

**Driver Education
Classroom and In-Car
Curriculum**

Unit 7

**Environmental Conditions
that Affect Safe Vehicle
Operation**

Driver Education Classroom and In-Car Instruction Unit 7-2

Unit Introduction

Unit 7 will introduce students to the problems associated with driving under conditions of inclement weather, limited visibility and limited traction. Specific attention will be directed to vehicular factors and increased time/space needs under such conditions relative to following, being followed, gap selection when crossing and turning, traveling with traffic in adjacent lanes, passing and adjusting to the actions of pedestrians.

Trip planning will be introduced with attention to purpose of trip, risk management, i.e., traffic density, time of travel and anticipated travel time.

Driving under conditions of limited visibility and traction, the use of flashers and lights other than headlights, and the use of safety restraints will be reviewed and analyzed.

Goals

Time Frame: 5 hours

Students will:

- Participate in teacher-led discussion of the problems associated with driving at night, in fog, rain, snow, smoke, hot and cold temperatures and when there are strong cross winds. The instructor will use the videos “Night Driving” and “Driving In Bad Weather.”
- Students will complete Worksheet 7.1.
- Participate in teacher-led discussions of the advances in occupant protection, including automotive technology designed to protect vehicle occupants or enhance a driver’s ability to respond in the event of loss of traction or other emergency.
- Participate in teacher led discussion of traction and how it affects the movement and control of your vehicle, how to detect and respond to various types of traction loss and how to return safely to the paved roadway after drifting or steering onto the shoulder.
- Complete Unit 7 Test.

Driver Education Classroom and In-Car Instruction Unit 7-3

<p>Title: Environmental Conditions that Affect Safe Vehicle Operation</p>	<p>Time Frame: 5 hours</p>
<p>Resources Needed</p>	<p>Instructor Preparation</p>
<p>Textbooks: <u>Drive Right</u> Ch. 5, 12, 18 <u>How to Drive</u> Ch. 8, 11 <u>Handbook Plus</u> Ch. 13, 14, 18 <u>Responsible Driving</u> Ch. 11, 13, 17</p> <p>Slides 7.1-7.22 Fact Sheets 7.1-7.6 Worksheet 7.1 Included Video: 7.1-7.7 Your state's Driver's Handbook Your state's vehicle law</p> <p>Included Videos:</p> <ul style="list-style-type: none"> • <i>"Understanding Car Crashes: It's basic physics"</i> (22 minutes 15 seconds) • <i>"Stomp, Stay and Steer"</i> (4 minutes 43 seconds) • <i>"ESP Consumer Video"</i> (3 minute 37 seconds) <p>Unit 7 Test</p>	<p>Review recommended learning activities Review textbook Review on-street lesson plan used in combination with this unit and textbook</p> <p>Review slides Review fact sheets Review worksheet Review included videos</p> <p>Included</p>

Driver Education Classroom and In-Car Instruction Unit 7-4

Performance Objectives	Learning Activities	Resources
<p>Students will demonstrate knowledge of the problems associated with reduced visibility such as driving at night, in fog, rain, snow, smoke, and glare conditions.</p>	<p>Show the Optional Video “<i>Night Driving</i>.” The instructor will then use Slides 7.1 through 7.4, Video 7.1 and Fact sheet 7.1 and 7.2 to lead discussions of the visual problems associated with driving at night, in fog, rain, snow, smoke and under other glare inducing situations and actions that can be taken to reduce the effects. Each student will complete Worksheet 7.1 during the class session.</p> <p>Use Slides 7.5 and 7.6 to discuss glare problems and countermeasures. Also show Video 7.2.</p>	<p>Optional Video: “<i>Night Driving</i>” (9 minutes)</p> <p>Slides 7.1-7.4 “Driving at Night”</p> <p>Video 7.1 “<i>Night Driving Visual Problems</i>” (47 seconds)</p> <p>Fact Sheet 7.1 and 7.2 “Changing Weather and Conditions of Visibility at Night”</p> <p>Worksheet 7.1 “Changing Weather and Conditions of Visibility”</p> <p>Slide 7.5 “Source of Glare”</p> <p>Video 7.2 “<i>Sources of Glare</i>” (11 seconds)</p> <p>Slide 7.6 “Countermeasures for Reducing Glare”</p>

