## CALIFORNIA

## Behind the Wheel Training SKILLS LEVEL 4

Defensive
Driving

The material in this handout is derived from the Instructor's Behind-The-Wheel Guide for California's Bus Driver's Training Course, the Instructor's Manual for California Bus Driver's Training course, California Commercial Drivers Handout, the internet and other sources related to defensive driving.

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## Elements of Defensive Driving

Defensive driving is being continually alert to possible hazards around the bus and taking action to avoid those hazards.

Defensive driving is expecting the unexpected.
Defensive driving is driving to avoid a collision in spite of the actions of others and the conditions around the driver.

## Differences Between a Bus and a Passenger Vehicle

A bus:

- Gives a higher point of view
- Is longer, wider, and heavier
- Requires a longer stopping distance
- Accelerates more slowly
- Carries more passengers
- May have air brakes
- May have more instruments
- May have a larger steering wheel
- Seats the operator in a different position relative to the steerable axle


## Hazards from Other Drivers

Expect the following from other drivers:

- To cross your path and make a right turn
- To stop for a yield sign, even when the intersection is clear
- To go through intersections without stopping
- To make sudden stops
- To suddenly turn left in front of you
- To creep up between your vehicle and the curb
- To ignore the flashing red light signal system during loading and unloading of passengers


## Road Conditions

Expect the following:

- Highways which may have soft shoulders, bumps, cracks, and potholes
- A heavy crown which may cause a bus to lean into objects
- Obstruction by road construction vehicles
- Low-hanging wires, tree branches, or signs
- Poorly designed intersections and highways


## People and Animals

Expect the following:

- Pedestrians in the danger zone
- Joggers or pedestrians who may run onto the roadway
- Animals which may run onto the roadway
- Children who may run onto the roadway
- Distractions from passengers
- Cyclists who ignore the traffic laws
- Drivers and pedestrians distracted by talking on cell phones


## Defensive Driving Factors

Factors trainees can't control:

- Actions of others
- Natural disasters
- Weather
- Light conditions
- Factors trainees can control:
- Preparation for the actions of others
- Preparation for bad weather
- Physical condition
- Pre-trip inspection of equipment
- Movement of the vehicle
- Attitude
- Passenger management


## Qualities and Attitudes of a Defensive Driver

1. Maintains a good defensive driving attitude
2. Understands his or her equipment and is proficient in its operation
3. Is capable of making decisions
4. Is physically and mentally prepared
5. Understands that most collisions are preventable
6. Does not insist on the right-of-way

## Characteristics of a Defensive Driver

A defensive driver is knowledgeable of:

- Traffic laws
- How to avoid a collision
- How to recognize hazards
- How to respond correctly
- Limitations of the equipment


## Alertness

- Compensates for physical and mental conditions affecting driving
- Gives driving 100 percent of his or her attention
- Stays alert to traffic situations


## Foresight

- Inspects the vehicle before driving it
- Anticipates and prepares for hazards
- Analyzes traffic situations as far ahead as possible
- Preplans the trip


## Judgment

- Looks for alternatives in every traffic situation
- Does not attempt risky maneuvers
- Passes only when it is safe to do so
- Always maintains a safe following distance


## Skill

- Operates the vehicle proficiently and safely
- Performs vehicle movements legally and safely


## Recognizing Hazards

Visual Techniques
Visual lead time

- Visual lead time should be at least 12 seconds in city driving and may in- crease to 20 to 30 seconds for higher-speed driving.
- In bad weather or night driving, never "overdrive" your headlights.



Following distance

## Following distance

- Following distance is the distance that is between your vehicle and the vehicle you are following and that is necessary to stop safely. At any speed in clear weather and on a dry highway surface, an alert driver should allow 1 -second intervals for each 10 feet of vehicle length.
- Use a road sign, tar strip in the road, mile marker, lamppost, or any fixed object as a checkpoint. As the rear of the vehicle ahead passes the checkpoint, start counting. Depending on the vehicle length that is used for the time interval, the front of your vehicle should not pass the checkpoint before you have completed your count. If you do not complete the count, you are following too close to make a safe stop in an emergency.
- If conditions deviate from normal, increase the following distance.
- Allow the same following distance for bicycles, motorcycles, or mopeds as you would for any other vehicles.


