

Proactive Driving System

Course Slides



Montgomery County Fire & Rescue Service

December 2002





Overview

MCFRS Fleet Losses
Starting
In-Motion
Intersections
Arriving on Scene or
Stopping
Backing



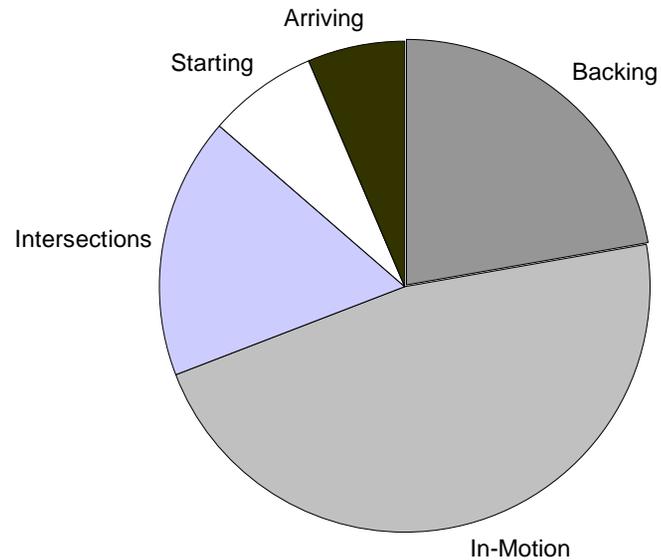
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1

MCFRS Loss Analysis

Insurance
Special Causes
Driving Tasks
At-Risk Behaviors
New Philosophy



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Insurance

Our collision loss experience is poor
Spending money for premium increases that
could be spent for more worthwhile things
Pledged to the insurer that we would improve
Insightful loss study completed
We changed the way we understand
collisions
Our driving is the loss source
Our drivers are the solution





Special Causes

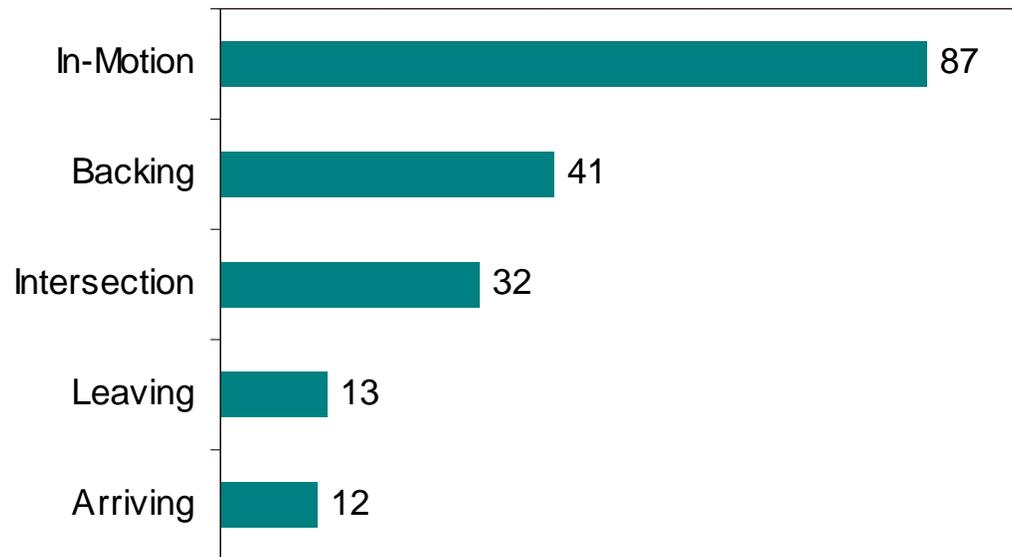
These loss factors are **not** root causes of our fleet losses

Apparatus Type
Emergency vs. Non-
Emergency Driving
Preventability
(the other driver)
Shifts
Districts
Stations

Assigned Station vs.
Detail
Location of Vehicle
Damage
Driving Experience
Multiple Collisions
Time of Day
Road Conditions



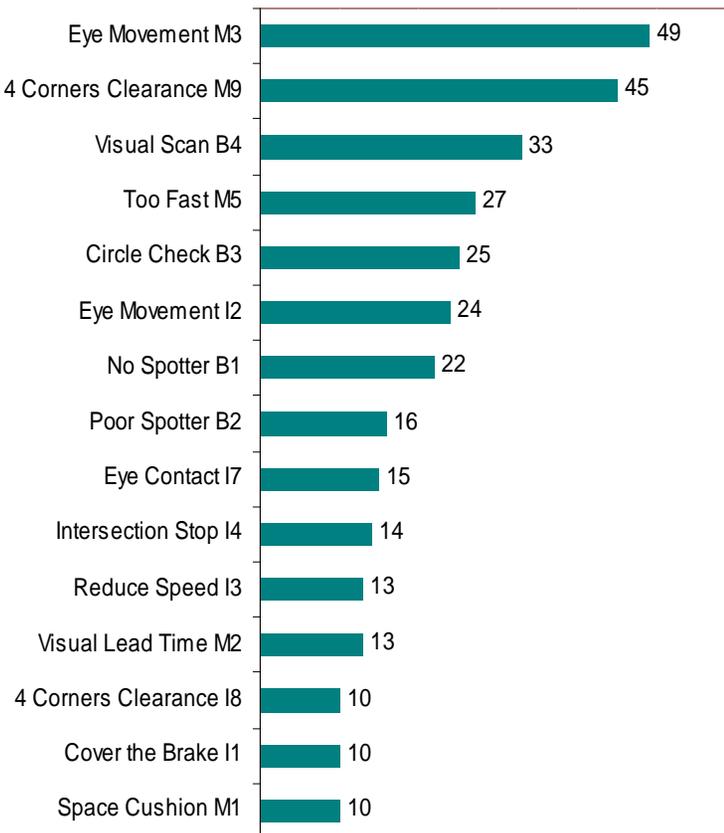
Driving Tasks



Five common driving tasks were related to DFRS collisions.
Collision reduction will occur by mastering these driving tasks.



At-Risk Driving Behaviors



At-risk behaviors are simply actions that place the vehicle in harms way. The loss analysis revealed a distinct set of at-risk behaviors for each driving task. We have not made this connection in the past.

Collision reduction will occur as more operators master the driving behaviors.



New Philosophy

We drive our vehicles with the mindset that the other driver will make a mistake in the path of our vehicle.

Our operators will drive proactively by adjusting their driving to avoid collisions triggered by other drivers, traffic, and environmental conditions.



