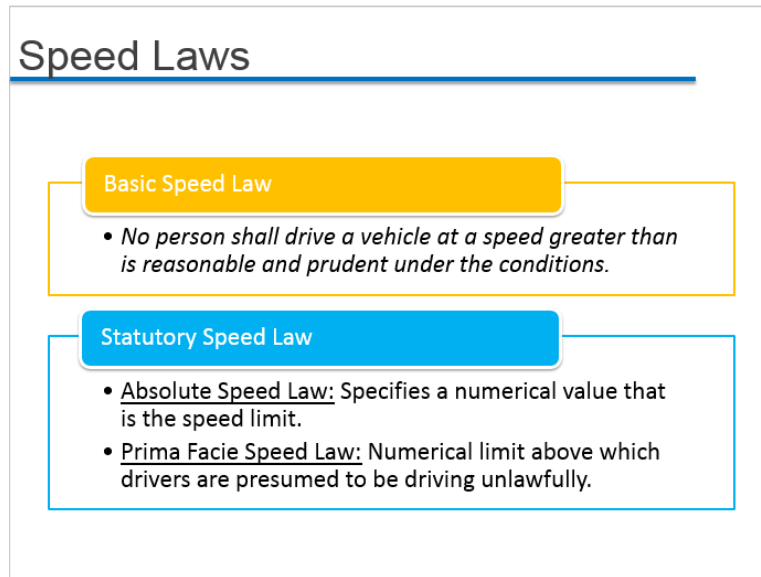
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## SPEED LAWS



### Speed Laws

- Basic Speed Law**
  - *No person shall drive a vehicle at a speed greater than is reasonable and prudent under the conditions.*
- Statutory Speed Law**
  - **Absolute Speed Law:** Specifies a numerical value that is the speed limit.
  - **Prima Facie Speed Law:** Numerical limit above which drivers are presumed to be driving unlawfully.

Slide 17.

The establishment of speed limits is an act of the traffic law system. There are a variety of traffic laws and traffic control devices that regulate speed and it is important to be aware of how they are established, implemented, and enforced.

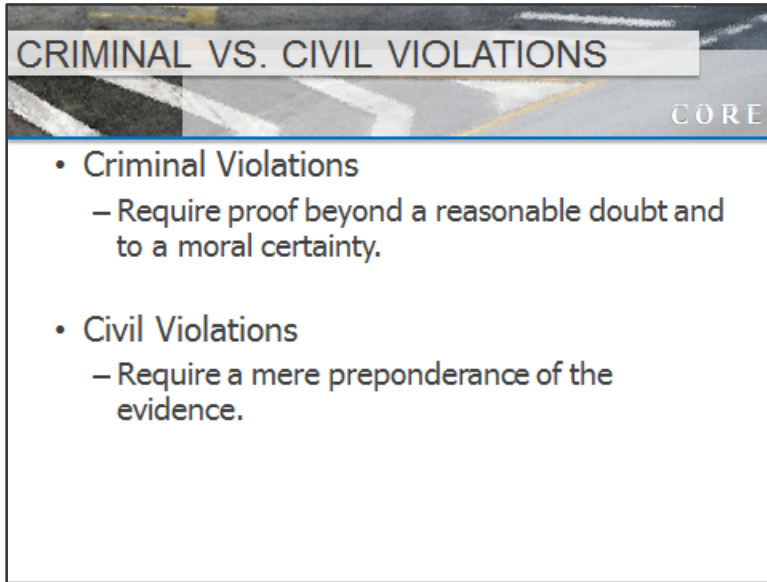
Most States have statutes that specify speed limits that generally apply for different types of roads unless otherwise posted. The legislators recognize that these statutory limits may not be appropriate for all locations and thus give the highway agency authority to establish limits above or below the general limits as warranted by conditions. The establishment of speed limits for specific road sections (zone) based on an engineering investigation is referred to as speed zoning and will be the focus of this module.

