



***Temporary
Traffic Control
Design
Specialist
Training Course***



About This Course

- ◆ This material is based upon work supported by the Federal Highway Administration (FHWA) under grant agreement No. DTFH61-06-G-00004



Developed & Presented by

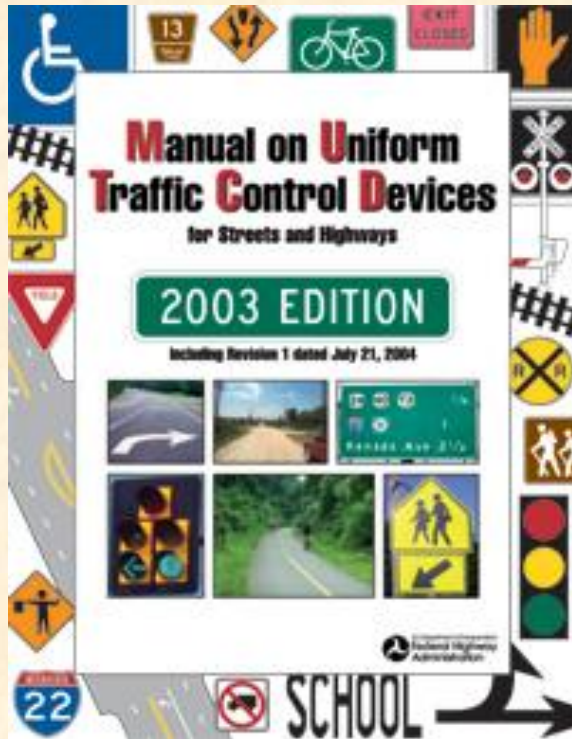
American Traffic

Safety Services Association



SAFER ROADS SAVE LIVES

About this course



- ◆ Based on the 2003 Edition of the ***Manual on Uniform Traffic Control Devices***
- ◆ Intended for engineers and others responsible designing of Traffic Control Plans (TCP)

About this course

- ◆ This course assumes no previous knowledge a work zone design
- ◆ If you are an ATSSA Traffic Control Supervisor (TCS) charged with a “design” responsibility, a 1-day course is available.



TCDS Training Course

- ◆ Two-day course
- ◆ Begins promptly at 8:00 AM
- ◆ Ends no later than 5:00 PM

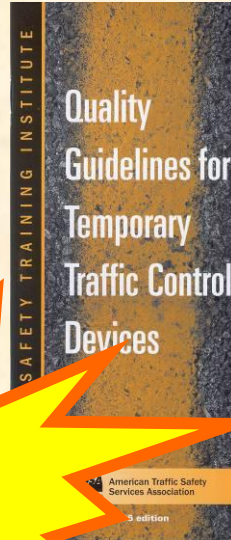
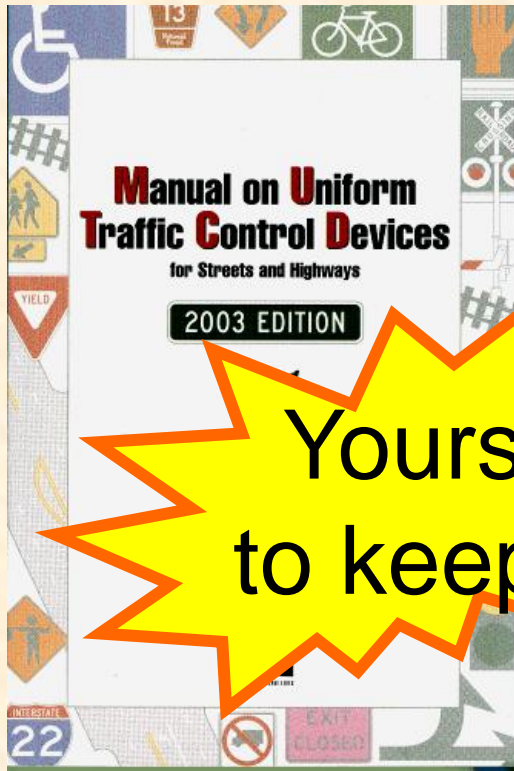


**Flexible
schedule!!**

Upon completion, you will be able to:

- ◆ Recognize the design elements of work zone traffic control
- ◆ Know the TTC standards & guidelines that govern the design of TCPs
- ◆ Apply these to real-world scenarios
- ◆ Know techniques and procedures for designing effective, efficient and safe TCPs, including nighttime work zones

Course Materials



**Yours
to keep!**

- ◆ Course notebook
- ◆ MUTCD (Parts 1, 5, 6)
- ◆ *Quality Guidelines for Work Zone Traffic Control Devices*
- ◆ Pencil
- ◆ Tent name sign

Course Schedule

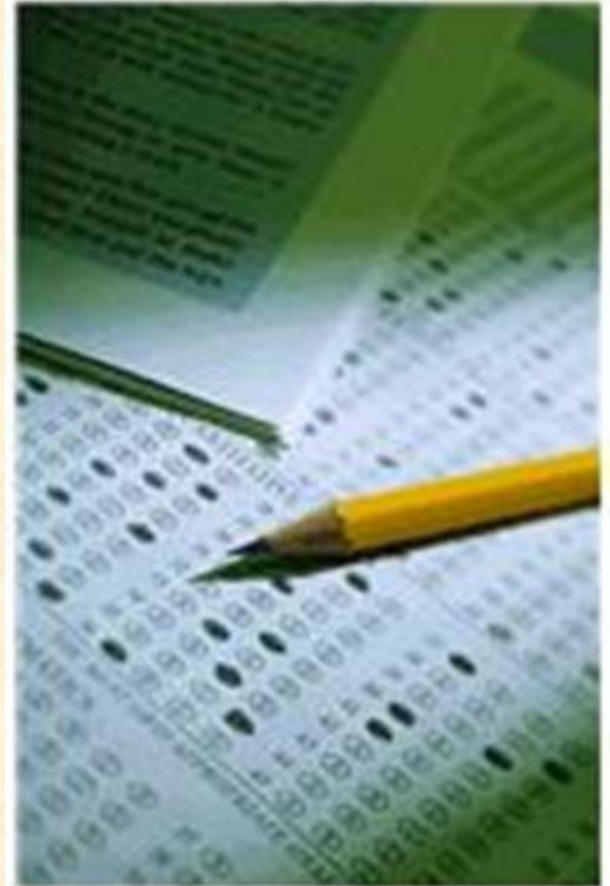
| | |
|----------|-------------------------------|
| 1 | Course Introduction |
| 2 | Fundamental Principles |
| 3 | Human Factors |
| 4 | Component Parts of a TTC Zone |
| 5 | Traffic Control Devices |
| 6 | Types of TTC Activities |
| 7 | TTC Design Strategies |
| 8 | Traffic Control Plan |