Proactive Driving Formula

Identify the hazard

Predict outcome

Decide action

Execute maneuver

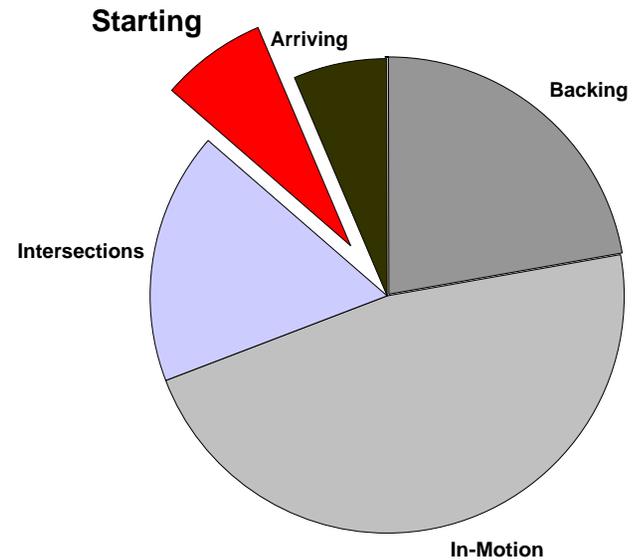
This formula will help you avoid collisions



2

Starting

- Daily Apparatus Check
- Circle Check
- Adjustments
- Seat Belts
- Visual Scan



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Daily Apparatus Check

Preventive maintenance process
Occurs at shift change
Identifies defects
Treats small problems
Mirror & seat adjustments
Documentation
Mark of a professional operator



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Cab Adjustments

- Passenger mirror
- Driver mirror
- Steering wheel height and angle
- Seat height
- Clean windshield
- Clean windows
- Clean mirrors
- Rear spot lights



Adjust mirrors so blind spot mirrors provide a view of the two blind spots.

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Circle Check

Rapid 360 degree vehicle scan

Sides

- Compartments
- Ladders, tools, lights, and equipment

Rear

- LDH and hose
- Appliances and loose equipment

Underneath

- Obstructions or forgotten equipment
- Wheel chock

Mark of a professional operator





Visual Scan

Operator completes a visual scan of the field of vision before moving

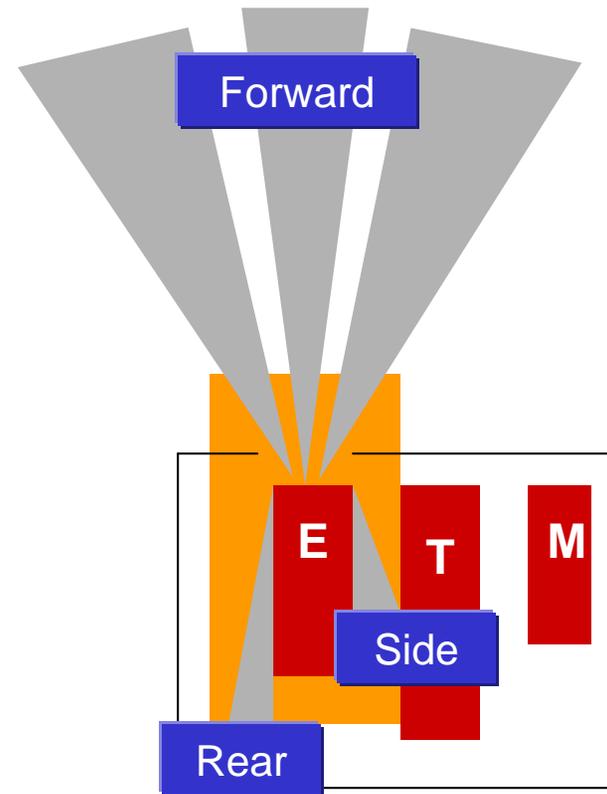
Forward

Sides

Rear

Remain parked until the overhead door is 100% open

Proceed slowly through the door opening and hazard zone



Fire Station

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Seat Belts

All crew members seated and restrained

Insurer's hot button

Patient care providers must use their judgment during patient transport

EMS unit driver must adjust speed and space cushions when crew member is unrestrained

Zero Tolerance. Consequences imposed for failing to wear a seat belt



Zero Tolerance

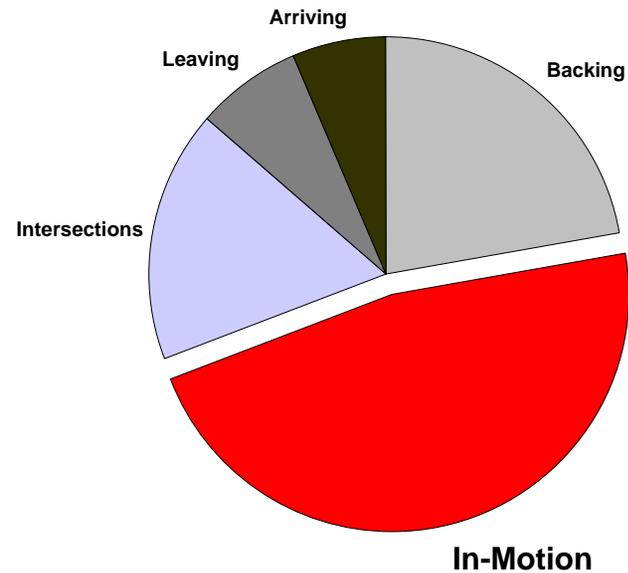
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In-Motion

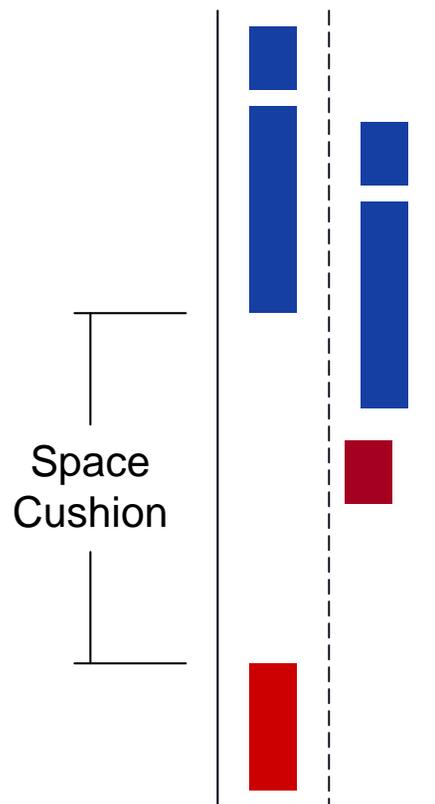
- Space Cushion
- Visual Lead Time
- Eye Movement
- Cover the Brake
- Safe Speed
- Railroad Crossings
- Hands Free
- Steering
- Signaling
- Traffic Signs & Signals



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Space Cushion



How the space cushion works:

Provides adequate space for braking

Provides space for offensive or aggressive drivers



Four Second Rule

What is an adequate space cushion for 60 mph on wet pavement?

