

## I. INTRODUCTION

- A. Introduce Yourself
- B. Give title of lesson

“Operating Apparatus-Vehicle Control Tasks”

### C. Lesson Objectives:

1. State the proper use and limitations of Emergency Vehicle signaling equipment.
2. Non Emergent Driving “Non-emergency mode.” Describe operating conditions and situations that make driving emergency vehicles difficult during non-emergencies.
3. Emergent Driving “Emergency Mode.” Describe additional conditions and situations that increase difficulty while driving in an emergent mode.
4. Explain how to safely operate your apparatus through the above mentioned situations.
5. State techniques you can use to safely negotiate intersections and/or safely pass other vehicles, in an urban as well as rural setting.
6. Explain procedures for backing up emergency vehicles safely.
7. Know the vehicle clearances for emergency vehicles you operate.
8. Shifting: Describe the differences between an automatic and manual transmission and how that applies to the operational differences with vehicles you operate.
9. Stopping distances: Explain the operational differences between hydraulic and air brakes.

## II. Emergency Vehicle Signaling Equipment

- A. Vehicle signaling equipment

1. State and local laws and policies govern the particular type and configuration of emergency lights and sirens. Review your local policy, controls and options.
2. State law requires the use of lights and sirens whenever any of the exemptions are exercised.
3. Emergency lights and sirens are used to inform traffic and pedestrians of your presence and to *AID* in clearing a path for your emergency response.
4. *Due regard* must be exercised at all times, even during the most serious emergencies. This is when the driver really needs to be focused and disciplined. Controlling your emotions and your adrenaline is critical when utilizing lights and sirens.
5. Use of signaling equipment does not guarantee an operator safety, nor does it free him/her from civil or criminal liability.

#### **B. Lights**

1. There are several limitations to emergency lights and their effectiveness.
  - a. Low sun or glare can greatly reduce effectiveness.
  - b. At night, red beacons can be confused with traffic and neon lights.
  - c. Lights on emergency vehicles may pass over the top of automobiles or rearview mirrors.

#### **C. Sirens**

1. Sirens are most effective to the vehicles traveling in the same direction, ahead of the emergency vehicle, and to pedestrians.

2. *Physical parameters:* There are several *physical parameters* that can limit the effectiveness of sirens.
3. *Frequency:* The sound from a siren travels forward from the vehicle in a cone shape. The higher the frequency (electronic siren) the narrower the cone & the further the sound travels. The lower the frequency (mechanical siren) the wider the cone & the less distance the noise will travel.
4. *Surrounding background noise:* Traffic, construction, heavy base &/or loud music from a surrounding vehicle can interfere with other drivers ability to hear your siren.
5. *Obstacles:* Sounds do not travel around corners or through buildings. Intersecting traffic could be approaching from behind a building, wall or other obstruction. They may not see you & they may not hear you as well.
6. *Personal shielding:* Today's drivers "SHIELD" themselves from the outside noise (your siren). Today's cars are noise and air tight, equipped with DVD players, high output stereo's, personal navigation systems and C-phones. This greatly reduces the driver's ability to hear your siren.

#### **D. General Guidelines for Emergency Signaling**

1. Some departments allow the use of lights only while driving in the emergency mode. RCW 46.61.035 (3) states, "*The exemptions herein granted to an authorized emergency vehicle shall apply only when such vehicle is making use of visual signals meeting the requirements of RCW 46.37.190*". It goes on further in subsection (b) to state, "*Authorized emergency vehicles*

*shall use audible signals when necessary to warn others....”* Again, discuss your local policy on siren usage.

2. Motorists respond in strange ways to a sudden siren sound. Prior to siren activation, slow the Emergency Vehicle’s speed, be cautious of the driver’s reaction and be prepared to maneuver accordingly.
3. Do not rely on or expect the siren to clear the traffic or assume that it is even being heard.

