

Virginia Department of Education

Module Eight Transparencies

Driver Responsibilities: Adverse Conditions

Topic 1 -- Visibility in Adverse Conditions

Topic 2 -- Extreme Weather Conditions

Topic 3 -- Protecting Occupants

Topic 4 -- Roadway and Vehicle Technology

Topic 5 -- Traction Loss Concerns

Provided in cooperation with the Virginia Department of Motor Vehicles

Changing Visibility at Night

The ability to identify risks depends on vision, and visual acuity is severely limited at night.

Driving at night:

- ✓ reduces the illumination of risks.
- ✓ requires the eyes to adjust quickly to glare.
- ✓ places limitations on gathering and processing information in time.



When visibility is reduced at night a driver needs more time to:

- ✓ identify hazards early and scan in and around the path of travel to the target area, and
- ✓ scan the road beyond the lighted zone.
(If you only scan the lighted zone you may miss important clues that warn you of hazards ahead.)



Visibility Limitations at Night



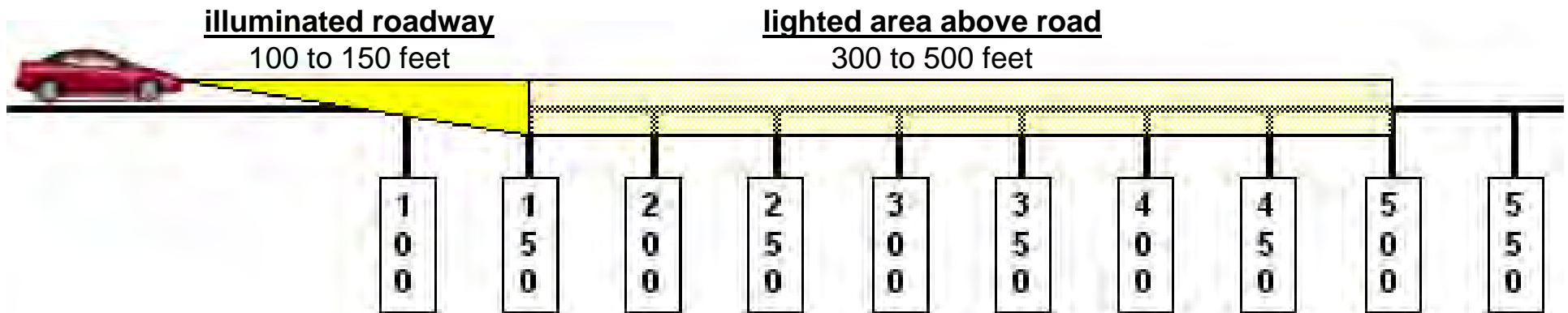
- ✓ The distance you can see ahead is inadequate at higher speeds
- ✓ Your headlights provide limited illumination of off-road areas
- ✓ A loss of contrast impairs your ability to judge distances
- ✓ Blinded by glare from lights of oncoming and following vehicles
- ✓ Distance traveled during glare recovery time

Headlight Alignment and Speed

The Code of Virginia requires that you use your headlights from sunset to sunrise and during inclement weather, such as rain, fog, snow, or when you use your windshield wipers. At twilight, when the sun light begins to fade, turn your headlights ON. This will make your vehicle more visible to others.

Properly aligned LOW BEAM headlights

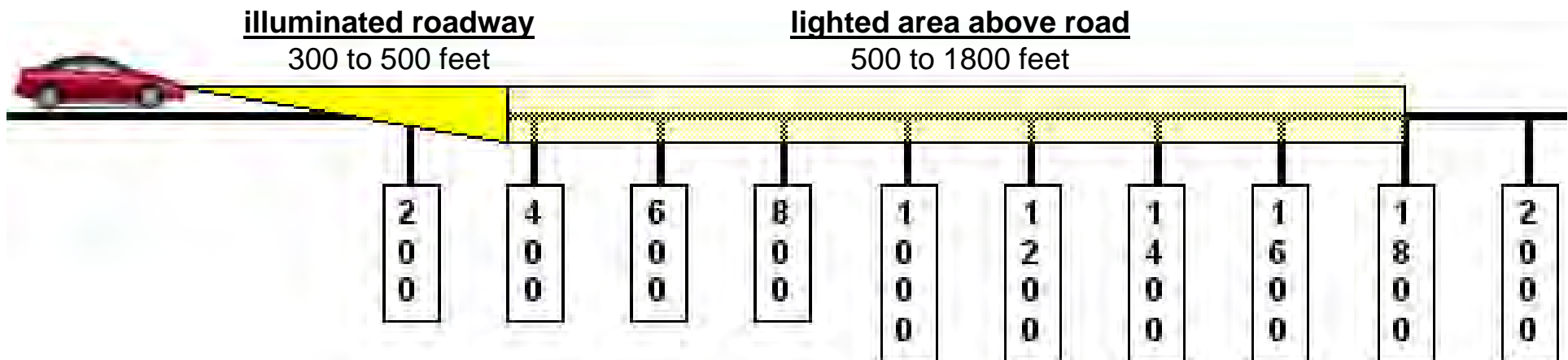
- beam hits roadway 100 to 150 feet ahead
- illuminates area above road 300 to 500 feet ahead
- load, load distribution, and vehicle height affect light beam distance
- a maximum safe speed of 40 to 45 mph is based on your ability to stop within the lighted area



Headlight Alignment and Speed

Properly Aligned **High Beam** Headlights

- ✓ the beam hits the roadway 300 to 500 feet ahead
- ✓ illuminates the area above the road 500 to 1800 feet ahead
- ✓ load, load distribution, and vehicle height affect light beam distance
- ✓ maximum safe speed is 65 mph based on your ability to stop within the lighted area



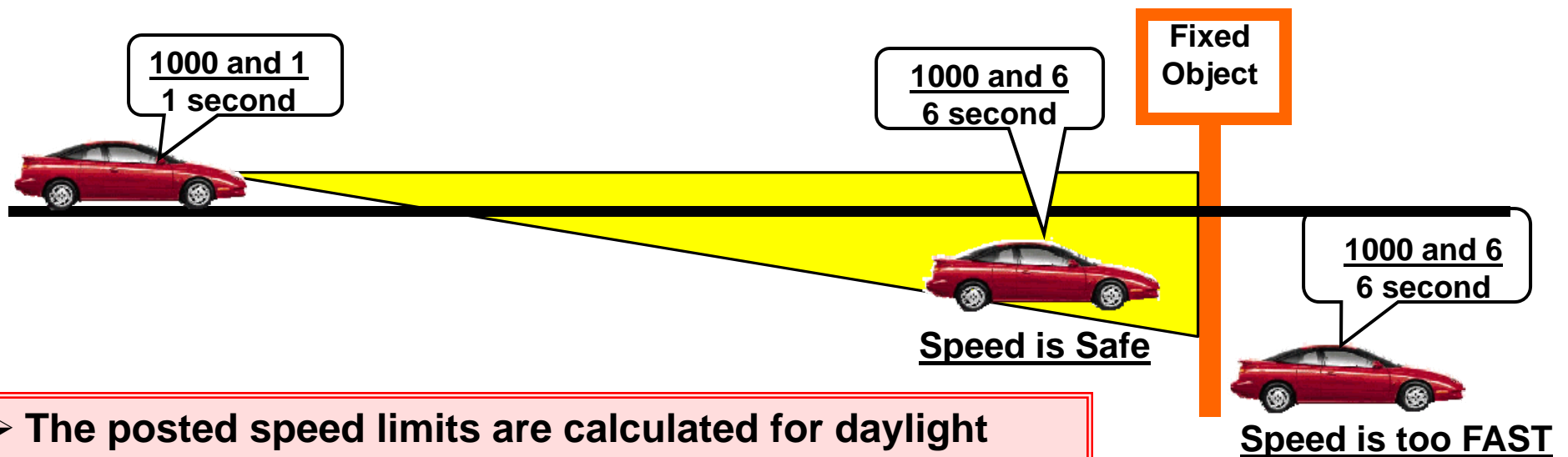
Lower (dim) high-beams headlights when you are:

- ✓ within 500 feet of an approaching vehicle
- ✓ following closely behind another vehicle (within 200 feet)
- ✓ driving on lighted roadways
- ✓ driving in fog, heavy rain, sleet, snow, or dust

Headlight Alignment and Speed

Overdriving your headlights

- ✓ Your vehicle's stopping distance is greater than the distance lighted by your headlights.
- ✓ To determine if you are overdriving your headlights, select an object the moment the headlights pick it up, and count off six seconds.
 - ❖ If the object is still ahead of your vehicle, you are driving at a safe speed.
 - ❖ If you have passed it, you are driving too fast.



- The posted speed limits are calculated for daylight driving and are often too fast for nighttime conditions.
- Dirty headlights and improper headlight alignment will add to this traffic safety problem.

Nighttime Precautionary Measures

- ▶ **Clean windshield inside and out.**
 - ✓ Windblown sand/dirt particles cause special problems.
 - ✓ Diffused light gives the appearance of a halo around the headlights of the oncoming vehicle. **Clean all lights.**
 - ✓ 50 to 90 percent loss of headlight efficiency is due to road grime.
- ▶ **Reduce daytime speed.**
- ▶ **Increase following interval.**
- ▶ **Turn off interior lights.**
- ▶ **Look to the right of oncoming vehicles.**
- ▶ **Use high/low headlight beams properly.**
- ▶ **Use parking lights only when parked. If stopped beside road, take appropriate safety measures.**
- ▶ **Use day/night switch on rearview mirror.**



Nighttime Precautionary Measures

Headlights — passing or being passed

Try to avoid blinding other drivers with your lights

- ✓ Before passing (approximately 600 feet), the driver passing can flash his/her headlights to warn the other driver.
- ✓ When two vehicles are side by side, the passing driver may switch to high beams, and the driver being passed to low beams.



Pedestrian safety

- Be alert for pedestrians walking on unlighted roadways after dark.
 - If you must walk on a dark roadway due to vehicle breakdown or for any other reason, carry a white handkerchief or wear light-colored clothing. If possible, wear reflective vests or other reflective clothing if you must be on or near a road at night. Having reflective stripes increases your chances of being seen.
- **In snow** wear dark clothing to create a contrast.