### BASIC SPEED LAW

Most State motor vehicle laws include a basic speed law which encompasses the following premise: No person shall drive a vehicle at a speed greater than is reasonable and prudent under the conditions and having regard for the weather, visibility, traffic, and the surface and width of the roadway.



## CRIMINAL V. CIVIL VIOLATIONS



**CRIMINAL VS. CIVIL VIOLATIONS** CORE

- Criminal Violations
  - Require proof beyond a reasonable doubt and to a moral certainty.
- Civil Violations
  - Require a mere preponderance of the evidence.

Slide 18.

These may vary from State to State.

- The difference is found in the burden of proof required to support the violation
  - Criminal violations require proof beyond a reasonable doubt and to a moral certainty
  - Civil violations require a mere preponderance of the evidence

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# SITE SELECTION

Estimated time for Chapter 4: 45 Minutes

**C O R E**

## » Objectives

By the end of this chapter, you will be able to:

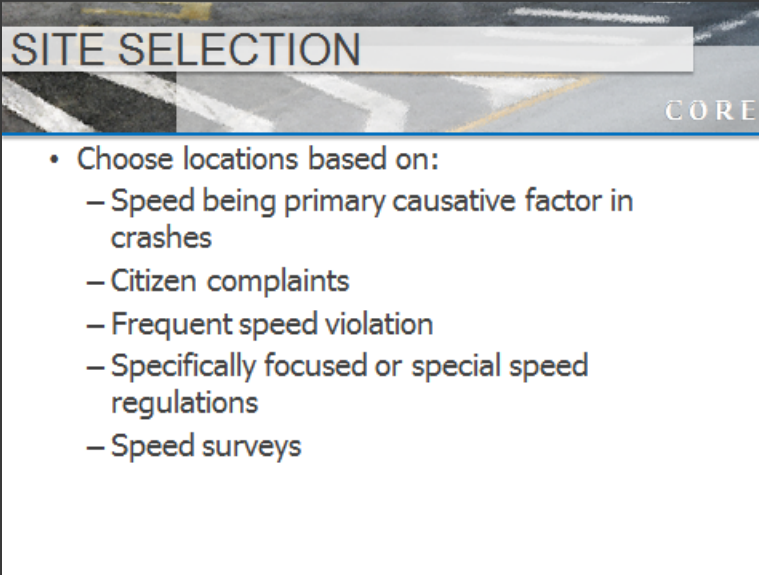
- Discuss safety considerations as they apply to speed enforcement

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Safety Considerations.....	33



## SITE SELECTION CONSIDERATIONS



**SITE SELECTION**

CORE

- Choose locations based on:
  - Speed being primary causative factor in crashes
  - Citizen complaints
  - Frequent speed violation
  - Specifically focused or special speed regulations
  - Speed surveys

Slide 20.

Several factors govern enforcement site selection. First, there must be a demonstrated need for speed enforcement. Enforcement should not be conducted at a site simply because it is convenient. Instead, choose a site that presents a speed-related traffic safety problem:

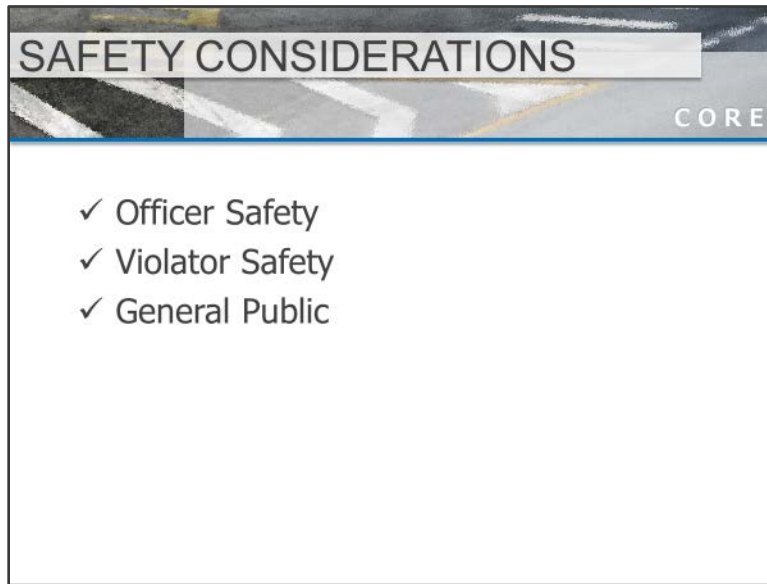
- Roadways where speed is a primary causative factor in crashes
- Areas or communities where citizen complaints have been received
- Locations where speed violations frequently occur
- Locations having specifically focused or special speed regulations (school zones, construction sites, etc.)
- Locations selected for speed surveys (to determine compliance, to establish speed limits, etc.)