Up to 40 mph

4 seconds

4 seconds

Each additional 10 mph

+1 second

+2 seconds

Poor Road Conditions

+1 second

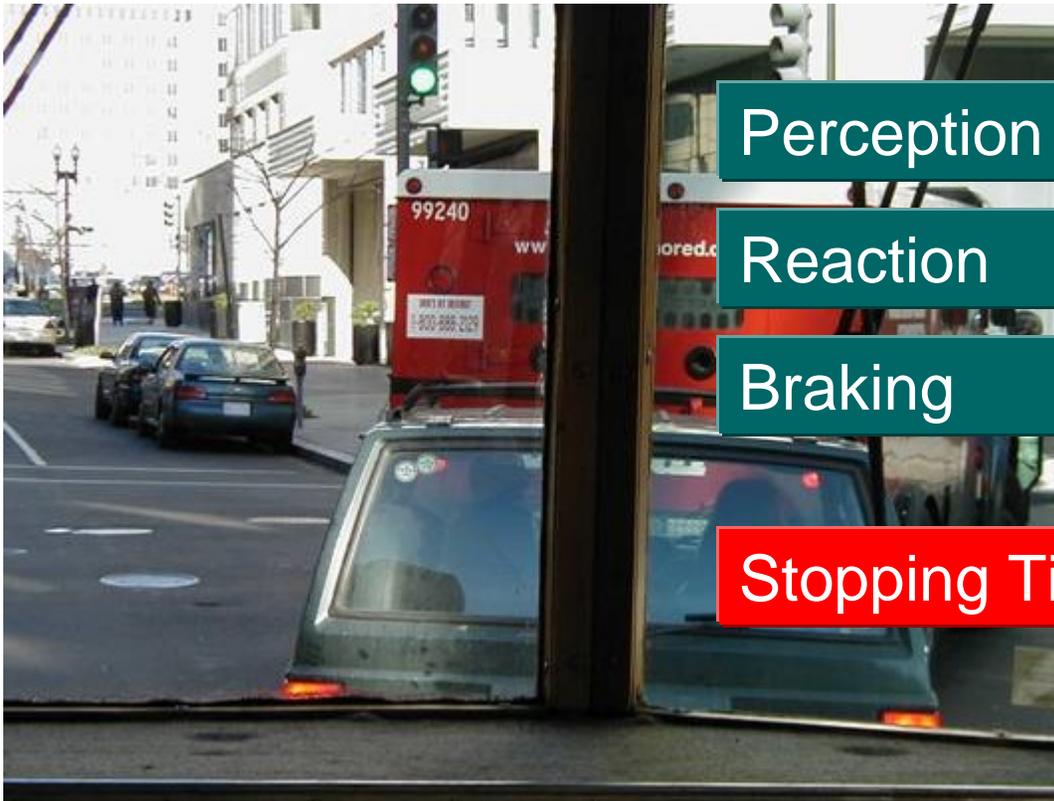
+1 second

= 7 seconds ←

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Stopping Time



Perception $\frac{3}{8}$ to $\frac{3}{4}$ second

Reaction $\frac{3}{4}$ second

Braking $2\frac{1}{2}$ seconds

Stopping Time 4 seconds

Based upon 40 mph on wet roads.

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Stopping Distance

How much distance do you need to stop on a dry road?

10 mph  30 feet

30 mph  113 feet

60 mph  315 feet



Stopping Distance

Actual stopping distance on dry road (COF=0.70)

Miles/Hour	Feet/Second	Stopping Time (sec.)	Actual Stopping Distance (ft.)
60	90	3.5	315
40	60	3.0	180
20	30	2.5	75
10	15	2.0	30



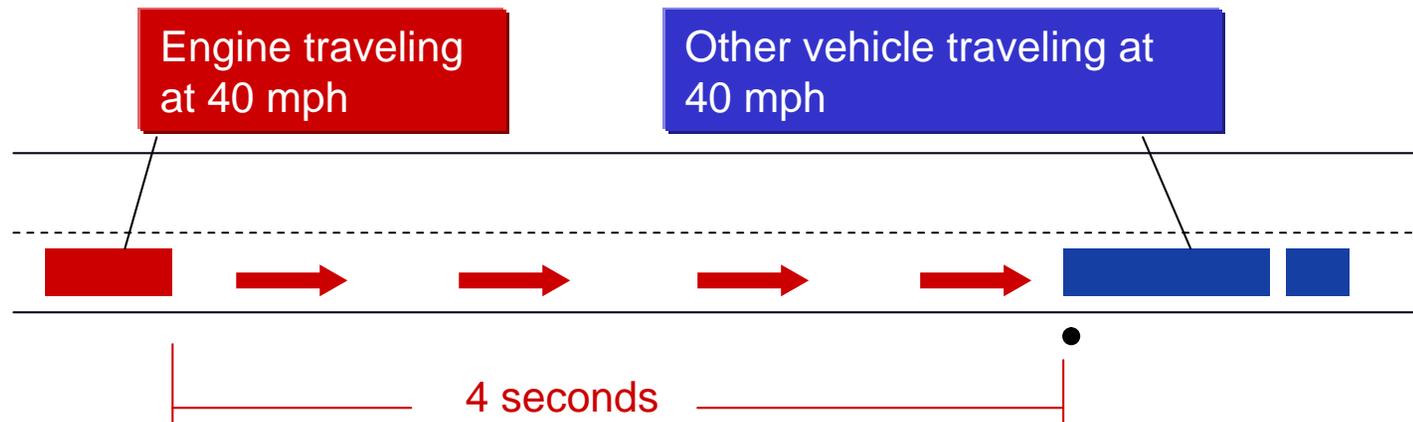
Stopping Distance

Actual stopping distance on wet road (COF=0.40)

Miles/Hour	Feet/Second	Stopping Time (sec.)	Actual Stopping Distance (ft.)
60	90	5.0	450
40	60	4.0	240
20	30	3.0	90
10	15	2.5	40



Four Second Rule



- It should take the engine 4 seconds to pass the light pole
- Add 1 second for each 10 mph over 40 mph.
- Add extra 1 second for poor conditions



Eye Movement

Eye Movement means keeping your eyes moving to see the fields of vision. Scan the entire field every 10 seconds.

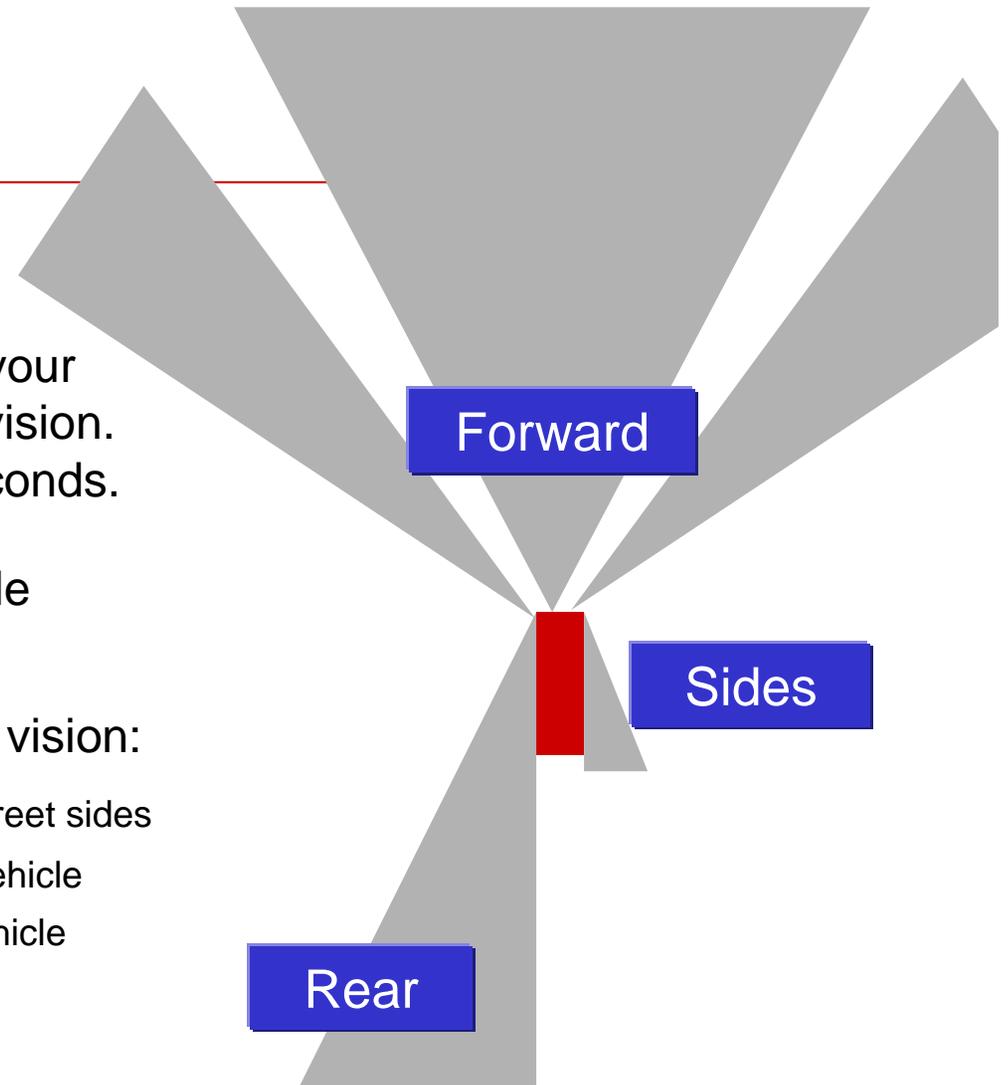
Tunnel Vision places your vehicle at-risk for a collision.

