

Idaho Driver Education and Training



Strategies for Negotiating Hills and Curves

DRIVING THROUGH CURVES

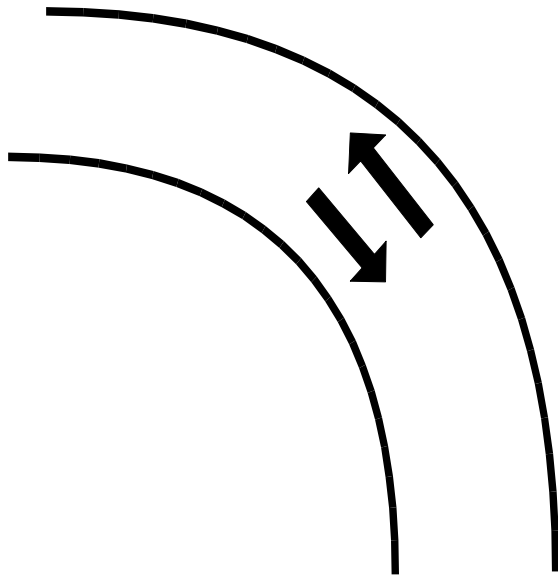
Curves Come in a Variety of Designs

Curves have a higher risk because there are many line-of-sight restriction and/or path-of-travel restrictions such as:

- **Trees**
- **Buildings**
- **Hills**

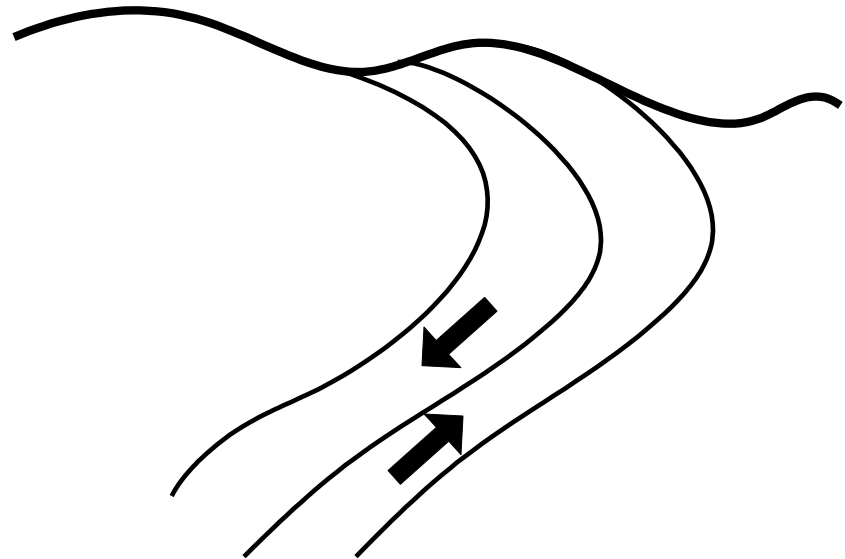


TYPES OF CURVES



Constant Radius

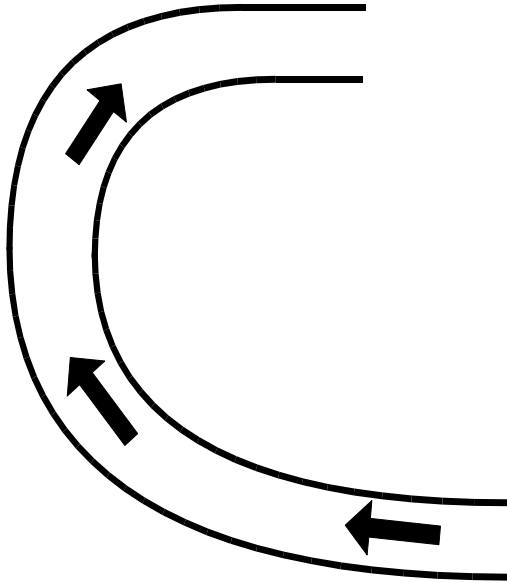
- Follows the circumference of one or more circles
- Line-of-sight less restricted



