

Emergency Vehicle Incident Prevention Program – EVIP

Vehicle Operations

PREFACE

This Training Guide has been reproduced verbatim in its entirety from the Student Manual developed for the Emergency Vehicle Incident Prevention Program by the Washington State Association of Fire Chiefs in February, 2008. The requirements for the Emergency Vehicle Incident Prevention Program are based on the National Fire Protection Association 1002, Standard for Fire Department Vehicle Driver/Operator, 1993 Edition, and Washington State Department of Licensing.

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It is the policy of Washington State that no person shall be denied, on the basis of race, sex, creed, national origin, age, handicap or veteran status, any of the rights and privileges accorded citizens of the United States in the recruitment and registration as students in vocational preparation and supplementary community college districts, state agencies or other community based organizations who receive federal, state or local vocational education funds.

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Chapter 1: Some Legal Aspects of Emergency Vehicle Operations

DEFINITIONS

Whenever one of these terms appears, it should be understood to mean the following:

- **Emergency Mode**
When an authorized emergency vehicle, operating with emergency warning devices (lights and sirens) activated, is on a mission involving a (possible) life-threatening situation.
- **Emergency Vehicle (EV)**
Any vehicle which is legally authorized to operate in the emergency mode. The vehicle is an emergency vehicle whether or not it is operating in the emergency mode.
- **Emergency Vehicle Operator**
A person who is authorized to drive an emergency vehicle in the emergency mode.
- **Emergency Service**
Police and volunteer or salaried fire rescue and ambulance personnel.

INTRODUCTION

As an EV operator, you will have three types of regulations to follow:

- Motor vehicle and traffic laws enacted by the state government
- Local ordinances (e.g., local speed limits)
- Departmental policy about what you as an EV operator may and may not do

It is important that you understand the following basic principles of EV operation before considering the specific statutes which apply in Washington State:

- The **operators of all EV's are subject to all traffic regulations unless a specific exemption is made** in the state or local statutes. The specific exemptions made in the statutes refer to an EV **only when it is operated in the emergency mode.**

- Even when a specific exemption is made under the relevant statute, **you can be held criminally and/or civilly liable for your actions** should you become involved in an accident where property damage, injury, or loss of life occur.

How often do you think about your driving habits? Do you want to be the driver of a vehicle that takes a life while responding to a situation with the opportunity to save one? No one wants to risk a career for that one moment when control of a vehicle or situation is not maintained.

THE LAW APPLIES TO ME

There is an old phrase often used in driver safety course, **“The law applies to me.”** Remember that the next time you are tempted to take a chance. Condition yourself, because the law and all implications apply to you, not just the other guy.

“THE BIG PRINT GIVES IT TO YOU, the little print takes it away”

Congress, the State Legislature, and local government prepare laws which give us the authority to operate and exceed certain rules which govern the general public. Where the operations involve risk, this is also provided for. They pass the buck, or risk, back to us. That risk should cause us to govern ourselves with “due regard for the safety of all persons.”

THE BIG PRINT

Do you know that while responding to an alarm, you may: (reference RCW 46.61.035).

- Park or stand your vehicle irrespective of all other laws to the contrary.
- Proceed past red lights and stop signs.
- Exceed the maximum speed limits.
- Disregard regulations governing the direction of movement of traffic or turning in specific directions regardless of posted signs or regulations to the contrary.

Sounds far-reaching, doesn't it? It sure is. How would we ever operate without those latitudes? It simply makes sense that to respond to an emergency where seconds count, we must be allowed some leeway.

“The little print”

Do you know that the last paragraph of the law that allows us all those necessary latitudes also places the responsibility to drive safely right squarely in our lap? [reference RCW 46.61.035 (4)].

5. “the foregoing provisions shall not relieve the driver of an authorized emergency vehicle from the duty to drive with due regard for the safety of all persons, nor shall such provisions protect the driver from the consequences of his reckless disregard for the safety of others.”

NO INSULATION FROM LIABILITY

Section 4.96.010 of the Code of Civil Procedure, in effect, provides that all political subdivisions will be liable for damages arising out of their tortuous conduct or the tortuous conduct of their officers, agents, or employees, to the same extent as if they were a private person or corporation.