## Stopping distance

Stopping distance is the distance a vehicle travels after a driver first recognizes a hazard, reacts to the hazard, applies the brake system, and brings the vehicle to a complete stop.

Stopping distance factors include the following:

- Reaction distance is the distance a vehicle travels from the time a driver recognizes a hazard and the driver applies the brake system (usually about $3 / 4$ of a second).
- Braking distance is the distance a vehicle travels from the time a driver applies the brake system and the vehicle comes to a complete stop. For a large bus critical factors are properly adjusted brakes, correctly inflated tires, and a dry highway surface.

| MPH | Feet <br> (per sec.) | Reaction time <br> (sec.) | Reaction <br> distance <br> traveled (ft.) | Braking distance <br> (after applying <br> brakes) (ft.) | Total stopping <br> distance (ft.) |
| ---: | :---: | :---: | :---: | :---: | :---: |
| 5 | 7.3 | $.75^{\star}$ | 5.5 | 1.2 | 6.7 |
| 10 | 14.6 | $.75^{\star}$ | 11.0 | 5.0 | 16.0 |
| 20 | 29.3 | $.75^{*}$ | 22.0 | 20.0 | 42.0 |
| 30 | 44.0 | $.75^{\star}$ | 33.0 | 45.0 | 78.0 |
| 40 | 58.6 | $.75^{\star}$ | 44.0 | 80.0 | 124.0 |
| 50 | 73.3 | $.75^{*}$ | 55.0 | 125.0 | 180.0 |
| 60 | 88.0 | $.75^{*}$ | 66.0 | 180.0 | 246.0 |
| 70 | 102.6 | $.75^{*}$ | 77.0 | 245.0 | 322.0 |

[^0]
## Stopping distance

## Effects on stopping distance

Road conditions:

- Rain
- Snow or ice
- Gravel, sand, or wet leaves
- Oil

Operator:

- Illness
- Emotional state
- Stress
- Fatigue


## Vehicle:

- Equipment type
- Weight


## Stopping behind other vehicles

- Keep a safe distance when stopping behind another vehicle.
- Allow enough room to maneuver around the vehicle ahead if it should stall. Generally 10 feet is adequate between the bus and a vehicle that is stopped ahead.


Another method would be for the driver to stop far enough behind the vehicle he or she is following so as to be able to see where the rear tires of the vehicle in front meet the highway's surface.

- When the vehicle ahead moves forward, allow a " 2 count" before moving the bus.


## Keeping your eyes moving

- Increase your side vision.
- Maintain a high degree of alertness.
- Check your mirror zones.


## Additional unexpected hazards

- Brake loss
- Tire failure
- Sudden loss of visibility
- Failure of the windshield wipers
- Headlight failure
- Steering failure
- Sticking of the accelerator/throttle
- Distractions from passengers
- Equipment failures


If the driver ahead makes a panic stop, do you have an alternate path of travel?

## Identify, Predict, Decide, and Execute (IPDE)

- This is a systematic method of seeing, interpreting, and responding to the everchanging traffic scene. IPDE can help meet that objective.
- The (I) stands for Identify.
- The (P) stands for Predict.
- The (D) stands for Decide.
- The (E) stands for Execute.



## Safety Circle

The clearance around your vehicle should be maintained so as to prevent collisions: The safety circle is an early warning system consisting of three distinct zones.

- The outer zone is known as the Zone of Recognition:
- The middle zone is known as the Zone of Action.
- The inner zone is called the Accident Zone.