Course Schedule

| | |
|-----------|----------------------|
| 9 | Nighttime Work Zones |
| 10 | Legal Aspects |
| 11 | Other Considerations |
| | Closing (EXAM) |

Exam

- ◆ **40 multiple choice questions**
- ◆ 2.5 pts each = 100 pts
- ◆ 60 minutes
- ◆ Open book, open notes
- ◆ Passing grade = 80%



-MODULE 1- Introduction



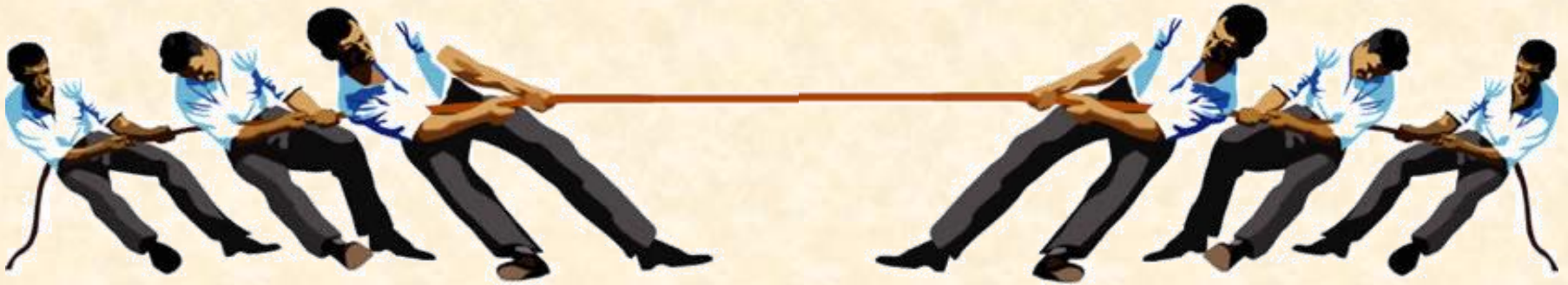
Module Objectives

- ◆ Define work zone traffic control and its impact on safety and mobility
- ◆ Discuss the designer's role in proper work zone traffic control
- ◆ Discuss Transportation Management Plans (TMP)
- ◆ Discuss the source of TTC standards and guidelines

What is Temporary Traffic Control (TTC)?

- ◆ The planning, design & preparation of contract documents necessary to control traffic temporarily in areas affected by:
 - ◆ Construction and reconstruction
 - ◆ Highway maintenance
 - ◆ Incident management
 - ◆ Utility operations
 - ◆ Special events

Conflicting goals?



- Maintain traffic flow
- Keep costs down

Maximum levels
of safety

***TTC impact on traffic flow is important,
but not at the expense of safety!***

The Designer's Dilemma

***Safety
vs. cost***

Safety is essential!



Work Zone Costs

◆ Indirect costs

- ◆ Crashes, injuries, fatalities
- ◆ Property damage
- ◆ Delays
- ◆ Vehicle costs
- ◆ Fuel consumption
- ◆ Quality of life

◆ Direct costs

- ◆ Labor and materials



The Designer's Role

◆ Critical to work zone safety

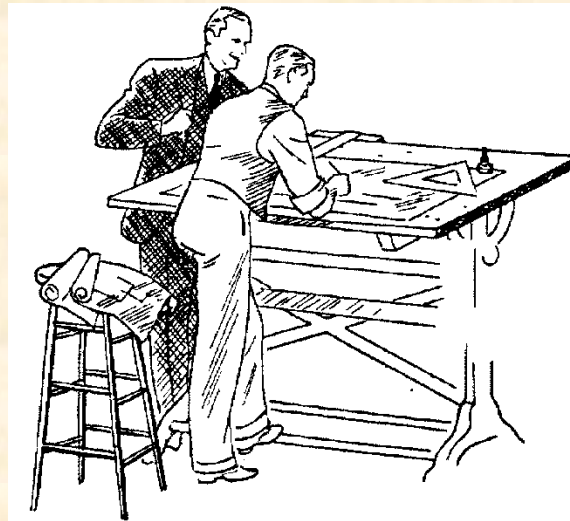
◆ Assess and consider ALL factors that may impact the safety of all people within the work zone

◆ Motorists

◆ Pedestrians

◆ Cyclists

◆ Workers



The Designer's Role

- ◆ To consider **ALL** factors and **ALL** users involved, the standards and guidelines, and apply engineering judgment to develop the **BEST** possible **Traffic Control Plan**



Engineering Judgment

An engineer's evaluation of available pertinent information, and the application of appropriate principles, standards, guidance, and practices for the purpose of deciding upon the applicability, design, operation, or installation of a traffic control device.

MUTCD Definition 25, Page 1A-11




This course discusses these principles, standards and practices!

How do we make work zones safer?

- ◆ Improving communication with road users (“positive guidance”)
- ◆ Following applicable standards and guidelines
- ◆ Conducting inspections
- ◆ COMMON SENSE!
- ◆ Doing more than the MINIMUM!
- ◆ Having an effective TCP!