THE LITTLE PRINT

That may be “little print,” but it surely carries a tremendous amount of weight in a court of law. And you can bet that if you are involved in a serious accident, which ends up in court, you are going to hear the other side’s attorney use those very words against you. And if you did not use good judgment or even if the jury can be led to believe you didn’t, it’s going to cost you dearly. Remember, “**The law applies to me.**”

RESTRICTIVE LAWS AND INTRODUCTORY REMARKS

Most of the laws and regulations that govern firefighters are restrictive. They place upon us the responsibility to perform certain tasks in a safe way. They cover the condition, the use of our equipment, and the manner in which we may operate it. Failure to comply with these laws makes us the target for a lawsuit if we are involved in an accident and even subject to a fine if we are found to be operating unsafe equipment. There are also laws, which give us the authority to direct others; these laws guide the general public as to how they must govern themselves at or around the scene of an emergency. But remember, the end liability could well rest on our shoulders.

By way of introduction to the legal aspects, the following is just a partial list of those laws and regulations with a reference number. The laws come from the Revised Code of Washington, the Vertical Standards for Firefighters, and the General Safety and Health Standards (horizontal standards) adopted by the Department of Labor and Industries. Our remarks following the reference indicate intent.

46.04.040 “Authorized Emergency Vehicles” spells out which vehicles may be considered “authorized.”

46.32.060 “Moving Defective Vehicle Unlawful -----Impounding Authorized.” No vehicles, not even emergency vehicles, are exempt from inspections while on public roads. Law officers have the authority to stop, inspect, and prevent you from moving your vehicle further. They can also impound it if it is defective. No exceptions are made.

46.37.005 “Commission on Equipment-----Powers and Duties.” The State Commission on Equipment is authorized to adopt rules and regulations for certain types of equipment on vehicles.

46.37.010 “Scope and Effect of Regulations-----General Penalty.” It is a misdemeanor to operate an unsafe vehicle as defined by state law on the highway. Nothing in the law exempts emergency vehicles from this requirement. The **driver**, not the district or city, could receive a citation.

46.37.184 “Red Flashing Lights on Fire Department Vehicles.” This section spells out the what, where, and how for red lights on your equipment. You will note if you read the whole section that it does not make allowances for any other color of warning light.

46.37.185 “Green Light on Firemen’s Private Vehicles” sets out the who, why, and when on green lights. A companion section (46.37.280) says “flashing” green lights are prohibited. It also says that the user of the light is afforded no special privileges; it’s for identification only.

46.37.186 “Fire Department Sign or Plate on Private Car.” An interesting section of the law says that you must be a “bona fide member” to have a sign or plate or sign on your car. If you fail to remove a sign or plate when you sell your car, the next buyer is subject to a fine if caught.

46.37.187 “Green Light, Sign, or Plate-Identification Card Required.” If you have a sign or plate on your private vehicle, you must have an identification card “attached in a convenient location” “bearing the signature of the chief of the service involved.”

46.37.340 “Braking Equipment Required” (as amended by 1977 1st ex.s. c 148). Sets forth braking requirements and equipment on every vehicle.

46.37.351 “Performance Ability of Brakes” spells out the required braking force (minimums) necessary on all types of vehicles.

46.37.360 “Maintenance of Brakes-----Braking System Failure Indicator.” The law simply states in complex terms that you must have good brakes and brake parts.

46.37.380 “Horns, Warning Devices, and Theft Alarms” authorizes sirens, whistles, or bells on emergency vehicles if they are “of a type approved by the Commission on Equipment.”

46.61.015 “Obedience to Police Officers, Flagmen, or Fire Fighters.” Here is one that gives you a little authority to “direct, control or regulate traffic” at the scene of an emergency.

46.61.035 “Authorized Emergency Vehicles.” The section of the law actually defines and authorizes emergency vehicles and the restrictions under which they must operate.

46.61.210 “Operation of Vehicles on Approach of Authorized Emergency Vehicle” defines the action that the other driver must take upon the approach of an emergency vehicle using the proper warning devices. Also warns of “**due regard for the safety of all persons using the highways.**” Again, the law places on your shoulders the responsibility to operate your vehicle safely.

46.61.264 “Pedestrians Yield to Emergency Vehicles” defines the action to be taken by pedestrians upon the approach of an emergency vehicle using the proper warning devices. Also warns again about your responsibility for the safety of the pedestrians.

46.61.506 “Persons Under Influence of Intoxicating Liquor or Drug” says it is unlawful for any person under the influence of “intoxicating liquor or of any drug to drive or be in actual physical control of a vehicle within this state.” Notice that it says **any** drug. Also spells out requirements for tests, which may be lawfully taken.

