Basic Emergency Vehicle Operators Course

High Speed Driving

High Speed Driving

Objectives:

By the end of this module, students will be able to:

- **Be able to understand the physics involved with High Speed Driving**
- **Be able to identify a properly & improperly banked road**
- **Be able to properly select the safest path of travel thru a curve**
- **Understand how to negotiate a curve at High Speed**

High Speed Driving

Guidelines:

- **Some emergencies may require high speed EV operation**
- **Operation at speeds over the posted limit requires a high degree of skill and sound judgment.**
  - **This requires an additional higher level of training**
- **Provide the knowledge and techniques for:**
  - **Driving on a curved or winding road at a safe speed**
- **Pursuit Driving will be covered under the POLICE Module**

High Speed Driving

Primary Rules:

- **Don’t drive faster then your abilities**
- **Observe posted speed limits and allow for conditions which make lower speeds necessary**
- **Don’t let the siren control your right foot**
- **Avoid BRAKE FADE**
- **Slowing down from a High Speed**

High Speed Driving

Curves & Limits Imposed by the Laws of Physics:

The tighter the curve the slower the EV must go.

It is the operators job to control speed.

If the speed in a curve is too great

PHYSICS WILL WIN!

High Speed Driving

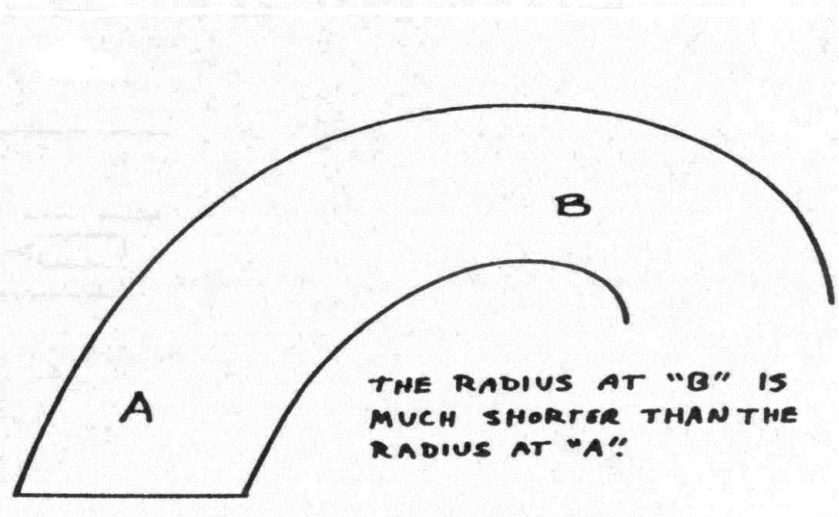
Curves & The Basic Laws of Physics:

- **In turns centrifugal force quadruples as speed doubles**
- **When the centrifugal force is high enough the vehicle cannot follow the curve on it's intended path.**
- **For every curve there is a maximum speed for successfully negotiating the turn.**

High Speed Driving

Factors EV Operators Must Be Aware of When Dealing With Curves:

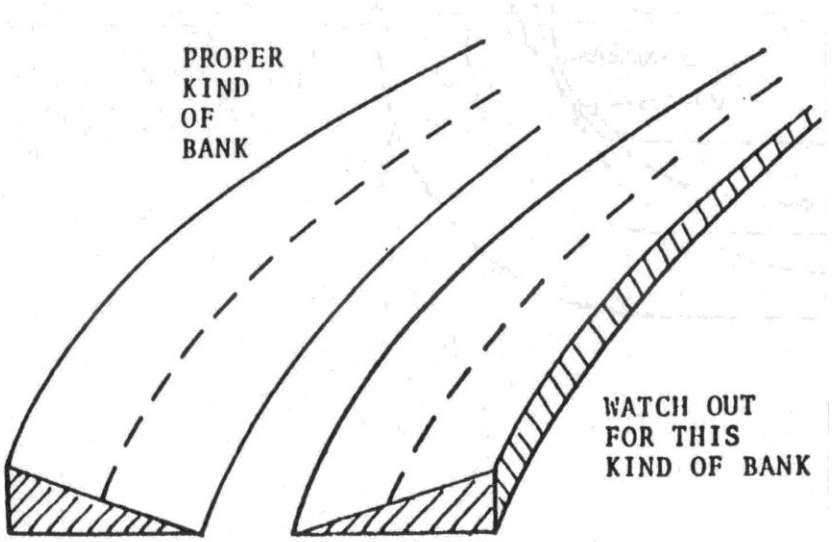
- **Local Road Familiarity**
- **Banked Curves**
- **Decreased Radius Curves**
- **Curves that crest hills**
- **or lead to an intersection**



