

## I. INTRODUCTION

- A. Introduce yourself as the instructor.
- B. Give title of lesson: “Driving Conditions and Contingencies.”
- C. State lesson objectives:
  - 1. Describe a Driving Contingency.
  - 2. List some specific driving habits to avoid a driving contingency.
  - 3. Describe a procedure for estimating vehicle following distances
  - 4. Describe precautions to take when driving in the following conditions:
    - a. Rain
    - b. Ice/snow
    - c. Rain wind
    - d. Water over roadway
  - 5. Name three different types of skids and how to regain control from them.
  - 6. Describe two problems associated with night driving and two ways to improve visibility at night while driving.

## II. WHAT IS A “DRIVING CONTINGENCY”?

- A. A contingency is defined as “a chance, accident, or possibility conditional on something uncertain”
- B. When it comes to driving, there are many opportunities for a contingent event:
  - 1. Sudden stop of the car in front of you.
  - 2. Driving in poor weather conditions.
  - 3. A vehicle crossing the median into your lane.
  - 4. Encountering ice on the road, leading to a skid.

- C. With proper preparation and understanding, many of these contingencies can be avoided and/or lessened in severity. However, no matter how much preparation you have made as a driver/operator, you will always be faced with the unexpected. This is why every driver/operator should be familiar with handling these contingencies.

### **III. DRIVING HABITS THAT WILL REDUCE CONTINGENCIES**

- A. Understand your own limitations - reaction time to brake or steer out of the path of travel.
- B. Practice safe following distances.
- C. Be familiar with stopping distances.
- D. Understand the effects of driving in adverse weather conditions.
- E. Be familiar with night-time driving.

### **IV. REACTION TIMES – Understanding your Limits.**

- A. Components of reaction time:
  - 1. Mental Processing Time:
    - a. Sensation – Detecting an object in your lane of travel.
    - b. Perception/Recognition – recognizing the object is a person.
    - c. Situational awareness – understand the layout of the area around your vehicle.
    - d. Response selection – Choosing the action that will lead to the least amount of damage.

2. Movement Time:
    - a. The time required to perform the selected action (ex. brake or steer).
    - b. An increase in emotions will result in a decrease of fine motor skills (Yerkes-Dodson Law).
  3. Device Response Time:
    - a. Every mechanical device takes some amount of time to function (ex. stepping on the brake pedal before the brakes engage).
- B. Reaction Distance: Suppose a reaction time of 1.5 seconds.  $1.5 \text{ seconds} \times 80.67 \text{ ft} = 120.9 \text{ ft}$ .
- C. Brake Engagement Distance: Approx. 0.3 seconds. This would add 24.2 ft.
- D. Physical force Distance: For a car traveling at this speed, it would take 134.4 ft to come to a stop. Before coming to a complete stop, this car would have traveled nearly 280 feet.

**Example:** A car is traveling at 55 mph (80.67 ft per second) during the day on a dry, level road. The driver suddenly sees a pedestrian in his path of travel. His braking distance is broken down as follows:

## V. FOLLOWING DISTANCES

- A. Three-second rule for ideal conditions – keep a separation of at least three seconds between the Emergency Vehicle and the vehicle being followed.
- B. Six-second rule for marginal weather conditions – keep a separation of at least six seconds between the Emergency Vehicle and the vehicle being followed.
- C. Nine-second rule for poor weather conditions (heavy rain, heavy fog, and heavy snow).

1. Begin counting (1001, 1002, 1003..) when the rear bumper of the vehicle in front passes some type of marker on or beside the roadway. A good marker would be a pole, tree, or paint stripe on the road.
2. Stop counting when the front bumper of the Emergency Vehicle reaches the same marker.
3. See chart on slide 124 of slide presentation that illustrates the distance given by providing an appropriate following distance.

## VI. STOPPING DISTANCES

- A. Stopping distance quadruples as the speed doubles. Example – A vehicle traveling 20 MPH will have a braking distance of 20 ft, but at 40 MPH will have a braking distance of 80 ft.
- B. Stopping distance chart.
  1. Based on hard, dry surface.
  2. Stopping distances based on  $\frac{3}{4}$  second reaction time.