46.61.635 “Following Fire Apparatus Prohibited” requires persons to stay back 500 feet from any fire apparatus traveling to an alarm.

46.61.640 “Crossing Fire Hose” prohibits crossing fire hose at fires.

Washington State Laws on Emergency Vehicle Operations

INTRODUCTION

The following sections of the Revised Code of Washington (RCW’s) represent but a few of the motor vehicle laws of the state of Washington. The fire department that desires further information should contact the Department of Licensing, Highways-Licenses Building, Olympia, WA 98504, and request the “motor vehicle laws” of the state of Washington.

TRAFFIC SIGNS, SIGNALS, AND MARKINGS

RCW 46.37.184 Red flashing lights on fire department vehicles.

All fire department vehicles in service shall be identified by red lights of an intermittent flashing type, visible from both front and rear for a distance of five hundred feet under normal atmospheric conditions. Such red flashing shall be well separated from the headlights so that they will not black out when headlights are on. Such red flashing lights shall be in operation at all times when such vehicle is on emergency status. [1961 c 12 § 46.37.184. Prior: 1953 c 161 § 1. Formerly RCW 46.40.220.]

RCW 46.37.190 Red lights on emergency vehicles, school buses, private carrier buses. Colored lights, optical strobe lights, sirens on emergency and law enforcement vehicles. Driver's duty to yield and stop.

(1) Every authorized emergency vehicle shall, in addition to any other equipment and distinctive marking required by this chapter, be equipped with at least one lamp capable of displaying a red light visible from at least five hundred feet in normal sunlight and a siren capable of giving an audible signal.

(3) Vehicles operated by public agencies whose law enforcement duties include the authority to stop and detain motor vehicles on the public highways of the state may be equipped with a siren and lights of a color and type designated by the commission on equipment for that purpose. The commission may prohibit the use of these sirens and lights on vehicles other than the vehicles described in this subsection.

(4) The lights described in this section shall not be mounted nor used on any vehicle other than a school bus, a private carrier bus, or an authorized emergency or law enforcement vehicle. Optical strobe light devices shall not be installed or used on any vehicle other than an emergency vehicle authorized by the Washington state commission on equipment or a publicly-owned law enforcement or emergency vehicle. An "optical strobe light device" means a strobe light device which emits an optical signal at a specific frequency to a traffic control light enabling the vehicle in which the strobe light device is used to obtain the right of way at intersections.

(5) The use of the signal equipment described herein shall impose upon drivers of other vehicles the obligation to yield right of way and stop as prescribed in RCW 46.61.210, 46.61.370, and 46.61.350. [1985 c 331 § 1; 1982 c 101 § 1; 1971 ex.s. c 92 § 1; 1970 ex.s. c 100 § 5; 1965 ex.s. c 155 § 53; 1963 c 154 § 14; 1961 c 12 § 46.37.190. Prior: 1957 c 66 § 1; 1955 c 269 § 19.]

RCW 46.37.194 Red lights on emergency vehicles, school buses, private carrier buses, police vehicles. Authorized emergency vehicles: Rules, tests, approval by commission on equipment. The state commission on equipment may make rules and regulations relating to authorized emergency vehicles and shall test and approve sirens and emergency vehicle lamps to be used on such vehicles. [1961 c 12 § 46.37.194. Prior: 1957 c 66 § 3.]

RCW 46.61.035 Authorized emergency vehicles.

(1) The driver of an authorized emergency vehicle, when responding to an emergency call or when in the pursuit of an actual or suspected violator of the law or when responding to but not upon returning from a fire alarm, may exercise the privileges set forth in this section, but subject to the conditions herein stated.

- (2) The driver of an authorized emergency vehicle may:
- (a) Park or stand, irrespective of the provisions of this chapter;
 - (b) Proceed past a red or stop signal or stop sign, but only after slowing down as may be necessary for safe operation;
 - (c) Exceed the maximum speed limits so long as he does not endanger life or property;
 - (d) Disregard regulations governing direction of movement or turning in specified directions.
3. 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, except that: (a) An authorized emergency vehicle operated as a police vehicle need not be equipped with or display a red light visible from in front of the vehicle; (b) authorized emergency vehicles shall use audible signals when necessary to warn others of the emergency nature of the situation but in no case shall they be required to use audible signals while parked or standing.