Other considerations that can affect site selection:

- Operations should not be conducted where there is interference with speed-measuring devices
- Operations at a location should not be continued too long or repeated too often; with time, drivers will come to know the locations



## SAFETY CONSIDERATIONS



Slide 21.

At no time, should an operator create a situation that endangers the public or themselves for the sake of issuing a speeding citation.

- Officer safety considerations
  - A stationary enforcement site must provide enough room for the patrol vehicle to park and not impede the normal flow of traffic
  - The site must allow for the operator to visually monitor traffic
  - The site must allow the patrol vehicle operator sufficient visibility and space to safely enter traffic
- Violator Safety Considerations
  - The operator should choose a location to initiate the traffic stop that will allow sufficient space out of the lanes of travel for the driver's vehicle and patrol vehicle
  - The site should provide, as much as possible, a safe situation for the driver and law enforcement officer(s)

**Ensure all actions are consistent with your agency policies and procedures.**



# TRACKING HISTORY

Estimated time for Chapter 5: 30 Minutes

**C O R E**

## » Objectives

By the end of this chapter, you will be able to:

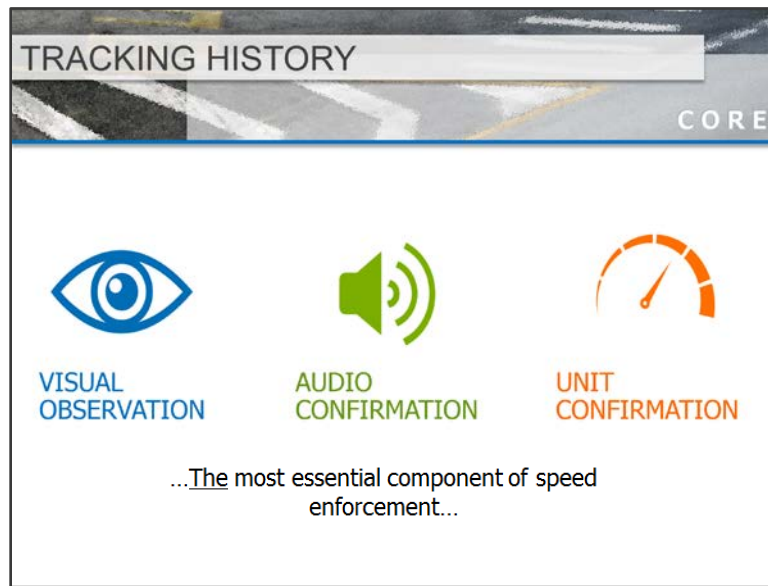
- Explain the elements of a speed enforcement tracking history

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Estimation of Speed .....	40
Audio Confirmation.....	42
Unit Confirmation.....	43



## TRACKING HISTORY



Slide 23.

Of all the topics contained in this training program, this topic area is the most essential. Regardless of how knowledgeable a student becomes of the applicable statutory and case law or how proficient they become with the operation of various types of speed-measuring devices, the officers who fail to develop the ability to identify violators and estimate the target vehicle's speed often fail to obtain conviction in the court.

The ability to estimate speed is a learned skill. This block of instruction is designed to provide information on the various elements to be considered when making a speed estimation and sufficient time to apply this information through practical application. The ability to estimate speed will continue to improve with time and experience. Experienced officers should possess the ability to estimate the speed of a target vehicle within very close tolerances.