## VII. ADVERSE WEATHER CONDITIONS

- A. Stopping distance increases:
  1. Stopping on wet pavement takes approximately twice the distance as stopping on dry pavement.
  2. Stopping on ice or sleet takes about five times the distance as stopping on dry pavement.
  3. Coming to a complete stop, on ice or sleet from 30 mph requires as much distance as coming to a complete stop from 65 mph on dry pavement.

*Note: Stopping distances vary from vehicle to vehicle. Size, weight, braking capacity and vehicle design, as well as weather and road conditions, all affect stopping distances.*

*Note: See chart on slide 126 in the presentation that illustrates the braking distance traveled when a driver perceives a hazard and reacts to bring the vehicle to a stop.<sup>1</sup>*

B. Driving through rain:

1. Rain distorts a driver's perception in several ways
  - a. Rain makes headlamps less effective by filtering away some of the light output.
  - b. Some headlamp light becomes "backscatter", as it is reflected back into the driver's eyes by the raindrops.
  - c. Poor visibility causes drivers to focus directly ahead of them, reducing their peripheral vision.
  - d. Normally, a rough road surface reflects some headlamp light back at the driver. Rainwater smoothes out the surface, causing the headlamp light to be cast forward making the road appear darker.

C. Driving on wet roads:

1. Approximately six times more people are killed on wet roads than on snowy or icy roads combined.
2. Roads are especially slippery during the onset of fog, mist or rain.
  - a. When moisture first appears on the surface of the roadway, it mixes with oil and/or dust to form a slippery surface. This mixture will slowly wash away if the rain is hard or prolonged or of such a small amount the surface is allowed to dry.
3. When possible, avoid making sudden moves with the steering wheel, brakes, or accelerator in rainy weather.

4. Double –check mirrors – rain on rear window or mirrors can distort or obliterate images.

D. Driving through flooded roads:

1. Driving through large areas of water can affect brake performance and a vehicle's electrical system.
2. As little as six inches of water can make most vehicles lose traction with the road surface.<sup>3</sup>
3. Driving too fast through even low levels of water can cause hydroplaning. This occurs when the weight of the vehicle will not allow the tire to push the water out of the way. As a result, the tire will actually ride on top of the water.
4. Two feet of water over the roadway will carry most vehicles off the road.<sup>2</sup> Some precautions that can be taken are:
  - a. Slow down before entering water.
  - b. Drive slowly through the water, so as to not create a large bow wave.
  - c. Turn wipers on while driving through water.
  - d. Drive at the highest point of the roadway, usually the center "hump" of the road.
  - e. Test your brakes as soon as you exit the water. If they don't work properly, apply light pressure on the brake while driving. This will dry the brakes out.

E. Winter Driving (including sleet, freezing rain, packed snow and ice). These conditions are especially hazardous.

1. Advanced preparation for winter driving can include:
  - a. Engine tuned.
  - b. Brakes properly adjusted – proper adjustment would prevent the wheels from locking up unevenly.
  - c. Accessible emergency weather equipment:
    - 1) Tire Chains
    - 2) Shovel
    - 3) Sand
  - d. Heater/defroster in good working order.
  - e. Battery charged.
  - f. Snow tires and/or chains.
  - g. Keep fuel tank full to minimize condensation within the tank.
  - h. Snow (Traction) tires
    - 1) Approved Traction tires which can be used year-round will have at least 1/8” tread and will be marked with “Mud and Snow”, “M+S”, “All Season”, or have a “Mountain/Snowflake” symbol (WAC 204-24-040).<sup>3</sup>
    - 2) Studded tires are approved traction tires, but are legal for use only between November 1 and April 1 in Washington State (WAC 204-24-030 addresses the standards for studded tires, WAC 204-24-050 addresses the dates studded tires can be used).<sup>4</sup>

- i. Tire chains - there are many types of tire chains available.
  - 1) Conventional type of tire chain, both in a single and dual application.
  - 2) Wire cable chains, used on radial tires.
  - 3) "Spot Chains" are a new type of drive-axle chain that is lowered while the vehicle is moving and uses the force of the drive tire to move the chain under the wheel. The short sections of chain are mounted on a five-spoke spider wheel, which is driven by the rotation of the drive wheel.
2. Driving on ice and snow:
  - a. Stay aware of the temperature. "Wet" ice and freezing rain are the most treacherous of all driving conditions.
    - 1) Wet ice and freezing rain occur when the temperature hovers around the freezing point. (*28 degrees F. to 40 degrees F.*)
    - 2) Bridge decks freeze before the road approaching the bridge does.
  - b. Do not make any sudden moves with the steering wheel, brakes, or accelerator unless absolutely necessary.
3. Driving with poor visibility, such as fog, mist, smog, etc.