You need to monitor 3 fields of vision:

Front – at least ¼ mile ahead and street sides

Sides – lanes right and left next to vehicle

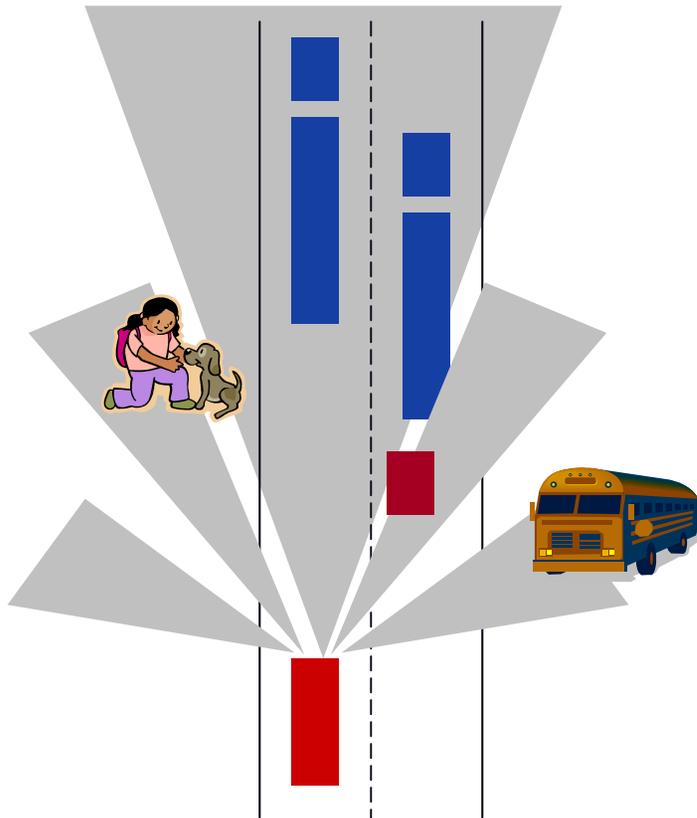
Rear – lanes right and left behind vehicle



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Visual Lead Time (Forward)



Scan the horizon and look over the vehicles in front of you

Scan ahead and scan street sides

Try to see what you will encounter
12 -15 seconds from now

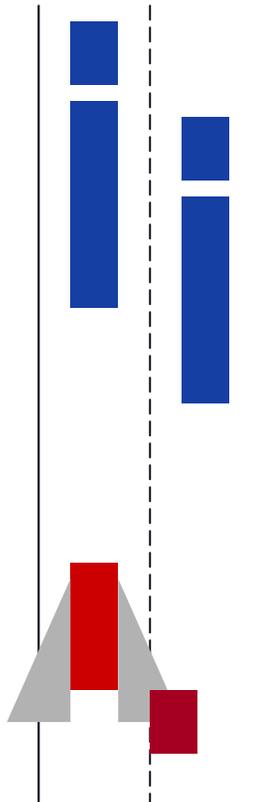
Helps vehicle stay in a straight line
Identify hazards and still have time
to react

Intersections, crosswalks, RR
crossings

Playgrounds, schools,
construction, parking lots,
shopping centers



Side Field of Vision



See what is happening to your sides

Use blind spot mirrors

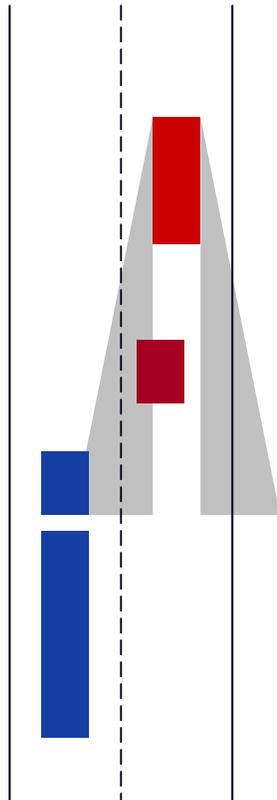
Monitor left and side lanes

See what is about to enter your peripheral vision

See aggressive drivers before they cut in front you



Rear Field of Vision



Check your mirrors every 5 to 10 seconds

You may see a vehicle approaching too fast or following too close

You may still have time react

Check mirrors before slowing or changing your path



Mirrors

Other times to check mirrors

Check mirrors before slowing down, stopping, decelerating

Check mirrors on long or steep hills

Mirrors distort the real image

Objects appear to be smaller and farther away than they really are





Railroad Crossings

808 requires you to stop at
unguarded crossings
Stop and look in both directions
Assume that guarded signals
are not working
Trains travel in both directions
Wait a moment to proceed
after a train passes
Assure the tracks are clear in
both directions



Stop for all railroad crossings



Safe Speed

Posted speed limits are for ideal conditions

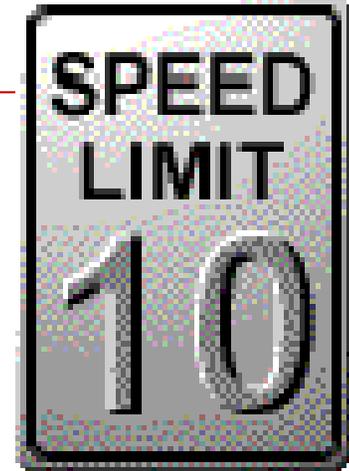
Do not go faster than the speed shown

Slow your speed for less than ideal conditions

Slow and smooth acceleration and stops

Maintain adequate space cushions

Your best defense is to SLOW
DOWN





Steering

Hold steering wheel firmly
Two hand skill
Hands positioned at 3:00 and 9:00
At-Risk Behaviors to avoid

- One-handed steering
- 360 heel turning
- Elbow steering
- Finger steering



Hands grip steering wheel at 3:00 and 9:00



Signaling

Signal before any change
of direction
Signal early
3 blinks before lane change
Assure that your turn signal
is off after the turn