Driver Education Classroom and In-Car Instruction Unit 7-5

Content Outline

Changing Weather and Conditions of Visibility

Driving at night:

Reduced lighting results in reduced visibility at night. Not only can a driver not see ahead as clearly, he/she cannot see to the sides as well. Drivers have difficulty seeing objects approaching from their left or right into their path of travel. Strategies for night driving include:

- Use high-beam headlights when safe and legal to do so
- Use low-beam headlights in bad weather or when following or meeting another car at night
- Precautionary measures

Sources of glare:

- Oncoming and following vehicle headlights
 - High beam
 - Misaligned
- Dirty windshield
- Paper on dashboard
- Snow-covered landscape
- The sun at dawn or dusk (ahead or behind)
- Flashing advertisement signs
- Rain amplifying glare
- Flood lights on businesses next to roadway
- Failure to dim own headlights in fog

Countermeasures:

- Keep all glass, lights and windows clean
- Do not place paper or other objects on dashboard
- Adjust sun visors and mirrors
- Sit as high in the seat as possible
- Wear sunglasses during the day
- Adjust speed to visibility conditions
- Look to the right edge of the roadway, away from headlights

Visibility limited by fog, smoke, rain or snow:

Visibility as presented in this lesson deals with atmospheric conditions beyond control of the vehicle operator.

While all of these conditions limit visibility, an additional problem associated with smoke, rain, and snow is that of gusting or continuous high winds. In contrast, fog appears to settle over the roadway in a virtual blanket. The strongest recommendation is not to drive knowingly in any of the conditions listed above.

Driver Education Classroom and In-Car Instruction Unit 7-6

Performance Objectives	Learning Activities	Resources
<p>Students will demonstrate knowledge of the problems associated with reduced visibility such as driving at night, in fog, rain, snow, smoke and glare conditions. (Continued)</p>	<p>Use Slides 7.7 through 7.8 and discuss driving in drifting and heavy fog.</p> <p>Show Video 7.3 and discuss.</p>	<p>Slides 7.7 through 7.8 “Countermeasures for Driving in Fog”</p> <p>Video 7.3 “<i>Driving in Fog</i>” (20 seconds)</p>
	<p>Use Slides 7.9 through 7.11 and discuss driving in smoke, rain and snow.</p> <p>Show Video 7.4 and discuss.</p>	<p>Slides 7.9 through 7.11 “Countermeasures for Driving in Smoke, Rain and Snow”</p> <p>Video 7.4 “<i>Driving in Rain</i>” (22 seconds)</p>

Driver Education Classroom and In-Car Instruction Unit 7-7

Content Outline

Changing Weather and Conditions of Visibility

Fog: People involved in multi-vehicle crashes in fog often state that they had driven through patches of light, drifting fog in the area, but nothing serious and had continued to travel at the prevailing speed. Suddenly it was impossible to see, they had braked hard, only to run into a vehicle stopped in the road ahead or to be rear-ended. The correct response would have been to reduce speed as soon as they were aware of drifting fog.

If driving in drifting fog:

- Reduce speed
- Make sure headlights are on low beam to reduce reflected glare
- Turn on windshield wipers
- Turn on defroster or air conditioner

If fog is heavy:

- Further reduce speed but do not 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 guardrail, check outside the guardrail, then back up outside of the guardrail, turn off all lights and wait for fog to lift

Heavy smoke, rain or snow:

- Smoke and ashes from a large brush fire can cover the road making it very hard to see.
- Drizzle can turn into a downpour and obscure vision.
- Light snow can turn into a whiteout causing very limited vision.

Precautionary measures should be taken as soon as any of the initial conditions become evident. In most instances, brush fires will be restricted to a limited area and torrential rains are of short duration. The snow storm-induced whiteout could cover a much greater area. In all three situations:

- Continue to reduce speed to limits imposed by visibility, but do not stop in travel lane or on shoulder near road*
- Turn headlights to low beam
- Turn on emergency flashers.
- Maintain lane position 1 (center of lane)
- Turn on windshield wipers**
- Be alert for vehicles stopped in roadway
- Be prepared for effects of gusting or strong steady crosswinds
- Make steering, acceleration and braking actions gently and smoothly

* For snow condition, look for exit from highway and turn on radio for weather report. If impossible to leave highway, stop beyond end outside of guardrail. If available, use cell phone to check road conditions.

