Texas Driver Education
Classroom and In-car Instruction
Model Curriculum

Module Eight

Texas Driver Responsibilities:

Adverse Conditions

- Visibility in Adverse Conditions
- Extreme Weather Conditions
- Protecting Occupants
- Roadway and Vehicle Technology
- Traction Loss Concerns

FACT SHEETS

Texas Education Agency
Texas Department of Public Safety
Texas Department of Transportation

Driving Through A New Century
Texas Education Agency

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 you 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.

HOW DO FLASH FLOODS OCCUR?

Several factors contribute to flash flooding. The two key elements are rainfall intensity and duration. Intensity is the rate of rainfall, and duration is how long the rain lasts. Topography, soil conditions, and ground cover also play an important role.

Flash floods occur within a few minutes or hours of excessive rainfall, a dam or levee failure, or a sudden release of water held by an ice jam. Flash floods can roll boulders, tear out trees, destroy buildings and bridges, and scour out new channels. Rapidly rising water can reach heights of 30 feet or more. Furthermore, flash flood-producing rains can also trigger catastrophic mud slides. You will not always have a warning that these deadly, sudden floods are coming. Most flood deaths are due to FLASH FLOODS.

Most flash flooding is caused by slow-moving thunderstorms, thunderstorms repeatedly moving over the same area, or heavy rains from hurricanes and tropical storms.

Occasionally, floating debris or ice can accumulate at a natural or man-made obstruction and restrict the flow of water. Water held back by the ice jam or debris dam can cause flooding upstream. Subsequent flash flooding can occur downstream if the obstruction should suddenly release.

RIVER FLOOD - Flooding along rivers is a natural and inevitable part of life. Some floods occur seasonally when winter or spring rains, coupled with melting snows, fill river basins with too much water, too quickly. Torrential rains from decaying hurricanes or tropical systems can also produce river flooding.

COASTAL FLOOD - Winds generated from tropical storms and hurricanes or intense offshore low pressure systems can drive ocean water inland and cause significant flooding. Escape routes can be cut off and blocked by high water. Coastal flooding can also be produced by sea waves called tsunamis, sometimes referred to as tidal waves. These waves are produced by earthquakes or volcanic activity.

Note: Coastal flooding caused by the storm surge associated with hurricanes is described in publication NOAA/PA 78019, “Storm Surge and Hurricane Safety.”

URBAN FLOOD - As land is converted from fields or woodlands to roads and parking lots, it loses its ability to absorb rainfall. Urbanization increases runoff 2 to 6 times over what would occur on natural terrain. During periods of urban flooding, streets can become swift moving rivers, while basements can become death traps as they fill with water.

FLASH FLOODING IN ARROYOS/WASHES - An arroyo is a water-carved gully or normally dry creek bed. Arroyos can fill with fast-moving water very quickly. Flash flooding at an arroyo in Arizona took only 58 seconds to develop.

ICE JAM - Floating ice can accumulate at a natural or manmade obstruction and stop the flow of water.

Clues to Problems

- Water weighs 62.4 lbs. per cubic foot and typically flows downstream at 6 to 12 times an hour.
- When a vehicle stalls in water, the water's momentum is transferred to the car. For each foot the water rises, 500 lbs. of lateral force are applied to the car.
- But the biggest factor is buoyancy. For each foot the water rises up the side of the car, the car displaces 1,500 lbs. of water. In effect, the car weighs 1,500 lbs. less for each foot the water rises.
- Two feet of water will carry away most automobiles.

What YOU can do:

Know your flood risk and elevation above flood stage. Do your local streams or rivers flood easily? If so, be prepared to move to a place of safety. Know your evacuation routes. Keep your automobile fueled; if electric power is cut off, gas stations may not be able to operate pumps for several days. Store drinking water in clean bathtubs and in various containers; water service may be interrupted. Keep a stock of food that requires little cooking and no refrigeration; electric power may be interrupted. Keep first aid supplies on hand. Keep a NOAA Weather Radio, a battery-powered portable radio, emergency cooking equipment, and flashlights in working order. Install check valves in building sewer traps to prevent flood water from backing up into the drains of your home.

(Video available; Hidden Danger, [$3.50]. National Weather Service, 301-713-0006 Larry Wenzel.)

Changing Weather and Conditions of Visibility

Unusually Strong Wind Conditions

Strong, persistent winds such as are occasionally experienced on the Galveston Bay bridge, may require that restrictions 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-10 between Presidio and El Paso, a 200-mile stretch of open highway that bridges over mountain gorges and rivers or passes through cuts in high hills, wind-socks, like those found at airports, 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 wind-socks 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 they are passing, and 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.
- Time exposure to wind when clear of traffic.
- Adjust position leeward to lane position 2 or 3.
- Just prior to exposure to wind, steer windward toward lane position 3 or 2.
- Be prepared to countersteer.
- Stay off brake.

Technology for Protection

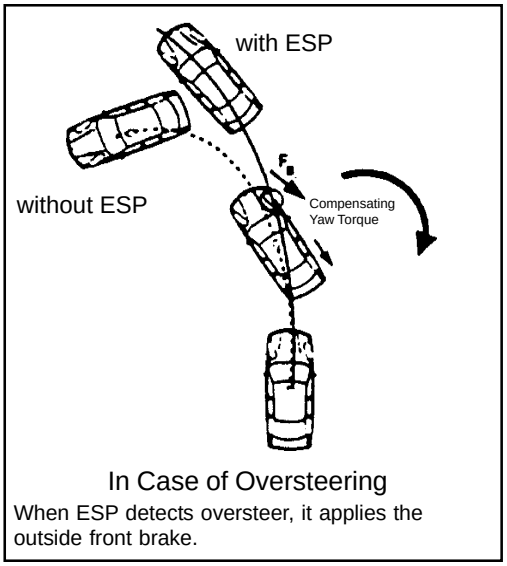
New vehicle technology aids the driver in maintaining balance control when performing avoidance maneuvers and increased protection should a crash occur. Enhanced control is provided through technologies such as the following:

- **Anti-lock brake systems** 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.