### **III. NON EMERGENCY DRIVING**

- A. Even in normal non-emergency conditions operating an emergency vehicle in congested urban areas as well as long rural roads can be difficult, requiring a high degree of skill and discipline.
  1. Visibility, maneuverability and more importantly braking are vastly different & much more difficult in an emergency vehicle, than they are in your personal vehicle.
  2. Apparatus must always be in a position to respond. Drivers must learn to avoid certain routes or committing to certain lanes that could limit your ability to respond.
  3. Be aware of certain “Watch outs!” that further complicate driving large, heavy emergency vehicles.
    - a. School zones
    - b. Children playing
    - c. Crosswalks
    - d. Bicyclists
    - e. Doors opening from occupied parked cars.
    - f. Exhaust from parked cars
    - g. Pets
    - h. Preoccupied motorists

- i. Unmarked crossroads and driveways
- j. Blind curves
- k. Steep inclines
- l. Graveled roadway

#### IV. DRIVING IN THE EMERGENCY MODE

- A. *Excessive Speed* – Do not over drive the capabilities of your brakes. Do not overdrive the capabilities of your equipment and your ability to maneuver that equipment in an evasive action.
- 1. Our natural inclination is to drive our apparatus like we drive our personal vehicles. This is what our *brains know* and the experiences we draw from in an emergency.
  - 2. Don't let your adrenaline dictate your driving style
  - 3. Consider the nature of your call and drive appropriately.
  - 4. Give yourself and others on the road more time to react, by slowing down.
  - 5. Don't overdrive your *brakes, equipment, or ability*.
  - 6. Consider the weight, load and high center of gravity at all times. (Tanker rollovers are happening far too frequently)!
- B. *Effectively utilize your lights and sirens* – To warn motorists and pedestrians of your approach and help to clear traffic.
- C. *DO NOT rely on appropriate reactions by motorists* – State law requires motorists to pull to the right and yield the right of way to emergency vehicles. This is not always the case and here are a few of the reactions you will encounter:
- 1. Vehicle in front of you will not pull to the right because they do not see/hear you, or they are racing you to the next

**Note:** *There are several major problems/concerns that we, as emergency vehicle operators, need to address if we are to safely operate our vehicles in an emergency response.*

**Note:** *The three most common causes for loss of control are driving too fast for the conditions, failing to properly appreciate weight shifts of heavy emergency apparatus, and failing to anticipate obstacles. Slowing down will help in all three situations.*

intersection, or are simply not sure what they are to do.

2. Vehicle will stop directly in your path.
  3. Vehicle will pull to the left or turn left in front of you.
  4. Unaware motorists can sometimes brake hard to avoid a car pulling to the right in front of them.
- D. *Confused and Unaware Motorists* – When you encounter a confused and/or unaware motorist remember who the professional is. It may be necessary to:
1. Vary the siren pitch or turn it off for a moment.
  2. Make eye contact and motion with your hands.
  3. Use the PA system.
  4. Be patient, you're the professional.
- E. *Blocked Traffic* – Same as above, slow down on your approach and quickly assess your options.
1. DO NOT excessively blast your siren and/or air horn at motorists who are stuck in the same jam you are. If they already know you are there they will most likely move to an area you direct them to.
  2. A crewmember (never the driver) may need to get out to direct traffic. *Use safety precautions and always wear the proper safety equipment i.e. traffic vest, and helmet.*
  3. Use siren intermittently.
  4. Do not travel in opposing traffic lanes unless you can do so safely.

## V. NEGOTIATING INTERSECTIONS & PASSING SAFELY

- A. Intersections are the most likely areas for fatal incidents.
1. Many intersections restrict visibility
  2. E.V. operators as well as the other motorist may be traveling at too great a speed.
  3. Weather conditions can greatly impact our ability to negotiate intersections, stopping/steering can become much more difficult.
  4. Emergency Vehicles approaching intersections from different directions have been involved in many recent incidents involving loss of life.
  5. Some intersections have multiple lanes, merging and turn lanes etc. that can be confusing to the motorists.
  6. 3 way, 4 way & 5 way intersections.
  7. Roundabouts and other traffic calming devices.
- B. Techniques for negotiating intersections
1. As you can see intersections can vary in their difficulty. Safely negotiating through many of these situations will require your full attention, patience, skill, and technique. As well, considerations for safe travel through a busy urban intersection during rush hour will differ from those considerations in a rural setting.
    - a. Approach all intersection prepared to stop.
    - b. Having a window partially open will help to hear oncoming sirens.
    - c. The officer's second set of eyes can assist in assessing difficult intersections.