** Snow and smoke may require use of windshield washer.

Driver Education Classroom and In-Car Instruction Unit 7-8

Performance Objectives	Learning Activities	Resources
Students will describe conditions of driving in strong winds and strategies to reduce risk in these situations.	Use Fact Sheet 7.2 to lead a discussion on the actions to take when the vehicle is buffeted by strong gusts of wind.	Fact Sheet 7.2 “Changing Weather and Condition of Visibility”
Students will demonstrate knowledge of technological advances in the design of motor vehicles that enhance occupant safety and ability to respond more effectively under conditions of limited time and space.	Use Slide 7.12 and Fact Sheet 7.3 to lead a discussion of the technological advances in automotive design including construction and their contribution to occupant safety and enhancement of the ability to respond more effectively under conditions of limited time and space.	Slide 7.12 “Automotive Technology” Fact Sheet 7.3 “Automotive Technology”
Students will demonstrate knowledge of actions necessary to better control the consequences if a crash appears imminent.	Use Slide 7.13 to lead a discussion of the technological advances in automotive design and construction and their contribution to occupant safety in controlling consequences if a crash appears imminent. Show Video 7.5 and discuss.	Slide 7.13 “Controlling Consequences” Fact Sheet 7.3 “Occupant Protection” Video 7.5 “ <i>Understanding Car Crashes: It’s basic physics</i> ” (22min 15sec)

Driver Education Classroom and In-Car Instruction Unit 7-9

Content Outline

Strong winds create a problem called “buffeting”. These conditions occur on bridges such as the Chesapeake Bay Bridge, through mountain passes and ravines, and when being passed by large trucks. These wind gusts and blasts can cause total loss of vehicle control. If your vehicle encounters strong gusts of wind, do the following:

- Reduce speed
- Check for oncoming traffic
- Adjust lane position
- Do not oversteer when responding to the gust
- Prepare to countersteer
- Stay off the brake

Automotive technology designs

- ABS
- Traction control devices
- Suspension control
- Crumple zones
- Door latches
- Safety glass
- Headlights
- ESP, Electronic Stability Program

Controlling consequences

- Avoid head-on collisions
- Drive off road rather than skid off road
- Hit something soft rather than something hard
- Hit something going your way rather than something stationary
- Hit stationary object with glancing blow or at an angle
- Hit stationary object rather than an approaching object
- Steer to avoid oncoming traffic
- Avoid direct impact

Driver Education Classroom and In-Car Instruction Unit 7-10

Performance Objectives	Learning Activities	Resources
<p>Students will demonstrate knowledge of weather, other physical conditions and driver actions that influence the level of traction or adhesion between tires, road surface and vehicle control</p>	<p>Discuss traction and the types of traction with the class. Use Slide 7.14 and 7.15 to discuss the types of traction.</p> <p>Lead a class discussion and ask the class to describe causes of traction loss and roadway conditions that can create traction loss.</p>	<p>Slide 7.14-7.15 “Changing Traction Conditions”</p>

Driver Education Classroom and In-Car Instruction Unit 7-11

Content Outline

Changing Traction Conditions

Traction: Traction or adhesion is the grip between the tires and the road surface that allows a vehicle to start, stop and/or change direction. Three types of traction influence the control/ or movement of a motor vehicle. They are static, rolling (dynamic) and sliding.

A stationary vehicle parked on a flat surface with its brakes set is an example of static traction. It has greatest resistance to movement.

There is greater traction between a stationary wheel and the road than there is between a sliding wheel and the road. Sliding traction does not grip the road as well as static traction.

There is more traction between a rolling wheel and the road than there is between a sliding wheel and the road. That is why a driver needs to keep the wheels rolling and not lock the brakes when trying to steer or stop a vehicle.

Traction between the tires and the road does not remain constant. For example, sand, gravel or water on the road decrease the level of traction. As speed increases, traction between the tires and the road decreases. The possibility of skidding or sliding increases with decreased traction.