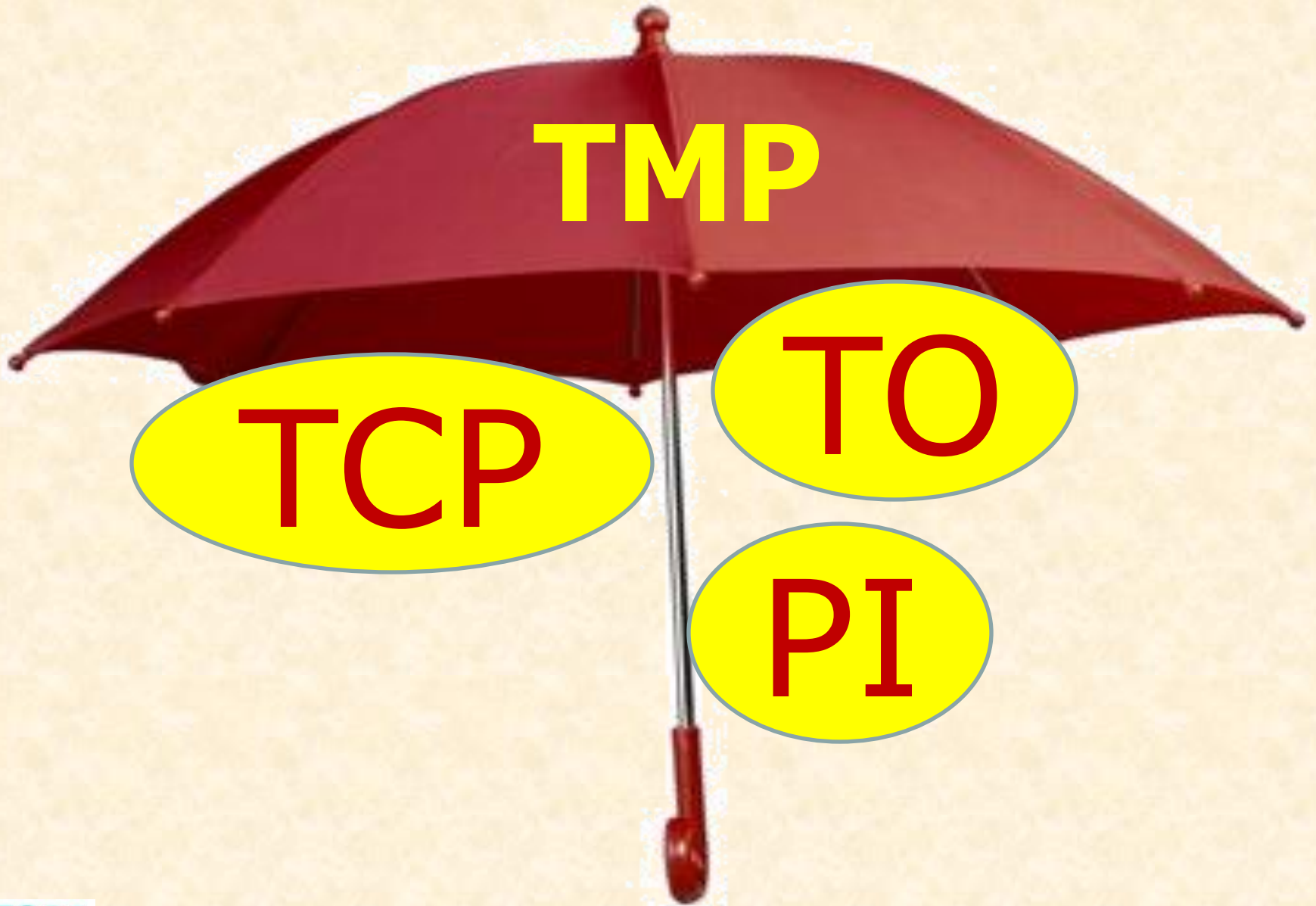
What is a TCP?

-  A **set of drawings** and other information detailing how the work will be accomplished.
-  A **plan** for maintenance and **control** of **traffic** during work
-  Part of a “Transportation Management Plan” (TMP)

What is a TMP?

- ◆ A set of coordinated transportation management strategies
- ◆ Describes how they will be used to manage the work zone impacts of a road project.
- ◆ The TCP is just one part





TMP

TCP

TO

PI

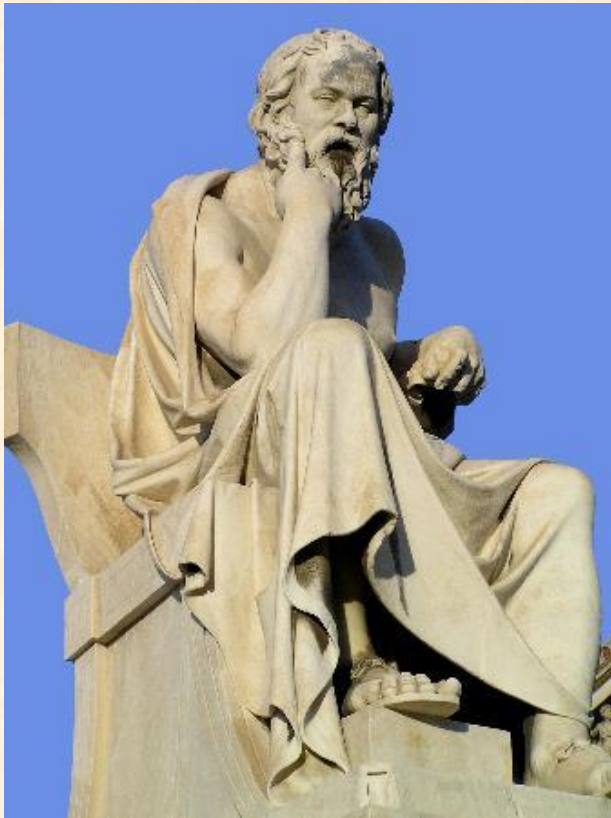


-MODULE 2- Fundamental Principles

Module Objectives

- ◆ Discuss the seven fundamental principles of TTC
- ◆ Describe their application

Fundamental Principles of TTC



- ◆ Provide a **“guiding philosophy”**
- ◆ If followed, will:
 - ◆ Protect road users
 - ◆ Protect workers
 - ◆ **Improve safety!**

Fundamental Principles of TTC

“SHOULD”

GUIDELINE

- ◆ The MUTCD includes **7** fundamental principles
- ◆ Under “**GUIDANCE**”
 - ◆ Steps we *should* take on every project
- ◆ Not requirements