Uphill/Downhill

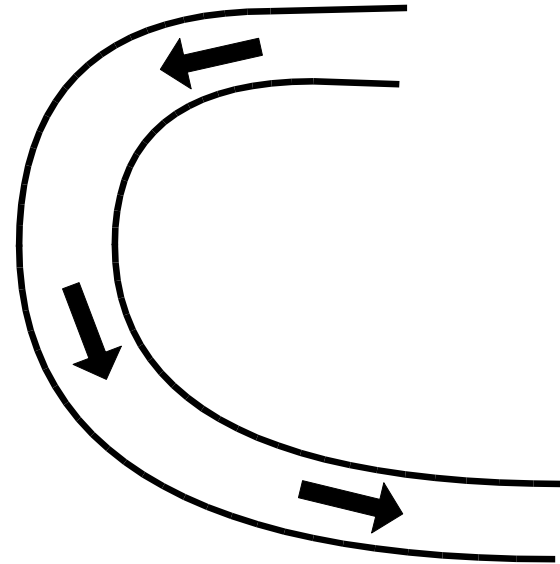
- Uphill: acceleration is needed to maintain speed
- Downhill: vehicles will naturally pick up speed

TYPES OF CURVES



Decreasing Radius

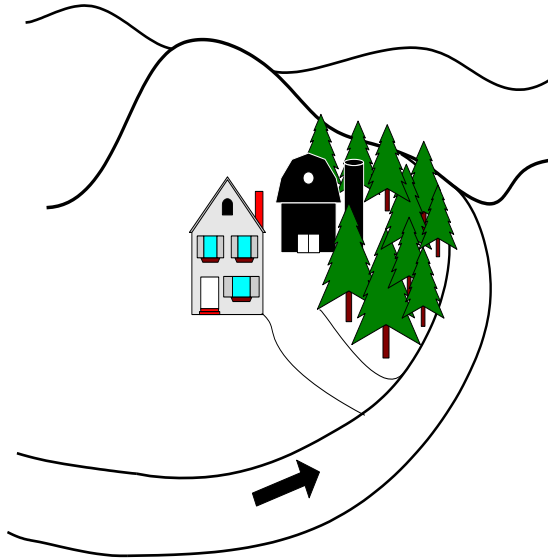
- Curve gets tighter requiring more steering adjustments



Increasing Radius

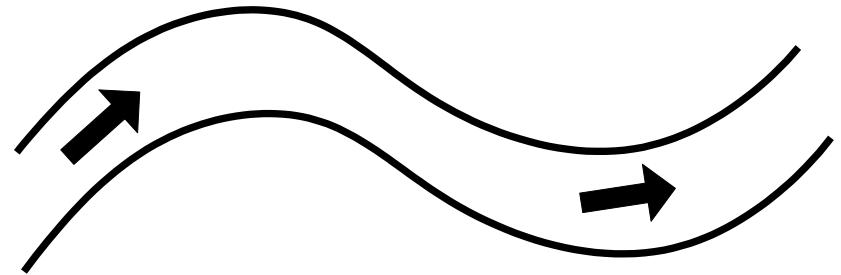
- Curve is sharper when you enter it and less sharp at the exit

TYPES OF CURVES



Blind Curve

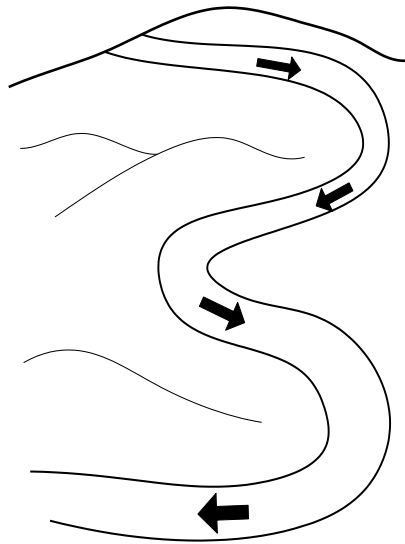
- Only a portion of the corner is visible; the rest is hidden