4. The foregoing provisions shall not relieve the driver of an authorized emergency vehicle from the duty to drive with due regard for the safety of all persons, nor shall such provisions protect the driver from the consequences of his reckless disregard for the safety of others. [1969 c 23 § 1; 1965 ex.s. c 155 § 6.]

WAC 204-40-020 Authorization

Firefighters, when approved by the chief of their respective service, shall be authorized to use a green light on the front of their private cars when on emergency duty only. [Order 7302, 204-40-020, filed 2/5/73.]

WAC 204-40-030 Standard

The green light shall be visible for a distance of two hundred feet under normal atmospheric condition and shall be of a type and mounting approved by the Commission on Equipment.

(1) The maximum light projected in any one direction shall not exceed 300 candle power.

(2) Vertical mounting of the lamp shall be not less than 24" above the level surface upon which the vehicle stands, or may be placed on the forward portion of the top above the windshield.

(3) The lateral mounting of the lamp shall be anywhere from the center of the vehicle to the left side thereof. [Order 7302, 204-40-020, filed 2/5/73.]

WAC 204-40-020 Limitations

The use of the green light shall only be for the purpose of identification and the operator of a vehicle so equipped shall not be entitled to any of the privileges provided in RCW 46.61.035 for the operators of authorized emergency vehicles. [Order 7302, 204-40-020, filed 2/5/73.]

Firefighter's Identification	Private	Vehicle
Name or Number of Fire Department		
County, Wash.		
Name of County		
THIS IS TO CERTIFY THAT:		
Firefighter's Name		
is a member of this Fire Department and is authorized by the undersigned Chief to mount the equipment checked below on the following described vehicle (for identification purposes only – not an emergency vehicle authorization):		
Year.	Make	Model.
License No.		
<input type="checkbox"/>	GREEN LIGHT	DATE ISSUED.
<input type="checkbox"/>	FIRE DEPT. I.D. PLATE
<input type="checkbox"/>	FIRE CHIEF Sig
(This Authorization must be carried with Vehicle Registration per RCW 46.37.187)		

The following is a letter dated September 5, 1985, from Lieutenant Gary R. Hallett, Executive Secretary, State of Washington Commission on Equipment.

“I have received numerous requests from various volunteer fire departments to amend WAC 204-40. They are requesting that flashing and/or rotating green lights be approved for use on firemen’s private vehicles.”

“I have discussed this with an assistant attorney general and he concurs with me in that there is sufficient leeway in WAC 204-40 to allow a flashing or rotating green light on the firemen’s private vehicle. The WAC does not stipulate that a steady green light is the only allowable type of light.” A flashing or rotating green light, not to exceed 300 candlepower, is acceptable.

RCW 46.37.186 Fire department sign or plate on private car

(1) No private vehicle, bearing a sign or plate indicating a fire department connection, shall be driven or operated on any public highway, except when the owner thereof is a bona fide member of a fire department.

(2) Any sign or plate indicating fire department connection on a private car of any member of a fire department shall include the name of the municipality or fire department organization to which the owner belongs. [1961 c 12 § 46.37.186. Prior: 1953 c 161 § 3 Formerly RCW 46.40.240.]

RCW 46.37.187 Green light, sign or plate – Identification card required

Any individual displaying a green light as authorized in RCW 46.37.185, or a sign or plate as authorized in RCW 46.37.186, shall also carry attached to a convenient location on the private vehicle to which the green light or sign or plate is attached, an identification card showing the name of the owner of the said vehicle, the organization to which he or she belongs and bearing the signature of the chief of the service involved. [1971 ex.s. c 92 § 2; 1961 c 12 § 46.37.187. Prior: 1953 c 161 § 4. Formerly RCW 46.40.250.]

RCW 46.37.188 Penalty for violation of RCW 46.37.184 through 46.37.188

Every violation of RCW 46.37.184, 46.37.185, 46.37.186, or 46.37.187 is a traffic violation. [1979 ex.s. c 136 § 70; 1961 c 12 § 46.37.188. Prior: 1953 c 161 § 5. Formerly RCW 46.40.260.]

RCW 46.61.210 Operation of vehicles on approach of authorized emergency vehicles.