-MODULE 3- Human Factors

Module Objectives

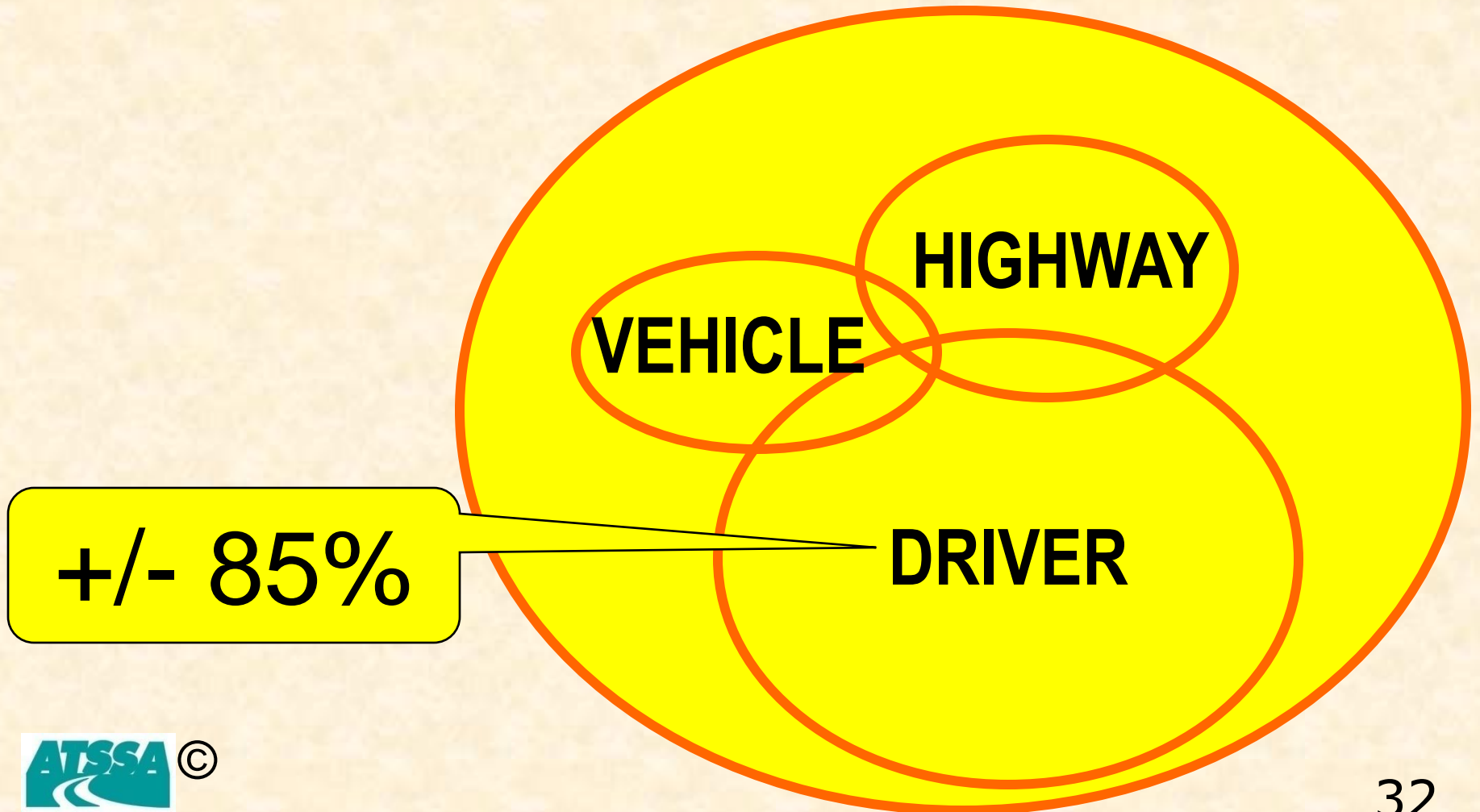
- ◆ Discuss how human factors impact TTC design
- ◆ Discuss design keys
- ◆ Discuss the “Design Driver” concept

What are Human Factors?

◆ The study of **how humans behave** physically and psychologically in relation to particular environments, in this case, the highway environment



Factors Affecting Crashes



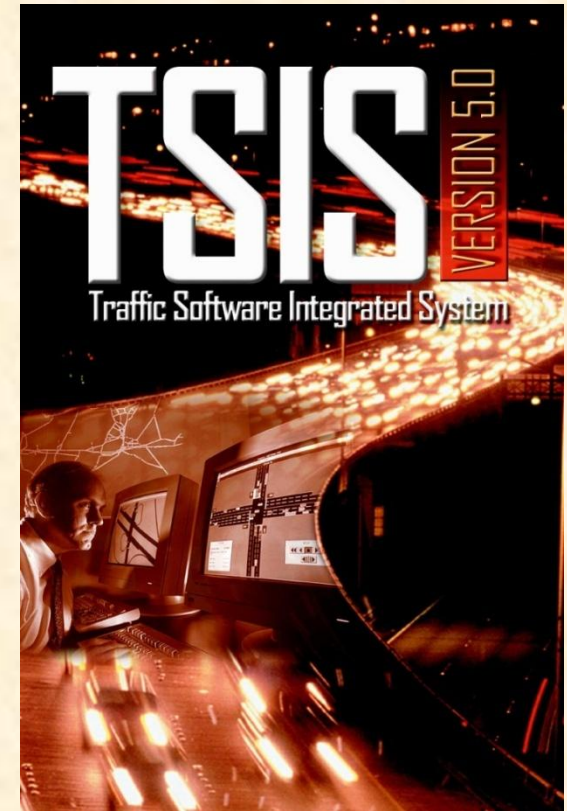
Perception/Reaction (P/R) Cycle

- ◆ **P**erception (Situation detected)
- ◆ **I**ntellection (Situation identified and analyzed)
- ◆ **E**motion (Decision on action made)
- ◆ **V**olition (Action executed)

PIEV

1. Traffic Simulation: e.g., CORSIM

- ◆ A great tool to assess the impact of the work zone on traffic flow **BEFORE** construction begins
- ◆ Enables adjustments to design
- ◆ Great for public hearings!



CORSIM Screen

The screenshot displays the CORSIM software interface for a freeway simulation. The window title is "FREEWAY1.TRF # 2". The interface includes a toolbar with various icons, a legend on the left, and a main simulation area. The legend defines vehicle colors and incident types: Blocked (red) and Restricted (yellow). The simulation area shows a multi-lane freeway with a closed lane on the right, indicated by a red and yellow bar with black 'X' symbols. A yellow callout box labeled "Closed lane" points to this area. Below the closed lane, a yellow callout box labeled "Rubbernecking" points to a traffic jam where vehicles are stopped or moving very slowly. A control panel at the bottom right shows "Frame Delay (Seconds)" set to 0.001 and "Frames/Time Step" set to 54. The simulation area also features a color-coded bar above the road representing different vehicle types or states.