S-Curve

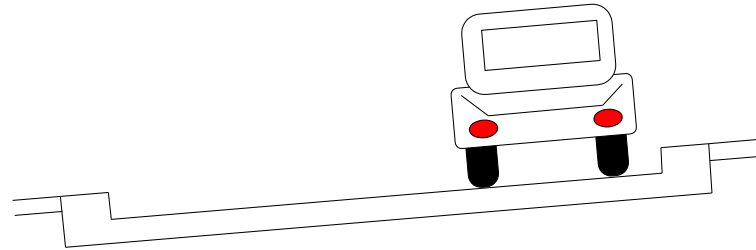
- A curve in one direction with a second curve in the opposite direction

TYPES OF CURVES



Winding Road

- A series of curves



Banked Curve

- One side of the curve is higher than the other side to help vehicles through the curve such as freeway entrances
- Some curves have negative banking that can create less traction

SEARCHING FOR CURVES

Search Far Ahead

- Searching far ahead is good; seeing the end of the curve is better
- If the target range shows trees, bushes, and grass – there's a curve

When approaching a curve, ask:

- Does the roadway curve left or right?
- Can the exit be seen?
- How sharp is the curve?
- What is the lane width, shoulder conditions, posted speed, advisory speed, and traffic volume?
 - What other questions should be asked?



SEARCHING FOR CURVES

After seeing a curve:

- Check the rear zone
- Check left, front, and right zones
- Search into the curve and evaluate the path of travel before turning the steering wheel
- Search for traction conditions
- Determine the best speed



Photos courtesy of AAA Foundation



Signs and Markings

Interpret warning signs

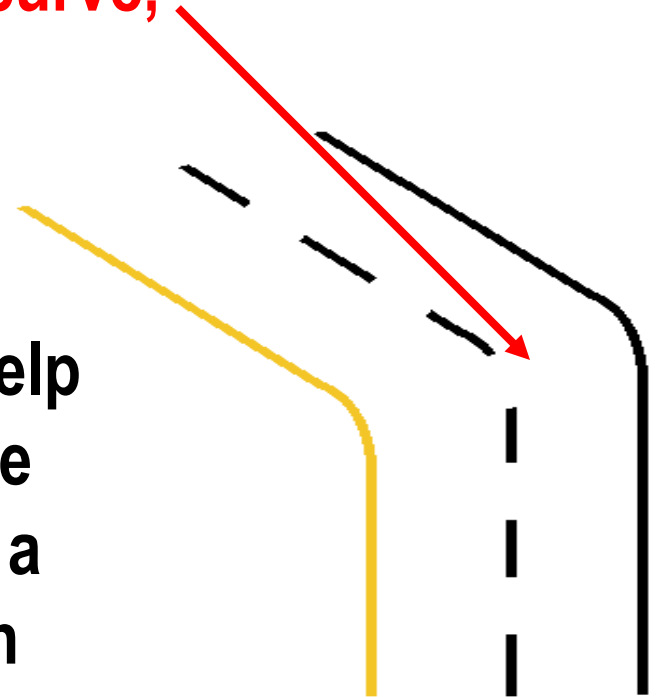
- Know their meaning



The Apex

The Apex is about the **middle of the curve**, closest to the inside edge of the turn

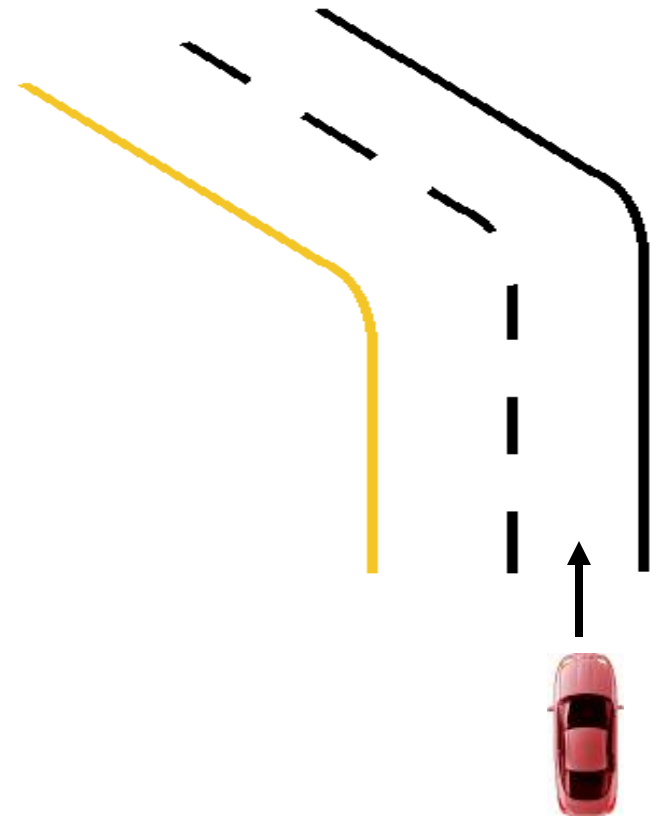
- Select a path of travel that will help “straighten out” the curve — use the Apex as a tool to help select a safe path of travel through a turn