Road surface conditions:

- Ice, snow or frost
- Wet surface; particularly first 15 minutes of rain after a long dry period when drops of oil and rubber particles have collected on the surface
- Standing water
- Mud near farm entrances, construction sites and truck crossings
- Wet leaves
- Broken or uneven road surface
- Sand or gravel

Driver Education Classroom and In-Car Instruction Unit 7-12

Performance Objectives	Learning Activities	Resources
<p>Students will demonstrate knowledge of weather, other physical conditions and driver actions that influence the level of traction or adhesion between tires, road surface and vehicle control. (Continued)</p>	<p>Use Slide 7.16 and discuss vehicle factors that affect traction loss. Refer to Fact Sheet 7.4 for further information.</p>	<p>Slide 7.16 “Changing Traction Conditions - Condition of the Vehicle” Fact Sheet 7.4 “Vehicle Control and Traction Loss”</p>
	<p>Use Slide 7.17 and discuss actions which drivers take that cause traction loss.</p>	<p>Slide 7.17 “Changing Traction Conditions - Actions of Driver”</p>
<p>Students will describe the term “hydroplaning” and how it causes loss of traction.</p>	<p>Discuss the loss of traction caused by hydroplaning. Continue using Fact Sheet 7.5 as a reference for discussion.</p>	<p>Fact Sheet 7.5 “Changing Traction Conditions”</p>

Driver Education Classroom and In-Car Instruction Unit 7-13

Content Outline

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 worn tread, front and rear pairs not matched to size, tread depth or type
- Different pressure on opposite sides have effects similar to uneven brake adjustment since one tire will drag more than others

Actions of the driver:

- Sudden steering action on a slippery surface
- Abrupt or sudden changes in vehicle speed
- Panic stop or applying brakes too hard on hill, curves or slippery surfaces
- Most skids are caused by excessive speed, coupled with excessive steering input and/or improper braking when turning, or the same actions at normal speed on ice/ snow or on roadways covered by sand, gravel or water

Hydroplaning:

- Front tires ride up on a film of water
- Reduce speed and steer where the driver wants the car to go
- The most difficult loss of traction condition for a driver to recognize

Driver Education Classroom and In-Car Instruction Unit 7-14

Performance Objectives	Learning Activities	Resources
<p>Students will describe the characteristics of front wheel and rear wheel traction loss.</p>	<p>Use Slides 7.18 and 7.19 and discuss the characteristics of traction loss of front-wheel drive vehicles.</p>	<p>Slides 7.18-7.19 “Front-Wheel Loss of Traction”</p>
	<p>Use Slides 7.20-7.21 and discuss the characteristics of traction loss of rear-wheel drive vehicles.</p>	<p>Slides 7.20 through 7.21 “Rear-Wheel Loss of Traction”</p>
	<p>Included Video 7.6: Show “<i>Stomp, Stay and Steer</i>” and discuss the techniques of stopping and controlling a vehicle equipped with anti-lock brakes.</p>	<p>Video 7.6 Included Video: “<i>Stomp, Stay and Steer</i>” (4 minutes 43 seconds)</p>
<p>Students will describe the actions to take in order to return the vehicle to the road surface under control, after having steered or drifted onto the shoulder.</p>	<p>Included Video 7.7: Show “<i>ESP Consumer Video</i>” and discuss the advantages of ESP.</p>	<p>Video 7.7 Included Video: “<i>ESP Consumer Video</i>” (3 minute 37 seconds)</p>
	<p>Discuss the procedure for regaining control of a vehicle that has lost traction.</p>	<p>Slides 7.22 “Off-Road Recovery”</p>
	<p>Use Slide 7.22 and discuss the steps to take in an off-road recovery.</p> <p>Fact Sheet 7.6 can be used as a reference.</p>	<p>Fact Sheet 7.6 “Changing Traction Conditions: Running Off and Returning to the Roadway”</p>

Driver Education Classroom and In-Car Instruction Unit 7-15

Content Outline

Front-wheel skid (loss of traction):

- Termed “understeer”
- Vehicle moving straight ahead in spite of steering input
- May first be identified visually
- Tires tend to roll under
- Rear wheels tend to push front straight ahead
- Direct vision to path of travel
- Ease off steering
- Re-establish rolling traction
- Jab brake to shift weight forward if necessary