LEGEND

VEHICLE COLORS
Random

INCIDENTS
Blocked ■
Restricted ■

Closed lane

"Rubbernecking"

Frame Delay (Seconds)
0.000 0.001 2.000

Frames/Time Step
1 54 100



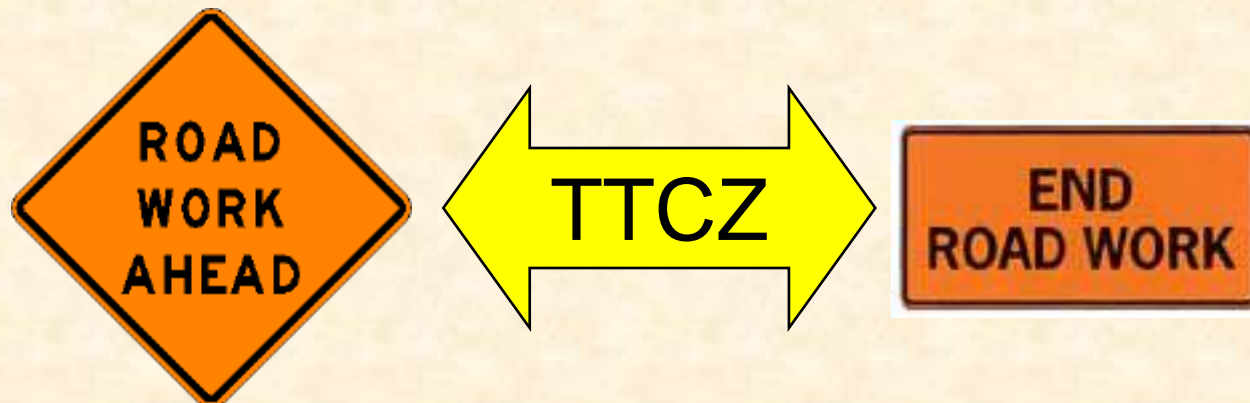
-MODULE 4- Component Parts of a Temporary Traffic Control Zone

Module Objectives

- ◆ Define temporary traffic control zone (TTCZ)
- ◆ Discuss its four component parts
- ◆ Discuss requirements of each component part
- ◆ Discuss tapers in detail

TTCZ Definition

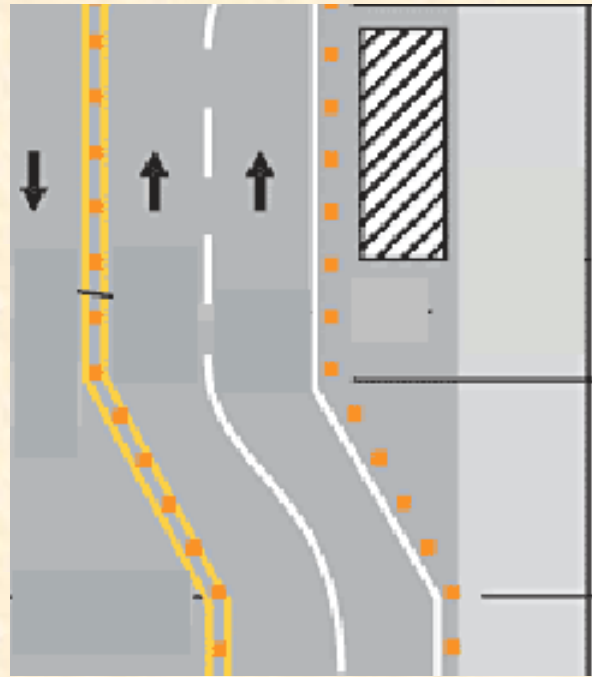
- ◆ The entire section of roadway between
 - ◆ The first advance warning sign (or device)
 - ◆ Through the last traffic control device, where traffic returns to its normal path



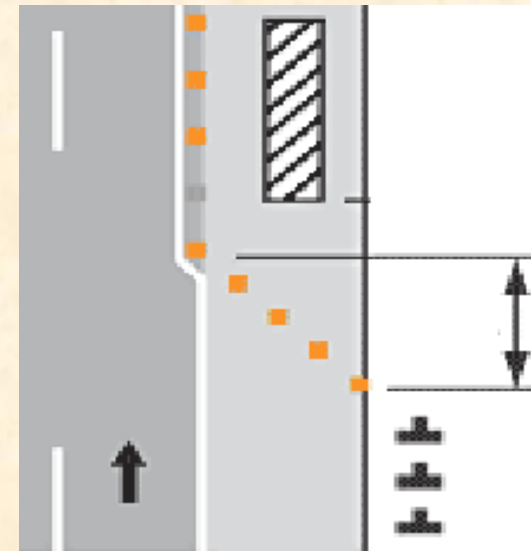
Types of Tapers



Merging



Shifting



Shoulder

Min. Length (L) of a MERGING Taper

$$L = WS \quad (45 \text{ mph or more})$$

$$L = (WS^2)/60 \quad (40 \text{ mph or less})$$

Where:

L = length of the MERGING taper in ft;

W = width lateral displacement in ft;

S = Speed in mph



-MODULE 5- ***Traffic*** ***Control*** ***Devices***

Module Objectives

- ◆ Define traffic control devices and their requirements
- ◆ Discuss signs, channelizing devices, arrow panels and pavement markings, PCMS, barriers, impact attenuators, and their requirements

What are Traffic Control Devices?

- ◆ “Things” used to implement a TTC plan in the field
- ◆ **Objects** motorists see and respond to when they drive through a TTCZ
- ◆ **Shall be approved in the MUTCD**



Design

- ◆ Color
- ◆ Size and shape
- ◆ Retroreflective or illuminated
- ◆ Safe if struck
- ◆ ***"Crashworthy"***



Crash Testing Requirements



FHWA 1997 Guidance Memo:



"All work zone devices used on National Highway System (NHS) shall be crash tested to meet NCHRP Report 350 requirements"



What is the NCHRP?