- C. In an *Urban* setting make sure all traffic is stopped prior to entering an intersection.
1. Use your lights & siren effectively.
  2. If you need to utilize the oncoming lanes, do so as soon as it is safe. This shows your intentions early and avoids confusion from oncoming motorists.
  3. **DO NOT** rely on your opticom, be prepared to stop.
  4. Be aware at crosswalks and always watch for pedestrians.
- D. In a *Rural* setting make sure all traffic is stopped or that you have a sufficient gap in traffic to safely enter intersection.
1. From a full stop most vehicles require about four (4) seconds to cross a two (2) lane intersection that is thirty (30) feet wide.
  2. Time varies depending on the size, weight and ability to accelerate. Know your vehicles capabilities.
  3. Cars approaching from either direction should be at least six seconds from the intersection.
  4. The operator should look left, then right, and then left again prior to entering intersection.

### **E. Passing Safely**

*Follow all state and local laws governing passing!*

1. Non-Emergency Mode:  
Remember on a two lane road it is unlawful to pass a vehicle that is doing the speed limit, it is also very poor public relations.
  - a. Urban Setting

***Note: This is another area that presents different challenges in urban and rural settings. Whether we are passing in emergency or non-emergency mode can also present differing and unique challenges.***

- 1) On residential streets it is not advised to pass another vehicle unless that vehicle has slowed substantially and you can do so safely.
- 2) On freeways and highways, know your vehicles capabilities. Acceleration, steering and braking will make passing much more of a challenge.
- 3) Remember your live load if you carry water and the high center of gravity found on most emergency vehicles. These can cause substantial sway when maneuvering.

b. Rural Setting

- 1) Rural departments frequently pass other vehicles on two lane highways. Posted speeds are often 60 – 70 mph and place our heavy emergency vehicle at substantial risk. Know your equipment. Remember your ability to accelerate and stop. Be aware of your high center of gravity. There are far too many fatalities in tanker rollovers which are attributed to overdriving vehicles with a high center of gravity and/or a live load.
- 2) Visibility is often poor, rolling hills, curves and weather can reduce our ability to see a safe distance.
- 3) Rough roads that can be narrow or without a shoulder. Others can have potholes or freshly graveled surfaces

- 4) Inclimate Weather, rain, snow and black ice are often an underlying factor in our incidents.
  - 5) Crossroads and crossing traffic. Some highways have unmarked intersections and driveways that can produce merging or crossing traffic unexpectedly.
  - 6) Slow moving vehicles such as farm equipment.
  - 7) Livestock and wildlife.
2. Emergency mode: Prior to passing in the emergency mode, give motorists every opportunity to pull to the right. Do not bear down on them.
- a. Be smooth and deliberate. Once you commit to passing, do not hesitate.
  - b. Remembering your high center of gravity and limited braking ability is critical when responding in the emergency mode. Be smooth, don't jerk the wheel.
  - c. Consider the nature of the call and drive appropriately.
  - d. In some instances it is quicker to turn your lights and siren off and go with the traffic flow.
  - e. Some apparatus have a difficult time keeping up with traffic or are slow on hills. If the weight of your vehicle prevents you from doing the speed limit up hills, then you should not exceed the speed limit on flat roads or down hills.

## VI. BACKING EMERGENCY VEHICLES SAFELY

- A. Park so backing is minimized or eliminated. To do this, the operator must plan ahead.

*(Ask students what kinds of planning they could do. Include at least the following.)*

1. Do not park head-in if departure will be hurried.
2. Select places that require the least backing.
3. Before entering a vehicle to be backed, survey intended path of vehicle.

- B. Backing the apparatus

### **When vehicle must be backed...USE A BACK UP PERSON!**

1. A crewmember shall be stationed in such a position as to assist the driver with the backing of the vehicle.
2. In the event it is a two-person crew, the officer shall place himself/herself at the left rear corner of the vehicle.
3. At night, use backup or rear-deck lights to illuminate the rear area behind the vehicle.
4. The driver's window shall be rolled down in order to allow direct communication between the driver and person (s) at the rear of the vehicle.
5. Check for pedestrians and obstacles.
6. Back SLOWLY (as if you are expecting to hit something).
7. Constantly check mirrors for changes in the traffic situations or obstacles in Emergency Vehicle's path.
8. When backing out of an alley, hidden driveway, etc., sound horn or "back-up alarm" for warning.