Rear-wheel skid (loss of traction):

- Termed “oversteer”
- Locked wheels try to assume front position
- Generated by slick surface, speed, braking or sudden steering input
- Identified visually as front of vehicle moves left or right of travel path without steering input in that direction
- Direct vision to path of travel
- Ease off brake or accelerator
- Steer back toward path of travel
- Direct vision to travel lane not road shoulder
- Adjust steering input as needed
- Light progressive acceleration may be needed to return rear tire traction

Off-road recovery:

- Do not panic and oversteer
- Ease off the accelerator and do not brake
- Sight and align vehicle with edge of roadway
- Check all traffic
- When clear, bring wheel back to road surface by turning steering wheel 1/8 to 1/4 turn
- As wheels touch the road surface, countersteer 1/4 or 1/2 turn, then turn to steer straight

Driver Education Classroom and In-Car Instruction Unit 7-16

Performance Objectives	Learning Activities	Resources
	Make reading assignment.	<u>Drive Right</u> , Ch. 8, 13 <u>Handbook Plus</u> Ch. 3-F, 14 <u>How to Drive</u> , Ch. 11, 13, 14 <u>Responsible Driving</u> , Ch. 12, 14
Students will complete the Unit 7 Test.	Distribute, collect and grade the Unit 7 Test.	Test Included

Driver Education Classroom and In-Car Instruction Unit 7-17

Fact Sheet

7.1

Changing Weather and Conditions of Visibility Driving at Night

Visibility, as presented in this lesson, deals with limitations placed on gathering and processing information when driving at night due to factors of reduced illumination and ability of the eyes to adjust to glare.

Vision:

- Distance a driver can see ahead is limited
- Headlights provide limited illumination of off-road areas
- Loss of contrast and impaired distance judgment
- Glare from lights of oncoming and following vehicles and glare recovery time

Headlight alignment:

- Properly aligned low beams
 - Illuminate roadway 100 to 150 feet ahead
 - Light area above road 300 to 500 feet
 - Load, load distribution and vehicle height affect light beam distance
 - Maximum safe speed 40 to 45 mph
- Properly aligned high beams
 - Illuminate roadway 300 to 350 feet ahead
 - Light area above road 500 to 1800 feet
 - Load, load distribution and vehicle height affect light beam distance
 - Maximum safe speed 55 to 60 mph

Driver Education Classroom and In-Car Instruction Unit 7-18

Fact Sheet

7.2

Changing Weather and Conditions of Visibility

Unusually strong wind conditions

Strong, persistent, winds such as are occasionally experienced on the Chesapeake Bay Bridge, the Tappan Zee Bridge in New York and the Mackinac Bridge in Michigan require that on those occasions, restrictions must be placed on the types of vehicles that may cross and the speed of travel. In these situations officials monitoring wind velocity can control traffic flow. On I-25 between Albuquerque and Las Cruces, New Mexico, a 225-mile stretch of open highway that bridges over mountain gorges and rivers or passes through cuts in high hills, windsocks are located beside or in the median of the highway. The warning message is communicated by the direction and angle the wind-sock is blowing.

The purpose of the precautions employed on the bridges and of the windsocks is to protect against and/or warn motorists of the dangers of loss of directional control due to a sudden unexpected blast of wind from one side or the other. Such a blast of wind is capable of causing total loss of directional control, particularly of vans, small cars and/or vehicles pulling trailers.

While the buffeting can be much more severe, the effect is similar to driving a small car when meeting or being passed by a tractor trailer rig traveling at high speed on a two-lane highway. The primary difference is that in the passing maneuver, the driver of the car should be alert to the pending bow wave effect.

When driving on a highway with steady, strong crosswinds a driver should be alert to prevailing wind direction and velocity, the terrain through which he/she is passing and the condition of the road surface. Driving out of a wooded area, from behind a long ridge or from under an overpass on an ice packed road and being struck by a strong wind gust can easily cause a vehicle to move one lane to the left or right or spin completely out of control. (Dealing with conditions of reduced traction will be addressed in another session.)