The Apex

When searching, evaluate the condition of the Apex to determine the best lane position at the Apex

- Identify road surface and traction conditions
- Mountain roads often have rocks and boulders that could affect path of travel in the Apex
- Identify other drivers and their path of travel



FORCES AT WORK IN CURVES

Vehicle Weight Transfer

- Curves can be dangerous places
 - Centrifugal force must be overcome as it pulls the vehicle to the outside of the path
 - Higher speeds create more pulling force that must be overcome
 - Excessive speed in curves is the cause of many crashes as drivers are often unable to maintain their path of travel



Photo courtesy of AAA Foundation

FORCES AT WORK IN CURVES

Vehicle Weight Transfer (Cont.)

- As a vehicle travels through a curve, inertia works on the vehicle along with pitch, roll, and yaw
- The goal is to keep the vehicle in controllable balance throughout the curve
- Smooth, controlled steering is needed



FOUR STEPS FOR DRIVING THROUGH CURVES

Good cornering techniques combine braking, steering, acceleration, and visual skills:

- Reduce the amount of sudden braking, acceleration or steering
- Read the curve to determine the type and condition of the curve
- Be aware of effects of vehicle load and driver control

How well a vehicle performs in curves depends upon :

- Speed and weight
- The sharpness of the turn
- The pavement condition
- The driver's skill



FOUR STEPS FOR DRIVING THROUGH CURVES

1. When Approaching Curves

- Select a lane position that will help straighten out the curve while keeping a good separation from oncoming traffic and roadside conditions



- Check front and rear zones
- Select the best lane position requiring the least amount of steering
- Reduce speed (if needed) before the turn with controlled braking
- Avoid hard braking while in a curve

FOUR STEPS FOR DRIVING THROUGH CURVES

2. Turn the Head and Look Through the Curve

- Use visual control by turning the head and looking all the way through the curve as far as possible to the exit of the curve
- If the exit is not visible, evaluate speed – is a lower speed needed?
- Evaluate the new target area



Determine which steering technique is best: push/pull or hand-over-hand?

FOUR STEPS FOR DRIVING THROUGH CURVES

3. Speed Control

- Going downhill:
Downshift to a lower gear and let the transmission help control speed
- Going uphill:
Accelerate to maintain speed



Describe the front zone conditions in this San Diego street scene.

FOUR STEPS FOR DRIVING THROUGH CURVES

3. Speed Control (Cont.)

- **Controlled Braking:**
 - Used prior to the curve
- **Threshold Braking:**
 - Used when maximum braking force is needed prior to the curve (What was insufficient if hard braking was needed?)
- **Trail Braking:**
 - Used when braking is carried into the curve, trail brake to the apex to maintain steering control
- **Acceleration:**
 - Begins when about halfway through the curve or when the exit can be seen



FOUR STEPS FOR DRIVING THROUGH CURVES

4. Lane Positions

Lane selection for entering, driving through, and exiting is important for maintaining vehicle balance and control

- **Oncoming Traffic:**
 - Create as much separation as possible
- **Left Curve:**
 - On narrow rural roads, left curves create special problems; oncoming drivers may go over the centerline as a result of inattention or inertia
 - Enter in LP3 for the best LOS
 - If the right front zone is closed, use LP1
 - At the Apex, take LP1 for separation from oncoming traffic and exit in LP1