Visibility Limitations in Fog

Driving in Drifting Fog



- Reduce speed
- Make sure your headlights are on low beam (aimed at the road surface) to reduce the amount of light/glare reflected back at you
- Turn on your windshield wipers
- If necessary, turn on the defroster or air conditioner

Visibility Limitations in Fog

Driving in Heavy Fog



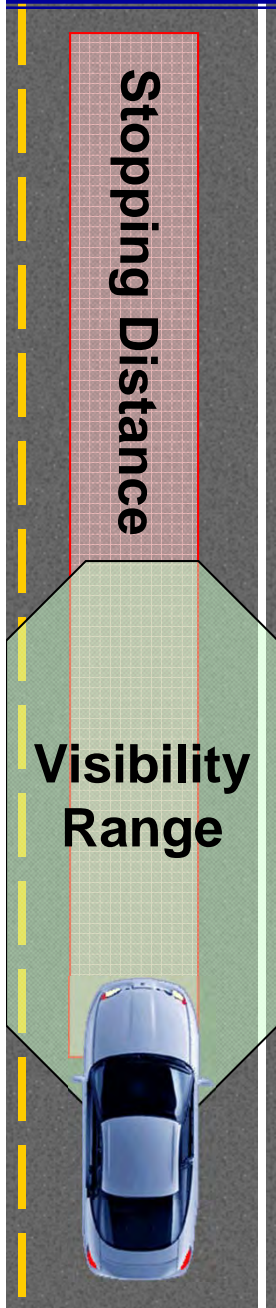
- Reduce speed, but NEVER stop in a travel lane
- Turn on emergency flashers
- Look for an exit from the highway

If impossible to leave highway

- ✓ stop beyond end of guard rail
- ✓ back up to outboard of the guard rail
- ✓ turn off all lights
- ✓ wait for the fog to lift

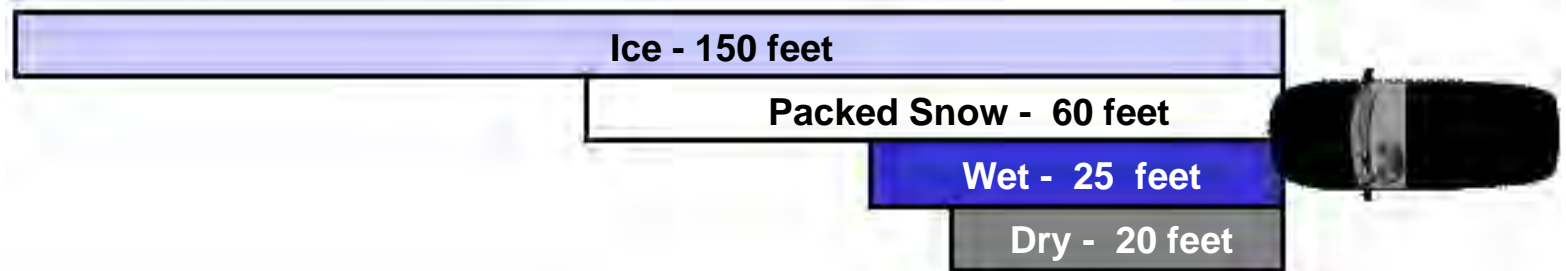


Visibility Limitations in Bad Weather



- ✓ Reduce speed to accommodate shortened sight distance
- ✓ Do not stop in travel lane or on shoulder
- ✓ Turn headlights to low beams
- ✓ Turn on emergency flashers when traveling below speed limit
- ✓ Maintain appropriate lane position
- ✓ **If your stopping distance is longer than your sight distance, you have created a high risk situation – slow down**

Braking distances at 20 mph with conventional tires on different pavement conditions



Precautions in Bad Weather



- ➔ Turn on windshield wipers
- ➔ Be alert for vehicles stopped on the roadway
- ➔ Be prepared for effects of gusting or strong steady crosswinds
- ➔ Make all steering, accelerating, and braking actions gently and smoothly



Precautions in Bad Weather

- ❄️ In severe snow conditions, look for exit from highway and turn on the radio for a weather report
- ❄️ If impossible to leave highway, stop beyond the outboard end of guard rail
- ❄️ Use cell phone to check conditions
- ❄️ Smoke, ice, fog, and snow often require use of windshield washer



Low Water Crossings



Flash Flooding Conditions



Not Specific to Time of Year



Affects braking, steering and engine systems



Low Water Crossings

- Nearly 50% of flash flood fatalities are vehicle related
- Search for flood prone areas:
 - highway dips
 - bridges
 - low areas
- Most vehicles will float
- Very little water on the road surface can cause loss of control



Low Water Crossings

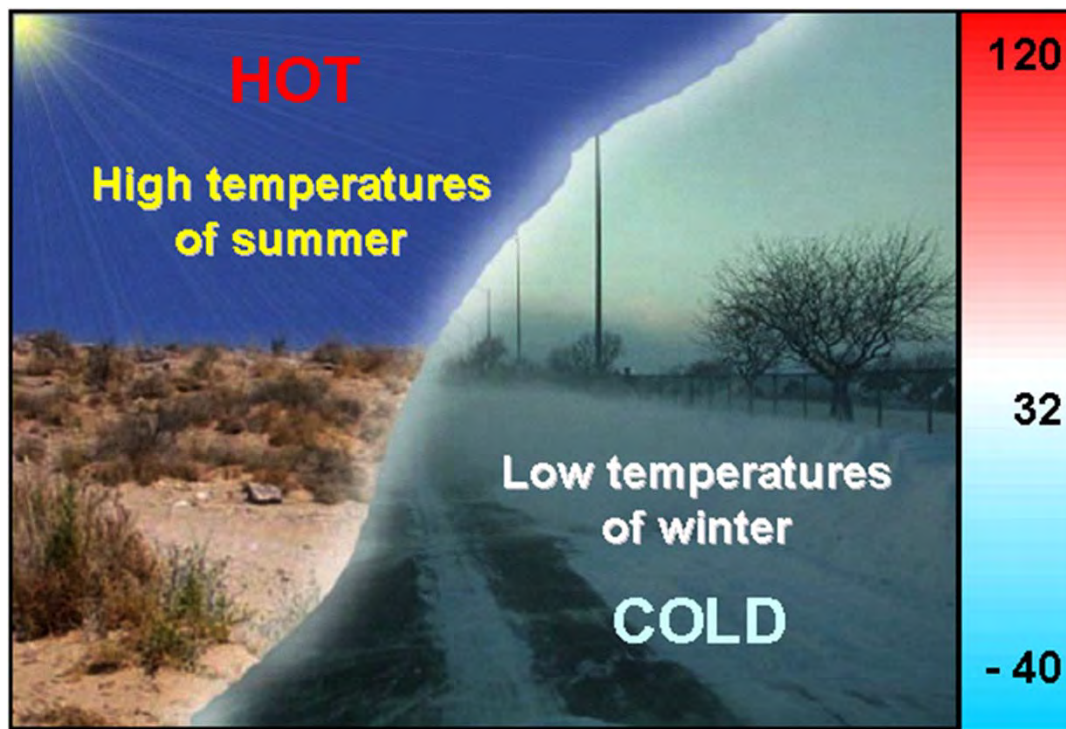


- **Two feet of water** “carries” most cars
- **Because visibility** is limited at night, driving during flooding condition is very dangerous
- Heed all flash flood watches and warnings
- Monitor road conditions through the news media

Hot and Cold Temperatures

Additional Demands on Vehicle Systems

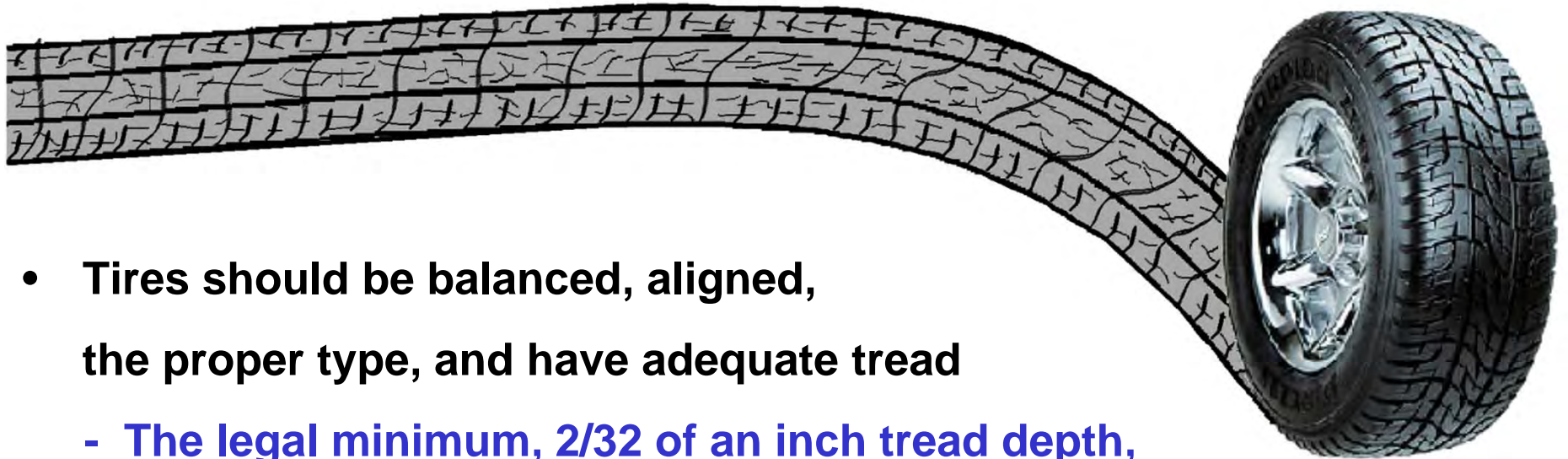
Vehicles are designed to operate in a wide range of temperatures, from very hot to extremely cold. However, these extreme conditions can cause stress to any vehicle part that is temperature sensitive.



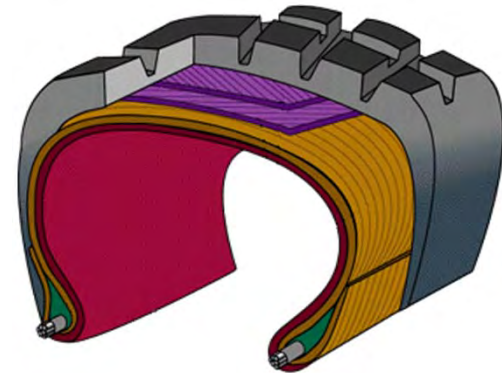
In Extreme Weather...