Signal early

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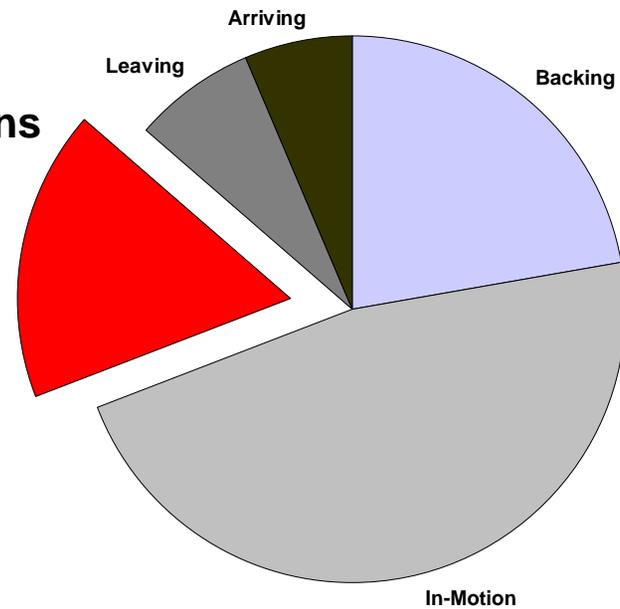


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Intersections

Cover the Brake
Eye Movement
Reduce Speed
Intersection Stop
Jumping
Clear Space

Intersections



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Cover the Brake

Cover the brake when you identify a probable hazard

Approaching, entering, or traversing intersections

Remove foot from accelerator and prepare to brake

Advantages

- Immediately decreases speed

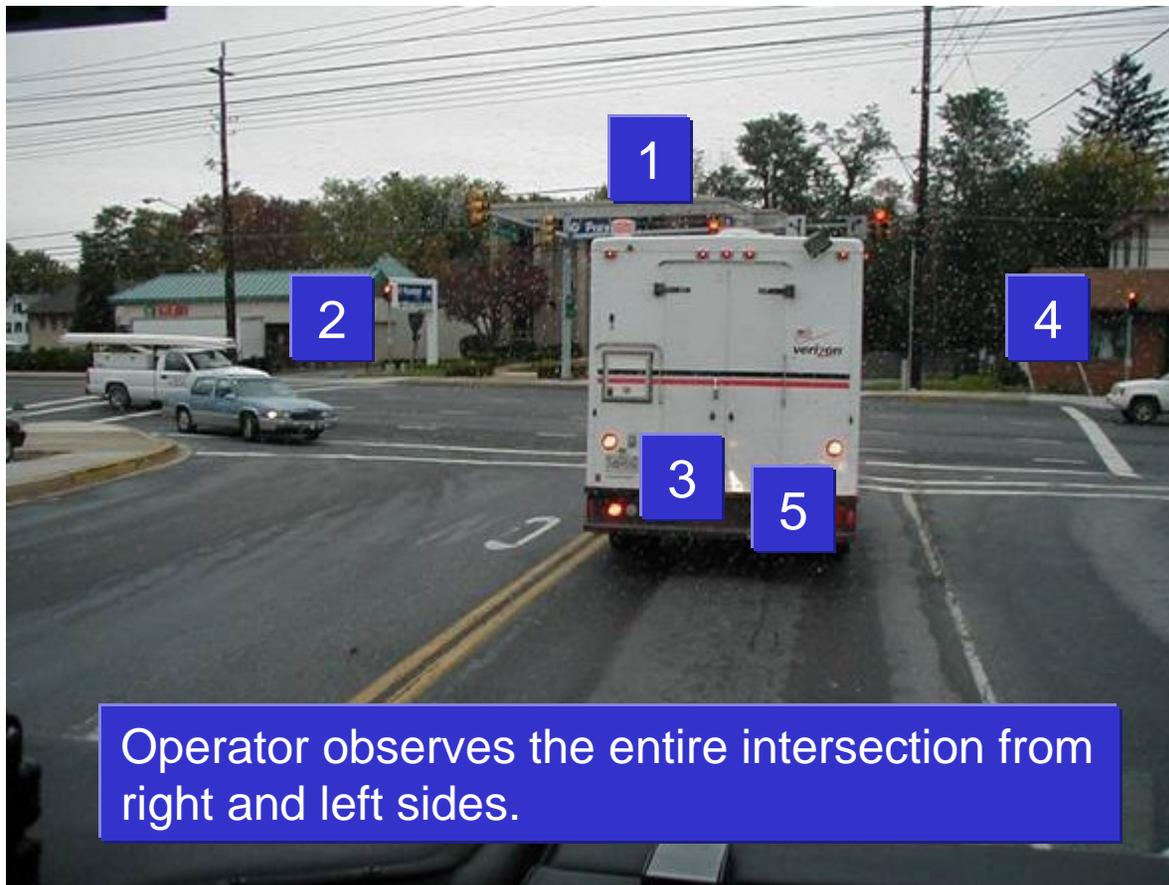
- Braking distance decreases

- Reduces reaction & braking times

- Resume speed without losing momentum



Eye Movement





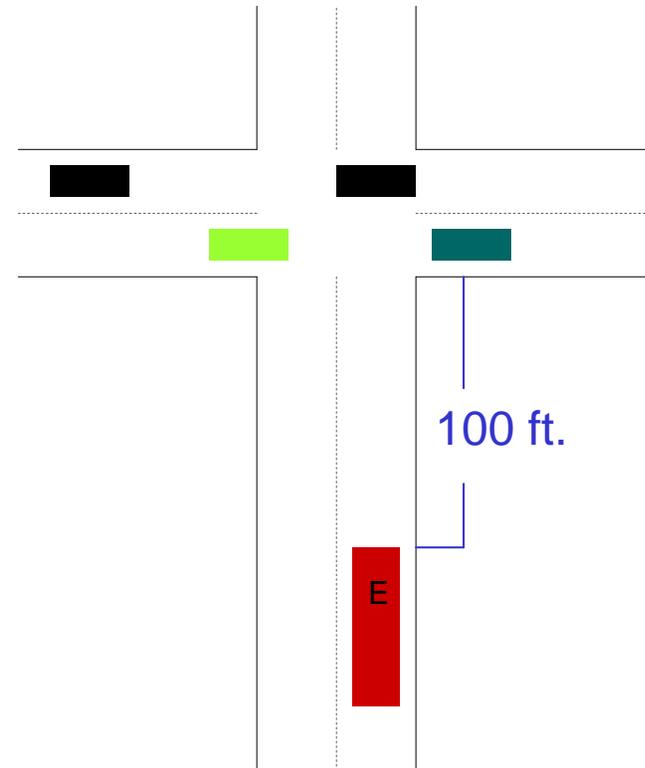
Reduce Speed

One of the best proactive driving tactics is to reduce speed

Reduces stopping distance needed

First gear or 10 mph no less than 100 feet before the intersection

Achieves stopping distance < space cushion



Reduce speed to 10 mph.

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Intersection Stop

The Intersection Stop applies to emergency driving

Must stop at a red light, stop sign, or other intersection when you are against the right of way

Only proceed when you make eye contact with other drivers

Avoid using the apparatus as a moving roadblock – this is aggressive driving



You must stop at intersections against the right of way.



Jumping

Operator depresses the accelerator hard from stopped position

Vehicle jerks or jumps forward

Hard on the apparatus

At-risk for rear-end collision

Jumps before other vehicle moves forward is a common low speed, at-fault collision

Smooth starts



Clear Space

Space cushion left while stopped

Clear space equals one-half of your vehicle length

Helps prevent low speed rear-end collisions

Adequate room to change lanes



Too close. No room to maneuver right or left.



Perfect. Clear space left for maneuvering.