FOUR STEPS FOR DRIVING THROUGH CURVES

4. Lane Positions (Cont.)

- **Right Curve:**
 - Enter the curve in LP2 for the best LOS and increasing visibility to oncoming drivers
 - Be aware of the inertia forces that must be overcome
 - At the Apex take LP3 if the right front zone is open; take LP1 if the zone is closed (rocks, debris, etc.)
- **Exiting the Curve:**
 - Select the best lane and speed
 - LP1 is used when ideal conditions exist
 - Evaluate the new target area



HILLS AND MOUNTAINS

Characteristics

Idaho has over 50 mountain ranges and many areas of rolling hills



- **A hill can rise and descend gently or, can be part of a mountain range**
- **Gravity is every driver's passenger when traveling up and down hills**

HILLS AND MOUNTAINS

Characteristics (Cont.)



- **Switchbacks:**
 - Hairpin turns switch back and forth
 - Trucks and buses can obstruct the LOS and may need space to complete the curve

HILLS AND MOUNTAINS

Characteristics (Cont.)

- Slow Moving Traffic
 - For slow moving traffic some areas have pull-out places about 2,000 feet long, allowing faster moving traffic the opportunity to pass safely
 - If three or more vehicles are being held up by a slower moving vehicle, Idaho law requires pulling over to allow faster moving traffic to go ahead



HILLS AND MOUNTAINS

When driving on mountain roads, be sure the brakes, windshield wipers, defroster, heater, and exhaust systems are all in good working order

Idaho has several steep grades such as Homestake Pass in Butte — The grades range from 6-7 percent



Photo courtesy of AAA Foundation

HILLS AND MOUNTAINS

Effect of Altitude on Drivers

- The lower amount of oxygen can:
 - Increase heart rate
 - Create shortness of breath
 - Cause headaches
 - Reduce concentration
 - Cause drowsiness
 - Ear Popping
- When any of these symptoms are experienced, pull over and rest, change drivers, or select a route with a lower elevation
- Driver fatigue can increase these symptoms



HILLS AND MOUNTAINS

Effect of Altitude on Vehicles

- Higher elevations can reduce available horsepower, causing the vehicle to not perform as well at 10,000 feet as it does at sea level

Thinner mountain air can affect a vehicle by:

- Making it easier to overheat
- Making it easier to stall
- Causing sluggish acceleration
- Reducing pulling power for uphill driving



Photo courtesy of AAA Foundation

HILLS AND MOUNTAINS



TEMPERATURE GAUGE

Effect of Altitude on Vehicles (Cont.)

- Check gauges regularly
- Overheating? Turn off the air conditioner and turn on the heater to pull some of the heat from the engine
- If the engine needs cooling, find a safe place and pull off to the side and park, keeping the car at a fast idle
 - Do not shut off the engine and never remove a hot radiator cap
 - Let the engine idle to see if it will start cooling off
 - Vapor lock could occur if the vehicle is turned off when very hot; the engine will not start again until it has cooled off

HILLS AND MOUNTAINS

Approaching Uphill — Searching

- **Search** 12-15 seconds ahead for advisory speed signs, oncoming traffic, road conditions for traction control, and slow moving vehicles
- **Identify** if the hill has curves and determine the type of curve for decision-making about speed and lane positions



- If there is a LOS, use LP1
- On narrow or one-lane roads, downhill yields to uphill traffic

HILLS AND MOUNTAINS

Approaching Uphill — Speed Control

- **Extra power may be needed to maintain uphill speed**
 - **Start acceleration at the bottom of the hill to maintain momentum**
- **Slower moving vehicles travel in the right-hand lane**



HILLS AND MOUNTAINS

Approaching Uphill — Passing Lane

- Some hills and mountains provide a center lane for passing for faster moving vehicles going up hill
 - Some passing lanes are restricted for use by the uphill driver
 - Some passing lanes may be marked for both uphill and downhill users



Two lanes going up hill provide for a passing lane for faster-moving vehicles

HILLS AND MOUNTAINS

Cresting the Hill

- When possible, look over the hillcrest for an open POT
- Stay in LP1 at the crest
- Be prepared to move to LP3 if there is a POT restriction or hazard



What potential hazards could exist on the other side of the hill crest?