How to respond:

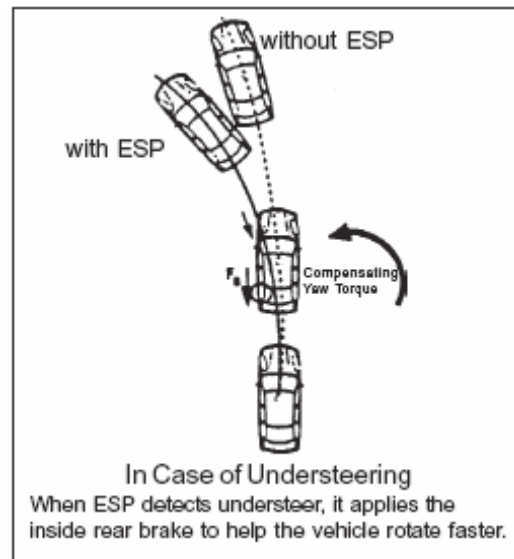
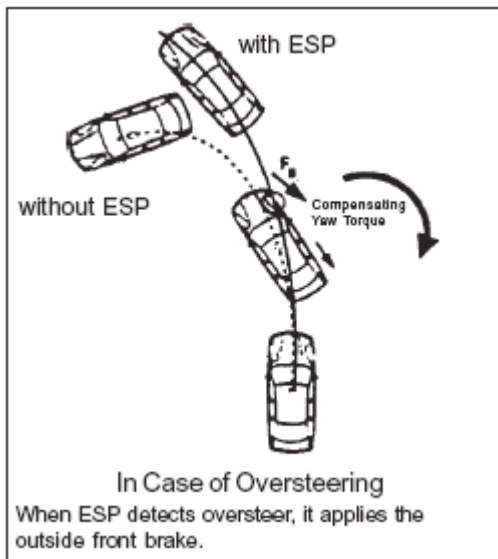
- Reduce speed
- Check for oncoming and following traffic
- Adjust position away from wind direction to lane position 2 or 3
- Just prior to exposure to wind, steer toward wind direction towards lane position 2 or 3
- Be prepared to countersteer
- Stay off brake

Automotive Technology

Automotive Technology

New vehicle technology aids the driver in maintaining balance control when performing avoidance maneuvers and increased protection should a crash occur. Enhanced control is provided through technologies such as the following:

- Anti-lock brakes which are designed to allow steering and simultaneous braking without losing vehicle balance. Anti-lock brakes do not necessarily shorten stopping distance on dry pavement, but generally shorten stopping distances on wet surfaces where traction loss can be a serious problem.
- Traction control is designed to activate brake sensors which do not allow the wheels to spin. The process is basically the reverse of anti-lock brakes. The device allows acceleration input without loss of vehicle balance.
- Suspension control adjusts vehicle balance at struts or shock absorbers through adjustment of fluid or air pressure when too much weight is suddenly transferred to a given shock or strut.
- Electronic Stability Program (ESP) compares where a driver is steering the vehicle with where the vehicle is actually going. When ESP senses a disparity between the two, it selectively applies any one of the vehicle's brakes to reduce the discrepancy and help the driver retain control and stability.



Driver Education Classroom and In-Car Instruction Unit 7-20

Fact Sheet

7.3

Occupant Protection

Automotive Technology

- Crumple zones and side impact panels protect occupants by allowing structures to collapse at different rates, reducing the risk of penetration into the passenger compartment or spreading forces over a wider area.
- Improved door latches and locks are designed to stay closed under the most severe conditions, unlike door fasteners of the early 1960s that resembled the fasteners found in the interior of the typical home, and generally flew open in a crash.
- Tempered glass in motor vehicles has literally eliminated the facial disfigurement associated with partial ejection through laminated plate glass formerly used in windshields.
- Headlights have undergone dramatic improvement in terms of level of illumination, focus and reliability over the past 15 years.

Driver Education Classroom and In-Car Instruction Unit 7-21

Fact Sheet

7.4

Vehicle Control and Traction Loss

Vehicle Control Concepts:

Vehicle suspension, geometry, and tire pressure are basic components of control when at rest.

When vehicle is in motion:

- Sudden steering, braking, and/or acceleration change vehicle control and traction dramatically.
- Sudden loss of vehicle control causes traction loss.
- Traction loss compounds crash results.