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Traffic Lights

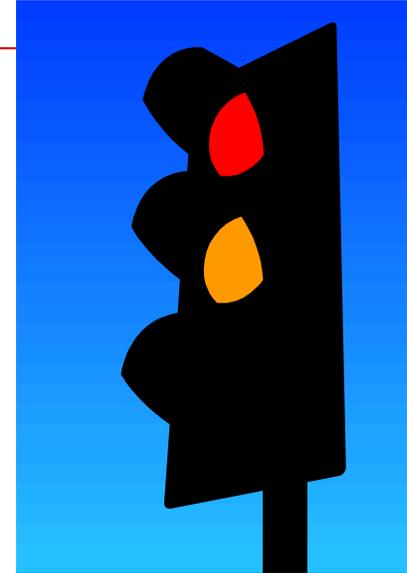
Pay attention to traffic lights

Stale green

Stop for yellow

Flashing yellow means
proceed with caution

Flashing red means stop
before proceeding





Zone of Confusion

Created by two or more emergency vehicles responding together

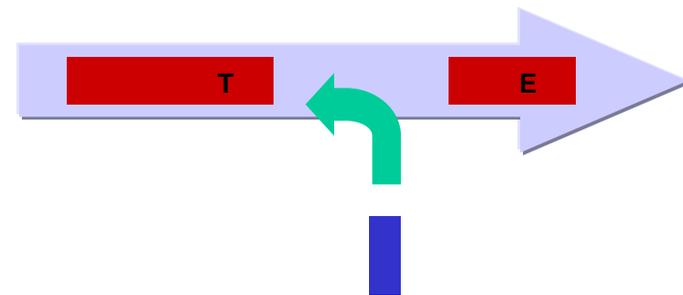
Civilian driver sees one emergency vehicle, but hears a different one at the same time

Civilian driver thinks the coast is clear but pulls into your path

Elderly and teenagers

High-risk situation

Anticipate other vehicles to make mistakes



Confused driver sees the Engine and hears the Truck. Driver's mind thinks there is only one emergency vehicle so driver pulls into the path of the trailing vehicle.



Zone of Confusion

Anticipate other drivers to make mistakes

Demonstrate care for other vehicles

Driving tactics for procession style response:

- Travel single file. A larger vehicle leads. Leading vehicle creates a path.

- Increase space cushions. NEVER travel nose to tail.

- Each vehicle must traverse intersections alone and make eye contact with other drivers. Trailing vehicles NEVER bust the intersection.

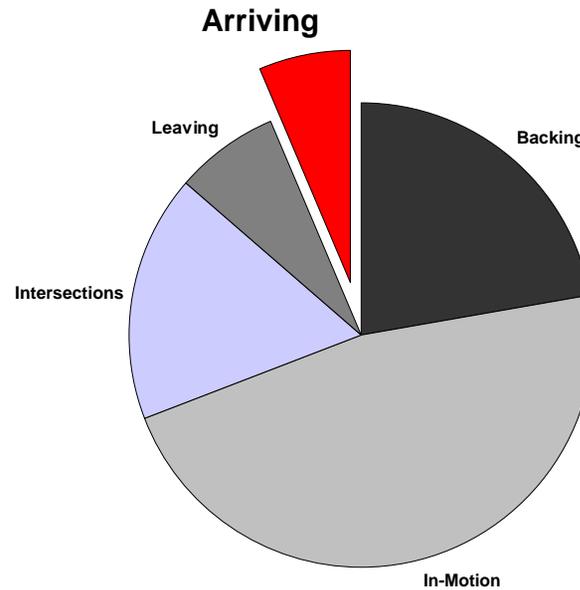
- Use contrasting siren tones. Switch to electronic siren with alternating or pulsing tone.



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Arriving on Scene or Stopping

- Deceleration
- Pass the Address
- Spotting
- Parking Brake
- Wheel Chock



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Deceleration

Important skill for heavy apparatus and EMS unit operators

Hard stops

- Harsh on apparatus, equipment, crew, patient

- Indicates operator was not scanning ahead

Smooth deceleration stops

- Plan ahead

- Good visual lead time – ¼ mile ahead

- Pick your stopping point on horizon

- Decelerate early



Stop at the Address

Common at-risk driving behavior is passing the address

- U-Turns in traffic

- Backing against traffic

- Operator gets frustrated

Preplan & teamwork

Know block numbers

Know the cross street before the target block

Reduce speed on the target block

Use spot lights

Stop and read the map book



Spotting

Consider these good habits when positioning or parking

- Approach the final spot slowly

- Spot for tactical advantage

- Leave clear space around vehicle

 - Compartment doors

 - Walking paths

 - Outriggers

- Drive out instead of back out

- Leave access for incoming companies



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Parking Brake

Set the parking brake before personnel dismount the vehicle.

It is good practice to set the parking brake when the vehicle is stopped for 10 seconds or longer in a non-driving situation.



Wheel Chock

- Redundant parking brake
- Downgrade side
- Required for parked vehicles either attended and unattended
- Light vehicles can use parking brake
- Turn wheels toward curb
- Mark of a professional operator