- a. Drive slowly, but keep moving. Since fog creates low visibility, incidents can occur no matter how much experience you may have.
- b. Turn headlamps on to low-beam only. The tiny droplets of water that make up the fog reflect the light back at the driver.
- c. Turn wipers on.
- d. Watch for cars ahead that are moving very slowly. Do not rely on the vehicle in front of you by tailgating.
- e. Watch the rear view mirror carefully.
- f. Avoid decelerating suddenly.
- g. If you must pull off the road use four-way flashers.
- h. Do not pass.
- i. Use defroster to minimize fogging inside the window.
- j. Keep close watch on your speed. Fog causes drivers to underestimate their speed.

## **VIII. HANDLING CONTINGENCY SITUATIONS**

- A. Contingency situations can arise at any time. When they do arise, normal traffic flow may be suddenly interrupted and the safety of all persons in the general area diminished.
- B. It is a good policy to be familiar with the contingency situations that occur most often, and to understand the actions that can be taken to minimize the likelihood of death or injury.
- C. There are four primary causes of contingency situations.
  1. Vehicle malfunctions or failure.
  2. A sudden change or deterioration in the road.

3. The appearance of an obstacle in the roadway.
4. Driver error (clearly a contributing factor in most incidents).

## **IX. PRECAUTIONS TO HELP PREVENT CONTINGENCIES**

- A. Changes in the apparatus - The operator of any Emergency Vehicle may reduce the chance of a vehicle malfunction or failure by:
1. Completing a thorough vehicle inspection. This can be done throughout the day while on duty. Be alert to anything out of the ordinary (low tire pressure, compartment doors not completely closed, body damage, etc.)
  2. Correcting or having any malfunctions or problems repaired promptly.
  3. When operating the vehicle, monitor to detect:
    - a. Noises out of the ordinary.
    - b. New or changed vibrations.
    - c. Odors.
    - d. Changes in handling characteristics.
- B. Changes in the road conditions (weather, damage, construction, etc.) can produce a contingency situation:
1. Remain alert
  2. Scan well ahead of your vehicle
  3. Look for cues:
    - a. Construction signs.
    - b. Skid marks on the road surface.

*Note: Even when under the most favorable conditions, when all precautions have been taken, contingencies will arise. Knowing what to do when they arise will minimize the risk of property damage, injury or death.*

4. Know the area:
  - a. Which roads become slippery when wet.
  - b. Which roads are in poor repair, etc?
  - c. Which roads have tight (decreasing radius) curves?
- C. Be prepared for the appearance of an obstacle in the roadway (includes pedestrians, other vehicles, etc.)
  1. Maintain a safe speed; one which allows maximum vehicle control.
  2. Search for obvious cues.
    - a. “Watch for children” and “School” signs.
    - b. Heavy pedestrian traffic.
  3. Learn to spot subtle cues.
    - a. Toys, bikes on lawns (even though no children are visible).
    - b. Vapor from exhaust or parked cars.
    - c. Back-up lights on parked cars.
    - d. After a car pulls to the curb, the driver’s door will usually open soon thereafter.
    - e. Scan the steering wheels of parked cars looking for people at the wheel.
- D. Driver error should always be considered:
  1. Driver error is cited as a contributing factor in 45 to 75% of traffic crashes<sup>5</sup>
  2. Begin the shift well rested, with no unusual physical or mental impairment.

- a. Personal problems, resulting in mental or emotional strain, can affect a driver's performance.
  - b. If a driver has been involved in a stressful driving incident during their shift, they should consider being put in a different role for the remainder of the shift.
3. Remain alert.
  4. Avoid unnecessary risks.
  5. Don't panic!