- ✓ Check tires
- ✓ Check fluids
- ✓ Check belts

Cold Weather Precautions

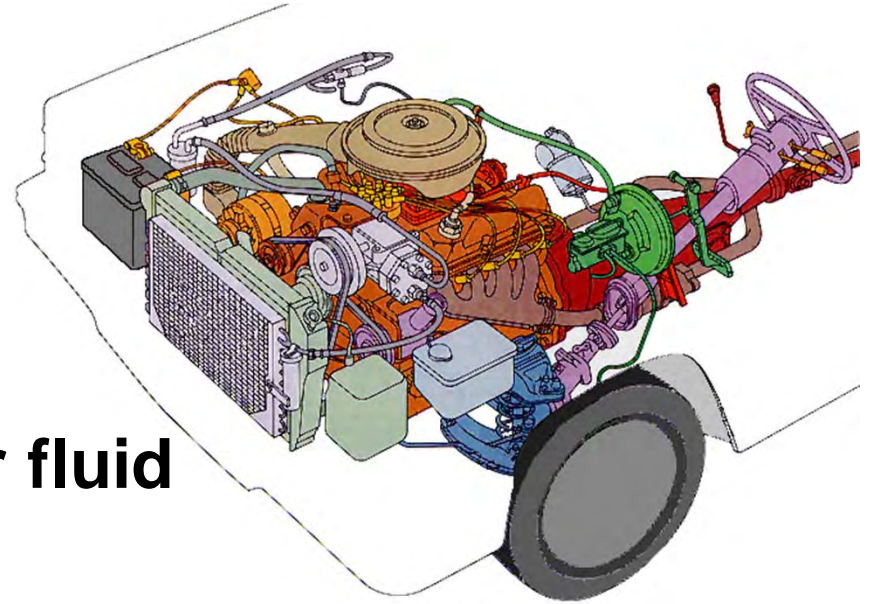


- Tires should be balanced, aligned, the proper type, and have adequate tread
 - The legal minimum, $\frac{2}{32}$ of an inch tread depth, is inadequate on wet surfaces
- Check tire inflation
 - Check cold tire pressure regularly (noted inside driver's door or in manual)
 - The maximum tire pressure listed on the tire sidewalls is NOT the recommended tire pressure
- Check radiator coolant, hoses, and connections



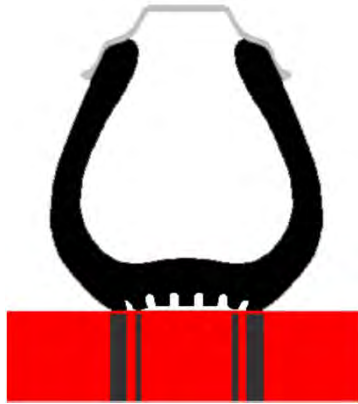
Cold Weather Checks

- ✓ Check heater, defroster and air conditioner system
- ✓ Winterized windshield wiper fluid
- ✓ Check drive belts for tension and wear
- ✓ Keep lights and glass areas clear and clean
- ✓ Check windshield wiper blades



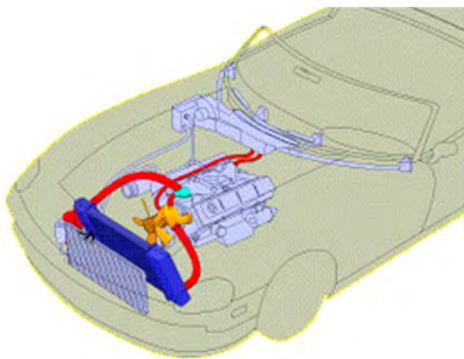
Hot Weather Checks

Tire inflation needs special attention



Underinflated tires are subject to heat and pressure buildup due to excessive flexion, especially when driving for extended distances at higher speeds.

The air conditioner, radiator coolant hoses, connections, and drive belts need special attention.



due to the extra load placed on these cooling systems.

Safety Restraints for Adults

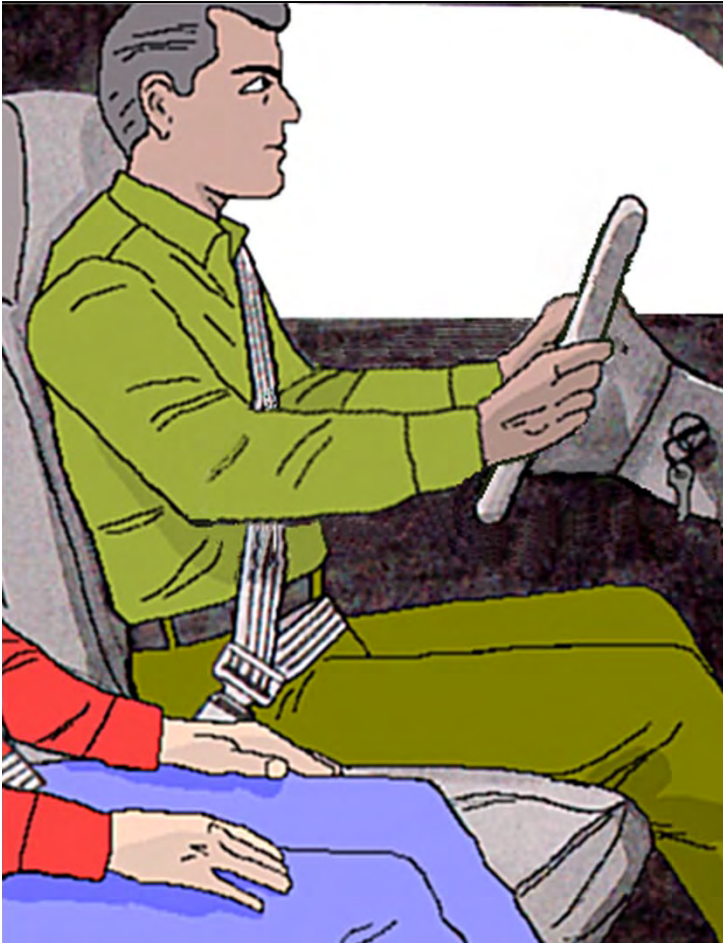


Your number one defense to prevent severe injuries is to wear your safety belt.

- **Adjust the seat, place your lower back firmly against the seat and sit up straight.**
- **If your vehicle is equipped with an adjustable center post mounting for shoulder belt height, adjust it to the proper height setting so the belt does not rub against your neck.**
- **The shoulder belt should go over the shoulder and across the chest and rest against the body.** If a crash occurs and a person has not taken the slack out of the shoulder belt, the extra forward movement of the body will increase the chance of injury.
- **The lap part of the belt should be worn low and snug on the hips, barely touching the thighs.** If a crash were to occur, the force would then be applied to the strong pelvic bones and not the abdomen, reducing the chance of serious internal injuries.
- **Check frequently for snug fit.**



Safety Restraints for Adults



- Keeping the seat back in an upright position avoids the submarine effect of the lower body in a frontal crash
- Properly worn seat belts minimize movement of the upper and lower body in a crash
- Belts dramatically reduce the severity of injuries

Safety Restraints for Adults

Air Bags in Dash or Steering Wheel

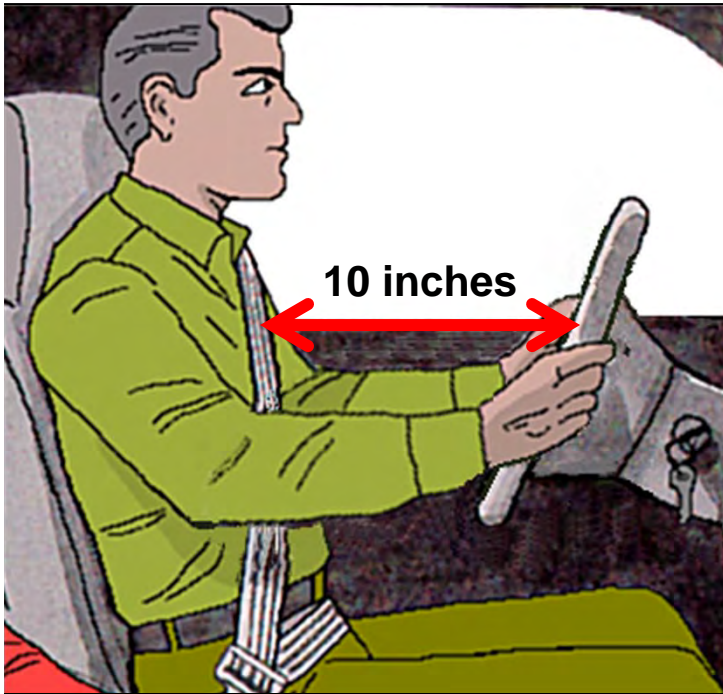


- ✓ No passenger under 12 years of age should sit in the front seat
- ✓ Protect driver or passengers from sustaining severe head and chest injuries
- ✓ The speed of bag inflation is critical to prevent body contact with the steering wheel



The air bag inflates in the blink of an eye, at speeds as high as 200 miles per hour.

Safety Restraints for Adults



Air Bag in Steering Wheel

- Raise seat or adjust steering wheel to direct air bag toward chest and not at the facial area
- Adjust seat for a minimum 10-inch clearance between chest and steering wheel
- Hand position should be at 8 and 4
- Avoid 10 and 2 hand position to prevent blow hole burns to hands and arms



Safety Restraints for Adults

Air Bags for side impact protection

- ✓ Located in the upper door frame, side of the seat, or door panel
- ✓ Protect head from hitting the window



Side air bag deploys in crash test. Red area shows where the dummy's head impacted the airbag.

Head Restraints



Proper adjustment minimizes whiplash.

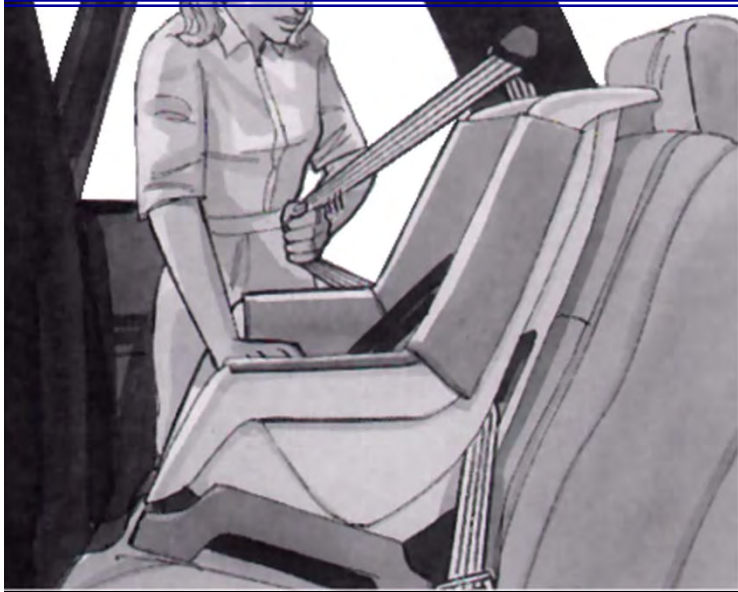


Improper adjustment may result in severe neck injury.