## Sharing the Road

- Leave yourself an escape route.
- Be alert for other drivers who may turn in front of your vehicle.
- Watch for strong winds when passing other vehicles.
- Beware of pedestrians on sidewalks.
- Maintain proper lane position


## "Three Is-a-Crowd"

- Several hazards encountered at the same time
- The defensive action that the driver must take to avoid a conflict
- A planned lateral escape route



## Turns

Proper turns are made up of the following:

- The turning radius of the vehicle
- Proper mirror use
- Avoidance of problem objects
- The turning zone
- The correct turning point


## Right Turns

- Check mirror zones; upper body movement may be necessary to clear blind spots.
- Signal your intention to turn well in advance of the turn.
- Make your approach as close as practicable to the right edge of the roadway.
- Observe traffic controls before attempting to make the turn.
- Check for cross-traffic to the left and right and for pedestrians.
- Check the right mirror zone to ensure clearance of right duals as you turn.
- Adjust your vehicle speed to conditions.


## Left Turns

- Check mirror zones; upper body movement may be necessary to clear blind spots.
- Signal your intention to turn well in advance of the turn.
- Observe traffic controls before attempting to make the turn.
- Reduce the speed of the vehicle.
- Check for cross traffic to the left and right and for pedestrians.
- Yield to oncoming traffic unless otherwise directed by a traffic control signal.
- Enter the appropriate lane.
- Adjust your vehicle speed to conditions.


## Lane Changes

- Cars in any lane may stop for a turn or a delivery.
- Cars behind the bus may speed up to pass the bus.
- Cars in the blind area may try to pass the bus.
- Check mirror zones.
- Activate your turn signals at least 100 feet prior to changing lanes
- Check for traffic in the next lane, behind, to the side of, and in front of the bus.
- Move smoothly into the next lane.
- Cancel your turn signal.
- Maintain a safe following distance


## Passing Stopped Vehicles

- Check mirror zones and activate your turn signal.
- Move into the left lane.
- Pass the vehicle.
- Check mirror zones and activate your turn signal.
- Move into the right lane when you have safely passed the other vehicle.
- Do not leave too much space between you and the vehicle you passed before turning back into the right lane. If you leave too much room, other vehicles may try to pass you on the right.
- Treat cyclists as other vehicles.


## Intersections

Intersection dangers include the following:

- Traffic, signals, signs, and regulations
- Pedestrians
- Cross-traffic
- Drivers that don't obey the laws
- Drivers that turn in front of vehicles


## Steps for Crossing Intersections

- Slow down as you approach an intersection.
- Obey traffic lights and signs, if applicable.
- Check for pedestrians and vehicles.
- Pull up to the corner for a clear view.
- Stop or yield for traffic even if you have the right-of-way.
- Cover the brake as you go through the intersection.
- Be alert and be prepared to stop for yellow lights. Slow, smooth stops can prevent rear-end collisions and injuries to passengers.


## Intersection Rules

- The vehicle that reaches a four-way stop first should proceed first.
- When two vehicles arrive at the same time the vehicle on the right goes first.
- Always give the right-of-way to pedestrians.
- Never insist on the right-of-way.
- Check for adequate room for your vehicle across the intersection before proceeding.


## The procedure for crossing an intersection also includes the following:

Check to the left first.
Check to the right.
Check to the left again
Proceed cautiously with your vehicle under control.

## Merging

- Check mirror zones.
- Signal your intention to merge.
- Look for a gap in the merging lane.
- Adjust speed as necessary to merge safely.
- Recheck traffic in the merging lane with your mirrors.
- Merge with traffic.
- Deactivate your turn signal.
- Adjust speed to the other traffic.


## Freeway Driving

- Watch for lane markings and follow them.
- Change lanes gradually.
- Use the following-distance rule of 1-second intervals for each 10 feet of vehicle length.
- Look for traffic hazards, such as vehicles stopped ahead.
- Travel in the right lane when exiting a freeway.
- Communicate traffic conditions ahead to the vehicles behind you.


## Merging onto a freeway

- Activate your turn signal 100 feet before merging onto a freeway.
- In the acceleration lane, adjust your speed to the flow of the traffic.
- Use your mirrors (and turn your head) to check for traffic.
- Merge smoothly into traffic and then cancel your turn signal.
- Maintain a safe following distance.
- Be aware of vehicles slowing or stopping in the acceleration lane



## Changing lanes on a freeway

- Check for proper following distance between your bus and the vehicle in front.
- Check for space before moving into another lane.
- Signal your movements.
- Gradually steer the bus into the new lane.
- Recheck your mirror and blind spots, and complete the lane change.
- Turn off your turn signal when the bus is completely in the other lane.