National Cooperative Highway Research Program (NCHRP)

 Conducts research

 Part of TRB



[TRB](#) | [About](#) | [Publications](#) | [TRB Map](#) | [Contact TRB](#)


Transportation Research Board

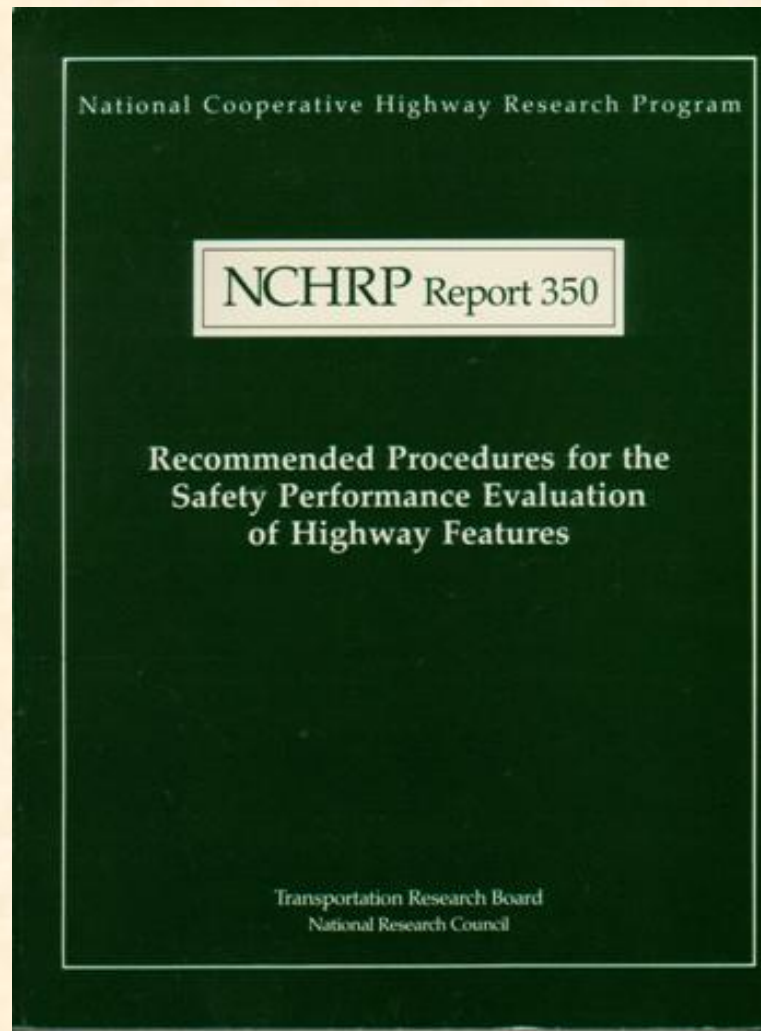
NCHRP Report 350

“350-compliant”

 Crash tested

 Crashworthy

 Meets the requirements of NCHRP Report 350



Proper Height?

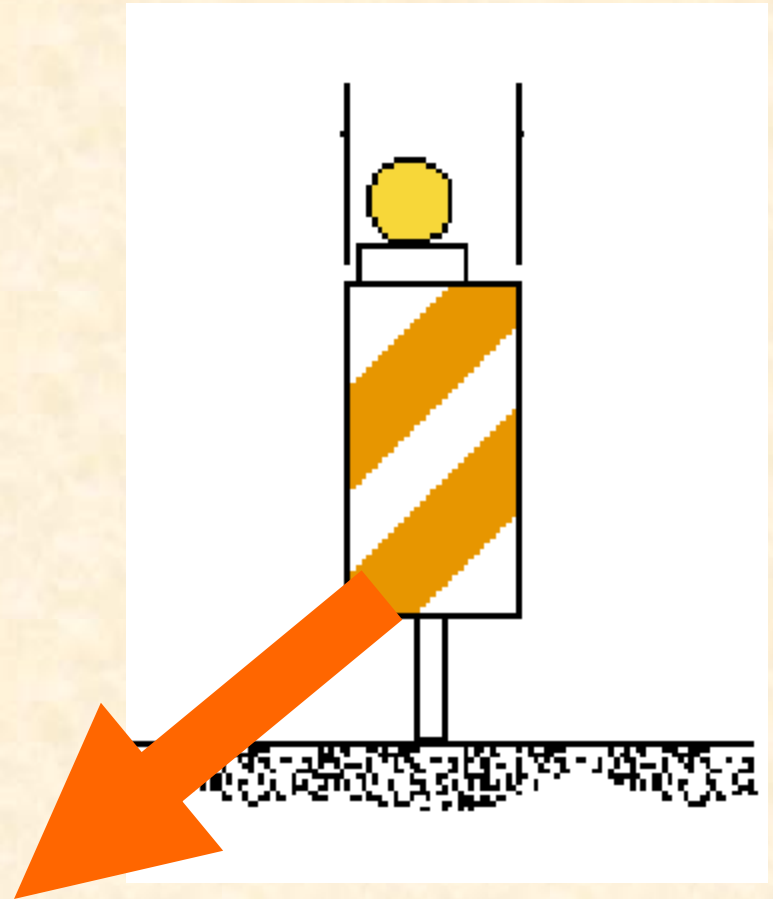


Vertical Panels

◆ Stripes slope down toward side traffic is to pass

◆ Ballast: Rubber bases and sand bags

Traffic to pass this way!





-MODULE 6- Types of TTC Activities

Module Objectives

- ◆ Discuss three factors used to categorize TTC zone applications:
 1. Duration
 2. Location
 3. Work type

1. Work Duration-

- ◆ A major factor in determining TTC
- ◆ Defined relative to the length of time a work operation occupies a **spot location**



MUTCD Categories of Work Duration

- A.** Long-term stationary
- B.** Intermediate-term stationary
- C.** Short-term stationary
- D.** Short duration
- E.** Mobile



-MODULE 7- TTC Design Strategies



Module Objectives

- ◆ Discuss planning considerations
- ◆ Discuss design strategies:
 1. Enforcement
 2. Phasing/Staging
 3. Contracting