Safety Restraints for Youth

Belt and Seat Restraint Use

- Safest if seated in back center seat
- Infant seats/rear facing/birth to 20 lbs.
- Use child seats up to 40 lbs.
- Use booster seats up to 60 lbs.



**Forward Facing
Child Restraints**



Infant Car Bed

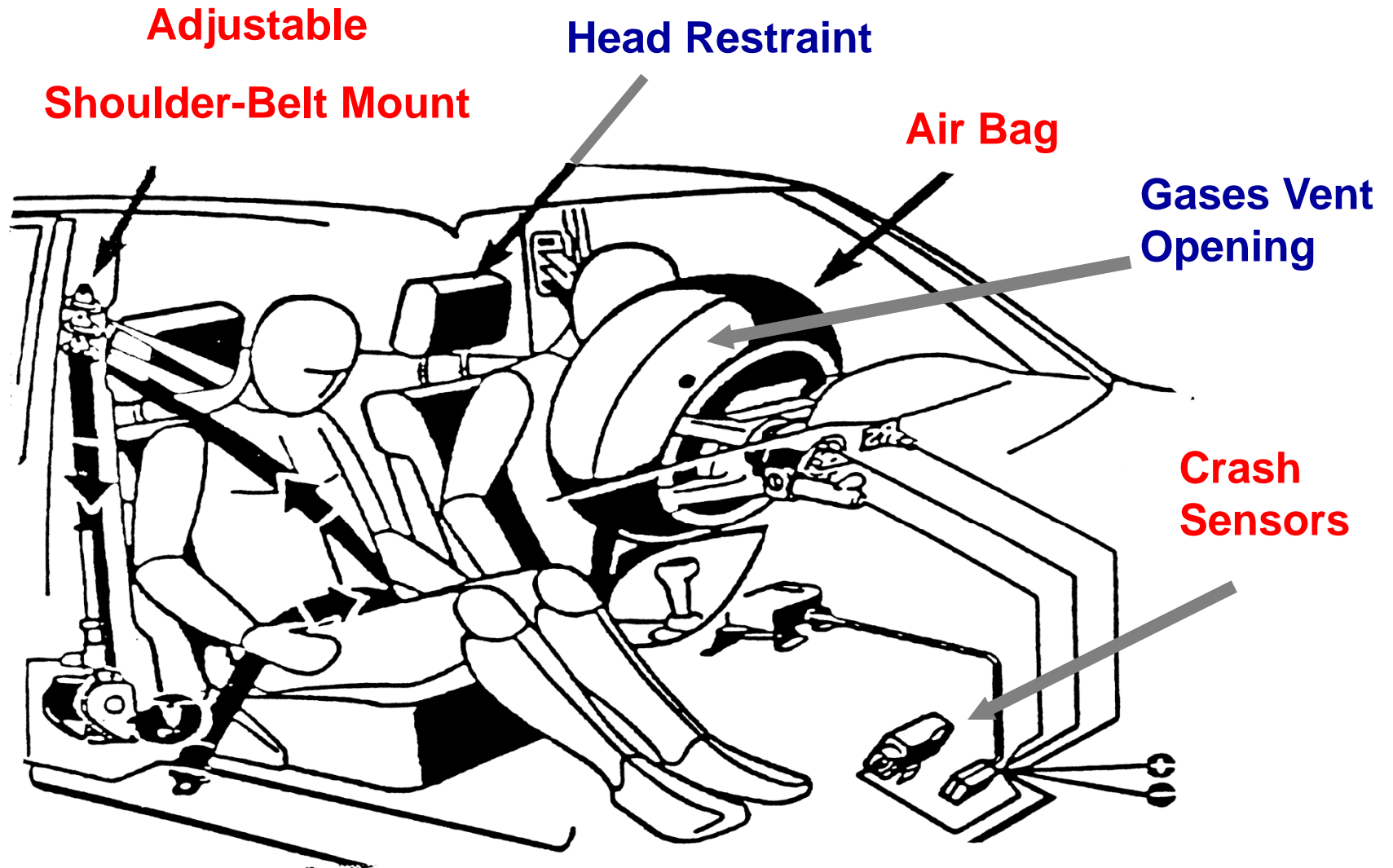


Booster Seats



**Rear Facing
Infant Seat**

Occupant Protection



Restraints Protect



Buckle up to guard against additional injury from a secondary collision or ejection from the vehicle

Never hold a child on your lap--always secure the child in an approved child safety seat



Movement of Belted Occupant

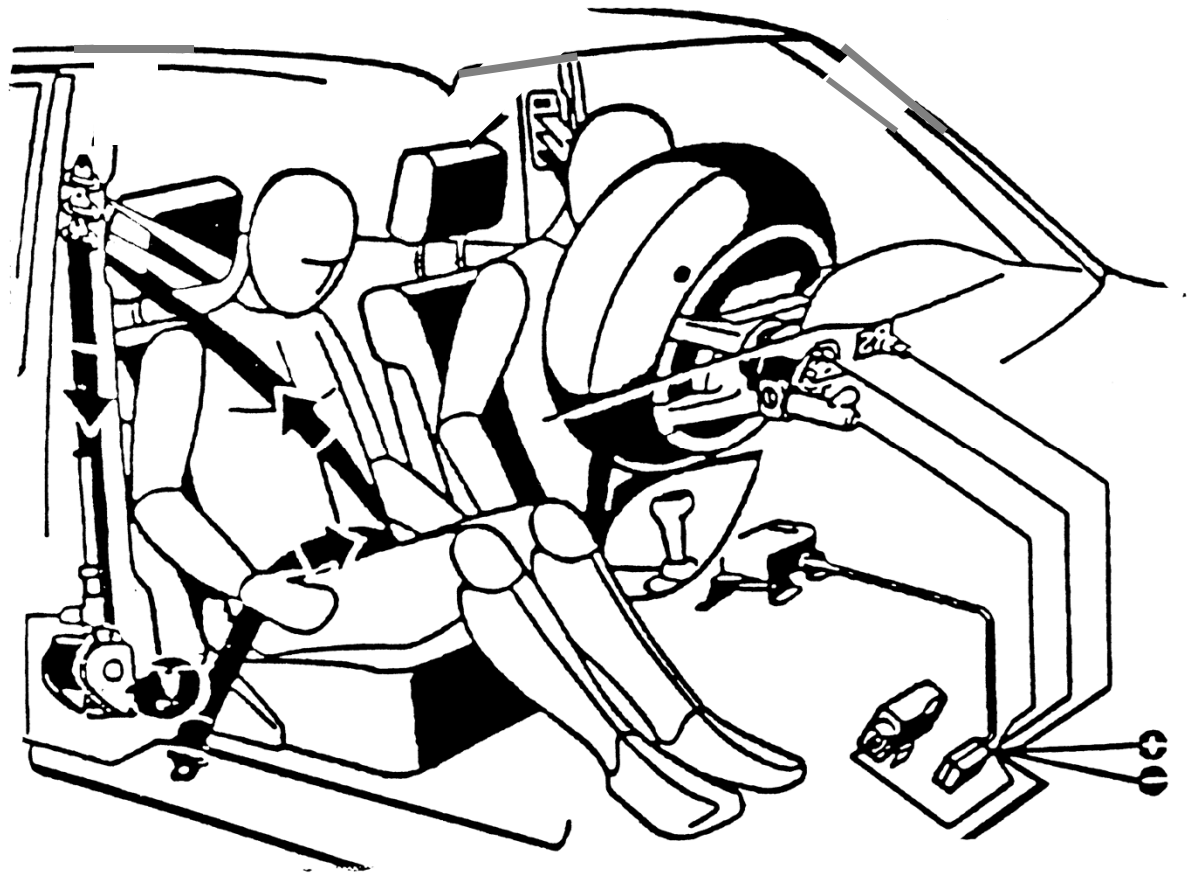
31 MPH Crash



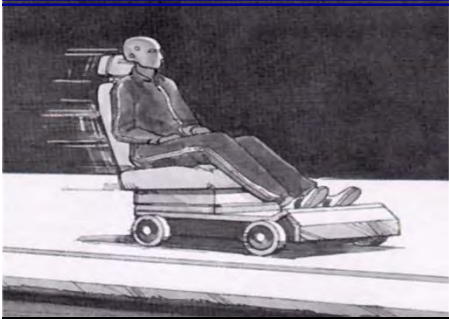
Head = 1.9 ft.

Chest = 1.3 ft.