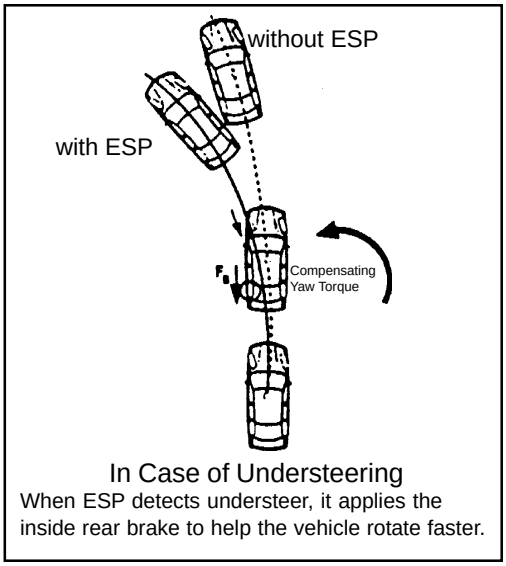
- **Traction control systems** are designed to activate brake sensors which do not allow the wheels to spin. The process is basically the reverse of anti-lock brakes. The device allows acceleration input without loss of vehicle balance.

- **Suspension control systems** adjust 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.



In Case of Oversteering
When ESP detects oversteer, it applies the outside front brake.



In Case of Understeering
When ESP detects understeer, it applies the inside rear brake to help the vehicle rotate faster.

New Vehicle 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 which 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.

- **Visibility enhancements** have been added to warn of the approach of objects to the rear in larger vehicles, and infrared devices are being used to enhance night vision.

Vehicle Balance And Traction Loss

Vehicle Balance Concepts:

- Vehicle suspension, geometry, and tire pressure are basic components of balance when at rest. When vehicle is in motion:
  - Sudden steering, braking, and/or acceleration change vehicle balance and traction dramatically.
  - Sudden loss of vehicle balance 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 of the rear deck.
  - 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 of the rear deck.
  - Occupants feel rearward movement.

- When steering is applied:
  - Weight or center of mass to the front right or left of the vehicle.
  - This causes a noticeable drop and tilt of the hood and a rise and tilt of the rear deck.
  - 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 affect on the balance of the vehicle.

Traction Concerns

Traction: Traction or adhesion is the grip between the tires and the road surface which 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. This 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. With decreased traction, the possibility of skidding or sliding increases.

Detecting Traction Loss

The first indication of traction loss should be motion-based sensory stimuli generated by vehicle movements and body tensions away from intended path of travel. By the time a driver is visually aware that the rear or front of the vehicle is not headed in the desired direction (or sliding rather than stopping), the situation is typically more difficult to correct.

Early movement detection begins with proper seating, safety belt snugged, left foot on dead pedal, and grasping the steering wheel with both hands in a balanced position. This seating 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 if it moves away from the targeted path of travel.

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

While there is no one way to handle a traction loss, there are guidelines that can be applied to help change sliding traction into rolling traction. Basic guidelines include:

- **Determine which tires (front or rear) have changed** from rolling traction to sliding traction.
- **Visually target an open path of travel**. Do not look at the object toward which you are sliding.
- **Release sudden inputs** of steering, accelerator, or brake pedal (whichever has caused the traction change) to regain vehicle balance to neutral.
- **Steer toward open path of travel** as long as vehicle is in motion.
- **In case of front wheel change to sliding traction**, jabbing the brake may be necessary to reestablish rolling traction.
- **In case of rear wheel change to sliding traction**, progressive acceleration (target speed of 2 mph) may aid in regaining rear wheel rolling traction which helps to regain steering control.

If the vehicle is sliding sideways on the roadway, it follows the same basic principles as the front wheel loss of traction to regain control. Establishing vision to the targeted path of travel is critical to regain some steering control with the front tires. The vehicle will then take on characteristics of front or rear loss of traction as rolling traction is established to the front tires.

Responding to Front Wheel Traction Loss

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

How Should You Steer?

Having identified a visual target, path of travel, turn the steering wheel in the direction you want the vehicle to go. This may take small readjustments as the vehicle responds to your initial steering input, especially in a front tire traction loss. Fast steering wheel movement produces more sliding traction or less rolling traction as the tire sidewall moves sideways. The key is not to steer more than necessary to keep the vehicle directed toward your 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 turning too fast and braking hard or suddenly providing too much steering input.

The traction loss may be more subtle and is identified visually when the front of the vehicle moves outward away from the travel path, even though the driver continues to turn toward the path of travel. The driver's vision picks up the movement straight ahead, instead of through the curve or around the corner. 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 rather than the tire tread makes contact with the road. 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 he was attempting to avoid. It is critical that the driver direct his vision to the targeted path of travel and not to the skid path. Release the pedal, brake or accelerator, so the weight of the vehicle lets the tires reform from the sidewall to the tread and reestablish 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 to the path of travel. 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.

Responding to Rear Wheel Traction Loss

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

How Should You Steer?

Having identified a visual target, path of travel, turn the steering wheel in the direction you want the vehicle to go. This may take some rapid readjustments as the vehicle responds to your initial steering input, especially in a rear tire traction loss. Lateral forces in a rear wheel traction loss 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 your path of travel. When the vehicle stops moving in one direction, this energy will want to quickly move 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 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 away from the targeted path of travel, even though he/she is not steering the vehicle in that direction. The best response is to keep targeting path of travel, ease off the brake or accelerator, continually steer toward the travel path, and use a very light and progressive acceleration as the rear of the vehicle recovers from sliding to rolling traction.

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 from rear tire sliding traction.

Stability Enhancement System

Definitions

There are many automotive stability enhancement systems on the market today, with more arriving almost daily. These systems each have an acronym unique to their design, performance, or marketing features. Some of these names and acronyms are trade names of the system or vehicle manufacturers.

Currently Known Acronyms

Antilock Braking Systems

ABS
(*Anti-lock Braking System*)
RWAL
(*Rear Wheel Anti-lock*)
SCS
(*Stop Control System*)

Traction Control Systems

ASC
(*Automatic Stability Control*)
ASR
(*Automatic Stability Regulation*)
Brake Only Traction

ETS (*Enhanced Traction System)*
TCS (*Traction Control System*)

TCB (*Traction with Brake Int.)*
TRAC
EDS

Active Yaw Control Systems

Active Brake

Active Handling

Active Safety

Advance Trac
ASMS
(*Automotive Stability Management System*)
ATTS
CBC (*Cornering Brake Control*)
DSC (*Dynamic Stability Control*)
DTSC
(*Dynamic Stability and Traction Control*)
ESBS
ESP (*Electronic Stability Program*)
ICCS (*Integrated Chassis Control System*)
IVD (*Integrated Vehicle Dynamics*)
PCS (*Precision Control System*)
PSM
SCS (*Stability Control System*)
StabiliTrac
Traxxar
VDC (*Vehicle Dynamics Control*)
VSA (*Vehicle Stability Assist*)
VSC (*Vehicle Stability Control*)
YCS (*Yaw Control Stability*)

System Descriptions

In this section, the minimum criteria of each system are listed. In addition, a brief description of atypical implementation and the advantages of each system are provided. This description is not intended to limit innovations such as development of alternate sensors, etc., but represents the current state of the art. In addition, it should be noted that performance of the systems might vary somewhat from manufacturer to manufacturer and from vehicle to vehicle as the systems are calibrated to satisfy the needs of a specific vehicle and target customer.