HILLS AND MOUNTAINS

Descending the Hill — Speed Control

- Speed control is essential to overcome gravity that will make the vehicle go faster
 - Downshift and use the transmission to reduce speed and help keep brakes from overheating
 - Avoid riding the brakes
 - Idaho Law: coasting downhill is illegal



What are the clues in this scene that describe the roadway conditions?

HILLS AND MOUNTAINS

Descending the Hill — Speed Control (Cont.)

- Heavier vehicles will pick up more momentum as speed increases
- Turn off the cruise control
- Brakes out of adjustment will not brake as efficiently
- Check the rear zone for vehicles that may be having trouble controlling speed

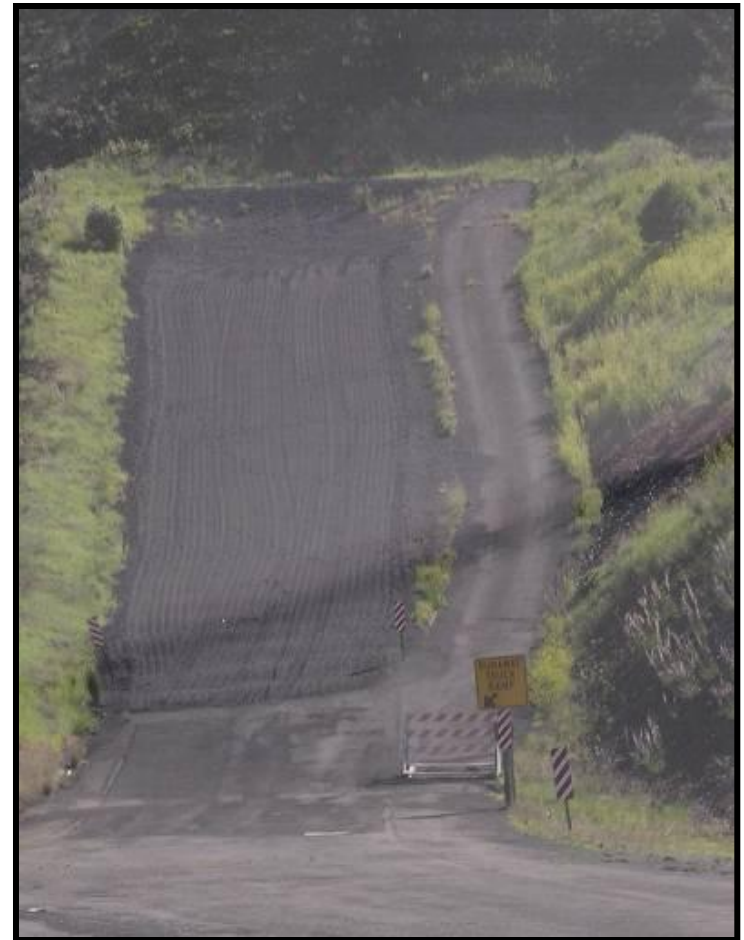


Did the pickup truck driver make a legal, safe passing maneuver?

HILLS AND MOUNTAINS

Descending the Hill — Runaway Ramps

- Runaway ramps are designed and restricted to large trucks that lose braking control on steep hills
- These sections have deep gravel, sand barrels and other materials to help slow down the runaway
- Pull off the road; give the runaway maximum room





Starting on Hills — Automatic Transmission

- **Some steep hills require using the accelerator and brake together to keep the vehicle from rolling back**
- **Before starting, check that the parking brake is on**
- **Maintain brake pressure until ready to move**
- **Use the right foot to accelerate and simultaneously slowly release the parking brake**



Starting on Hills — Manual Transmission

- **Maintain brake pressure until ready to move**
- **Ease off the clutch to the friction point while slowly and fully releasing the parking brake**
- **Ease off the brake and accelerate smoothly with controlled acceleration**

HILLS AND MOUNTAINS

Stopping Uphill — Manual Transmission

- Use left foot to disengage the clutch
- Use the right foot to brake to a stop
- When turning off the engine, set the parking brake and shift to 1st gear or reverse



HILLS AND MOUNTAINS

Stopping Uphill — Automatic Transmission

- Squeeze the brake until stopped
- Keep the foot on the brake while stopped
- When turning off the engine, set the parking brake