When brakes are applied to vehicle

- Weight or center of mass transfers to the front of the vehicle. This causes a noticeable drop of the hood and a rise in the rear of the vehicle. Occupants feel forward movement.

When acceleration is applied to the vehicle

- Weight or center of mass transfers to the rear of the vehicle. This causes a noticeable rise of the hood and drop in the rear of the vehicle. Occupants feel rearward movement.

When steering is applied

- Weight or center of mass transfers to the front right or left of the vehicle. This causes a noticeable drop and tilt of the hood and a rise and tilt in the rear of the vehicle. Occupants feel movement forward toward the corner of the vehicle.

Key to vehicle operation

- Smooth and efficient steering, braking, and accelerator movements. Any abrupt movements or changes of the vehicle are transferred to the vehicle suspension and have a significant effect on the control of the vehicle.

Changing Traction Conditions

Detecting Traction Loss

The first indication of traction loss should be kinesthetic, sensory stimulus generated by bodily movements and tensions, rather than sight. By the time a driver is visually aware that the vehicle is not headed in the desired direction or sliding rather than stopping, the situation is typically more difficult to correct. Early detection begins with proper seating, safety belt snapped tightly and grasping the steering wheel firmly with fingers rather than the palms of the hands. This position allows the vehicle to more readily communicate changes in motion to the driver. When seated in this manner, employing an aggressive visual search to detect conditions that could reduce available traction should require minor corrections of accelerator, brake or steering wheel to bring the vehicle back to the intended path of travel.

Having failed to detect early warning signals, how do you respond?

While there is no one way to handle a particular skid, there are guidelines that can be applied to help control skidding. Basic rules include:

- Determine which wheels, front or rear, have lost traction.
- Visually target an open path of travel, do not look at object toward which the vehicle is sliding.
- Release accelerator or brake pedal, whichever the driver is applying, to regain vehicle balance.
- Steer toward open path of travel as long as vehicle is in motion.
- Jabbing brake may be necessary to aid in case of front wheel loss of traction, but only after rolling traction has been reestablished.
- Progressive acceleration may aid a rear wheel loss of traction to allow rolling traction to regain control.

Changing Traction Conditions

Detecting Traction Loss

What does a driver do when he realizes he's skidding?

Look for an open path of travel and release the accelerator or brake pedal to regain vehicle balance.

When in a skid, how should a driver steer?

Having identified a visual target, path of travel, turn the steering wheel in the direction the driver wants the vehicle to go. This may take some rapid readjustments as the vehicle responds to the driver's initial steering input. Lateral forces also will affect the movement of the vehicle. Lateral acceleration is the sideways movement of the vehicle and is determined by how fast the steering wheel is turned and the momentum of the vehicle. Fast steering wheel movement produces more side or lateral acceleration. The key is not to steer more than necessary to keep the vehicle directed toward the path of travel. When the vehicle stops moving in one direction, this energy will want to move quickly in the opposite direction; so being able to respond with the steering wheel demands constant attention until the vehicle is safely back on the desired path of travel.

Identifying and responding to front wheel loss of traction

Front wheel loss of traction, termed "understeer", occurs when the steering wheels move from rolling traction to sliding traction. It typically occurs on a slippery surface when trying to steer a vehicle through a curve or around a corner. It also may occur as a result of approaching a curve or turn too fast and braking hard or suddenly providing too much steering input.

In the first instance, the traction loss may be more subtle and is identified visually when even though the driver continues to turn toward the path of travel, the front of the vehicle moves outward away from the travel path. The driver's fringe vision picks up the movement straight ahead, instead of through the curve or around the corner.

In the second instance, since the tires are designed to go straight ahead, if the wheels are turned too sharply or abruptly, the sidewalls tend to roll under and the smooth sidewall makes contact with the road rather than the tire tread.