Antilock Braking Systems (ABS)

A system is identified as an Antilock Braking System if it:

- Is computer controlled.
- Has a means to determine if any wheel is about to lock.
- Has the capability of regulating the brake torque at the wheels to limit wheel lock.
- Controls the brake torque to each of the front wheels independently and the rear wheels either independently or as a pair.

ABS systems monitor the vehicle wheel speeds and regulate the brake forces to control the slip between the tire and the road surface. By avoiding wheel lock, vehicle stability is improved and the driver retains the ability to steer the vehicle. On most surfaces, the stopping distance of a vehicle with ABS is improved when compared to the same vehicle without ABS. Whether the rear wheels are controlled individually or as a pair depends on the specific characteristics of the vehicle including load distribution and inherent vehicle stability, and the target market for the vehicle.

Rear Wheel Anti-lock (RWAL)

A system is defined as a Rear Wheel Anti-lock System if it:

- Is computer controlled.
- Has a means to determine if a rear wheel of the vehicle is about to lock.
- Has the capability of regulating the brake torque at the rear wheels to limit wheel lock.

RWAL systems monitor the vehicle's wheel speeds and limit the rear wheel brake torques to limit rear wheel lock-up. By avoiding rear wheel lock-up, the vehicle stability is improved. This system does not control the vehicle's front wheels and does not provide steering or stopping distance improvement.

Engine and Brake Traction Control Systems (EBTCS)

A system is defined as an Engine and Brake Traction Control System if it:

- Is computer controlled.
- Has a means to determine if a drive wheel is spinning.
- Has the capability of applying brake force individually to the drive wheels to limit wheel spin.
- Has the capability of controlling engine torque to reduce the brake torque needed to limit wheel spin.

Traction Control Systems monitor the wheel speeds and apply brake torques and/or control engine torque to the drive wheels as necessary to control spinning during acceleration. By controlling wheel spin, the vehicle stability, steerabililty and acceleration are improved. Also since the brakes can be applied to the drive wheels individually, engine torque can be transferred through the differential from one wheel to another. This can improve vehicle mobility and acceleration on surfaces which have non-uniform frictions (such as a condition where one drive wheel is on a slippery surface and another is on a higher-friction surface). The capability for controlling engine torque allows the system to minimize use of the brakes by reducing engine torque.

Brake Traction Control System (BTCS)

A system is defined as a Brake Traction Control System if it:

- Is computer controlled.
- Has a means to determine if a drive wheel is spinning.
- Has the capability of applying brake force individually to the drive wheels to limit spinning.

Brake Traction Control Systems monitor the wheel speeds and apply brake torque to the drive wheels as necessary to control spinning during acceleration. By controlling wheel spin, the vehicle stability, steerabilitly, and acceleration are improved. Also since the brakes can be applied to the drive wheels individually, engine torque can be transferred through the differential from one wheel to another. This can improve vehicle mobility and acceleration on surfaces which have non-uniform frictions (such as a condition where one drive wheel is on a slippery surface and another is on a higher-friction surface.) Since the Brake Traction Control Systems do not have the capability of reducing engine torque, the duration of their activation must be limited, especially at high speeds. These systems may be deactivated at high speeds and may include algorithms to estimate brake temperatures and disable the system if the temperatures exceed some limit.

Engine Only Traction Systems (ETS)

A system is defined as an Engine Only Traction System if it:

- Is computer controlled.
- Has a means to determine if a drive wheel is spinning.
- Has the capability of controlling engine torque to limit wheel spin.

Engine Only Traction Systems monitor vehicle wheel speeds to determine if a drive wheel is spinning during acceleration, and reduce engine torque to control spinning. Controlling wheel spin can improve vehicle stability, steerability, and acceleration capability. No brake applications are used with this system, and it does not have any ability to transfer torque from one wheel to another.

Active Yaw Control Systems (AYC)

A system is defined as an Active Yaw Control System if it:

- Is computer controlled and the computer contains a closed-loop algorithm designed to limit understeer and oversteer of the vehicle.
- Has a means to determine vehicle yaw velocity and side slip.
- Has a means to monitor driver steering input.
- Has a means of applying and adjusting the vehicle brakes to induce correcting yaw torques to the vehicle.
- Is operational over the full speed range of the vehicle (except below a minimum speed where loss of control is unlikely).

Active Yaw Control Systems in use today can be divided into four categories.

Four Wheel AYC Systems with Engine Control:

- This system must have the means to apply all four brakes individually and a control algorithm which utilizes this capability.
- The system must have an algorithm to determine the need, and a means to modify engine torque, as necessary, to assist the driver in maintaining control of the vehicle.
- The system must be operational during all phases of driving including accelerating, coasting, and decelerating (including braking).
- The system must stay operational when ABS or Traction Control are activated.*

Four Wheel AYC Systems without Engine Control:

- This system must have the means to apply all four brakes individually and a control algorithm which utilizes this capability.
- The system must be operational during all phases of driving including accelerating, coasting, and decelerating (including braking).
- The system must stay operational when ABS or Traction Control are activated.*

Two Wheel AYC Systems with Engine Control:

- This system must have the means to apply all four brakes individually and a control algorithm which utilizes this capability.
- The system must have an algorithm to determine the need and a means to modify engine torque, as necessary, to assist the driver in maintaining control of the vehicle.
- The system must be operational during all phases of driving including accelerating, coasting, and decelerating (including braking).
- The system must stay operational when ABS or Traction Control are activated.*

Two Wheel AYC Systems without Engine Control:

- This system must have the means to apply all four brakes individually and a control algorithm which utilizes this capability.
- The system must be operational during all phases of driving including accelerating, coasting, and decelerating (including braking).
- The system must stay operational when ABS or Traction Control are activated.*

**Some systems may have limited Yaw Control performance during ABS or Traction Control activation.*

All Active Yaw Control Systems are assumed to include ABS. The vehicles may also include other brake-related or stability enhancement features such as:

- Traction Control to control wheel spin during acceleration.
- Dynamic Brake Proportioning to control the vehicle front/rear brake balance.
- Engine Drag Control to prevent excessive wheel slip due to throttle lift-off or down shifting.
- Other computer-controlled features which can activate or modify vehicle braking.
- Other computer-controlled stability enhancement features.