Pelvis = 1.2 ft

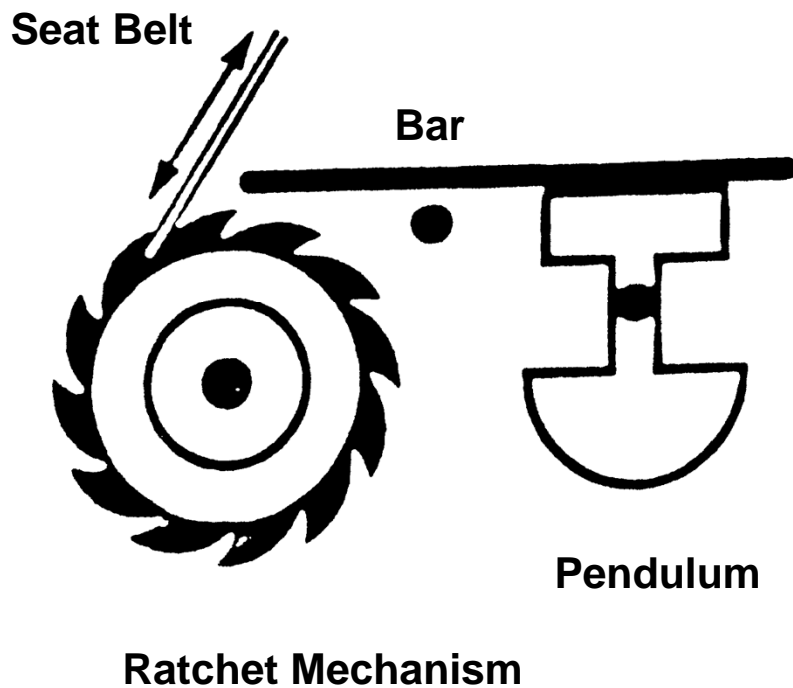


Types of Belt-Locking Systems

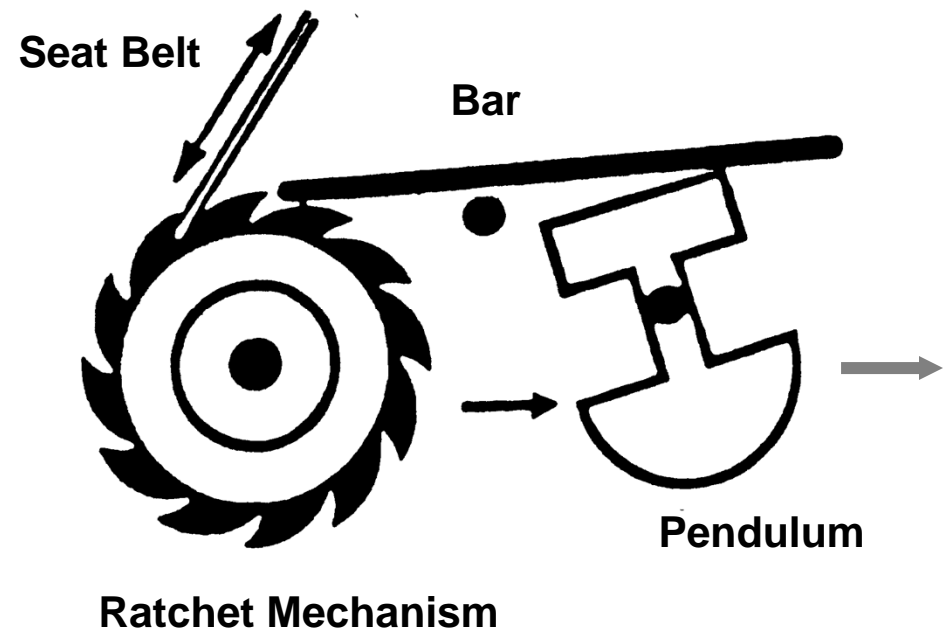


Sudden Car Movement →

Normal Conditions



Emergency Conditions



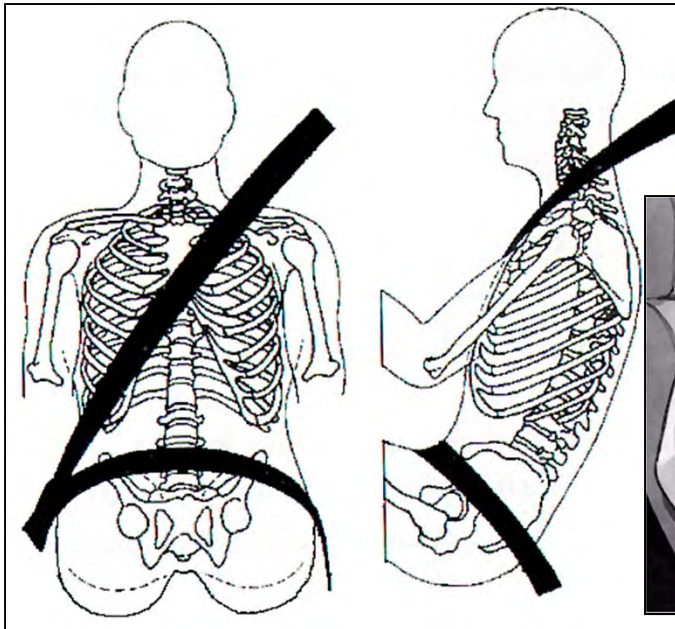
Adjusting Belts for Proper Fit



Seat belts should be worn over the strongest skeletal bones

Wear Lap Belt

low and snug across hips (pelvis) to avoid unnecessary internal injuries



Wear Shoulder Belt

over collar bone and chest (sternum) to avoid shoulder dislocation and rib cage damage



Highway Safety Design Features

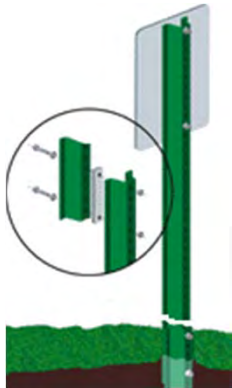
Occupant Protection Highway Design Features Include

- ✓ Wide clear shoulders and wide lanes
- ✓ Rumble strips installed at the road edge
- ✓ Redesign of median barriers
- ✓ Traffic calming devices



Highway Safety Design Features

Occupant Protection Highway Design Features Include



- Breakaway sign support posts



- New design guard rails with ends angled away from roadway and buried



- Crash attenuators such as vinyl liquid or sand filled drums

Highway Safety Design Features

Occupant Protection **Highway Design** Features Include:

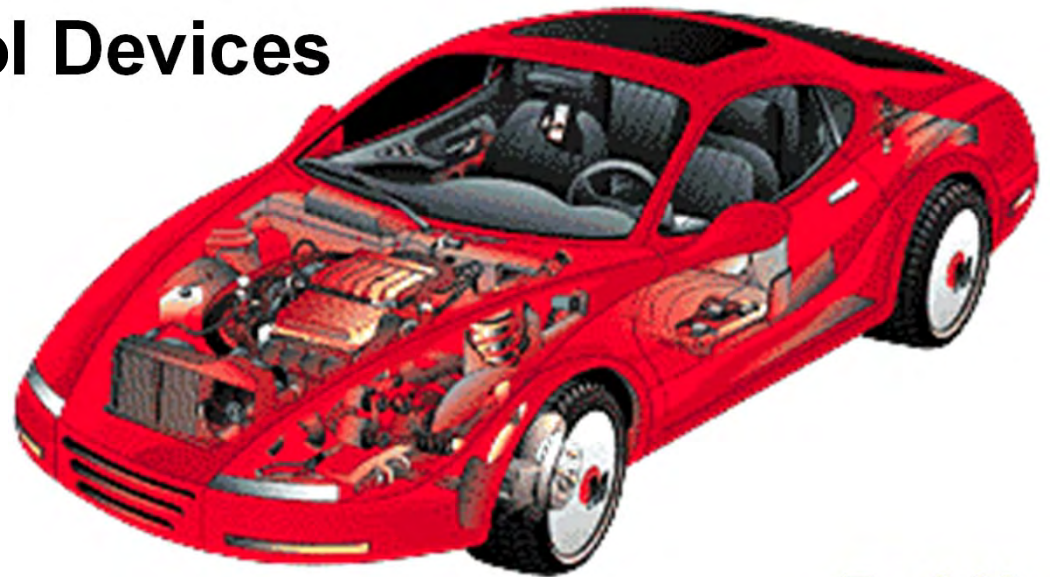


- ✓ Protected left and right turn bays
- ✓ Collector/distributor lanes on high speed, high density highways
 - separates slower moving entering/exiting traffic from the higher speed through traffic
- ✓ Variable message signs alert drivers to weather conditions, construction, and traffic problems



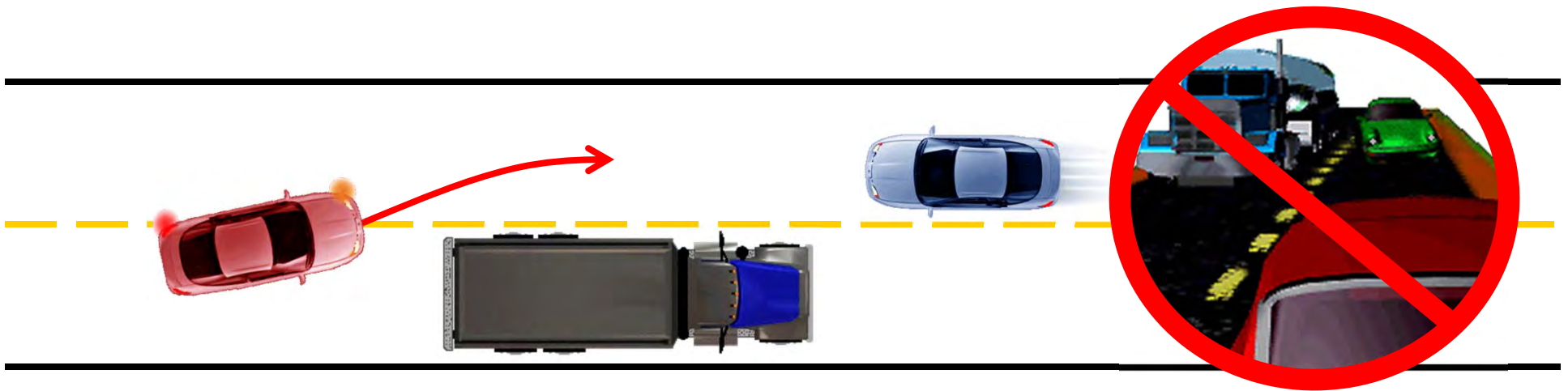
Automotive Technology

- ❖ Anti-Lock Brakes
- ❖ Crush Zones
- ❖ Traction Control Devices
- ❖ Electronic Stability Program (ESP)
- ❖ Suspension Control Devices
- ❖ Door Latches
- ❖ Glass
- ❖ Headlights