High Speed Driving

Banked Curves

- The road should slant down towards the inside of the curve
- Improperly banked curves
  - Older roads



High Speed Driving

Things EV Operators Should Consider

- **The Road Surface**
  - **Is it narrow**
  - **Cracks / Ruts / Potholes**
  - **Soft Shoulders**
  - **Change in traction**
- **Curve Speed**
  - **Complete braking before entering the curve**
  - **Look for skid marks as an indicator of curve radius**

High Speed Driving

Techniques for negotiating curves at high speed

- **Three Key Points**
  - **Entry Speed & Vehicle Position**
  - **Speed through the curve**
  - **Exit Speed & Vehicle Position**

High Speed Driving

Entry Speed & Vehicle Position

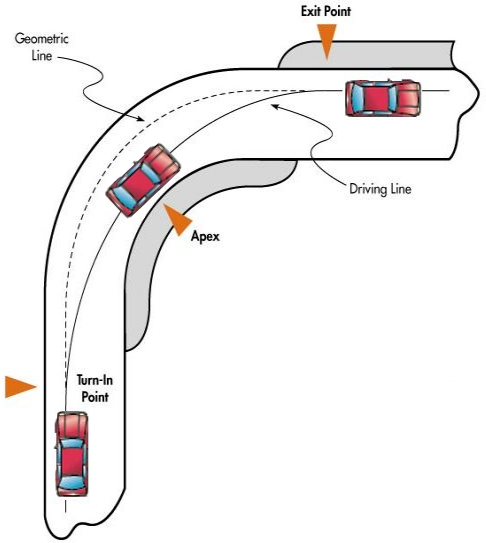
Brake or decelerate to the proper entry speed before entering the curve.

The proper speed is different for every curve

Enter the curve as far to the outside of your lane as possible

Entering on the outside of the curve effectively increases the radius of the track for the EV.

The greater the radius, the safer the EV can take the curve.



High Speed Driving

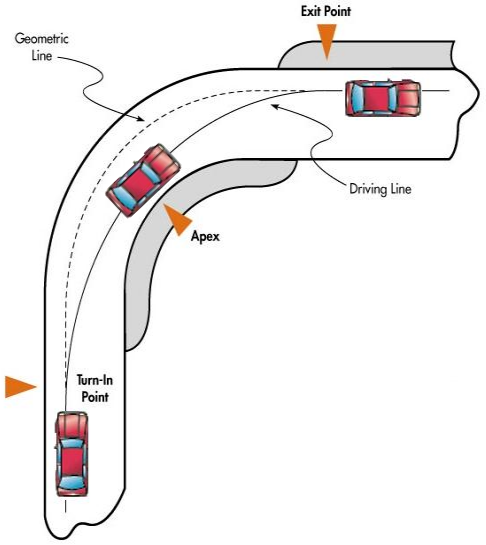
Entry Speed & Vehicle Position

Begin the turn as early as possible

Inexperienced drivers invariably go “too deep” into a curve before starting to corner the vehicle.

Establish an apex (when beginning the turn) at the last part of inside road edge (or centerline) that can be seen from the entry point.

The apex is the point on the inside of the curve where the vehicle comes closest to the road edge or centerline

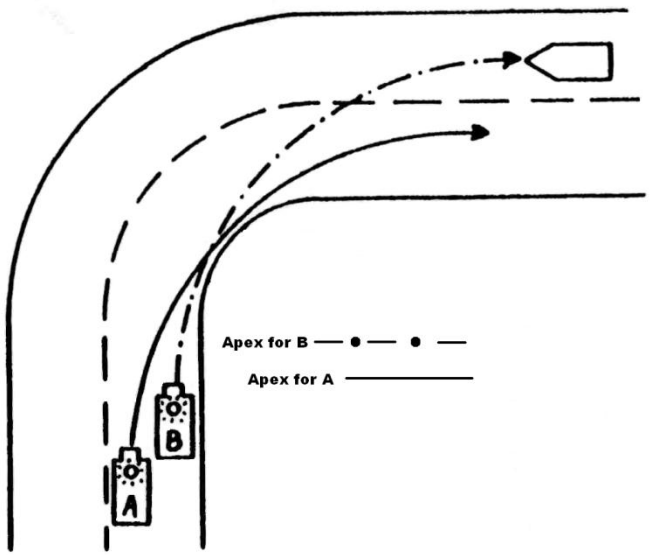


High Speed Driving

Entry Speed & Vehicle Position

The assumed speed and the radius of the vehicle track for both vehicles (A & B) are identical.