Do not reduce your speed when changing lanes.

## Exiting freeways

- Position the bus in the correct lane well before the exit
- Activate your turn signal 5 seconds before reaching the exit.
- Do not slow down while still on the freeway.


## In the deceleration lane:

Begin slowing down by letting up on the accelerator.
Maintain proper following distance.
Activate the stop lamps.

## On the exit ramp:

Slow down to the posted speed. Watch for slower or stopped traffic.


## Railroad Grade Crossings

§22451(b). No driver or pedestrian shall proceed through, around, or under any railroad or rail transit crossing gate while the gate is closed.
§22452(b). Before traversing a railroad grade crossing, the driver of any vehicle described in subdivision (a) shall stop such vehicle not less than 15 nor more than 50 feet from the nearest rail of the track and while so stopped shall listen and look in both directions along the track, for any approaching train and for signals indicating the approach of a train and shall not proceed until he can do so safely Upon proceeding, the gears shall not be shifted manually while crossing the tracks.


Railroad Crossing

## No stop need be made at any crossing:

(1) Of railroad tracks running along and upon the roadway within a business or residence district.


Railroad tracks along and upon the roadway
(2) Where a traffic officer or an official traffic control signal directs traffic to proceed.


Railroad crossing through intersection
(3) Where an exempt sign was authorized by the Public Utilities Commission prior to January 1, 1978


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(4) Where an official railroad crossing stop exempt sign in compliance with Section 21400 has been placed by the Department of Transportation or a local authority pursuant to Section 22452.5. This paragraph shall not apply with respect to any schoolbus or to any school pupil activity bus.

## EXEMPT

[^1]
## 13 CCR 1228

In addition to the provisions of Vehicle Code Section 22452, the driver shall stop the school bus parallel to and as close as practicable to the appropriate edge of the highway, fully open the entrance door on a Type 1 bus or open the window on a Type 2 bus, and then listen and look to ensure that the tracks are clear of an approaching train, and proceed only when the tracks are safe to cross and the door is closed.

## Crossing Railroad Tracks

In addition to the requirements of Vehicle Code Section 22452 and Title 13, California Code of Regulations Section 1228, drivers must:

- Make sure there is adequate space for the vehicle on the other side after the crossing. This will prevent portions of the vehicle from blocking the tracks. This space is referred to as the "queuing area".

- Make sure radios are turned down or off.
- Make sure passengers remain quite during the crossing.
- Avoid stopping on the tracks.
- Be aware of multitrack grade crossings

If there is not sufficient space between tracks to safely stop, proceed


Multitrack railroad grade crossing


Railroad grade crossing multitrack visibility warning

## Mountain Driving

Factors which affect the speed of the bus on mountain roads are as follows:

- Steeper grades
- Longer grades
- Heavier loads
- Road conditions and weather
$11 \%$ grade $=11$ feet drop in elevation for every 100 feet of travel

$$
1 \text { mile }=5,280 \text { feet }
$$

$$
5,280 \text { feet } / 100=52.8 \text { feet }
$$

$$
52.8 \times 11 \text { feet }=580.8 \text { feet }(581)
$$

581 feet drop in elevation in 1 mile for an $11 \%$ grade

Steep grade

## General guidelines

- As a general rule go down the hill no faster than the bus will go up the hill.
- It is essential that the temperature of the vehicle's brakes be kept as cool as possible for the safe operation of the vehicle.
- Establish and maintain a safe target speed.
- Use light brake pressure when needed to maintain the target speed of the vehicle.
- If your brakes start to "fade" due to excessive heat, bring the bus to a stop immediately. If possible, block the wheels. If you cannot block the tires, set the parking brake.
- As the brake drums cool and contract, they are forced in against the brake parts. This action could cause damage and may even keep the brakes from releasing.


## Brake fade

Brake fade is caused by overheating in the brakes. As brake drums heat and expand, the brake shoes have to travel farther. If the slack adjusters have too much slack, the brakes will not work as well as they should. Too much heat also causes the friction material used in brakes to work poorly.