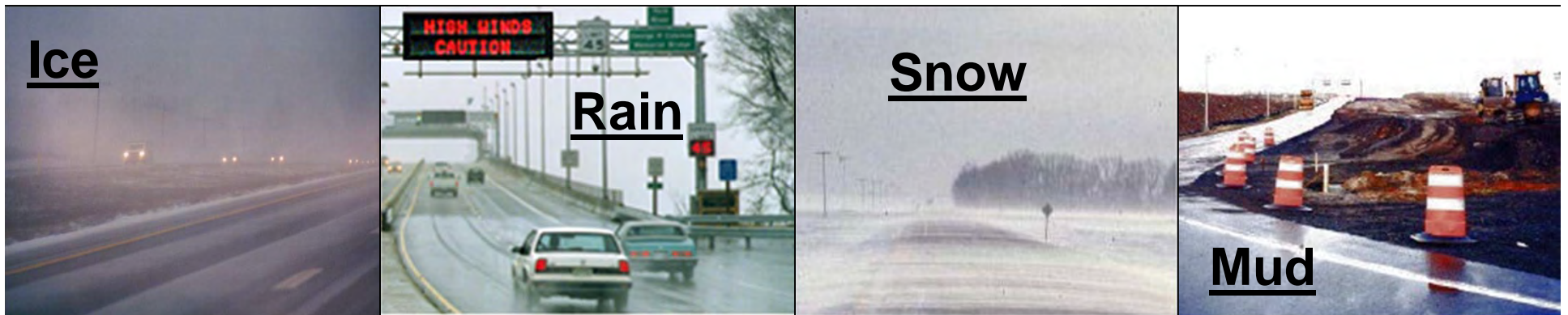
Controlling Consequences

- ➡ Drive off road rather than skid off the road
- ➡ Hit something soft rather than something hard
- ➡ Hit something going your way rather than something stationary
- ➡ Hit stationary objects with a glancing blow
- ➡ Hit a stationary object rather than an approaching object
- ➡ Steer to avoid oncoming traffic and head on collision



Dangerous Road Surface Condition

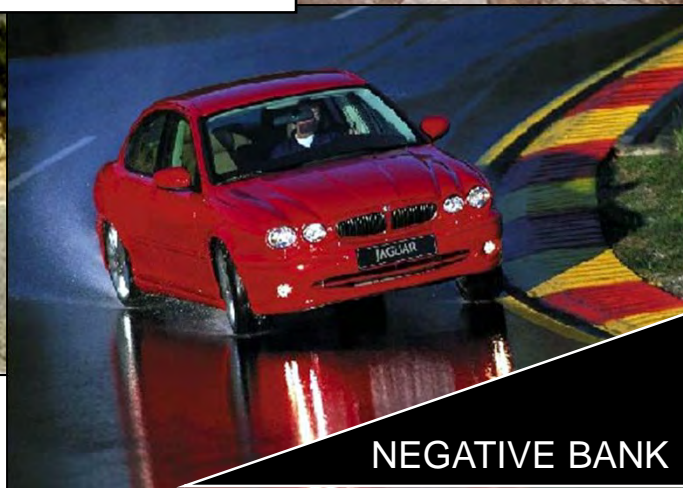
- Ice, snow, or frost
- Wet--particularly the first 15 minutes of rain after a long dry period when oil and rubber particles have collected on the road surface and mix with water
- Heavy rain or standing water
- Mud near farm entrances, construction sites, and truck crossings



Dangerous Road Surface Condition

- Wet leaves
- Broken or uneven road surface
- Sand or gravel frequently found on curves in rural areas

On improperly banked or flat curves, traction is more likely to be lost when roads are wet or slippery at slow speeds, or when dry at higher speeds



Causes of Traction Loss

Condition of the Vehicle

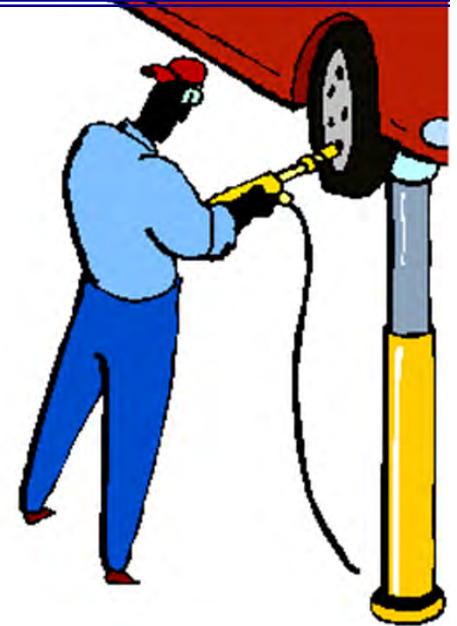
➤ Brakes unevenly adjusted

Brakes pulling in one direction or the other can cause a skid--as can wheels out of alignment when brakes are applied

➤ Tires with unevenly worn tread

- The size of the front and rear tires do not matched
- The tread depth or tire type of the front and rear tires are different

➤ Different tire pressure on opposite sides of the vehicle has a similar effect to uneven brake adjustment since one tire will drag more than others



Causes of Traction Loss

Driver Actions that may cause loss of traction

- ✓ Sudden steering actions on a slippery surface, or abrupt or sudden changes in vehicle speed
- ✓ Panic stop or applying the brakes too hard on a hill, curve or slippery surface
- ✓ Suddenly engaging the clutch on a slippery surface



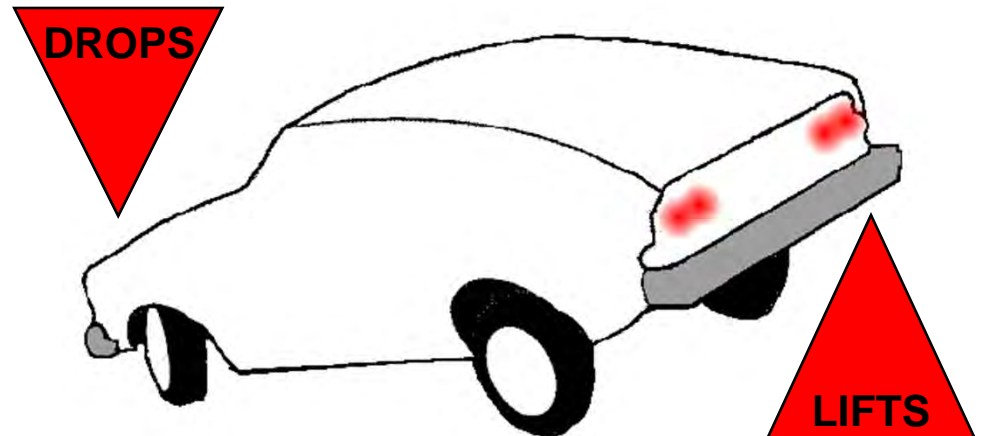
Most driver-induced skids are caused by:

- ✓ **excessive speed**
- ✓ **coupled with excessive steering input**
- ✓ **or improper braking when turning**

Loss of traction also occurs with these driver's actions at normal speeds on ice/snow or on roadways covered by sand, gravel, or water

Traction Loss Considerations

- Sudden shifts of vehicle weight causes traction loss
 - Left, Right, Forward, or Backward
- Simultaneous steering, braking and/or acceleration creates sudden shifts in vehicle balance
- Traction loss compounds crash consequences

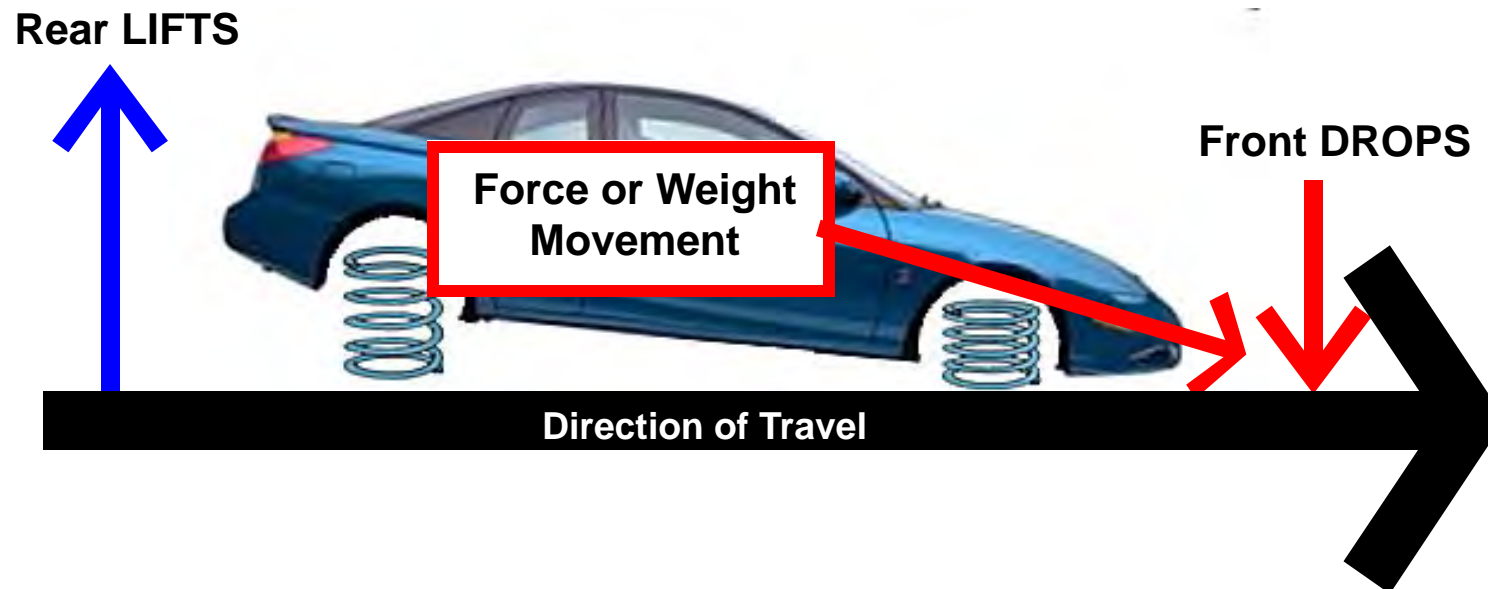


Traction Loss Considerations

When **Brakes** are Applied Too Hard or Quickly

Weight Moves to the Front of the Car Causing

- a noticeable drop of the hood
- a noticeable rise of the rear deck
- forward movement of driver and passengers