If any of these features is included on the vehicle, the Active Yaw Control System must be capable of coordinating their activities to aid the driver in maintaining control of the vehicle and to prevent undesirable interactions.

Active Yaw Control Systems use various sensors (typically wheel speed sensors, steering angle sensors, yaw rate sensors, and accelerometers) to monitor the dynamic state of the vehicle and the driver's commands. They then apply the vehicle's brakes (and adjust engine torque) to make appropriate adjustments to the rotational movement about the vehicle's vertical axis and correct the path of the vehicle to the driver's intended path. These systems improve the vehicle's stability, the driver's control of the vehicle, and correct understeer and oversteer conditions that occur.

The type of Active Yaw Control used on a specific vehicle is the decision of the vehicle manufacturer. Factors affecting this decision may include handling characteristics of the vehicle, vehicle weight distribution, powertrain size and type, intended vehicle use, size, cost, and targeted customer.

Other Stability Enhancement Features

While the emphasis of today's Yaw Control Systems is placed on control of the brake forces, the broader objective of such systems is to control the forces between the tire and the road by any actuation mechanism. In addition to the brakes, other systems are capable of effecting the wheel forces and thereby influencing the vehicle's dynamic behavior. These systems include the suspension, steering, and drivetrain.

Controlled suspension systems have the ability to manage vertical wheel loads and thus influence the longitudinal and lateral force capability of each tire. The actuation may be through the active control of any or all of the following:

- Damping coefficients.
- Spring rates.
- Anti-roll bar rates.
- Other suspension components.

Controlled steering systems have the ability to actively adjust the steered angle or the camber angle of any or all of the wheels to influence the longitudinal and lateral forces of the tire.

Drivetrain controls have the ability to adjust the engine torque applied to each of the wheels to influence the longitudinal and lateral forces of the tire. This may be accomplished by a combination of engine torque adjustment and control of differentials to manage the torque across axles.

Integrated Vehicle Systems

[Vehicle Dynamics Control (VDC), Integrated Chassis Control System (ICCS), Electronic Stability Programs (ESP), Dynamic Stability Control (DSC)]

These systems combine vehicle stability features such as ABS, Traction Control, Electronic Brake Distribution (Dynamic Rear Proportioning), Active Yaw Control Systems, Suspension Controls, and Steering Controls on one vehicle. Each manufacturer may package and name these combinations to suit their specific vehicle and customer. These names may be trademarks of individual manufacturers.

Discussion

The advent of the automotive microprocessor and sensor technologies has made possible an array of electronically controlled vehicle stability enhancement systems. These systems have the capability of applying or regulating the brake force at the wheels to influence the stability and/or steering and handling of the vehicle. In addition, many of the systems have interfaces with the powertrain, suspension, steering, and other vehicle systems to further enhance their control capability.

Each of these systems is designed to optimize use of the friction at the tire/road interface. Since the friction between these patches of tire and the road surface is the force which allows the vehicle to accelerate, decelerate, and turn, optimization of this force provides the opportunity to enhance vehicle stability and handling.

Some of these systems, such as ABS, have widespread application in the market and already are contributing to improved handling and control of vehicles. Others, such as Active Yaw Control, are beginning to penetrate the market and demonstrate their benefits in assisting the driver and making further contributions to vehicle safety.

As these systems have been developed, each manufacturer has included its own features and in many cases has marketed them under their own name. In some cases this has caused confusion in the industry. In some cases, different systems may have been called the same or very similar names, and in other cases, similar systems have been referred to by different names. Some differentiation between manufacturers will continue to exist, and manufacturers will continue to market features or combinations of features under their own names. The definitions outlined here provide a baseline set of agreed-upon definitions to avoid confusion, to represent the current state of the art, and provide building blocks for further development.

Conclusions

Over the past several years, engineers at the motor vehicle manufacturers and their suppliers have developed an array of stability enhancement systems. These systems are all computer controlled and use various sensors to monitor vehicle parameters. They improve the vehicle stability and handling by optimizing the use of the friction between the tires of the vehicle and the road surface.

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- Traction Loss Concerns

WORKSHEETS

Texas Education Agency
Texas Department of Public Safety
Texas Department of Transportation

Driving Through A New Century
Texas Education Agency

W-8.1 Adverse Conditions **Name** _____

Changing Weather and Conditions of Visibility

Complete the following questions to the best of your ability during the class session or as a review of Topic 1 materials.

For items 1 through 7, 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. _____

W-8.1 Adverse Conditions **Name** _____

Changing Weather and Conditions of Visibility

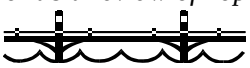
5. Snow:
   a. _____
   b. _____
   c. _____

6. Temperature drops to near zero degrees:
   a. _____
   b. _____
   c. _____

7. Temperatures in the high 90's, low 100's:
   a. _____
   b. _____
   c. _____

W-8.2 Low Water Crossings **Name _____**

Complete the following questions to the best of your ability during the class session or as a review of Topic 2.



Definitions

- Describe a "low water crossing":

- How would you recognize a low water crossing?

Concerns.

√ Why are low water crossings so dangerous?

√ Where does a driver look for problem areas?

√ What types of vehicles are a problem at low water crossings?

√ How much water does it take to lose control of the vehicle?

√ Why are low water crossings so dangerous in Texas?

√ How can a driver avoid potential problems?

W-8.2 Low Water Crossings **Name __Answer Sheet_____**

Definitions

♦ Describe a "low water crossing": ***A roadway area that allows water to cross in the event of sustained heavy rainfall or sudden thunderstorms and is normally a dry area.***

♦ How would you recognize a low water crossing? ***Sometimes warning signs are posted, but mostly whenever the driver sees moving water across the roadway,***

Concerns.

√ Why are low water crossings so dangerous? ***Nearly half of all flash flood fatalities are vehicle related.***

√ Where does a driver look for problem areas? ***Look out for flooding at highway dips, bridges, and low areas.***

√ What types of vehicles are a problem at low water crossings? ***Any type of vehicle is dangerous, as even the largest and heaviest of vehicles will float.***

√ How much water does it take to lose control of the vehicle? ***Six inches of water may cause you to lose control of your vehicle, while two feet of water will carry most cars away.***

√ Why are low water crossings so dangerous in Texas? ***They are a hidden danger that await most motorists and especially when visibility is limited at night.***

√ How can a driver avoid potential problems? ***Heed all flood and flash flood watches and warnings and keep abreast of road conditions through the news media.***

W-8.3 Occupant Protection **Name _____**

Complete the following questions to the best of your ability during the class session or as a review of Topic 3.