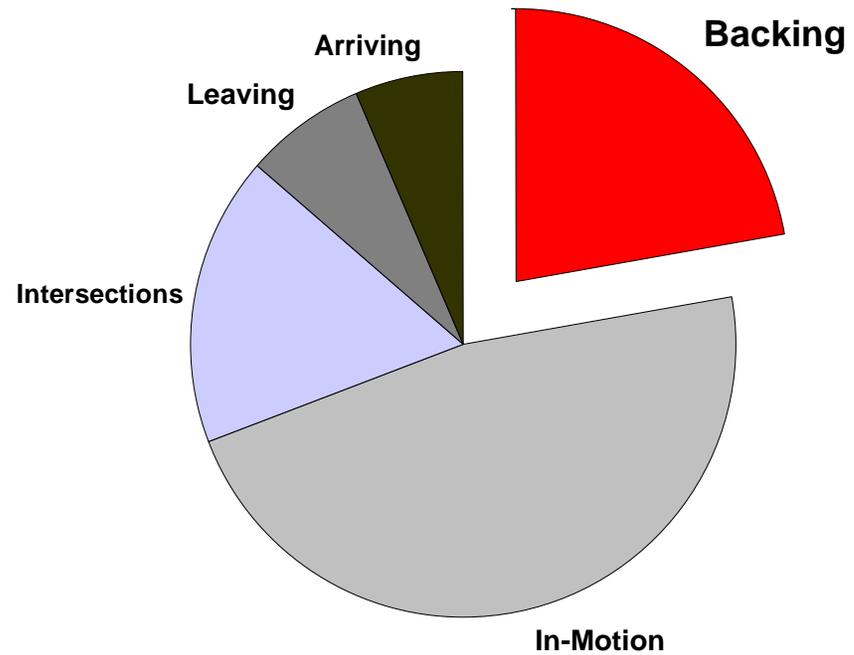
Chock a wheel



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Backing

Safe Spotting
Hand Signals
Circle Check



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Backing Policy Changes

Fire Administrator wants backing collisions eliminated

Zero tolerance

Minimum - Unit officer must dismount & spot

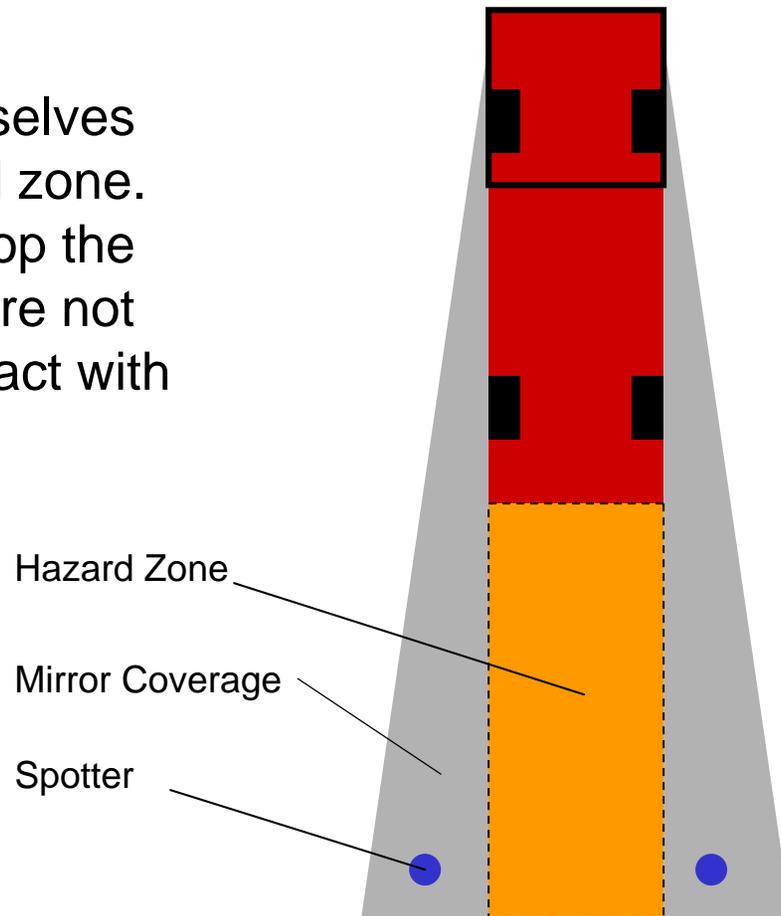
Driver must complete circle check if alone

EMS units must use spotters when patient care is not compromised



Safe Spotting

Spotters position themselves outside the rear hazard zone. The operator should stop the vehicle if the spotters are not visible or lack eye contact with the mirror.



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Hand Signals



Stop



Turn



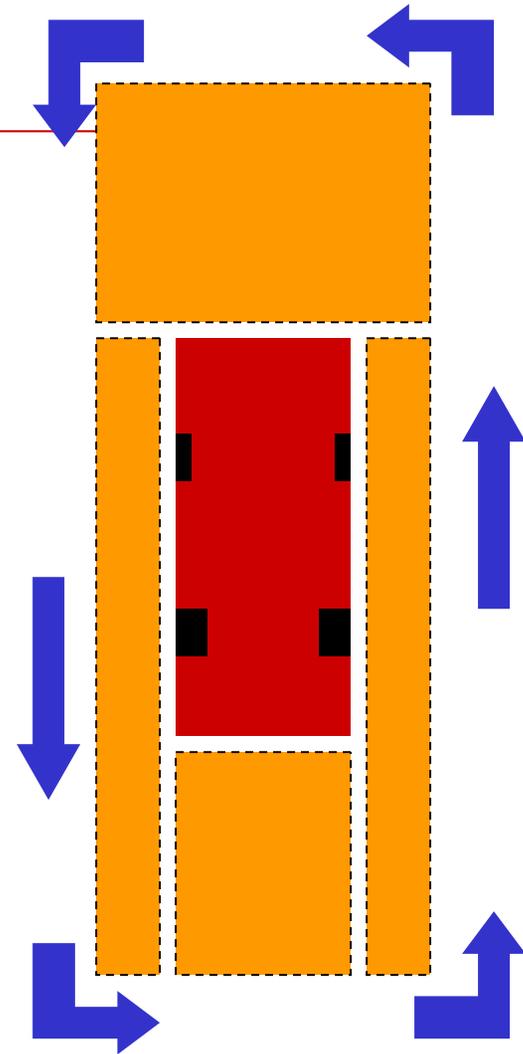
**Diminishing
Clearance**

These standard hand signals should be used to communicate with the driver.



Circle Check

- 360 degree inspection around the vehicle
- Observe the rear blind spot
- Observe the vehicle sides
- Note object positions
- Check overhead clearance
- Check underneath the vehicle



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Remember....

The easiest way to prevent a backing collision is to back with a spotter.

If a spotter is unavailable, then complete a circle check.



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Case Studies

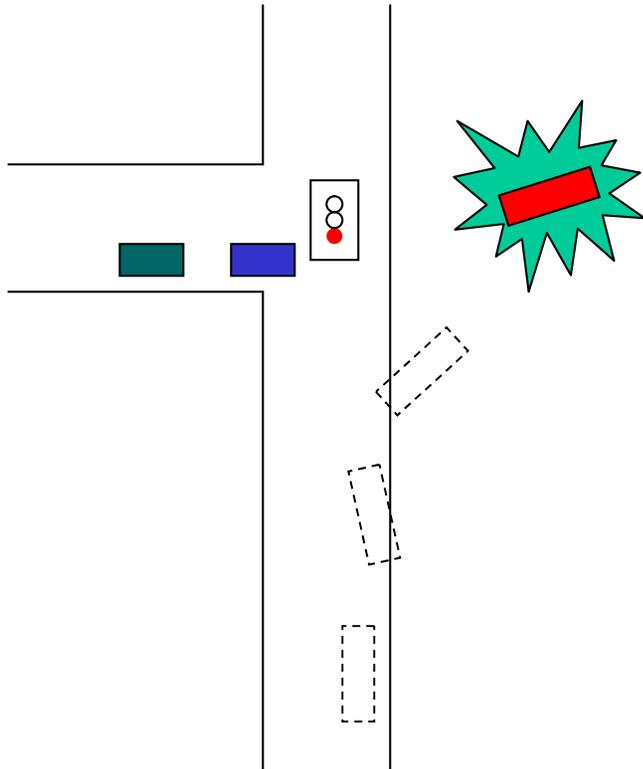


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Case Study 1

Tanker crash kills two firefighters



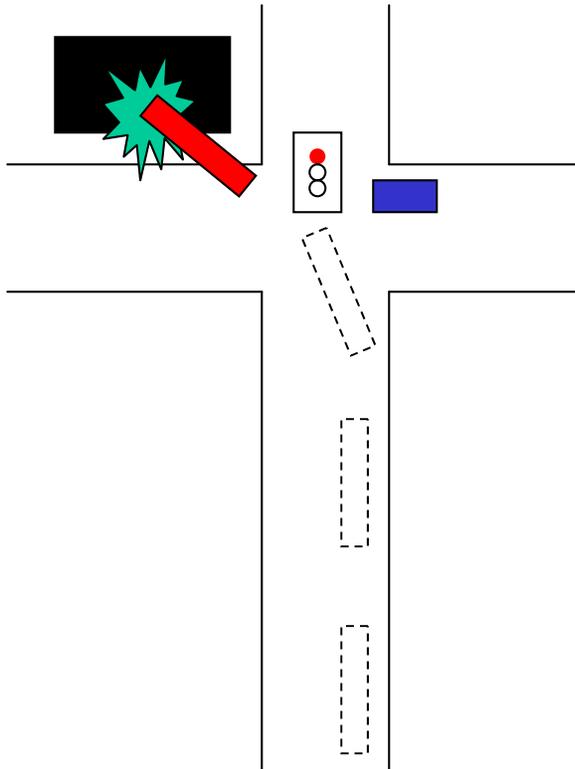
Tanker descending a hill at 47 mph on wet, rural road. Traffic light turns red when tanker is half-way down hill. Tanker brakes, slides, rear wheels leave road, and rolls over.