*Note: Incidents while backing up account for a large portion of emergency vehicle incidents. While some have resulted in loss of life, most are relatively minor. Never the Less, if you stop to consider O.O.S. equipment, repair costs, incident review boards & bad public relations even the most innocent backing incident can cause stress to employee's and their organizations. Review the tips that will help avoid unnecessary backing incidents.*

*Review department specific policies*

9. It is the driver's responsibility to have a back-up person assist when maneuvering or backing and the driver must follow the direction of the back-up person. It is also the responsibility of the back-up person to give clear and correct signals that the driver will obey.
10. When turning, while backing, check the front fender to avoid front-end collisions.
11. About 90 percent of the time the operator should be looking to the rear.
12. Properly positioned and adjusted convex mirrors can be helpful in eliminating blind spots. (If convex mirrors are used, advise students of the distorted distances).

#### C. Horn signals

1. Station a crewmember outside the vehicle to direct the operation. The following signal code by the driver is recommended with use of horn.
  - a. One blast...STOP immediately
  - b. Two blasts...Forward
  - c. Three blasts...Back up

#### D. Hand signals

1. **STOP:** Hold hands out in front, shoulder high, exposing palms to driver. At night, hold hands in the same manner, with the addition of a flashlight in one hand, shining at the driver. This will indicate an immediate STOP.
2. **RIGHT OR LEFT:** Point in the desired direction with one hand and motion in a circular "come on" gesture with the other, at chest level. At night, direct a flashlight beam at the hand pointing at the desired direction.

*Signals should be given distinctly, the signal for "go forward" or "back-up" must be acknowledged before action is taken.*

3. **AHEAD OR BACK UP:** Hold hands directly in front, chest high, fingers on hands directed toward one another, and motion in a circular “come on” gesture. At night, hold a flashlight in one hand and direct the beam toward the other.
4. **DIMINISHED CLEARANCE:** Hold the hands to one side of the body indicating the approximate amount of distance the apparatus is from the obstacle. Close hands accordingly as the driver slowly maneuvers the apparatus toward it. Close hands as the distance narrows to a point where the signal person indicates immediate STOP. Always allow enough for the driver’s reaction time. At night, indicate in the same manner with a flashlight in the upper hand and beam directed at the palm of the other. On STOP, cover the flashlight beam with the hands.

## VII. VEHICLE CLEARANCES

### A. Emergency Vehicle Dimensions

1. **Width:** The maximum width of a vehicle driven on the roadways in the State of Washington shall not exceed 8 feet 6 inches. With an exception of the extension of the rear view mirrors which may extend an additional 5 inches on each side of the vehicle.
2. **Height:** The maximum height of a vehicle, excluding emergency vehicles shall not exceed 14 feet.
3. **Length:** The maximum length of any single-bodied vehicle shall not exceed 40 feet in length. It will be important for the operator to understand and become familiar with the turning radius of each vehicle. The operator must know about the length of the overhangs, both on the front and rear

**Note:** *As with all vehicles, the Emergency Vehicle Operator must know the size and limits of his/her vehicle. There are many factors to take into consideration, as to the height, width, and length of the Emergency Vehicle. Operators must become familiar with their assigned vehicle. Washington Administrative Code requires the height of all emergency vehicles be clearly displayed on the dash of every apparatus.*

**Note:** *(Discuss the types of vehicles the drivers will be operating. Explain the differences between cab-over and conventional-style vehicles.)*

of the apparatus. The difference between a conventional cab design and a cab-over design, as it relates to the turning and swing distance of the front of the vehicle.