## Braking on downgrades

Brakes get hot, and if there is excessive heat, they will stop working. Excessive heat is caused by trying to slow the vehicle's speed by applying and releasing the brakes repeatedly. As noted above, brakes will fade (lose stopping power) when they get too hot. Brake fade can occur due to the heat buildup caused by repeated brake applications.

When driving down long grades, choose the correct target speed, select the correct gear range, and use the proper braking method.

## "CDL Method"

Once the vehicle is in the proper low gear, the following is a proper braking technique: Apply the brakes just hard enough to feel a definite slowdown. When your speed has been reduced to approximately five mph below your "target" speed, release the brakes. (This brake application should last for about three seconds.) When your speed has increased to your "target" speed, repeat the above steps.

It is always important for the brakes to be adjusted.
However, it is especially important when going down steep grades.

## Target speed

Target speed is the desired speed of the vehicle, as determined by the driver, that permits the vehicle to descend a grade under control. A target speed is established by:

- Observing road signs, such as CURVE AHEAD, TRUCKS USE LOW GEARS, and 7\% GRADE AHEAD.
- Drivers' visual experience
- Experiences of other drivers
- Light brake application


## Retarders

Retarders help slow the vehicle. Retarders work best at higher speeds and may even disengage at 4 to 5 mph . Under poor traction conditions (e.g., snowy or icy roads), the retarder could cause a loss of traction -and possibly a loss of vehicle control.

## Emergency Stops

In an emergency, drivers should not "slam" on the brakes. Doing so could cause the vehicle to skid. Use a steady, even brake pedal pressure which will allow continued rolling friction and the driver to steer or keep the vehicle moving in a straight line:

- Engage the brakes as hard as possible without locking the wheels.
- Do not turn the steering wheel.
- If large steering adjustments are needed or if the vehicle's wheels slide, release pressure on the brakes.
- Brake again as soon as the tires regain traction.


## Curves in the Road

- Observe the roadway ahead for signs and pavement markings indicating the maximum safe entering speed. Hazards can be detected sooner and appropriate action can be taken.
- Approach a curve at a speed that will enable you to negotiate the curve safely.
- Brake on the straight portion of the road. If you brake hard on the curved portion, you could go into a skid.
- Accelerate smoothly as you pass the midpoint of the curve.
- For tight right curves: Keep the left front bumper close to the centerline. This allows the rear wheels to remain on the road's surface.
- For tight left curves: Keep the right front bumper close to the outside edge of the road. This allows the rear wheels to remain on the proper side of the road.
- Maintain a position within the lane (do not change lanes or cut across the centerline).
- Maintain speed throughout a curve by keeping light pressure on the accelerator.


## Night Driving

Night driving presents several problems:

- You can see only 250 feet ahead with your low beams and 350 to 500 feet with your high beams.
- Glare from other vehicles can cause momentary blindness.
- Passengers waiting at the bus stop are hard to see.
- People tend to get sleepy at night.
- Drivers may experience eye strain due to poor lighting.
- It's hard to judge the rate of acceleration of other vehicles on the road.
- A higher percentage of drivers are under the influence of drugs or alcohol.

Proper procedures for driving at night include the following:

- Headlights should be used a half-hour before sunset until one-half hour after sunrise (never drive with only your parking lights on).
- Dim your headlights at least 500 feet from an oncoming vehicle or at least 300 feet from a vehicle you are following.
- Never overdrive your headlights.
- Be sure your windshield is clean.
- Use your high beams (when legal) on open country roads to increase your visibility


## Adverse Weather Conditions

A proper pre-trip inspection of your vehicle is essential to operating safely in adverse weather conditions. Adverse weather conditions include:

- Rain
- Ice
- Snow
- Wind
- Fog
- Smoke
- Blowing sand


## Hydroplaning and Traction

The first rain after an extended dry period is usually the most dangerous. Highways become slick with oil and other substances that are brought to the surface by the rain. When driving in the rain:

- Use defroster equipment to keep your windshield clean.
- Be alert for road spray when passing or following other vehicles.
- Check wiper blades for signs of wear before beginning your trip.
- Check tires for proper tread and air pressure. Problems with either could cause skids.
- Double or triple your following distance.
- Avoid braking hard to prevent skids.
- Watch for stalled vehicles.
- Do not drive through deep water. If you are unsure of the depth of the water, do not go through it. Observe other vehicles going through the water to help determine its depth.
- If you must traverse water at a level that would affect your brakes, keep light pressure on the brake pedal to keep the brake shoes in contact with brake drums or rotors. This will reduce the possibility of water reducing braking ability.