Driving task?
At-risk driving behaviors?
proactive driving skills?
Preventable?



Case Study 2

Truck company crashes into occupied building



Truck company traveling at 30 mph on city street. Operator experiences brake failure 30 seconds before collision. Truck avoids car, tries to swerve left, but crashes into building.

Driving task?

Worst case scenario?

At-risk driving behaviors?

proactive driving skills?

Liability?

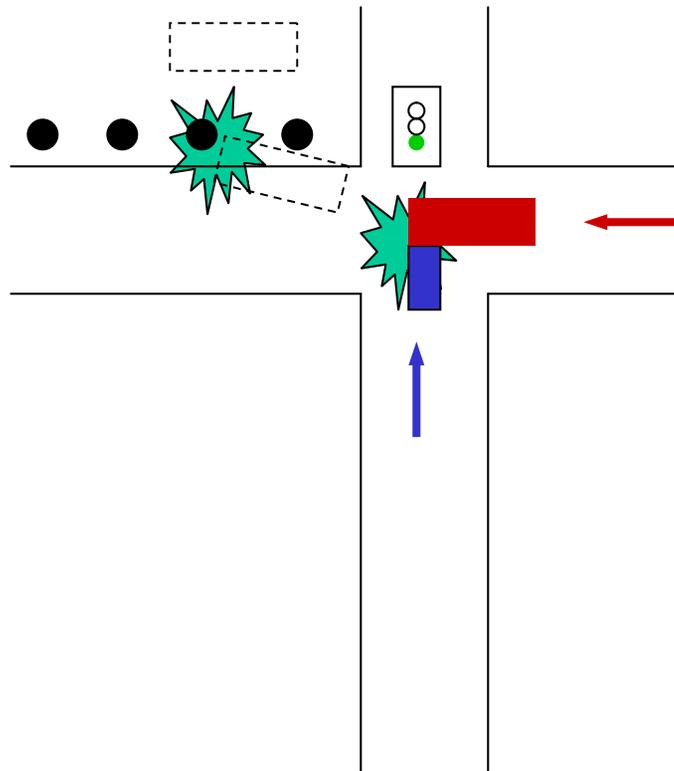
Preventable?

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Case Study 3

Captain killed in engine crash



Engine company enters intersection against a red light. Other vehicle with green light collides with the engine. Engine then strikes a concrete bridge column. Unrestrained captain is ejected onto the road and dies. Crew struck by flying equipment.

Preventable?

Driving task?

At-risk driving behaviors?

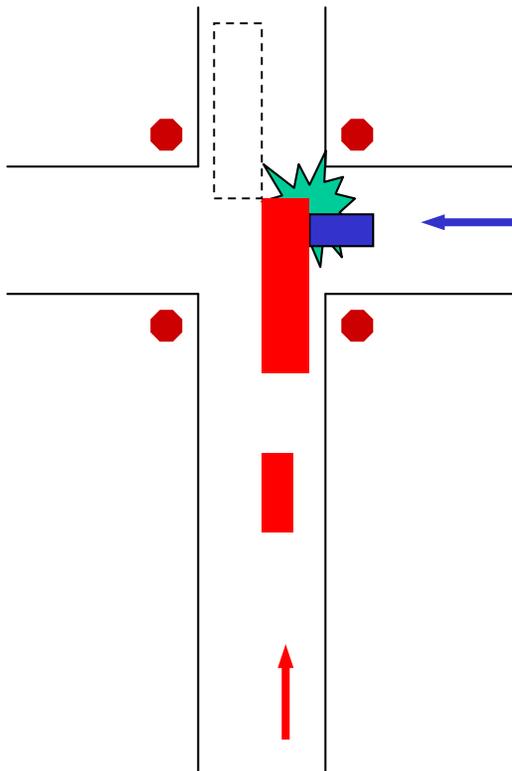
Proactive driving skills?

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Case Study 4

Lieutenant killed in truck company collision



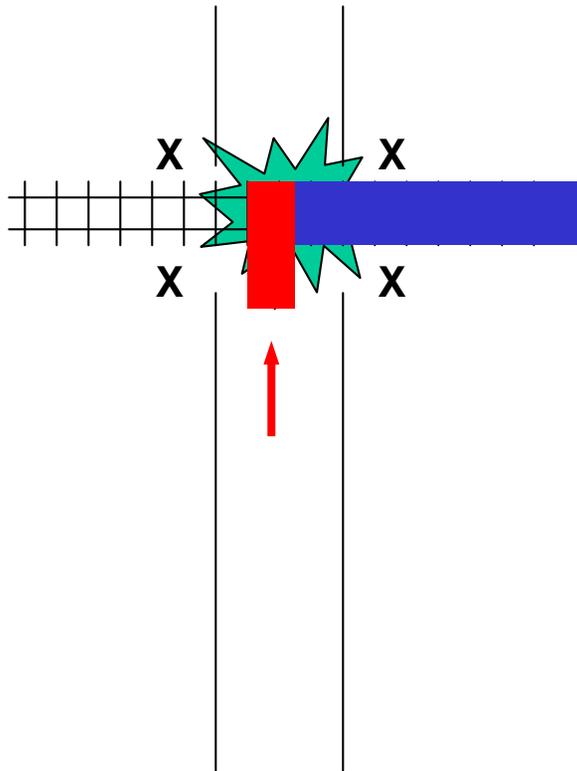
Truck company with broken officer's door approaches intersection with a four-way stop. Operator's view is slightly obstructed to the right. Truck proceeds despite seeing pickup approaching fast to the right. Pickup runs stop sign and collides with truck. Lieutenant ejected out the broken door and killed. Lieutenant's seat belt was not working.

Preventable?
Driving task?
At-risk driving behaviors?
Proactive driving skills?
Liability?



Case Study 5

Tanker operator killed in crash with train



A tanker was traveling 10-15 mph and accelerating as it approached an unguarded railroad crossing. The tanker crossed the path of a freight train and was struck. The unrestrained operator was ejected and killed.

Preventable?

Driving task?

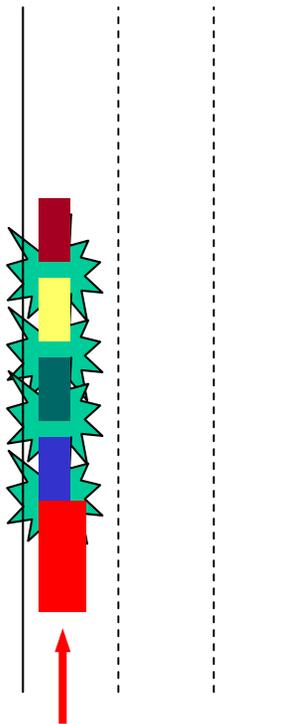
At-risk driving behaviors?

Proactive driving skills?



Case Study 6

EMS Unit rear-ends automobile



EMS Unit responding via the left lane of an interstate highway. EMS Unit is tailgating other vehicles to bully them out of the lane. A car six to seven ahead made a sudden hard stop, causing a chain reaction stop. The EMS Unit has a delayed reaction and rear-ends car in front. This collision causes three other collisions totaling four collisions.

Preventable?

Driving task?

At-risk driving behaviors?

Proactive driving skills?



Peer Observations

We will be instituting a monitoring system of peer evaluations

Choose a partner

Complete two driving observations

Coach each other to better driving practices

Teach inexperienced operators