### C. Railroad Crossings and Draw Bridges

***(Important the instructor must review vehicle height and weight restrictions for roads and bridges in this section. Please review any such limitations that exist within the boundaries of your response area.)***

1. When approaching a railroad crossing, discontinue using the vehicle's siren, look for the crossing gates to be closing or the red flashing warning lights. Come to a complete stop prior to the crossing of the tracks. Look both ways, and then cross the railroad tracks. It is advisable to cross the tracks at or as close to a 90-degree angle as possible. This will reduce possible damage to the tires on the vehicle.
2. When approaching a draw or swing bridge, discontinue using the vehicle's siren. Check for the crossing gates to be closing. Listen for the bridge's siren or bells.

## VIII. SHIFTING

- A. Shifting entails proper gear selection to accomplish the driver's objective for the power the engine produces (i.e., speed up, slow down, and pull ahead). The transmission is the driver's tool; he/she must be able to utilize it properly.
- B. Manual shifting "Do's." A good driver:
  1. Knows shift patterns of every piece of apparatus he/she drives.
  2. Knows just where the clutch begins to engage.

***Note: Extreme care must be used when crossing at railroad crossings or drawbridges. When approaching either type of obstacle, the driver must confirm if a train is approaching or if the bridge is about to open.***

***Note: Most emergency vehicles manufactured after 1980 are equipped with automatic transmissions. Some tenders/tankers and forestry apparatus, as well as some older vehicles, still utilize manual transmissions. A few of those need to be "double clutched".***

***Note: Every agency is responsible to properly train every emergency vehicle driver specifically for each vehicle "type" they are certifying them to drive. If a driver is to drive anything with a manual transmission, they must be competently trained on a manual transmission.***

3. Shifts before or after turns so as to keep both hands on the wheel during turns.  
*(Mention engine brakes and how they affect shifting if left on.)*
  4. Takes his/her foot off the clutch immediately after completing shifts.
  5. Places transmission in neutral and lets clutch out if vehicle will be parked idling for an extended period.  
*(Explain about throw-out bearing wear.)*
  6. Knows that heat and shock loading are major cause of premature drive train failure. *(Discuss shock loading.)*
  7. Is capable of determining when clutch needs adjustment. (When free play becomes excessive or clutch engages too far out).
  8. Can double-clutch properly on upshifts and downshifts.
  9. Knows the speed ranges of each gear.
  10. Knows how to “flare out” shifts to get load off transmission to make shifting easier.
  11. Chooses proper gear to get vehicle moving on different terrain. (Do not overspeed engine.)
  12. Is familiar with special equipment, such as clutch, brakes, retarders, or engine brakes (jakebrakes).
- C. Manual shifting “Don’ts.” A good driver does not:
1. Force transmission into gear.
  2. Hold vehicle on hill with the clutch
  3. “Pop” clutch, especially on diesel.
  4. “Ride” the clutch. (Even the slightest pressure on the pedal causes wear.)
- D. Manual shifting hints:

1. It is not necessary to upshift just because the engine is at governed speed. If the operator is in a congested area, he/she may achieve better performance by not shifting; they will have good engine braking as well as power to accelerate. Remember, the transmission is a tool.
  2. If the transmission is hard to get out of gear on upshifts, try “flaring out” shifts. Run the engine up to desired speed and hold it there for a few seconds before attempting to shift. This lessens the shock on the driveline components.  
*(Discuss other instances where NOT shifting is an advantage.)*
  3. Many drivers experience difficulty with synchromesh transmissions because they do not move the shift lever from gear to gear fast enough.
  4. Some departments that use both synchromesh and non-synchromesh transmissions require drivers to double-clutch all vehicles. This keeps drivers in practice and eliminates the need to know which vehicles have what transmissions.  
*(Discuss local policies.)*
  5. Know what the manufacturers recommend for engine-operating range, and use the transmission to keep the engine within it.
- E. Automatic shifting “do’s.” A good driver:
1. Learns the manufacturer’s recommendations for automatic upshifting and downshifting.
  2. Learns what extra features a transmission may have and how to use them properly.

3. Learns how to properly operate the transmission and the accelerator to work the two as a unit. Learns the speed range in each gear.
- F. Automatic shifting “Don’ts.” A good driver does not:
1. Overheat transmission.
    - a. Operator must watch temperature gauge for transmission oil.
    - b. Try to force downshifts at speeds above those recommended by the manufacturer.