Safety Restraints

1. How should safety belts be worn/adjusted to provide maximum protection?

   Lap belt: _____

   Shoulder belt: _____

2. The primary purpose of a driver side air bag is to:

   _____

   _____

3. What precautions should front seat occupants take in an air bag-equipped vehicle?

   _____

   _____

4. Why do you, don't you, will you, won't you use safety belts?

   _____

   _____

5. What are Texas 's safety belt laws?

   _____

   _____

W-8.4 Highway Design Features **Name _____**

Complete the following questions to the best of your ability during the class session or as a review of Topic 3.

Identify how each of the following contribute to occupant protection.

1. Wide, clearly marked lanes and clear highway shoulders:

_____

_____

2. Rumble strips:

_____

_____

3. New design median barriers:

_____

_____

4. Break away sign support posts:

_____

_____

5. New design guard rails:

_____

_____

6. Crash attenuators:

_____

_____

7. Protected left and right turn bays:

_____

_____

W-8.5 Front Wheel Traction Loss **Name** _____

Complete the following questions to the best of your ability during the class session or as a review of Topic 4.

Recognition:

Describe how you would recognize a front wheel traction loss while driving:

_____

_____

_____

Changing Sliding Traction to Rolling Traction by:

Describe how you would respond below:

Vision Control:

_____

_____

Motion Control:

Brakes

_____

_____

Accelerator

_____

_____

Steering Control:

_____

_____

_____

_____

W-8.6 Rear Wheel Traction Loss **Name** _____

Complete the following questions to the best of your ability during the class session or as a review of Topic 4.

Recognition:

Describe how you would recognize a rear wheel traction loss while driving:

_____

_____

_____

Changing Sliding Traction to Rolling Traction by:

Describe how you would respond below:

Vision Control:

_____

_____

Motion Control:

Brakes

_____

_____

Accelerator

_____

_____

Steering Control:

_____

_____

_____

_____

W-8.7 Destination Driving Activity **Name _____**

Complete the following plan for evaluation prior to the end of Module Nine activities

The goal of this activity is to prepare a thirty minute lesson that would allow the driver to demonstrate the driving skills acquired during the class time to a parent and/or to an instructor.

The student will:

. Develop a driving route using a local map.
. Time the driving route to complete all activities within 25 to 30 minutes.
. Calculate the mileage required to complete the route.
. Calculate the gas mileage of the vehicle assuming a rate of 20 miles to a gallon.
. Calculate the costs of the driving route at a rate of $0.32 per mile.
. Provide a self-assessment sheet to the instructor after completing the route.
. Start and stop the driving route at the local school.

Draw or attach the route on the sheet provided for this activity...

What is the actual driving time of this route? _____

What is the actual mileage from start to stop on this route?

Starting Odometer Mileage _____

Finishing Odometer Mileage _____

Total Route Mileage _____

What is the fuel mileage for this route? _____
(you may assume 20 mpg or place actual fuel mileage)

What is the total costs of this trip @ $0.32 per mile? _____

Attach the self-assessment sheet or complete the one attached to this guide.

W-8.7 Destination Driving Activity **Name _____**

Draw the driving route on this sheet or attach a map to this sheet...

W-8.7 Destination Driving Activity Self-Assessment Review Guide

Name _____ Grade ____

Date_____ Time _____ Condition _____

Total Points Possible 100

Total Points Deducted —

Total Score ☐

Scoring: You will receive points for precise and legal operation
A…100-93; B…92-85; C…84-76; F…75 and below

1. MECHANICAL OPERATION: Danger Potential — 2 Points
- PRE-DRIVE ☐
- STARTING VEHICLE ☐
- OPERATION OF VEHICLE CONTROLS ☐
- HAND SIGNALS ☐
- PROPER HAND AND SEATING POSITION ☐
- CANCEL SIGNALS ☐
- SECURING VEHICLE ☐

Lack of Skill — 1 Point
- STARTING VEHICLE ☐
- CHECK GAUGES & DASHBOARD ☐
- SHIFTING & PARK BRAKE USE ☐
- BRAKE & ACCELERATE SMOOTHLY ☐

2. CONTROLLED STOP: Danger Potential — 2 Points
- CHECK REARVIEW MIRROR ☐
- BRAKE QUICKLY IN STRAIGHT LINE ☐
- CHECK MIRRORS & BLINDSPOT ☐

3. START/PARKED POSITION: Danger Potential — 4 Points
- BRAKE FIRMLY DEPRESSED ☐
- MIRRORS, BLINDSPOT, SIGNALS ☐

4. BACKING: Danger Potential — 4 Points
- SPEED CONTROL ☐
- VISUAL HABITS ☐
- STOP & YIELD PEDS & CARS ☐
- STAY IN PROPER LANE ☐

Lack of Skill — 2 Points
- WITHIN 2 FEET OF EDGE ☐
- STEER CORRECTLY ☐
- RUB CURB ☐

5. PARK & START ON HILL: Danger Potential — 4 Points
- MIRRORS, BLINDSPOT, SIGNALS ☐
- SECURE WHEELS ☐
- COMPLETE PARK ☐
- ONTO CURB ☐

Lack of Skill — 2 Points
- HIT OR RUB CURB ☐
- STEERS TO CURB SMOOTHLY ☐

Congestion Potential — 2 Points
- OVER 12" FROM CURB ☐

6. PARALLEL PARKING: Danger Potential — 4 Points
- MIRRORS, SIGNAL ON APPROACH ☐
- CHECK & YIELD TO TRAFFIC ☐
- AVOID CONTACT WITH PARKED CARS ☐
- HAND SIGNALS LEAVING SPACE ☐
- LOOK OUT REAR WINDOW AT STOPS ☐

Lack of Skill — 2 Points
- SIGNAL OR STOP LATE ☐
- MORE THAN THREE MOVEMENTS ☐
- RUB OR HIT CURBS ☐
- SHIFT TO PROPER GEAR ☐
- LEAVE IN ONE MOVEMENT ☐

Congestion Potential — 2 Points
- HOLD UP TRAFFIC WHILE PARKING ☐
- PARK OVER 12" FROM CURB ☐

7. UNCONTROLLED INTERSECTIONS: DangerPotential — 4 Points
- COVER BRAKE & SLOW ☐
- CHECK LEFT-RIGHT-LEFT ☐
- IF CLEAR DOES NOT STOP ☐
- YIELD PROPERLY ☐
- GIVE UP RIGHT-OF-WAY IF NEEDED ☐