Many drivers use R.A.D.A.R./L.I.D.A.R. detectors to avoid speeding citations. Officers that are proficient in the identification of violators and the estimation of target vehicle speed are not hampered in their enforcement efforts by detectors.

Law enforcement officers on patrol continually divide their attention among many tasks. The primary task of officers assigned to traffic enforcement duties is monitoring traffic. Officers assigned to routine patrol duties are expected to take appropriate traffic enforcement action when warranted. Regardless of an officer's assignment, the ability

to quickly and accurately identify speed violators will allow officers to divide their attention among the other necessary tasks.

Many speed-measuring devices are equipped with a feature that will allow the device to remain in a “stand-by” mode until the measure of a specific target vehicle’s speed is needed. This method of device operation keeps the transmitter active without broadcasting any signal which would activate the detectors.

A basis is needed for any speed enforcement action. An officer must know, and later articulate, that a specific vehicle and a person operating that vehicle did in fact violate a speed law. This basis supports the proving of elements for any speed law or rule and is known as a Tracking History.

There are various steps which are part of developing a Tracking History. Each step supports another and the number of steps incorporated can vary with the type being used.

Developing a Tracking History involves three components:

1. Visual observation and estimation
2. Audio confirmation
3. Unit confirmation

Studies have shown that people can learn to estimate the speeds of vehicles accurately based on their visual observation. Law enforcement officers can become very proficient at estimating speeds because observing traffic is a major part of their job. When officers become proficient with this skill, they easily identify violators and estimate the violator vehicle’s speed. This learned skill improves the effectiveness of speed enforcement through the proper and efficient use of speed-measuring devices.

Safety should be the primary consideration when selecting speed enforcement sites. The goal of the speed enforcement program is to improve traffic safety. At no time, should an operator create a situation that endangers the public or themselves for the sake of issuing a speeding citation.

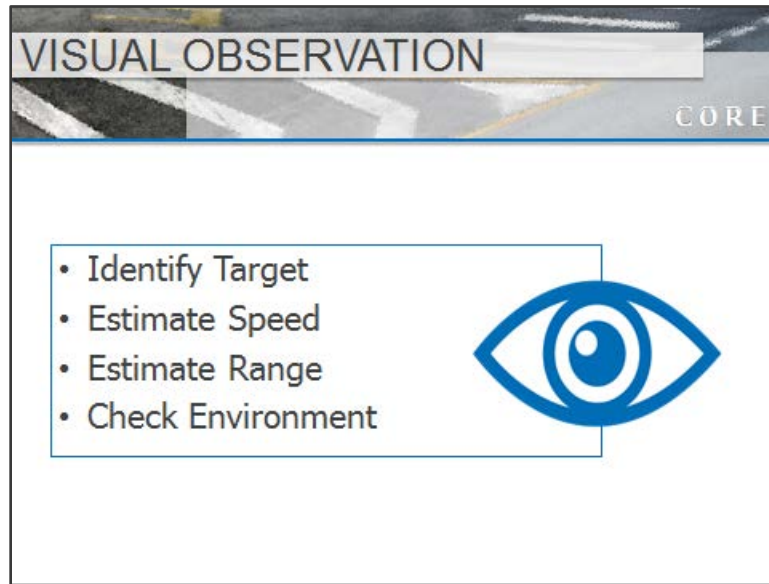
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## VISUAL OBSERVATION



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These categories can be broken down further into various steps.