Vehicle "A" has started entry <u>early</u> and on the <u>high</u> side.



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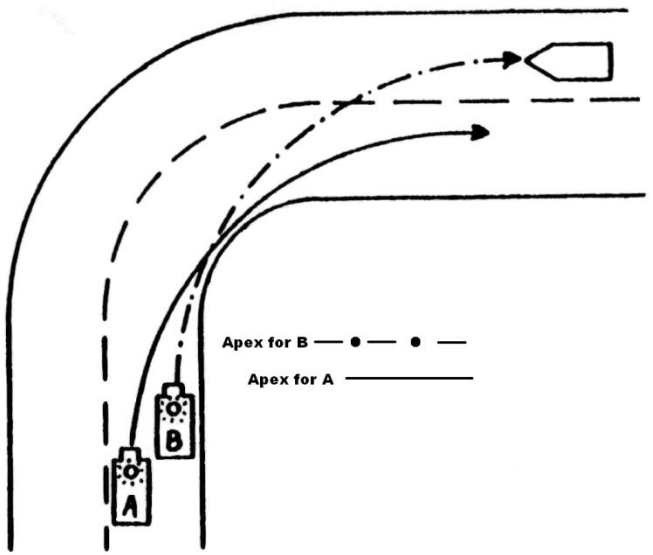
Entry Speed & Vehicle Position

The apex for vehicle “A” is further along the curve than the apex for vehicle “B”.

Vehicle “B” is going to have a serious crash

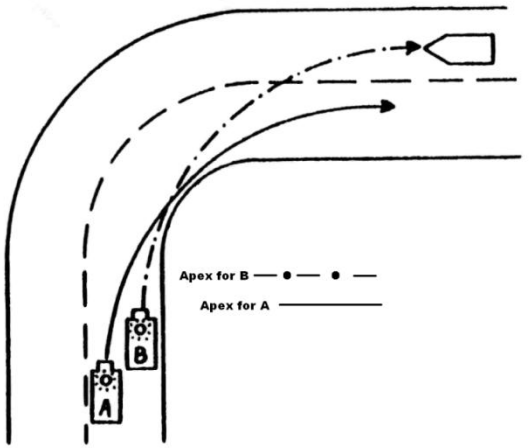


High Speed Driving

Speed Through the Curve (In the Curve)

The EV should be in the groove by the time the apex is reached

The EV suspension <u>is set</u> for cornering in a constant radius

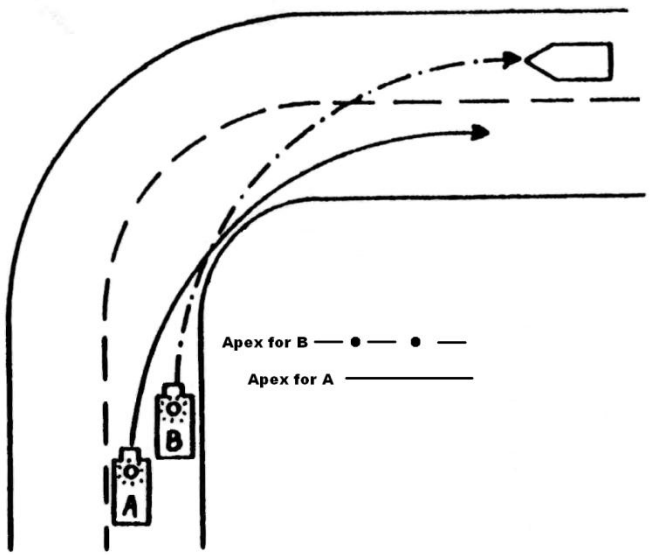


High Speed Driving

Speed Through the Curve (In the Curve)

The EV is close to the inside edge of the curve

Once in the groove, apply slight power in the curve to maintain speed.