## **X. GENERAL TECHNIQUES FOR HANDLING CONTINGENCIES**

- A. Evasive steering is a sudden or extreme change in the vehicle's direction and is often used to avoid pedestrians, animals, vehicles, or other obstacles. This action is taken because it is too late to stop.
1. Scan the roadway and nearby areas for escape routes. Consider: Can the vehicle be safely steered off to the side of the road?
  2. Consider the road surface when using evasive steering (ex. gravel vs. concrete). Is it likely to contribute to loss of control?
  3. Be especially careful when approaching the crest of a hill, rounding a curve, and when approaching intersections.
    - a. These situations minimize possible escape routes.

*Note: Hundreds of "possible" contingencies can arise. Since Emergency Vehicle operators may spend many hours driving (and travel many thousands of miles), it is possible that sooner or later a contingency situation will occur. Following are general techniques that can be applied to possible contingency situations:*

4. Remain alert when approaching a bridge, railroad crossings, or changing from an all-weather surface to off-road driving conditions.
    - a. Bridge decks may be of the same road surface as the roadway or may be grated metal, grooved concrete or even wooden timbers.
    - b. Railroad crossings may have wide gaps between the road surface and the tracks or may have wooden railroad ties as the road surface.
  5. Evasive steering is performed as follows:
    - a. The driver's hands should be at 3 and 9 o'clock on the steering wheel – this will allow the largest possible turn without moving the hands.
    - b. Turn the steering wheel in the direction of the escape route.
    - c. Counter steer as soon as the vehicle is clear of the obstacle.
    - d. Although it may be necessary to brake somewhat, hard braking should be avoided.
      - 1) Hard braking can lock the wheels – locked wheels won't steer!
- B. Handling Skids: Skidding means loss of steering and braking control.**
1. Causes of skids:
    - a. A sudden change of speed or direction.
    - b. Any change of speed or direction under conditions of poor traction.

2. Avoiding skids:
  - a. Smooth driving (steering, braking, etc.) will eliminate the potential for skids.
  - b. Be aware of the road surface condition – use extra precaution when on a potentially slippery surface.
3. Counter-Steering: Steer in the direction to which the rear end of the vehicle is skidding. Two points on counter-steering:
  - a. A steering wheel does not have to be turned violently to correct a skid. This is a common “PANIC” reaction, and further trouble often arises because the car tends to skid back and forth (fishtailing).
  - b. Once the steering wheel has been turned to counter-steer, it may be necessary to immediately counter-steer in the opposite direction.

C. Types of Skids and How to Handle Them:

1. Braking Skid: Occurs with sudden braking, causing one or more of the wheels to lock. If brakes are unevenly adjusted, all the wheels will lock at the same time.
  - a. Steering will be lost. A wheel that is not turning cannot be steered.
  - b. If all the wheels on a vehicle lock evenly or if just the front wheels lock, the vehicle will move straight ahead, unless influenced

by some other force (i.e. Dip in the road).

- c. If just the rear wheels lock, their reduced traction will cause them to move forward faster than the front wheels. The vehicle may spin 180 degrees (depending on speed, road surface, etc.). The vehicle may actually end up traveling in a different direction.

## 2) Handling a Braking Skid.

- a) Release the brake immediately; steering should return by allowing the wheels to turn.
- b) If braking is still necessary (to reduce speed or avoid an obstacle), apply with less pressure so the wheels don't lock again.
- c) For vehicles without ABS, practice Cadence Braking. Cadence Braking is pumping the brake pedal rapidly but deliberately, causing the wheels to momentarily lock and unlock. This is the automated process built into ABS.

## 3. Power Skid: Occurs from sudden, hard acceleration.

- a. Since power is delivered only to the rear wheels, sudden acceleration can cause the rear wheels to lose traction.
- b. Power skids are more likely to occur on slippery surfaces.

- 4) Handling a Power Skid.
  - a) Reduce acceleration.
5. Cornering Skid: Occurs when the speed of the vehicle is too great and/or traction is lost while cornering.
  - a. May involve the locking up of rear and/or front wheels.
    - 1) Handling a Cornering Skid:
      - a) Release the brake.
      - b) Counter-steer “into the skid” (as explained above).
      - c) Once the vehicle straightens out, it may require counter-steering in the opposite direction.
- D. Evasive Acceleration: Simply means a quick burst of speed. Can be used to avoid collision with side approaching or merging vehicles.
  1. Drivers don’t often think of this evasive maneuver.
  2. When a vehicle is approaching from the side or merging, increasing your speed can often avoid a collision.
- E. Unavoidable Collisions: When a collision is unavoidable, choose an object to collide with. Considerations are:
  1. Choose the course least likely to cause injury or death.
  2. Head-on collisions are the most damaging in terms of both life and property.