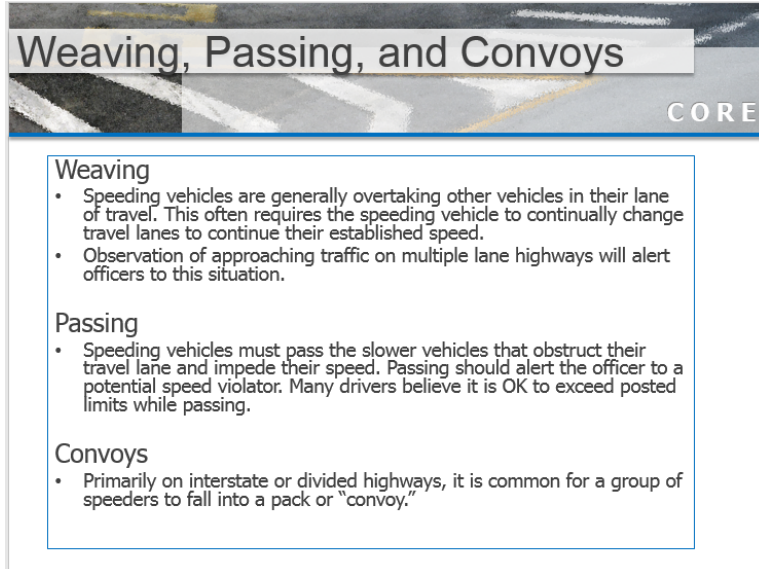
### Target Identification

The first step in any speed enforcement action is the identification of the violator. This identification is often done by officers at a subconscious level. It's that energized reaction that most officers receive when they suddenly observe a vehicle traveling at an extremely high speed. Vehicles traveling at speeds much higher than the posted speed limits are easily identified while the vehicles that are speeding just above the posted speed limits are generally harder to identify initially.

### Estimation of Target Speed

Once an officer identifies a speeding vehicle, that vehicle then becomes the target vehicle. This simply implies that the officer is now focusing, or targeting, their attention on this specific vehicle. It is during this period of observation that the officer will estimate the target vehicle's speed independent of and prior to the use of any speed-measuring device. With experience, the speed estimation will occur simultaneous with target identification.

Visual observation of the target vehicle is all that is needed to make a speed estimation. There is no time frame that must take place for this to occur. Experienced officers will use as much time as is available and necessary to make the speed estimation.



**Weaving, Passing, and Convoys**

**Weaving**

- Speeding vehicles are generally overtaking other vehicles in their lane of travel. This often requires the speeding vehicle to continually change travel lanes to continue their established speed.
- Observation of approaching traffic on multiple lane highways will alert officers to this situation.

**Passing**

- Speeding vehicles must pass the slower vehicles that obstruct their travel lane and impede their speed. Passing should alert the officer to a potential speed violator. Many drivers believe it is OK to exceed posted limits while passing.

**Convoys**

- Primarily on interstate or divided highways, it is common for a group of speeders to fall into a pack or "convoy."

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Slide 25

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### Weaving

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Observation of approaching traffic on multiple lane highways will alert officers to this situation.

### Passing

Speeding vehicles must pass the slower vehicles that obstruct their travel lane and impede their speed. Passing should alert the officer to a potential speed violator. Many drivers believe it is OK to exceed posted limits while passing.

### Convoys

Primarily on interstate or divided highways, it is common for a group of speeders to fall into a pack or "convoy."







## SPEED CONVERSION FORMULA

$$1 \text{ mph} = 1.5 \text{ fps}$$

$$\frac{\text{Mile}}{\text{Hour}} = \frac{5,280\text{ft}}{60\text{min}} = \frac{5,280\text{ft}}{3600\text{sec}}$$

$$\frac{5,280\text{ft}}{3,600\text{sec}} = 1.4667 \approx 1.5$$



Slide 27

Officers should be able to recognize and translate time and distance proportionality. A vehicle will travel approximately 1.5 feet during each second for each mile per hour of speed. If a vehicle traveled approximately 75 feet during one second of time, the vehicle is traveling approximately 50 miles per hour (75ft/sec = 50mph). This method of estimating speed is reasonably accurate and acceptable for speed estimations.