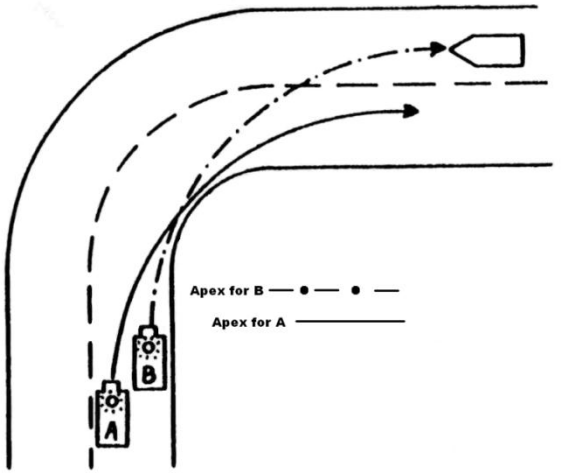


High Speed Driving

Speed Through the Curve (In the Curve)

Apply steady acceleration carefully

Too much power at the drive wheels can result in loss of steering control, or cause the rear wheels to spin and lose traction

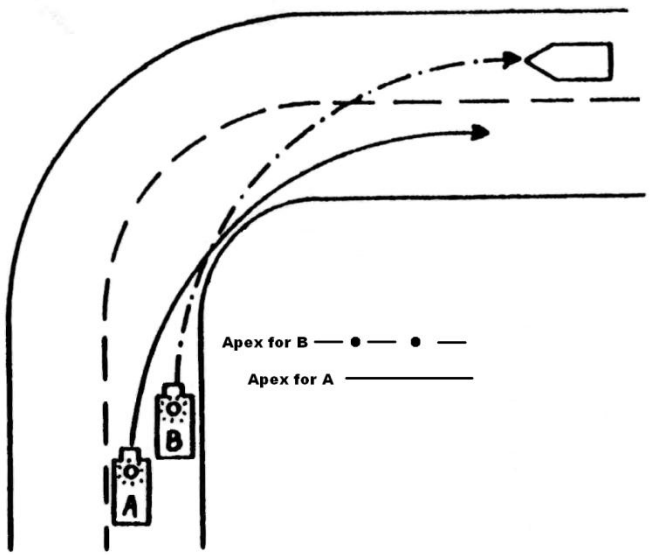


High Speed Driving

Speed Through the Curve (In the Curve)

Never try to gain speed beyond the established maximum safe speed for the curve

For most combinations of vehicle characteristics, road conditions, radius of curves, and speed; an increase of just three miles per hour over the safe speed can cause complete loss of control.



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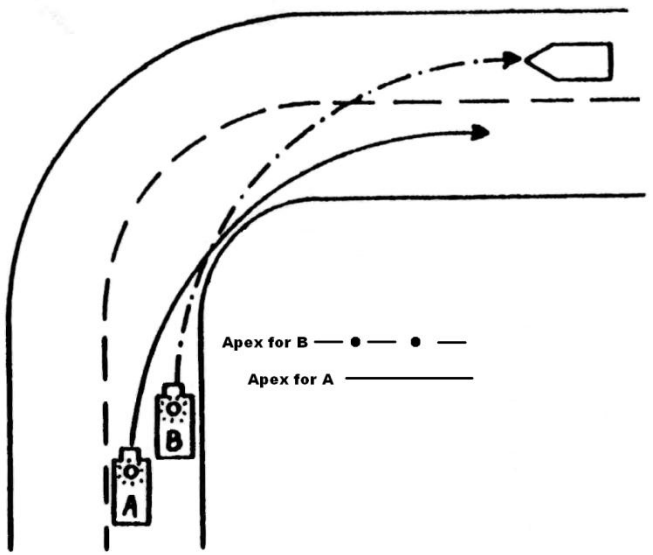
Exit Speed & Vehicle Position

Establish the widest position or larger radius

Accelerate out of the curve after the apex has been reached

Proper exit from a curve to a straight road is where good drivers gain time.



High Speed Driving

Exit Speed & Vehicle Position to Another Curve

- **Establish an apex for the next curve**
- **Start the process over again**
- **If the radius for the next part of the curve is tighter, the operator must slow down before tightening the EV's turning radius**
- **If possible, let the scrubbing action of the tires do the slowing. Avoid hard braking if at all possible**

High Speed Driving

Slowing from High Speeds

Braking distance increases dramatically with increased speed

When speed is doubled braking distance quadruples.