8. RIGHT-OF-WAY: Danger Potential — 4 Points
- YIELD TO PEDESTRIANS ☐
- YIELD TO EMERGENCY VEHICLES ☐
- PROCEED ONLY WHEN SAFE ☐

Congestion Potential — 2 Points
- PROCEED WHEN CLEAR ☐
- DOES NOT HOLD UP TRAFFIC ☐
- ACCELERATE PROPERLY ☐

9. TRAFFIC CONTROL DEVICES: Danger Potential — 4 Points
- REACT TO CAUTION SIGNS/CONTROL DEVICES ☐
- OBSERVE REGULATORY SIGNS/SCHOOL ZONES ☐

Congestion Potential — 2 Points
- SLOW ONLY FOR SAFETY ☐
- AVOID UNNECESSARY STOPS ☐

10. LEFT TURNS: Danger Potential — 6 Points
- MIRRORS, BLINDSPOT, SIGNALS ☐
- SPEED ON TURN ☐
- TURN FROM & INTO PROPER LANES ☐
- PROPER POSITION WAITING TO TURN ☐
- YIELD TO TRAFFIC & PEDESTRIANS ☐
- CUT CORNER OR GO TOO WIDE ☐

Lack of Skills — 2 Points
- POSITION CAR WITHIN LANE ☐
- BRAKE & ACCELERATE PROPERLY ☐
- STEER SMOOTHLY ON THE TURN ☐

Congestion Potential — 2 Points
- AVOID UNNECESSARY SLOWING/STOPPING ☐
- WAIT IN INTERSECTION TO TURN ☐
- SPEED UP AFTER TURN ☐

11. RIGHT TURNS: Danger Potential — 5 Points
- MIRRORS, BLINDSPOT, SIGNALS ☐
- SPEED ON TURN ☐
- TURN FROM & INTO PROPER LANES ☐
- POSITION WAITING TO TURN ☐
- YIELD TO TRAFFIC & PEDESTRIANS ☐
- CUT CORNER OR GO TOO WIDE ☐

Lack of Skill — 2 Points
- POSITION CAR WITHIN LANE ☐
- BRAKE & ACCELERATE PROPERLY ☐
- STEER SMOOTHLY ON THE TURN ☐

Congestion Potential — 2 Points
- AVOID UNNECESSARY SLOWING/STOPPING ☐
- WAIT TO TURN CLOSE TO RIGHT EDGE ☐
- SPEED UP AFTER TURN ☐

12. LANE TRAVEL: Danger Potential — 4 Points
- STAY IN SAFE & LEGAL LANE ☐
- POSITION WITHIN LANE ☐
- SIGNAL BEFORE LANE CHANGING ☐
- MIRRORS/BLINDSPOT BEFORE LANE CHANGING ☐
- SAFE & LEGAL LANE CHANGE ☐

Congestion Potential — 2 Points
- SPEED IN LEFT LANE ☐
- WHEN SAFE, DRIVE CLOSE TO SPEED LIMIT ☐
- SPEED & TIMING ON LANE CHANGE ☐

13. FOLLOWING: Danger Potential — 4 Points
- KEEP MINIMUM SPACE CUSHION AHEAD ☐
- ADJUST SPACE FOR CONDITIONS & TRAFFIC ☐
- LEAVE SPACE WHEN STOPPED ☐

Congestion Potential — 2 Points
- AVOID EXCESSIVE SPACE ☐

14. PASSING: Danger Potential — 4 Points
- PASS WHEN SAFE & LEGAL ☐
- CHECK MIRRORS, BLINDSPOT, SIGNALS ☐
- WARN OTHER BEFORE PASSING ☐
- SPEED CONTROL IN PASSING ☐
- ALLOW OTHERS TO PASS SAFELY ☐

Congestion Potential — 2 Points
- PASS AS NEEDED TO AVOID CONGESTION ☐

15. STOP SIGN/FLASHING LIGHT: Danger Potential — 4 Points
- MAKE COMPLETE STOPS ☐
- CHECK & YIELD PROPERLY ☐

Congestion Potential — 2 Points
- STOP AT PROPER LOCATION ☐
- SLOW & STOP ONLY AS NEEDED ☐

16. TRAFFIC SIGNAL LIGHT: Danger Potential — 4 Points
- REACT TO STALE GREEN LIGHT ☐
- SCAN WHEN LIGHT TURNS GREEN ☐
- STOP & YIELD WHEN TURNING ON RED ☐
- CHECK/YIELD TO TRAFFIC & PEDESTRIANS ☐
- CLEAR/STOP AT LIGHTS ☐

Congestion Potential — 2 Points
- SLOW ONLY AS NEEDED ☐

17. GENERAL DRIVING: Danger Potential — 4 Points
- STOP/YIELD FROM DRIVEWAY PARKING LOT ☐
- OBSERVE SAFE & LEGAL SPEED LIMITS ☐
- USES S.E.E.iT SPACE MANGEMENT SYSTEM ☐
- REACT APPROPRIATELY TO EMERGENCIES ☐
- DEMONSTRATE MATURE DRIVING ATTITUDE ☐

TRIP PLANNING INFORMATION

Learning to Read a Map. Maps are available from state and city offices, motor clubs, book stores, and many service stations. Whether planning a trip out of state or trying to locate an address in a nearby city or your own home town, using a map in advance to determine the best way to get there can make driving less stressful. The sudden braking and/or change of lanes as drivers realizes that they have just missed or are about to miss their turn, has caused many crashes. Unfortunately many persons either do not take the time or do not know how to use a map.

Reading a Map. Maps typically contain a chart or legend that explains the markings and symbols used on the map. For instance:

- Different color and width of lines to identify classes of roads—Interstates, Toll Roads, two lane, and four lane divided and undivided, unpaved, scenic, and under construction.
- Symbols for Federal, State, secondary, and county roads.
- Black and red numerals to indicate mileage between major points.
- Identification of rest areas.
- Toll roads and service areas.
- Airports.
- Camp ground facilities.
- Symbols for cities and towns of a given population.
- Scale of miles
- Maps of large cities
- State maps have town and city index with number/letter coordinates.
- City maps have street and major points of interest index with number/letter coordinates. (With both city and state maps the letters and numbers correspond to the letters and numbers located on the top/bottom and sides of the map.)