(1) Upon the immediate approach of an authorized emergency vehicle making use of audible and visual signals meeting the requirements of RCW 46.37.190, or of a police vehicle properly and lawfully making use of an audible signal only, the driver of every other vehicle shall yield the right of way and shall immediately drive to a position parallel to, and as close as possible to, the right-hand edge or curb of the roadway clear of any intersection and shall stop and remain in such position until the authorized emergency vehicle has

passed, except when otherwise directed by a police officer.

(2) This section shall not operate to relieve the driver of an authorized emergency vehicle from the duty to drive with due regard for the safety of all persons using the highway. [1965 ex.s. c 155 § 32.]

MISCELLANEOUS RULES

RCW 46.61.015 Obedience to police officers, flagmen, or firefighters.

No person shall willfully fail or refuse to comply with any lawful order or direction of any duly authorized flagman or any police officer or firefighter invested by law with authority to direct, control, or regulate traffic. [1975 c 62 § 17; 1965 ex.s. c 155 § 3.]

RCW 46.61.600 Unattended motor vehicle.

(1) No person driving or in charge of a motor vehicle shall permit it to stand unattended without first stopping the engine, locking the ignition, removing the key and effectively setting the brake thereon and, when standing upon any perceptible grade, turning the front wheels to the curb or side of the highway.

(2) The most recent driver of a motor vehicle which the driver has left standing unattended, who learns that the vehicle has become set in motion and has struck another vehicle or property, or has caused injury to any person, shall comply with the requirements of:

- (a) RCW 46.52.010 if his vehicle strikes an unattended vehicle or property adjacent to a public highway; or
- (b) RCW 46.52.020 if his vehicle causes damage to an attended vehicle or other property or injury to any person.

(3) Any person failing to comply with subsection (2)(b) of this section shall be subject to the sanctions set forth in RCW 46.52.020. [1980 c 97 § 2; 1965 ex.s. c 155 § 68.]

RCW 46.61.605 Limitations on backing.

(1) The driver of a vehicle shall not back the same unless such movement can be made with safety and without interfering with other traffic.

(2) The driver of a vehicle shall not back the same upon any shoulder or roadway of any limited access highway. [1965 ex.s. c 155 § 69.]

RCW 46.61.615 Obstructions to driver's view or driving mechanism.

(1) No person shall drive a vehicle when it is so loaded, or when there are in the front seat such a number of persons, exceeding three, as to obstruct the view of the driver to the front or sides of the vehicle or as to interfere with the driver's control over the driving mechanism of the vehicle.

(2) No passenger in a vehicle shall ride in such position as to interfere with the driver's view ahead or to the sides, or to interfere with his control over the driving mechanism of the vehicle. [1965 ex.s. c 155 § 71.]

RCW 46.61.620 Opening and closing vehicle doors. No person shall open the door of a motor vehicle on the side adjacent to moving traffic unless and until it is reasonably safe to do so, and can be done without interfering with the movement of other traffic, nor shall any person leave a door open on the side of the vehicle adjacent to moving traffic for a period of time longer than necessary to load or unload passengers. [1965 ex.s. c 155 § 72.]

RCW 46.61.635 Following fire apparatus prohibited. The driver of any vehicle other than one on official business shall not follow any fire apparatus traveling in response to a fire alarm closer than five hundred feet or stop such vehicle within five hundred feet of any fire apparatus stopped in answer to a fire alarm. [1975 c 62 § 38; 1965 ex.s. c 155 § 75.]

RCW 46.61.640 Crossing fire hose. No vehicle shall be driven over any unprotected hose of a fire department when laid down on any street, or private driveway, to be used at any fire or alarm of fire, without the consent of the fire department official in command. [1965 ex.s. c 155 § 76.]

SPEED RESTRICTIONS

RCW 46.61.400 Basic rule and maximum limits.

(1) No person shall drive a vehicle on a highway at a speed greater than is reasonable and prudent under the conditions and having regard to the actual and potential hazards then existing. In every event speed shall be so controlled as may be necessary to avoid colliding with any person, vehicle or other conveyance on or entering the highway in compliance with legal requirements and the duty of all persons to use due care.

(2) Except when a special hazard exists that requires lower speed for compliance with subsection (1) of this section. The limits specified in this section or established as hereinafter authorized shall be maximum lawful speeds, and no person shall drive a vehicle on a highway at a speed in excess of such maximum limits.

- (a) Twenty-five miles per hour on city and town streets;
- (b) Fifty miles per hour on county roads;
- (c) Sixty miles per hour on state highways.