### **SUPPLEMENT 4: Speed and Range Estimation Worksheet (10 Minutes)**

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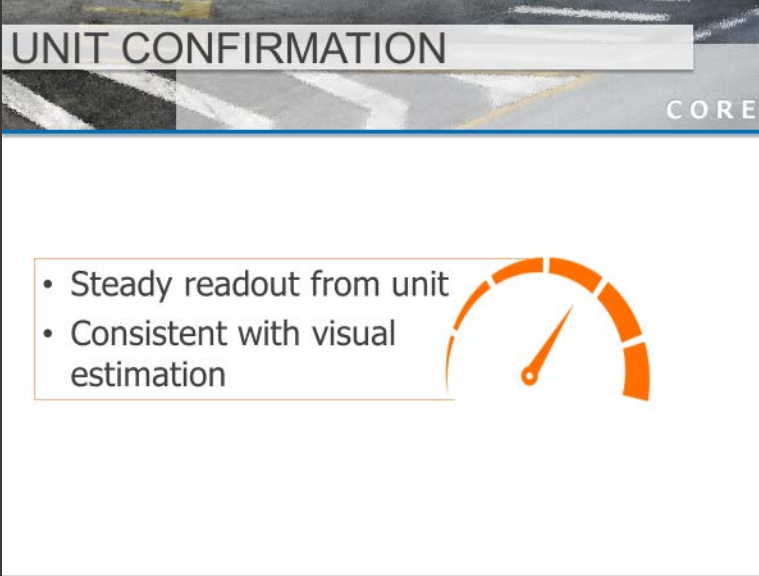
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## UNIT CONFIRMATION



UNIT CONFIRMATION

CORE

- Steady readout from unit
- Consistent with visual estimation

Slide 29

The final step in developing a Tracking History is the confirmation of the two previous steps with speed-measuring device readout.

A steady read-out with the speed-measuring device is preferred. The operator must be able to articulate that the speed reading came from the target vehicle.

Once the read-out is obtained, it must corroborate the operator's visual estimation of the target vehicle's speed.

The process of developing a Tracking History may appear to be complicated. It takes only a few seconds and becomes automatic. A Tracking History is necessary for ALL speed enforcement actions.

**If ANY doubt ever exists while developing a Tracking History, no enforcement action should be taken.**



**SUPPLEMENT 5: Tracking History Worksheet (10 Minutes)**



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## STOPPING DISTANCE WORKSHEET

**Stopping Distance**

S = Speed  
DF = Drag Factor

$$\frac{S^2}{30 \times DF} = \text{Distance to Stop Once Brakes are Applied}$$

**Perception/Reaction Distance**

S = Speed  
1.47 = Converts mph - feet per second  
1.5 = Average perception/reaction

$$S \times 1.47 \times 1.5 = \text{Distance Covered During Perception/Reaction Time}$$