Planning the Cost of the Trip. The basic costs to be anticipated for any trip include fuel, lodging, meals, and in many cases tolls. While there are wide variations in the cost of fuel, typical prices for regular unleaded at this time appear to range from about $1.10 to $1.25 per gallon. Prices for lodging typically run higher during the peak vacation periods, but at family oriented chains rooms for one night for two persons are frequently available for about $55.00. Estimates for food vary widely, depending on the section of the country, type of restaurant, and whether some meals are eaten picnic style. However, when traveling the cost of meals, not including dinner in an upscale restaurant, will tend to range from about $25 to $40 per day.

By making motel/hotel reservations in advance those expenses can be predetermined, as can tolls by checking the information provided on state maps or checking with an automobile club. Fuel costs can be estimated by determining as closely as possible the number of miles you will be driving to and from your vacation site and then adding 50 to 100 miles to cover local travel and side trips. The miles to and from your destination can be determined by checking the map's mileage chart or, if that is not provided, adding up the mileage indicated by the miles between points indicated in red and/or black on the map. Having calculated the number of miles to be traveled, divide that number by the average miles per gallon (MPG) that you get with the vehicle you will be driving. For instance you find that you will be driving about 1,500 miles. Your car averages 22 MPG. 1,500 divided by 22 = a little over 68 gallons of fuel. 68 gallons of fuel at $1.20 per gallon = $81.60.

In addition to these costs there are others such as admission to theme or recreation parks or shows etc. that you plan to visit. While figuring these costs in advance may seem like a lot of trouble, failure to do so can turn a happy trip into a very stressful experience.

W-8.7 Destination Driving Activity

Preparations. While certain checks should always be made before driving, preparing for an extended trip of several days, some of which will likely be over high speed highways, requires extra preparation.

Preparing The Vehicle:

- Tires: Inflation, balance, alignment, condition of tread and sidewalls.
- Brakes for wear and/or adjustment.
- Windshield wiper blades and all lights.
- Engine compartment: Tune-up if applicable, oil change, lubrication and filters hoses, belts, brake, radiator and windshield wiper fluids.

Loading Considerations:

- Distribute weight evenly throughout vehicle. DO NOT OVERLOAD. [Load capacity is basically 150 lbs. per belted seating position plus 125 -175 lbs. for luggage, check owners manual or "B" post.]
- Soft items only within passenger compartment, i.e. pillows and or blankets.
- Car-top carriers raise center of gravity, adversely effect braking and steering.

Basic Equipment:

- Maps with routes marked.
- Flashlight, first-aid kit, screwdriver, pliers, adjustable end wrench, and socket set.
- Jack, spare tire, lug wrench, wheel blocks, and battery jumper cables.

Emergency Equipment (Depending On Weather)

- Tow line, gloves, Mylar blanket, radiator coolant, and windshield wiper fluid.
- Water to drink, high energy food, and fruit.
- Window scraper, chains, and warm clothing.

Personal Preparation:

- Know where you are going and plan your routes in advance.
- Check on road construction projects along planned routes.
- If camping or staying in hotels/motels make reservations in advance.
- Determine number of miles to be traveled daily. (Normal average on major highways is 100 to 110 miles every two hours with 10-15 minute breaks every two to three hours and one hour stops for meals. Travel on secondary roads which go through towns and cities will take longer, as will driving through mountains.)
- If one person will be doing all of the driving, six to eight hours driving in any one day should be considered the limit. When two or more persons can share the driving, total driving time should not exceed 10 to 11 hours.
- Be aware of your "down time" between 1 and 5 p.m. and plan to take a break during that period.
- If crossing a desert area, plan to do so in the cooler morning hours.
- Since two out of three traffic fatalities occur a night, avoid driving after dark when visibility is limited and particularly after 11 p.m. when you are more apt to fall asleep while driving.
- Let a family member or trusted friend know where and how to reach you in an emergency.
- Be prepared to pay any large repair bill in case of a vehicle breakdown.

Remember to take:

- An extra set of keys.
- Insurance infirmation.
- Money for expected and unexpected travel expenses.
- Vehicle owner's manual.
- Maps of local areas you plan to visit.
- Determine approximate cost of fuel, meals, lodging, and entertainment.

Get a good night's sleep the night before you start on any trip.

Texas Driver Education
Classroom and In-car Instruction
Model Curriculum

Module Eight

Texas Driver Responsibilities:

Adverse Conditions

- Visibility in Adverse Conditions
- Extreme Weather Conditions
- Protecting Occupants
- Roadway and Vehicle Technology
- Traction Loss Concerns

EVALUATION AND ASSESSMENT

Texas Education Agency
Texas Department of Public Safety
Texas Department of Transportation

Driving Through A New Century
Texas Education Agency

MA- 8.1 Driving in Adverse Conditions

Name: _____ Date: _____

1. If a vehicle is not equipped with Daylight Running Lights (DRL), it is recommended that drivers turn on the low beam headlights any time the vehicle is in motion. The reason for turning them on:
   a. It helps the driver see the road ahead.
   b. It helps the driver identify the edge of the road.
   c. It makes it easier for other road user to see the vehicle.
   d. It makes it easier to see objects off road.

2. When driving in fog it is best to drive with _____.
   a. high beam headlights. b. low beam headlights.
   c. four way flashers. d. parking lights.

3. For a driver who has been temporarily blinded by the bright lights of an oncoming vehicle, glare recovery time:
   a. Is the same regardless of age. b. Decreases with age.
   b. Increases with age. d. Is greater for men than women.

4. Due to a sudden change in direction, the rear end of your vehicle skids left or right. The first thing to do is to _____.
   a. ease off brake or accelerator and steer toward lane.
   b. pump brakes rapidly.
   c. accelerate slightly.
   d. brake and accelerate lightly.

5. If the vehicle you are driving starts to hydroplane, you should _____.
   a. pump brakes to slow. b. ease off accelerator, do not brake.
   c. increase speed slightly. d. steer sharply toward shoulder.

6. The best way to control consequences if you cannot avoid a collision is to _____.
   a. throw yourself to the floor b. lock brakes and steer hard right.
   c. lock brakes and turn off engine d. control brake and steer to collide at an angle with object.

7. A rear facing infant seat should be properly secured in _____.
   a. the front passengers seat. b. the right rear seat.
   c. the left rear seat. d. the center rear seat.

8. Traveling 55 MPH your vehicle suddenly drifts off onto a shoulder about three inches lower than the road surface. To recover safely to the pavement you should _____.
   a. slow quickly by braking and steer sharply back to the pavement.
   b. turn the steering wheel a little bit at a time to ease back onto the pavement.
   c. ease off accelerator and move off road wheels 12-18 inches from road edge. When clear, steer slightly to turn back to pavement and then steer to the correct lane position.
   d. ease off accelerator and move all four wheels off road. When clear steer sharply back onto roadway and steer to correct lane position.