- a. Steer so that the Emergency Vehicle sideswipes or hits the other object at an angle.
- b. Avoid hitting large, immobile objects in favor of “impact absorbing” objects.
- c. Such “impact absorbing” objects are:
  1. Parked cars
  2. Low bushes or shrubs
- d. “Non-impact absorbing” objects are:
  1. Concrete bridge abutments.
  2. Buildings.
  3. Large Trees
  4. Utility poles (also pose a hazard of downed power lines).

F. Blowouts, Flat Tires, or Tire Failures:

1. Be aware that a tire has failed. It may produce a sound, vibration, or shaking of the vehicle. Being able to quickly assess the situation will allow you the time to safely pull the vehicle off the roadway and reduce the chance for an incident or injuries.
2. Hold the steering wheel firmly. In the even the front tire fails, the vehicle will have a tendency to “pull” in the direction of the failure. As a driver, you should always maintain a two-handed grip of the steering wheel.

3. Stay off the brakes. The natural tendency when a failure occurs is to apply the brakes. When a tire fails and the brakes are applied, this could cause a complete loss of vehicle control. Reduce the speed of the vehicle by allowing the compression of the engine to slow the vehicle. Apply brakes slowly, smoothly, and gently until the vehicle comes to a complete stop.

G. Brake Failure (after ensuring that an object isn't preventing the brake pedal from being depressed).

1. Shift to the next lower gear, if possible. Continue shifting down until apparatus has come to a near stop and the parking brake can be engaged.
2. Advise other motorists that you have an emergency by using your four-way flashers, emergency lights and sounding the horn.
3. Make every effort to avoid head-on collisions. Look for energy-absorbing objects that can be used to slow your vehicle.
4. Avoiding brake failure:
  - a. Ensure the brake system has been properly maintained.
  - b. Do not continuously depress the brake pedal for long periods. This will create heat which will expand the brake drum, causing temporary failure.

H. Steering Failure:

1. When power-steering fails, the vehicle can still be steered, but will take extra effort to maintain control.

## XI. IF YOU MUST PULL OFF THE ROAD

### A. Warning Devices

1. You should select the equipment and method most likely to provide visible early warning to surrounding traffic.
2. You can determine the best equipment to use by its effectiveness.
  - a. Most Effective – Self-illuminated cone, flares, reflecting traffic cones, triangular reflectors.
  - b. Okay – Overhead beacon, four-way flashers, emergency lights.
  - c. Poor – Headlights, parking lights.

## XII. WHAT WOULD YOU DO?

- A. The attached slides (reference to slide #) illustrates a potential incident situation. The options to avoid an incident include:
  1. Emergency braking
  2. Evasive steering
  3. Evasive acceleration
  4. No action

## XIII. LESSON APPLICATION

- A. Situation #1: The Emergency Vehicle is traveling on a four-lane road with no median. Gravel shoulders are on both sides of the road. The only other vehicle in the immediate vicinity is a car that appears to be out of control – it is crossing the centerline headed for the Emergency Vehicle.
  1. Steering to the right shoulder is probably the best, since more traffic could be in the oncoming lanes. Also, the driver may suddenly straighten out and pull back into his/her lane.

*Note: Due to adverse weather conditions, or a contingency situation, you may find that you must pull off the road. Whenever this situation arises, both you and the vehicle must be protected. The principle of “protecting the scene” is to provide visible early warning to the surrounding traffic, and thus avoid a collision.*

*Note: Use care when using flares around dry vegetation or incidents where flammable liquids are involved.*

*Instructor: This section is intended as a review exercise if time permits.*

*(Discuss each slide. Call on students to state which action or combination seems most appropriate for each slide. Give correct answers if the class is not able to.)*