Violator's Speed \_\_\_\_\_

1. Reaction Distance \_\_\_\_\_

2. Stopping Distance \_\_\_\_\_

3. Total Stopping Distance \_\_\_\_\_

Violator's Speed \_\_\_\_\_

1. Reaction Distance \_\_\_\_\_

2. Stopping Distance \_\_\_\_\_

3. Total Stopping Distance \_\_\_\_\_

Violator's Speed \_\_\_\_\_

1. Reaction Distance \_\_\_\_\_

2. Stopping Distance \_\_\_\_\_

3. Total Stopping Distance \_\_\_\_\_

Violator's Speed \_\_\_\_\_

1. Reaction Distance \_\_\_\_\_

2. Stopping Distance \_\_\_\_\_

3. Total Stopping Distance \_\_\_\_\_

Violator's Speed \_\_\_\_\_

1. Reaction Distance \_\_\_\_\_

2. Stopping Distance \_\_\_\_\_

3. Total Stopping Distance \_\_\_\_\_

Violator's Speed \_\_\_\_\_

1. Reaction Distance \_\_\_\_\_

2. Stopping Distance \_\_\_\_\_

3. Total Stopping Distance \_\_\_\_\_

SPEED LIMIT WORKSHEET

Speed Limit \_\_\_\_\_

Speed Limit \_\_\_\_\_

Violator's Speed \_\_\_\_\_

Violator's Speed \_\_\_\_\_

1. Reaction Distance \_\_\_\_\_ / \_\_\_\_\_

1. Reaction Distance \_\_\_\_\_ / \_\_\_\_\_

2. Stopping Distance \_\_\_\_\_ / \_\_\_\_\_

2. Stopping Distance \_\_\_\_\_ / \_\_\_\_\_

3. Total Stopping Distance \_\_\_\_\_ / \_\_\_\_\_

3. Total Stopping Distance \_\_\_\_\_ / \_\_\_\_\_

4. % Over Speed Limit \_\_\_\_\_

4. % Over Speed Limit \_\_\_\_\_

5. % Farther to Stop \_\_\_\_\_

5. % Farther to Stop \_\_\_\_\_

Speed Limit \_\_\_\_\_

Speed Limit \_\_\_\_\_

Violator's Speed \_\_\_\_\_

Violator's Speed \_\_\_\_\_

1. Reaction Distance \_\_\_\_\_ / \_\_\_\_\_

1. Reaction Distance \_\_\_\_\_ / \_\_\_\_\_

2. Stopping Distance \_\_\_\_\_ / \_\_\_\_\_

2. Stopping Distance \_\_\_\_\_ / \_\_\_\_\_

3. Total Stopping Distance \_\_\_\_\_ / \_\_\_\_\_

3. Total Stopping Distance \_\_\_\_\_ / \_\_\_\_\_

4. % Over Speed Limit \_\_\_\_\_

4. % Over Speed Limit \_\_\_\_\_

5. % Farther to Stop \_\_\_\_\_

5. % Farther to Stop \_\_\_\_\_

Speed Limit \_\_\_\_\_

Speed Limit \_\_\_\_\_

Violator's Speed \_\_\_\_\_

Violator's Speed \_\_\_\_\_

1. Reaction Distance \_\_\_\_\_ / \_\_\_\_\_

1. Reaction Distance \_\_\_\_\_ / \_\_\_\_\_

2. Stopping Distance \_\_\_\_\_ / \_\_\_\_\_

2. Stopping Distance \_\_\_\_\_ / \_\_\_\_\_

3. Total Stopping Distance \_\_\_\_\_ / \_\_\_\_\_

3. Total Stopping Distance \_\_\_\_\_ / \_\_\_\_\_

4. % Over Speed Limit \_\_\_\_\_

4. % Over Speed Limit \_\_\_\_\_

5. % Farther to Stop \_\_\_\_\_

5. % Farther to Stop \_\_\_\_\_

## SPEED LAWS

ELEMENTS	BASIC SPEED LAW	ABSOLUTE SPEED LAW	PRIMA FACIE SPEED LAW
Driver	Accused must be shown to have been the driver at the time of the infraction.	(Same)	(Same)
Location	Any place to which the public has right of access for vehicle use.	(Same)	(Same)
Speed	Unreasonable or imprudent	In excess of specified limit and thus are in violation of the law.	In excess of specified limit and thus presumed to be driving unlawfully.
Conditions	Having regard to actual and potential hazards.	Not applicable	Having regard to actual and potential hazards.



## SPEED AND RANGE ESTIMATION WORKSHEET

Name \_\_\_\_\_ Location \_\_\_\_\_

Date \_\_\_\_\_ Time \_\_\_\_\_

Speed Est.	Range Est.	Speed Est.	Speed Actual	Range Actual	Difference Speed	Difference Range
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
Total	Total	Total	Total	Total	Total	Total

Total of All Speed ÷ 10 = Range of Speed Estimates

“My ability to estimate speeds averaged within \_\_\_\_\_ mph in a structured test.”

Total of All Ranges ÷ 10 = Range of Distance Estimates

“My ability to estimate range averaged within \_\_\_\_\_ feet in a structured test.”

## TRACKING HISTORY

### Visual

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

4. \_\_\_\_\_

### Audio

1. \_\_\_\_\_

2. \_\_\_\_\_

### Unit Confirmation

1. \_\_\_\_\_

2. \_\_\_\_\_