9. Children under age _____ should always ride secured in the back seat.
   a. 6 years. b. 12 years.
   c. 15 years. d. 9 years.

MA- 8.1 Driving in Adverse Conditions

10. Which of the following **does not help** make local trips easier?
    a. Traveling during rush hour.
    b. Listening to weather reports.
    c. Leaving at the scheduled time.
    d. Allowing an extra 15 to 20 minutes.

11. When preparing for a long distance trip you should _____.
    a. take along an extra pair of gloves.
    b. pack a complete tool box.
    c. place a 5 gallon can gas in the trunk.
    d. have the vehicle serviced.

12. When you will be doing all of the driving, you should limit driving to no more than____.
    a. five hours a day.
    b. six hours a day.
    c. eight hours a day.
    d. 12 hours a day.

13. If you are planning a trip someplace you have never been before, you should _____.
    a. study a road map while driving.
    b. plan your route and stops before leaving.
    c. stop for directions at rest stops.
    d. know the limits of your cell phone.

14. When selecting a route for a long trip, you should _____.
    a. just choose the Interstate.
    b. choose the most leisurely route.
    b. evaluate the risks of each route.
    d. stick to four lane US highways.

.

15. When driving on a highway, sudden strong cross wind gusts _____.
    a. always cause severe dust problems.
    b. affect large cars more than small cars.
    c. can move a car sidewise into another lane.
    d. do not affect a car as much as a strong head wind.

16. The loss of traction emergency most difficult to quickly identify is _____.
    a. a power skid.
    b. a spin-out situation.
    c. hydroplaning.
    d. a braking skid.

17. The primary problem associated with front wheel lock up when braking on a slippery surface is ____.
    a. inability to stop the vehicle.
    b. it's hard on tires.
    c. inability to steer the vehicle.
    d. the momentary increase in speed.

18. When driving up a slippery hill, you can reduce the chance of the wheels spinning by _____.
    a. increasing speed before starting up the hill.
    b. shifting into a lower gear for more torque before starting up the hill.
    c. increasing speed slightly as you move up the hill.
    d. keeping a progressive pressure on the accelerator.

19. Head restraints when properly adjusted provide the most protection when a vehicle _____.
    a. is struck from the rear.
    b. rolls over in a crash.
    c. is struck from the side.
    d. runs off the road.

MA- 8.1 Driving in Adverse Conditions

20. The best way to prevent skidding on a slippery road surface is to _____.
    a. drive slowly at all times.
    b. pump the brakes when stopping.
    c. drive in low gear.
    d. steer and brake smoothly and gradually.

21. Of the following, which is the most important in deciding how fast to drive in fog?
    a. How far ahead you can see.
    b. The condition of your vehicle's brakes.
    c. Amount of traffic on the road.
    d. Depends on whether it's day or night.

22. When traveling in very hot weather, you should _____.
    a. add dri-gas at each fill-up.
    b. check tires when they are cool.
    c. release hot tire pressure build up.
    d. drive slower.

23. When it's raining, your choice of speed should be influenced most by the _____.
    a. posted speed limit.
    b. speed of other drivers.
    c. size of your vehicle.
    d. amount of traction.

24. Explain how you would recognize a front wheel loss of traction.

25. Explain how you would respond to change the sliding traction to rolling traction.

MA-8.1 Driving in Adverse Conditions
TEST ANSWER SHEET
Circle the letter indicating the correct answer

Name: _____ Date: _____ / _____ / _____

1.	a.	b.	c.	d.	13.	a.	b.	c.	d.
2.	a.	b.	c.	d.	14.	a.	b.	c.	d.
3.	a.	b.	c.	d.	15.	a.	b.	c.	d.
4.	a.	b.	c.	d.	16.	a.	b.	c.	d.
5.	a.	b.	c.	d.	17.	a.	b.	c.	d.
6.	a.	b.	c.	d.	18.	a.	b.	c.	d.
7.	a.	b.	c.	d.	19.	a.	b.	c.	d.
8.	a.	b.	c.	d.	20.	a.	b.	c.	d.
9.	a.	b.	c.	d.	21.	a.	b.	c.	d.
10.	a.	b.	c.	d.	22.	a.	b.	c.	d.
11.	a.	b.	c.	d.	23.	a.	b.	c.	d.
12.	a.	b.	c.	d.					

ANSWER IN SENTENCE FORMAT BELOW:

24.

25.

MA-8.1 Driving in Adverse Conditions
KEY ANSWER SHEET
Circle the letter indicating the correct answer

1.	a.	b.	**c.**	d.
2.	a.	**b.**	c.	d.
3.	a.	**b.**	c.	d.
4.	**a.**	b.	c.	d.
5.	a.	**b.**	c.	d.
6.	a.	b.	c.	**d.**
7.	a.	b.	c.	**d.**
8.	a.	b.	**c.**	d.
9.	a.	**b.**	c.	d.
10.	**a.**	b.	c.	d.
11.	a.	b.	c.	**d.**
12.	a.	b.	**c.**	d.
13.	a.	**b**	c.	d.
14.	a.	**b.**	c.	d.
15.	a.	b.	**c.**	d.
16.	a.	b.	**c.**	d.
17.	a.	b.	**c.**	d.
18.	a.	b.	c.	**d.**
19.	**a.**	b.	c.	d.
20.	a.	b.	c.	**d.**
21.	**a.**	b.	c.	d.
22.	a.	**b.**	c.	d.
23.	a.	b.	c.	**d.**

ANSWER IN SENTENCE FORMAT BELOW:

24. The vehicle continues straight ahead even though I am steering to the right..
(The student does not have to use the exact words above to describe this situation...)

25, Look to the targeted path of travel, ease off any pedals or steering, steer toward the targeted path of travel, jab brake to reestablish rolling traction..
(The student does not have to use the exact words above to describe this situation...)

Texas Driver Education
Classroom and In-car Instruction
Model Curriculum

Module Eight

Texas Driver Responsibilities:

Adverse Conditions

- Visibility in Adverse Conditions
- Extreme Weather Conditions
- Protecting Occupants
- Roadway and Vehicle Technology
- Traction Loss Concerns

TRANSPARENCIES

Texas Education Agency
Texas Department of Public Safety
Texas Department of Transportation

Driving Through A New Century
Texas Education Agency