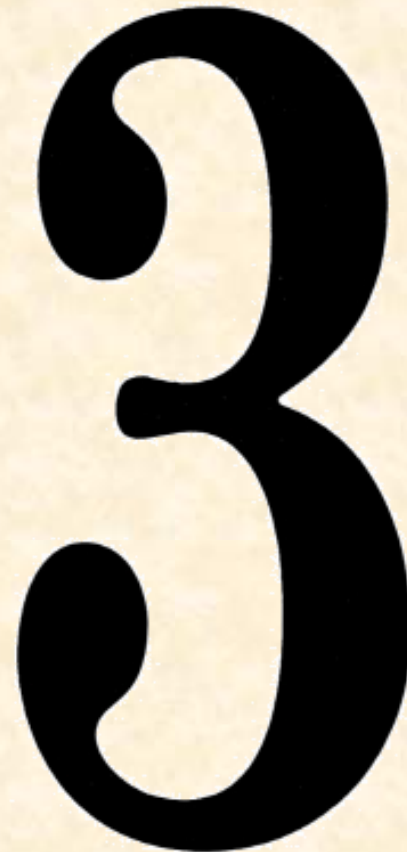
Planning Considerations

- ◆ Gather available data
- ◆ Assess roadway characteristics
- ◆ Identify all agencies that may have jurisdiction
- ◆ Coordinate with local officials



Design Strategies to Discuss

1. Use of police services
2. Phasing
3. Contracting





-MODULE 8- ***Traffic*** ***Control Plan*** ***(TCP)***

Module Objectives

- ◆ Discuss strategies used in developing an effective TCP
- ◆ Discuss TCP requirements
- ◆ Discuss component parts of a good TCP

The Traffic Control Plan

- ◆ Describes temporary traffic control measures to be used for facilitating road users through a work zone
- ◆ Specific requirements may be detailed in various publications, depending on the state

TCP

The TCP...

The letters 'TCP' are rendered in a large, bold, yellow font with a blue outline. The letters are slightly shadowed, giving them a 3D appearance as if they are floating above the slide background.

- ◆ Must be consistent with the MUTCD and the RDS
- ◆ May be incorporated in the TMP by reference
- ◆ May also be specifically designed for individual projects

Keys to TCP Development

- ◆ Understand the project
- ◆ Gather the necessary data
- ◆ Develop specific objectives
- ◆ Evaluate and brainstorm multiple alternatives
- ◆ Develop a **detailed TCP** that would meet the project's objectives re: safety, mobility and cost

-MODULE 9- Nighttime Work Zones



Module Objectives

- ◆ Discuss factors that influence the design and operation of nighttime work zones
- ◆ Discuss work zone lighting requirements
- ◆ Discuss possible night work enhancements

Nighttime Work Zones

- ◆ Becoming more common due to:
 - ◆ Daytime congestion
 - ◆ Reduced business impact
 - ◆ Reduced community impact



Objectives of Nighttime Temporary Traffic Control

- ◆ Provide high levels of safety for workers and the public
- ◆ Minimize congestion and community impact
- ◆ Provide adequate access to the roadway

Conditions for Nighttime Work

1. Reduced traffic volumes
2. Easy setup and removal of the traffic control **on a nightly basis**



Recommended Min. Illuminance Levels & Categories for NWZ

| LEV. | Min. Illuminance Level, lx (fc) | Area of Illumination | Examples of Activities |
|-------------|--|-------------------------------|--|
| I | 54 (5) | Throughout spaces | Excavation, sweeping & cleanup, movement area in work zone, movement between two tasks |
| II | 108 (10) | Of tasks and around equipment | Paving, milling, concrete work, around paver or miller |
| III | 216 (20) | Illuminance on task | Crack filling, pot filling, tasks requiring extreme accuracy and attention |

-MODULE 10- Legal Aspects of Temporary Traffic Control



Module Objectives

- ◆ Discuss legal aspects of TTC
- ◆ Define litigation
- ◆ Define legal terms
- ◆ Explain the civil lawsuit process
- ◆ Provide tips to minimize liability exposure

What is Litigation?



A procedure for the settlement of **civil claims**, generally involving two or more parties.



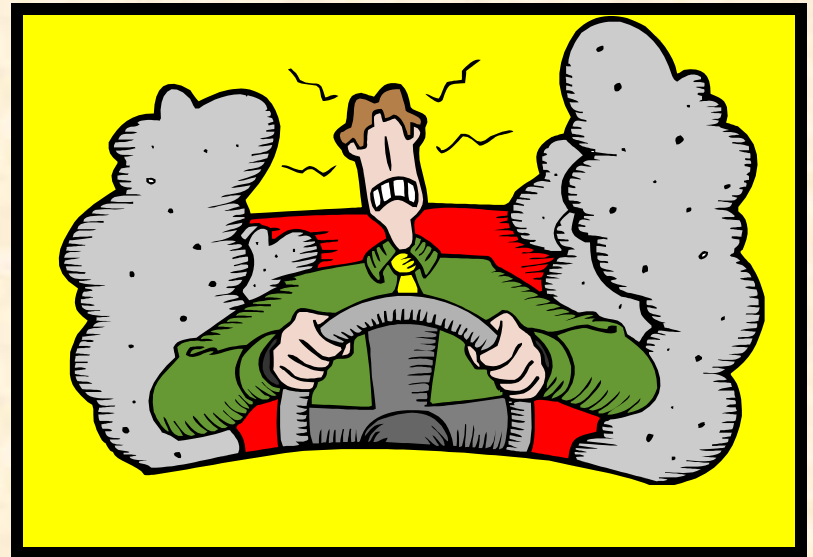
Legal Terms to Define

- ◆ Plaintiff
- ◆ Defendant
- ◆ Tort
- ◆ Liability
- ◆ Standard of Care
- ◆ Negligence
- ◆ Interrogatories

- ◆ Subpoena
- ◆ Subpoena Duces Tecum
- ◆ Deposition
- ◆ Summary Judgment
- ◆ Trial
- ◆ Perjury