Changing Traction Conditions

Detecting Traction Loss

Detecting and correcting traction loss:

When a vehicle is in a front wheel skid, available traction at the front tires is being transferred to the sidewall of the tire instead of the tread pattern. Turning force cannot be developed from the sliding traction. At the same time, the rolling rear wheels push to keep the vehicle moving in a straight line. If the driver locks the brakes while attempting to steer around an obstacle, the vehicle simply skids into whatever they were attempting to avoid. The driver should recognize the front wheel loss of traction by observing that even though he is providing steering input to maintain the desired path of travel, the vehicle is moving straight ahead. It is critical that the driver direct his vision to the targeted path of travel and not to the skid path. Release the brake pedal or accelerator, so the weight of the vehicle lets the tires reform from the sidewall to the tread, and re-establish rolling traction. Ease off the steering. Jab the brake to shift some weight to the front of the vehicle if the vehicle does not respond after rolling traction has occurred. The steering will respond quickly when rolling traction regains, so be prepared for a sudden movement of the vehicle toward the planned path of travel.

Identifying and responding to rear wheel loss of traction:

Rear wheel loss of traction, termed oversteer, occurs when rolling traction moves to sliding traction on the rear wheels of the vehicle. In this skid, unless corrective action is initiated quickly, the tires with less traction try to move to the front and the vehicle's natural tendency is to rotate 180 degrees and end up going backward. As with front wheel loss of traction, rear wheel traction loss may occur on a slippery surface when trying to steer a vehicle through a curve or around a corner. It also may occur as a result of approaching a curve or turning too fast and braking hard, suddenly providing too much steering input or acceleration. On a slippery surface, the driver should recognize rear wheel loss of traction when observing that the front of the vehicle is moving to the left or right of the travel path, even though he is not steering the vehicle in that direction.

The best response is to keep targeting the travel path, ease off the brake or accelerator, steer back toward the travel path, and use a light and progressive acceleration if the vehicle does not recover after rolling traction occurs. The key to this problem is to keep targeting the travel lane and not the side of the road and to steer back to the lane. At this point of the slide or skid, the driver may not have steered enough to regain his path of travel, so he may have to increase steering inputs until rolling traction begins to help. This is where light and progressive acceleration can transfer weight and help rolling traction return rear tire traction.

Changing Traction Conditions Running Off and Returning to the Roadway

Detecting Traction Loss

Running off and returning to the roadway:

Whether steering off road to avoid a crash, drifting off road due to inattention, nodding or falling asleep, leaving the roadway and losing directional control, rolling over or crashing into a solid object accounts for more than 50 percent of all vehicle fatalities. The primary problems associated with unexpected run off roadway are surprise or panic, typically followed by oversteering, hard braking or a combination of these actions, any of which can lead to loss of directional control.

The driver's response depends to some degree on whether two or all four wheels are off the pavement. In either case momentarily stay off the brake, ease off the accelerator and steer gently to align the vehicle with the road edge, keeping the side of the tires away from the edge of the pavement if there is a difference in pavement and shoulder height. If the shoulder is clear of obstructions, allow the vehicle to slow by applying gentle brake pressure. (If the vehicle is equipped with "ABS," brakes can be applied to slow the vehicle more rapidly.) If there are obstructions such as trees or bridge abutments in the immediate path ahead, it may be necessary to return to the pavement without slowing. In any case **DO NOT OVERSTEER!**

Regardless of whether there are two or four wheels off road, to reduce the possibility of slingshotting across the highway, return to the pavement two wheels at a time. If the difference between pavement and shoulder height is two to four inches, position the off road wheels 12-18 inches from the road edge. Check oncoming and following traffic, when clear, turn the steering wheel 1/8 to 1/4 turn back toward the pavement, as soon as the front off road tire makes contact with the road edge, countersteer 1/4 to 1/2 turn and then immediately back to center steer. Repeat the process if all four wheels are off road. Only under the most extreme conditions steer all four wheels back onto the pavement as one maneuver. **DO NOT OVERSTEER!**

Driver Education Classroom and In-Car Instruction Unit 7-26

Worksheet

7.1

Name:

Date:

Changing Weather and Conditions of Visibility

For items 1 through 5, answer the following questions:

- A. How can this condition affect a driver's ability to see?
- B. What adjustment should a driver make to better cope with the problem?
- C. What adjustments or checks other than driving, can be made to help compensate for the condition?

1. Sun glare:

- a. _____
- b. _____
- c. _____

2. Sunrise, Sunset:

- a. _____
- b. _____
- c. _____

3. Fog:

- a. _____
- b. _____
- c. _____

4. Rain:

- a. _____
- b. _____
- c. _____

5. Snow:

- a. _____
- b. _____
- c. _____