## IX. STOPPING DISTANCES

*(Ask students to use chart to estimate the total stopping distances for each of the vehicles they drive at 60 mph.)*

- A. Normal stopping distances for various types for vehicles at various speeds are shown in a chart, “Stopping Distances at Various Highway Speeds.”
1. All stopping distances on the chart assume driver uses  $\frac{3}{4}$  second to react.
  2. All stopping distances on the chart are based on “hard, dry surfaces.”
    - a. Sedans – about 366 feet.
    - b. Light trucks – about 426 feet.
    - c. Heavy 2-axle – about 436 feet.
    - d. 3-axle – about 531 feet (more than  $\frac{1}{8}$  mile).
  3. The heavier the vehicle the longer it will take to stop. *(Summarize)*
  4. The higher the speed, the longer it will take to stop.

B. Emergency Braking: If there is not enough room to stop, or if no escape route is available, emergency braking may be one way to avoid a collision to minimize the consequences. Goal: Produce shortest possible stopping distance without locked wheels or loss of control. The best method for accomplishing this is:

1. Hydraulic Brakes:

- a. Hard pressure to brake pedal without locking wheels:
  - 1) Quick, firm jabs.
  - 2) Short, steady pressure; release and repeat.
  - 3) If wheels lock, RELEASE BRAKE PEDAL. Reapply with less pressure.

2. Air Brakes:

- a. Air brakes should be applied with a steady pressure at the beginning of a stop and then eased off as the vehicle comes to a complete stop, brakes should be released to avoid jerk and rebound and then applied again to hold the vehicle while it is stopped.
- b. Air brakes should not be fanned, except on slippery pavement where this type of braking gives better control, reduces the danger of skidding and gives a shorter stop. Fanning brakes wastes air pressure and serves no useful purpose on dry pavement.

3. Disc brakes

**Note:** *Emergency braking was already covered in lesson 3 “Important Physical Forces” this should be a review to reiterate the importance of knowing your stopping distances, allowing for reaction time, and understanding the braking systems that your apparatus are equipped with.*

**Note:** *The best braking method is somewhat dependent on whether the vehicle is equipped with drum or disc brakes. (If you have information about the kinds of brakes the students’ emergency vehicles are equipped with, go into more detail about braking methods for those particular vehicles.)*

- a. Disc brakes can take more sustained hard braking since they cool off more effectively and are less likely to fade.
- 4 *ABS (Anti-lock Brake System)* There are several types of Anti- lock Brake Systems on vehicles.
- a. The most basic is the two-wheel ABS, designed to prevent the rear wheels from locking up. In this system, found on trucks and vans more than a few years old, it is still possible to lock the FRONT wheels and loose steering control
  - b. The other type of system is the four-wheel ABS, which is designed to prevent lock-up on all four wheels. This system uses electronic sensors to compare tire speeds at all 4 wheels. It automatically reduces brake pressure to the wheel(s) that are locking up. The advantage to this over the two wheel system is that it enables the Operator to stop as quickly as possible while retaining steering control.
  - c. When making an emergency stop with and ABS equipped vehicle, the Operator should *maintain pedal pressure, even if the pedal begins to pulsate*. This pulsation is the system “pumping” the brake at the wheel(s) that are trying to lock up. It does this at a rate of 6-20 times per second. There can be a corresponding sound synchronous with the pulsations. Some ABS systems do not give the pedal or sound feedback at all; in such vehicles, the Operator must remember to keep a steady pressure on the pedal while attempting an emergency stop.  
***IT IS IMPORTANT TO KEEP IN MIND THAT ON A DRY, SMOOTH SURFACE, A SKILLED***

***OPERATOR CAN OUT-BRAKE AN ABS SYSTEM BY 10-20% DISTANCE. THE ABS SYSTEM WILL HELP KEEP THE VEHICLE UNDER STEERING CONTROL WHILE STOPPING, NOT***

C. Rapid deceleration

D. Evasive acceleration

1. Evasive acceleration.

Simply means a quick burst of speed.  
Can be used to avoid collision with side approaching or merging vehicles.

***(Drivers often do not think of this evasive maneuver.)***