## Winter Driving and Tire Chains

For driving in snow:

- Turn on your headlights.
- Start slowly; release the accelerator if the wheels begin to spin.
- Double your following distance.

If you encounter snow removal equipment:

- Reduce your speed.
- Allow for more stopping distance.
- Watch for sudden movement of the equipment.
- Be alert for snowdrifts.
- Pass only when it is safe to do so.


## Skid Control

Skids occur when tires lose traction with the roadway. This often happens when there is a sudden change in the vehicle's direction or hard braking. Check tire tread and pressure (2/32 rear and $4 / 32$ front minimum).

To prevent skids:

- Reduce speed.
- Use smooth accelerating and braking techniques.
- Avoid quick movements.
- If you start to loose traction, do not brake hard!

To recover from a skid follow these steps:

Once the bus is heading in the direction that you want to go, continue to reduce speed in order to prevent another skid.

The bus will continue to recover and to travel in the direction that you want the bus to go. If you steer too far to the right to recover, you may cause the bus to go past straight and "fishtail" to the right.

The bus will begin to recover. Continue to look and to adjust your steering in the direction you want the bus to go.

Countersteer and look in the direction you want the bus to go.

The back end of the bus skids to the left. The bus is now moving forward on an angle. Do not brake. Use the accelerator to maintain power to the rear wheels.

The bus is heading straight.


## Smoke and Fog

When driving in smoke or fog:

- Drive with your low-beam headlights to reduce glare.
- Reduce your speed.
- Increase your following distance.
- Be prepared to make sudden stops for stalled or stopped vehicles.
- Be aware of the freeway fog marker system


## Glare

Be prepared for glare in the early morning and late afternoon. Tips for dealing with glare are the following:

- Check the operation of your sun visor during the pre-trip inspection.
- Use a sun visor and sunglasses.
- Reduce your speed.
- Increase your following distance.


## Parking Lots

In parking lots watch for:

- Drivers speeding up to cut you off to get parking spaces
- Drivers rolling through stops
- Drivers entering through the exits
- Pedestrians walking between cars or down the rows


Drivers backing up without warning

## Aggressive Driving

Drivers that are angry or violent have become a greater problem in our state. Below are suggestions for avoiding confrontations:

- Do not retaliate.
- Don't make eye contact with an angry driver.
- Be polite and courteous.
- Slow down and relax.
- If another driver harasses you, contact law enforcement or drive to a police station.


## Summary of Defensive Driving Strategies

For visibility concerns:

- Increase your following distance.
- Increase your side clearance.
- Avoid quick movements.
- Do not brake hard (braking hard can cause rear-end collisions).
- Turn on your headlights.

With regard to traction procedures:

- Accelerate and brake smoothly.
- Begin to brake sooner.
- Avoid quick movements.
- Increase your following distance.
- Increase your side clearance.

Defensive Driving Factors $\qquad$Visual Lead Time $\qquad$Following Distance $\qquad$
Stopping Distance $\qquad$Stopping behind other vehicles $\qquad$Other Hazards $\qquad$
 IPDE $\qquad$Safety Circle $\qquad$

Sharing the Road $\qquad$
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Three Is A Crowd
$\qquad$
Turns and Lane Changes
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Intersections
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Passing Moving and Stopped Vehicles
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Merging
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Skid Control $\qquad$
Aggressive Driving $\qquad$

Parking Lots $\qquad$
$\square$ Parking stalls


[^0]:    * or $3 / 4 \mathrm{sec}$.

[^1]:    YELLOW BACKGROUND - BLACK BORDER AND LETTERING