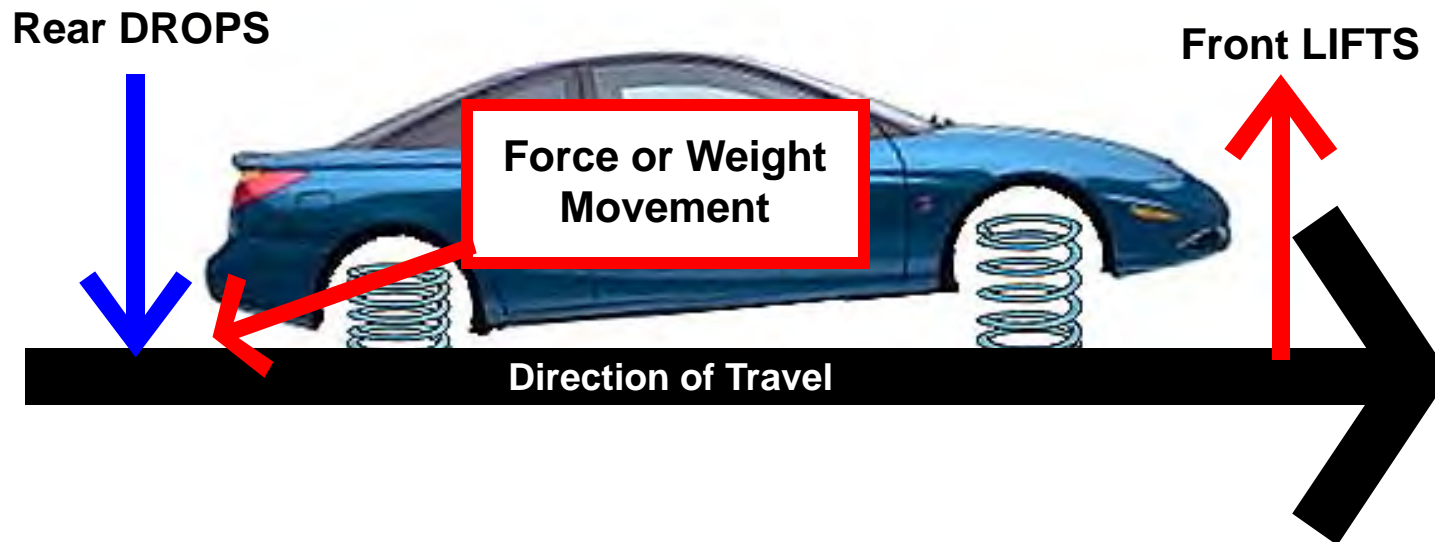


Traction Loss Consideration

When **Acceleration** is Applied Too Hard or Quickly

Weight Moves to the Rear of the Car Causing

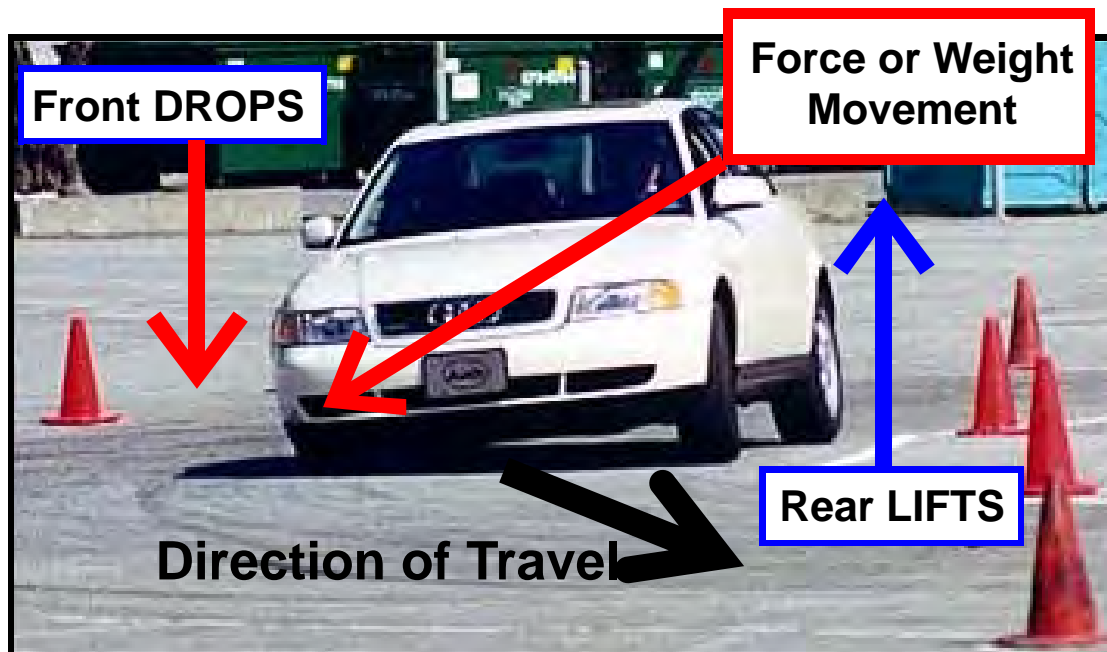
- a noticeable rise of the hood
- a noticeable drop of the rear deck
- rearward movement of driver and passengers



Traction Loss Consideration

When **Steering** is Applied Too Hard or Quickly

- ✓ **Weight Moves to the Opposite Side of the Car**
- ✓ **Weight Movement Causes:**
 - a noticeable drop and tilt of the hood
 - a noticeable rise and tilt of the rear deck
 - driver and passenger movement towards the car's corner

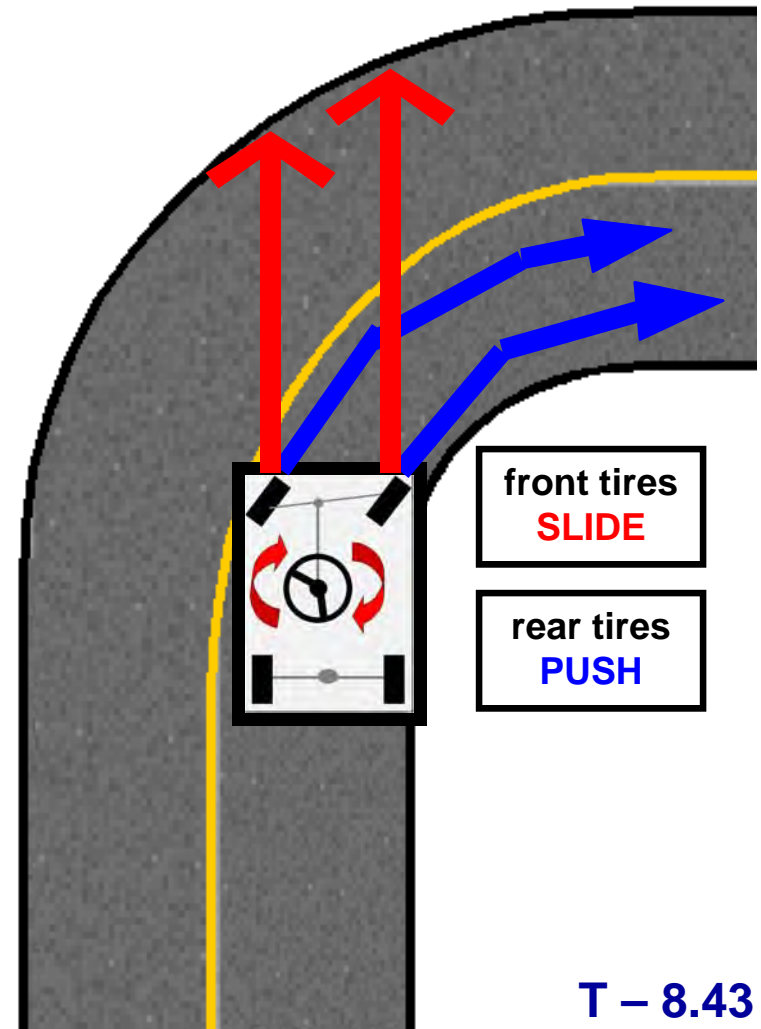
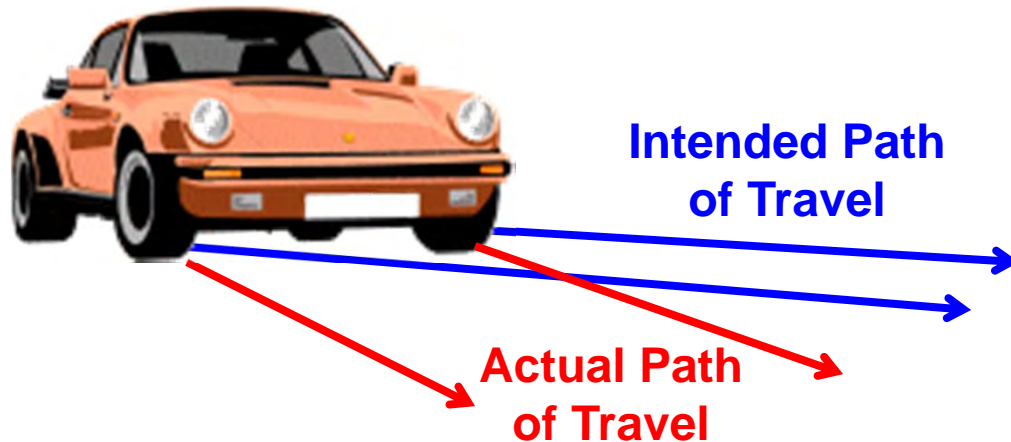


Traction Loss to Front Tires

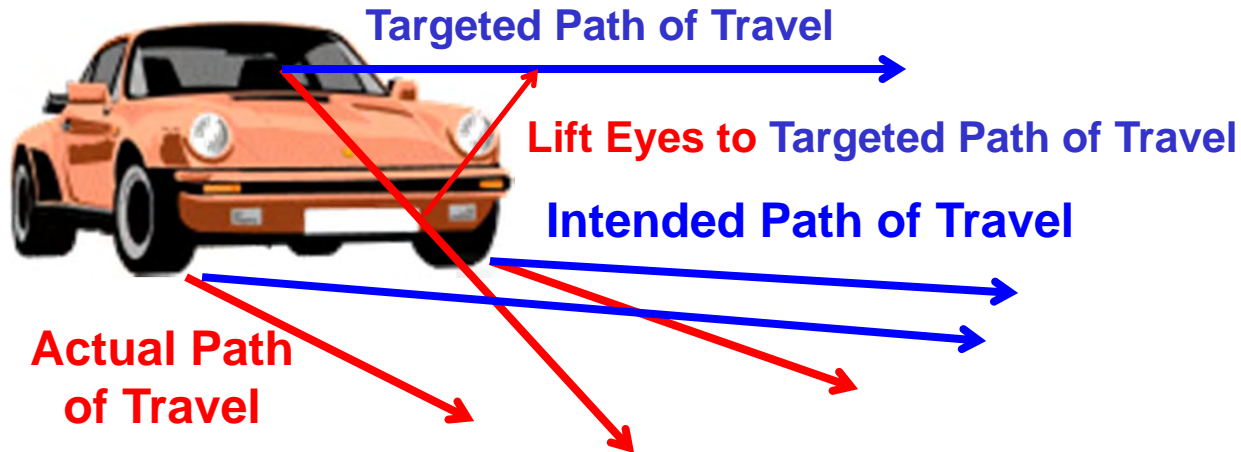
If A Vehicle Keeps Moving Straight Ahead in Spite of Steering Efforts To the Contrary, It Means Front Traction Has Been Lost