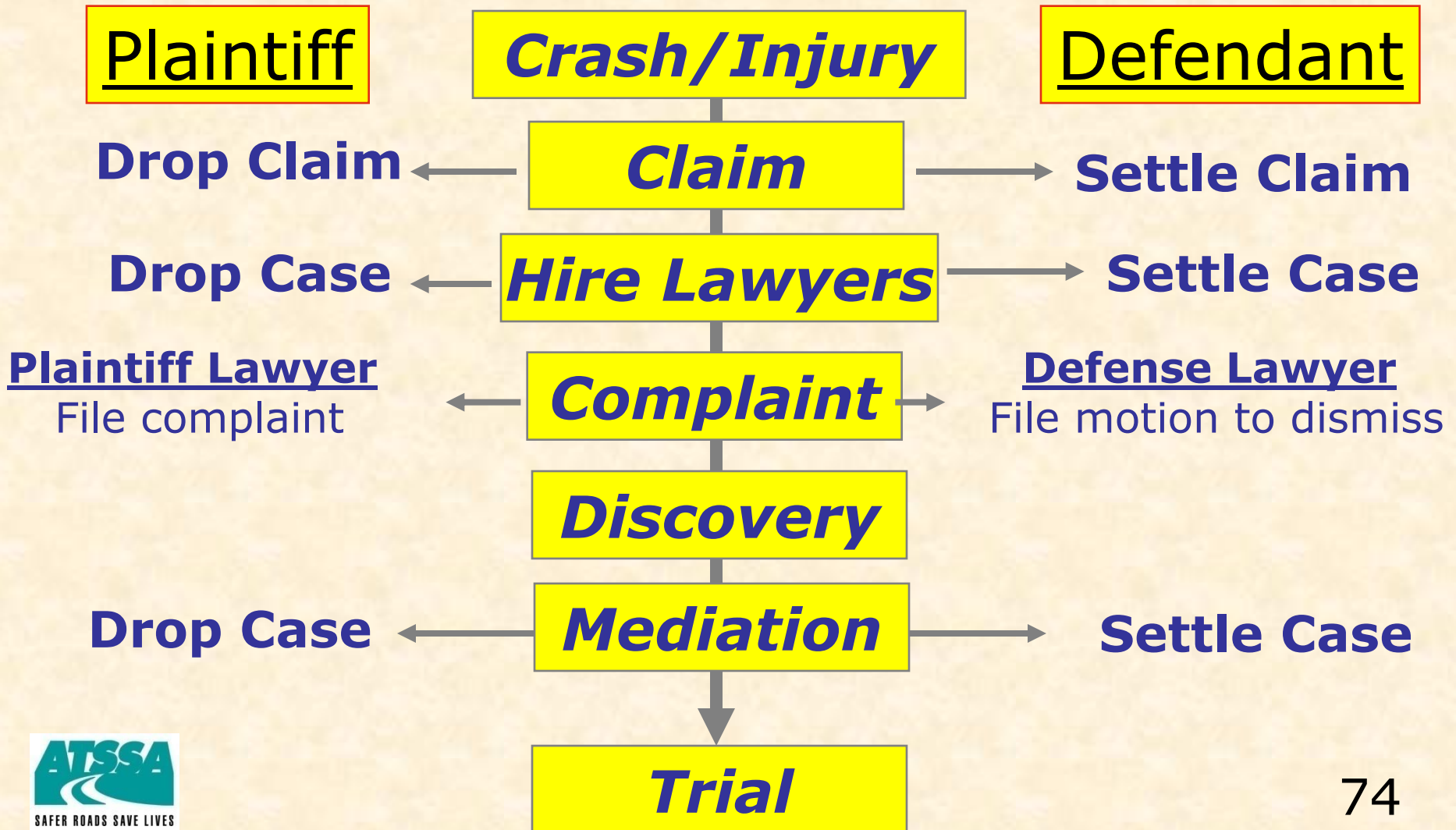
Plaintiff

- ◆ A person who brings an action
- ◆ The party who complains or sues in a civil action and is so named on the record



Who could be a plaintiff?

Civil Lawsuit Process





-MODULE 11- ***Other*** ***Considerations***

Module Objectives

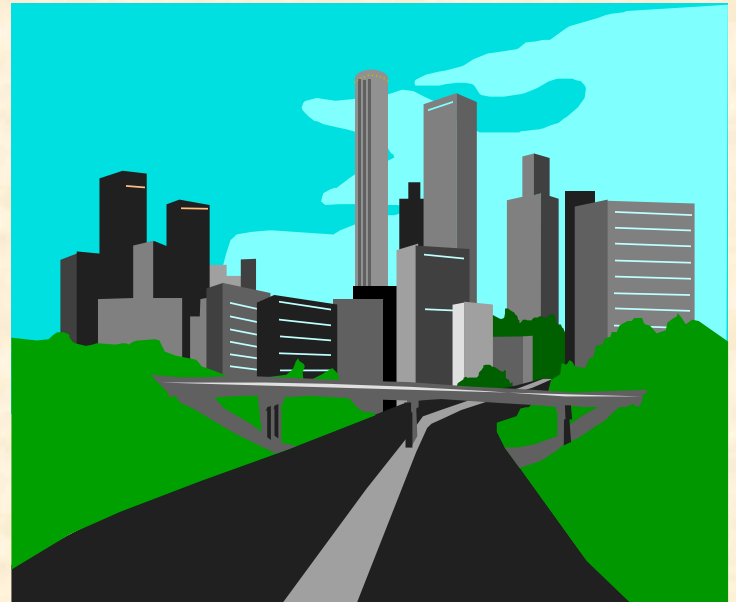
Discuss “other” considerations

1. Work in urban areas
2. Pedestrian considerations
 - ADA
3. Motorcycle considerations
4. Bicycle considerations

1. Urban Areas



May be problematic for work zones due to unique conditions and restricted spaces



What is an Urban Area?

- ◆ *An area normally characterized by:*
 - ◆ *Relatively low speeds*
 - ◆ *Wider range of traffic volumes*
 - ◆ *Narrower lanes*
 - ◆ *Frequent intersections & driveways*
 - ◆ *Significant pedestrian traffic*
 - ◆ *More businesses & houses*

Source: 2003 MUTCD

Problems with Urban Work Zones

- ◆ Restricted spaces
- ◆ Heavy traffic
- ◆ Signals
- ◆ Restricted sight distance
- ◆ Parking
- ◆ Conflicts with pedestrians
- ◆ Conflicts with “other” vehicles
 - ◆ Delivery trucks, utility
 - ◆ Bicycles, buses





-CLOSING-

Module Objectives

- ◆ Review the “Parking Lot”
- ◆ Review course objectives
- ◆ Complete course evaluation form
- ◆ Take exam
- ◆ Adjourn!