High Speed Driving

Slowing from High Speeds

Techniques for slowing from high speed:

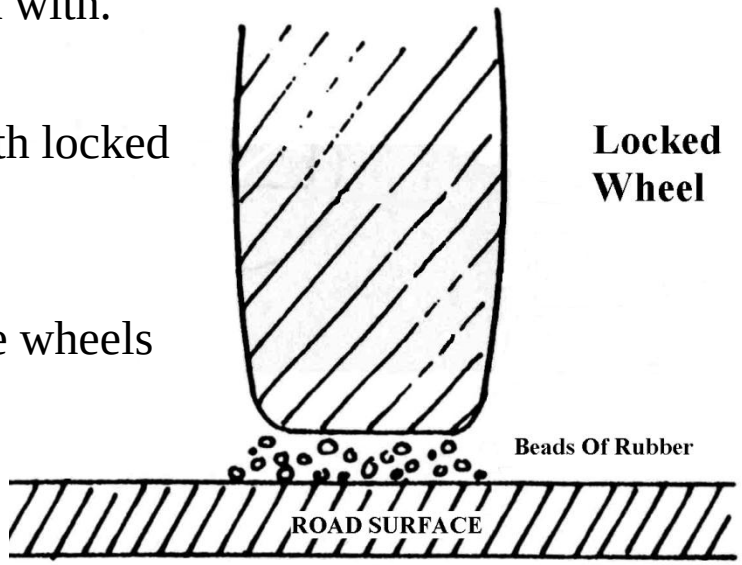
- Do not ride the brakes – brakes are mechanical devices and should not be abused
- The laws of physics apply always, particularly the generation of heat in reducing speed, at the brake rotor.
- Overdo it and the physics will make the EV's brakes useless
- Be particularly cautious of long downhill grades
- If possible use a lower gear instead of the brakes

High Speed Driving

Stopping from High Speeds

Techniques for stopping high speed:

- Braking systems are different, know the type braking system you vehicle is equipped with.
- You never want to lock the wheels.
- Stopping distance may be increased with locked wheels
- Directional control may be lost.
- Beads of rubber may build up under the wheels causing loss of traction.

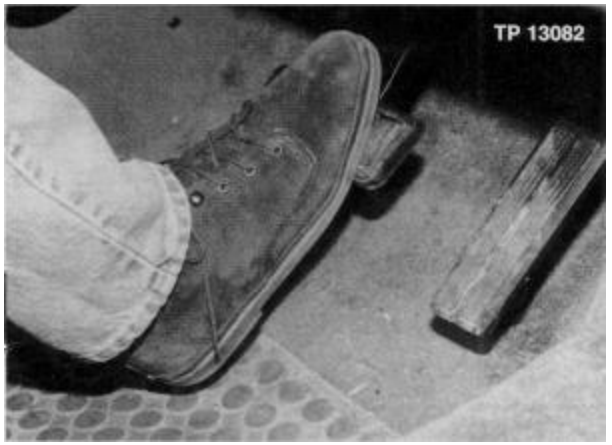


High Speed Driving

Stopping from High Speeds

Techniques for stopping high speed:

- Use only the right foot for braking
- When a stop is imminent. “cover” the brake with the right foot (toes only)
- Don’t risk brake fade by riding the brake
- Always use a smooth braking motion
- Use “threshold” braking
- Keep pressure on until the desired reduced speed is reached



High Speed Driving

Agency Particularities:

- **Police**
- **Fire**
- **EMS**

High Speed Driving

Agency Particularities:

- **Police**
  - **Code Response**
  - **Traffic violators (RADAR)**
  - **Pursuit**

High Speed Driving

Agency Particularities:

Fire

Large, heavy fire apparatus are especially difficult to control at high speed.

High Speed Driving

Agency Particularities:

EMS

An ambulance/rescue vehicle with a patient aboard should never travel over the posted limit

High Speed Driving

Summary

The EV operator should always attempt to drive in a manner which will not require the use of collision avoidance maneuvers. However under response conditions that involve speeds above the posted limit, the potential for collision avoidance maneuvers increases.

REVIEW QUESTIONS

1) When stopping from high speeds an EV diver/operator should never do what with the brakes?

2) When should you begin to accelerate when heading out of a curve?

3) What are three key points for negotiating a curve at high speed?

4) When your speed doubles your braking distance does what?

5) What should your entrance position be in the beginning of the curve?