- B. Situation #2: The Emergency Vehicle is traveling about 25 MPH down a narrow, one-way alley. On either side of the alley are buildings set very close to the street. A large truck begins to back out of an intersection alley to the left.
1. Emergency braking and sounding horn.
- C. Situation #3: The Emergency Vehicle is traveling at about 30 MPH on a busy, urban street. A car is behind the Emergency Vehicle following closely. Another car is approaching in the opposing lane of traffic. Parked cars are in the lane immediately to the Emergency Vehicle's right. A small dog runs out into the roadway.
1. No change in direction of travel.
  2. Some braking and lane travel.
- D. Situation #4: The Emergency Vehicle is traveling 55 MPH in the right most lane of a four-lane divided expressway. Two cars are in the left lane beside the Emergency Vehicle. A care is about to enter the expressway from the entrance ramp; it is traveling approximately 45 MPH.
1. Evasive acceleration.
  2. Braking would probably increase the chances of collision with the merging car and would open the possibility of being rear-ended.
  3. No action would probably result in a collision.
  4. An alert Emergency Vehicle driver should avoid this situation.

- E. Situation #5: The Emergency Vehicle is traveling on a two-lane rural road. There is a car in the opposing lane. On both sides of the road is a heavy growth of low bushes and shrubs. A small child runs out into the road.
1. Evasive steering and emergency braking.
  2. Braking alone will not allow the operator to avoid hitting the child. Since the low bushes and shrubs are impact absorbing, it would be wise to steer toward the right side of the road and collide with them at an angle.

#### **XIV. DRIVING HAZARDS**

- A. Driving techniques must be adjusted for all driving hazards
1. Slow down
  2. Drive at a speed appropriate for conditions.
  3. Increase the following distance.

#### **XV. NIGHT DRIVING**

*Note: According to the National Highway Traffic Safety Administration, nearly one half of all fatalities occur at night; but only 25% of travel occurs at night. This means the fatality rate per vehicle mile of travel is about three times higher at night than during the day.<sup>6</sup>*

- A. Causes of night-time incidents:
1. Less light to see by. Vision is restricted. Here are some facts to remember:
    - a. Night vision varies considerably among persons.

*Note: See chart with day and night incident ratios.*

**(WRITE ON WHITEBOARD. ASK STUDENTS WHAT CONCLUSIONS THEY CAN DRAW FROM THESE STATISTICS)**

*Drivers must be very aware of drunk drivers between the hours of 2300-0300 and although the large percentage of accidents take place during daylight hours 47% of traffic fatalities are at night.*

- b. Older people's night vision is not usually as good as younger people.
- c. Eye-straining activities (during the day) can reduce night vision.
- d. Sunglasses reduce eyestrain in bright sun – but they should NEVER be worn after sunset.
- e. Bright flashes of light (lightning, high-beam glare) can cause momentary blindness.

2. Drunk Drivers:

- a. Search for indications of drunk drivers.
  - (1) Weaving across lanes
  - (2) Delayed start at a stop sign or traffic light.
  - (3) Erratic speed

B. Using headlights and high beams:

1. Headlights:

- a. It is recommended headlights be on at all times. Use headlights at all times between first signs of dusk and full daylight.
- b. Headlights are required to be on and operating as part of the emergency lights while responding in a "code red" response.

2. High beams:

- a. Dim high beams within 500 feet of approaching vehicle.
- b. Dim high beams within 300 feet of overtaking or following other vehicles.
- c. Avoid high beams on right curves – they tend to blind the oncoming driver.

- d. Don't stare directly into high beams. Guide the vehicle by using the right edge of the road.

C. Tips to improve visibility at night:

1. Keep windshield clean, inside and out.
2. Keep instrument panel lights dim.
3. Keep eyes moving.
  - a. Moving eyes can pick out dim objects better than tightly focused eyes.

Sources:

1. Oregon State Police – patrol division.  
[http://www.oregon.gov/OSP/PATROL/safety\\_tip\\_following\\_close.shtml](http://www.oregon.gov/OSP/PATROL/safety_tip_following_close.shtml)
2. CDC  
<http://www.bt.cdc.gov/disasters/psa/driving.asp>
3. Washington State Department of Transportation  
<http://www.wsdot.wa.gov/winter/>
4. Visual Expert Human Factors  
<http://www.visualexpert.com>
5. U.S. Department of Transportation Federal Highway Administration  
<http://www.tfhrc.gov/humanfac/02003execsum.htm>
7. National Highway Traffic Safety Administration  
<http://www.nhtsa.dot.gov/>