The Technical Term is Called “**Understeer**”

The Driver Will First Visually Identify Unusual Forward Sliding Movement Caused by the Vehicle’s Weight Pushing the Front Wheels Straight Ahead Regardless of Any Steering Input



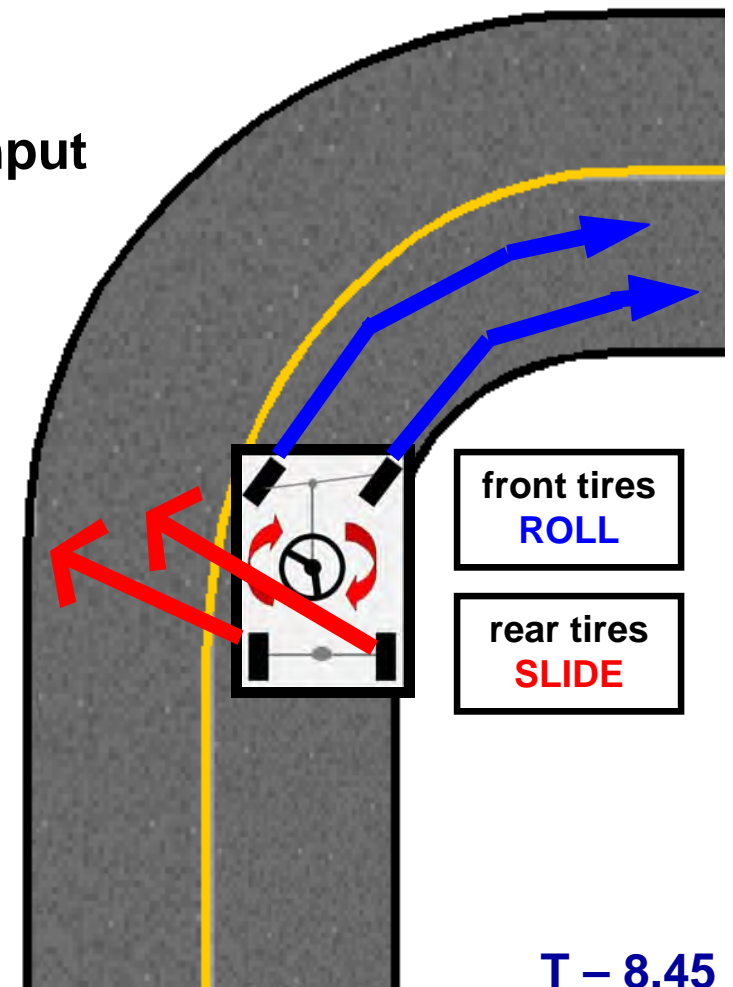
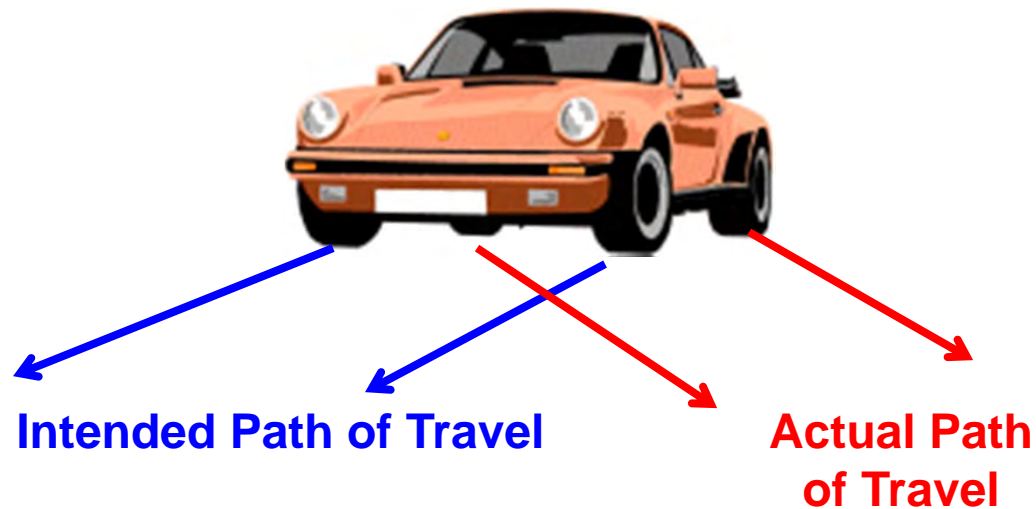
To Correct Front Traction Loss



- Direct Vision to Targeted Path of Travel
- Activate ABS, if Vehicle is Equipped
 - Ease off Conventional Brake System
 - Reestablish Rolling Traction
- Ease off Steering Inputs
 - Abrupt Steering Can Create Traction Loss
 - Allows Tire Tread to Point Toward Path of Travel
- Jab/Stab Brake to Move Weight Forward if ABS is not Available
(ABS performs this function automatically)

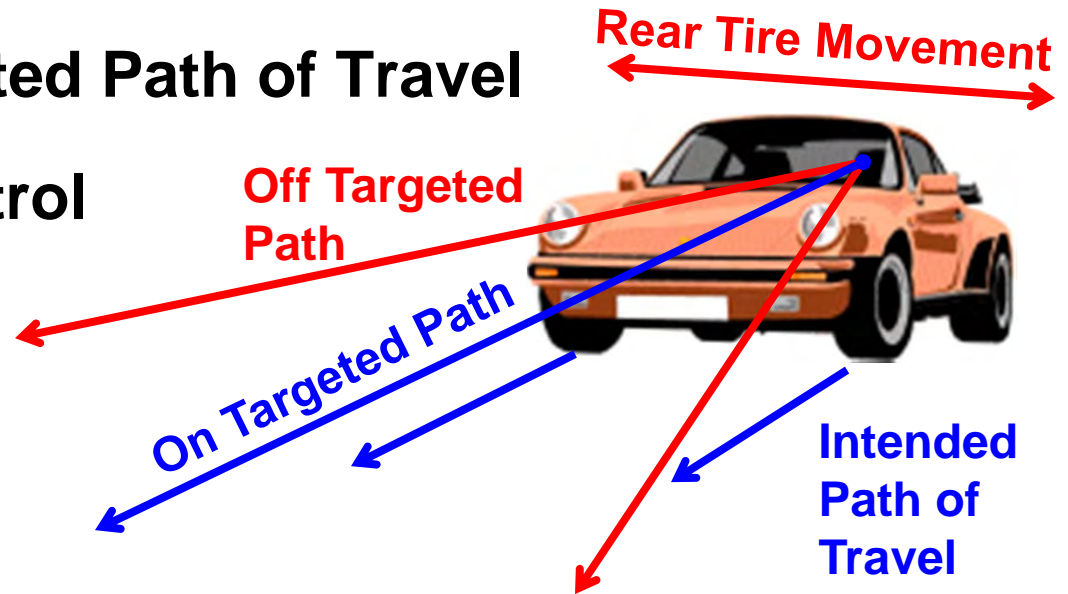
Traction Loss to Rear Tires

- Identified by driver when front of vehicle moves to the left or right of travel path without steering input in that direction
- Technical term is “**Oversteer**”
- Vehicle’s Weight Tends to Push Rear Wheels Left or Right Without Steering Input
- Vehicle Begins To Yaw

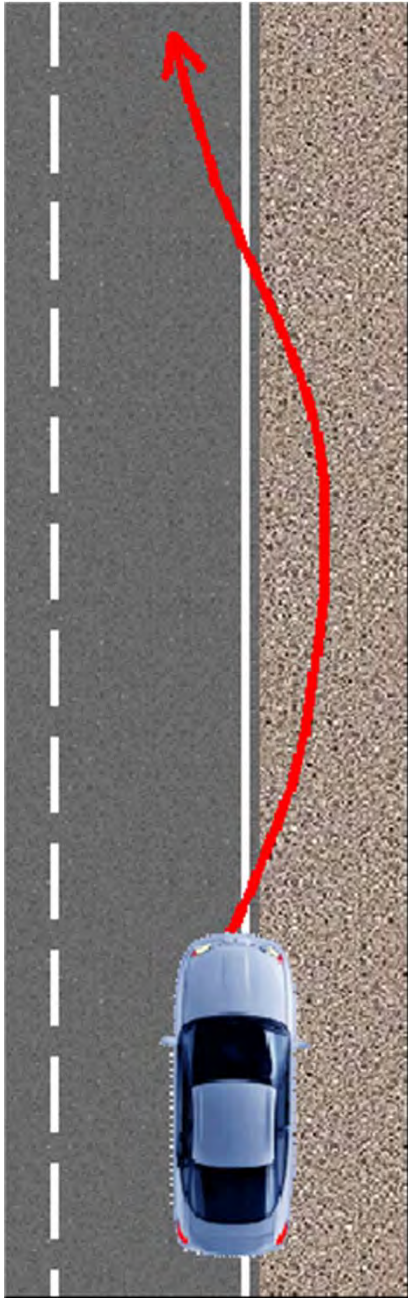


Rear Traction Loss Correction

- Direct Vision to Targeted Path of Travel
- Activate Traction Control System, if Equipped:
 - Ease off brake or accelerator
 - Reestablish rolling traction
- Steer Toward Targeted Path of Travel
- Adjust Steering Input as Needed to Maintain Targeted Path of Travel
- Apply Light Progressive Acceleration (2 mph is goal) to Move the Weight to the Rear. (The Traction Control System will adjust the speed and brakes automatically when activated)



Off-Road Recovery



- Do not panic and steer too abruptly
- Ease off accelerator
- **DO NOT BRAKE**
- Get both wheels off the pavement
- Steer the vehicle parallel to the roadway
- If clear, ease back on to the roadway one wheel at a time
- Limit steering inputs to less than 1/8 of a turn of the wheel
- Use even less input when the edge of road is high
- Target the center of the adjacent lane to avoid a “Slingshot” maneuver into oncoming traffic

Off-Road Recovery

Did You Know?

In 2002, 53% of the motor vehicle fatalities among 16-20 year olds were caused by run-off-the-road crashes!

Source: DMV Traffic Crash Facts