The maximum speed limits set forth in this section may be altered as authorized in RCW 46.61.405, 46.61.410, and 46.61.415.

3. The driver of every vehicle shall, consistent with the requirements of subsection (1) of this section, drive at an appropriate reduced speed when approaching and crossing an intersection or railway grade crossing, when approaching and going around a curve,

when approaching a hill crest, when traveling upon any narrow or winding roadway, and when special hazard exists with respect to pedestrians or other traffic or by reason of weather or highway conditions. [1965 ex.s. c 155 § 54; 1963 c 16 § 1. Formerly RCW 46.48.011.]

RCW 46.61.465 Exceeding speed limit evidence of reckless driving

The unlawful operation of a vehicle in excess of the maximum lawful speeds provided in this chapter at the point of operation and under the circumstances described shall be prima facie evidence of the operation of a motor vehicle in a reckless manner by the operator thereof. [1961 c 12 § 46.48.026. Prior: 1951 c 28 § 12; 1949 c 196 § 6, part; 1947 c 200 § 8, part; 1937 c 189 § 64, part; Rem. Supp. 1949 § 6360-64, part; 1927 c 309 § 3, part; 1923 c 181 § 6, part; 1921 c 96 § 27, part; 1917 c 155 § 16, part; 1915 c 142 § 24, part; RRS § 6362-3, part; 1909 c 249 § 279, part; Rem. & Bal. § 2531, part. Formerly RCW 46.48.026.]

RECKLESS DRIVING, DRIVING WHILE INTOXICATED, AND NEGLIGENT HOMICIDE BY VEHICLE

RCW 46.61.500 Reckless driving – Penalty.

(1) Any person who drives any vehicle in willful or wanton disregard for the safety of persons or property is guilty of reckless driving. Violation of the provisions of this section is a misdemeanor.

(2) The license or permit to drive or any nonresident privilege of any person convicted of reckless driving shall be suspended by the department for not less than thirty days. [1979 ex.s. c 136 § 85; 1967 c 32 § 67; 1965 ex.s. c 155 § 59.]

RCW 46.61.525 Operating motor vehicle in a negligent manner – Penalty – Exception.

It shall be unlawful for any person to operate a motor vehicle in a negligent manner. For the purpose of this section to “operate in a negligent manner” shall be construed to mean the operation of a vehicle in such a manner as to endanger or be likely to endanger any persons or property: *Provided however*, that any person operating a motor vehicle on private property with the consent of the owner in a manner consistent with the owner’s consent shall not be guilty of negligent driving.

The offense of operating a vehicle in a negligent manner shall be considered to be a lesser offense than, but included in, the offense of operating a vehicle in a reckless manner, and any person charged with operating a vehicle in a reckless manner may be convicted of the lesser offense of operating a vehicle in a negligent manner. Any person violating the provisions of this section will be guilty of a misdemeanor: *Provided*, that the director may not revoke any license under this section, and such offense is not punishable by imprisonment or by a fine exceeding two hundred fifty dollars. [1979 ex.s. c 136 § 86; 1967 c 32 § 69; 1961 c 12 § 46.56.030. Prior: 1939 c 154 § 1; RRS § 6360-118 1/2. Formerly RCW 46.56.030.]

RCW 46.61.520 Vehicular homicide – Penalty.

(1) When the death of any person ensues within three years as a proximate result of injury proximately caused by the driving of any vehicle by any person while under the influence of intoxicating liquor or any drug, as defined by RCW 46.61.502, or by the operation of any vehicle in a reckless manner or with disregard for the safety of others, the person so operating such vehicle is guilty of vehicular homicide.

(2) Vehicular homicide is a class B felony punishable under chapter 9A.20 RCW. [1983 c 164 § 1; 1975 1st ex.s. c 287 § 3; 1973 2nd ex.s. c 38 § 2; 1970 ex.s. c 49 § 5; 1965 ex.s. c 155 § 63; 1961 c 12 § 46.56.040. Prior: 1937 c 189 § 120; RRS § 6360-120. Formerly RCW 46.56.040.]

Interpreting the Law

You will greatly reduce the chances of being found guilty of negligence if you follow these guidelines: Be reasonably certain that a situation represents a true emergency before exercising the exemptions granted in your state statutes.

You should be able to answer “yes” to the following questions:

- Is there a high probability that this situation could cause death or serious injury to an individual?
- Is there significant property imperiled?
- Could action on my part reduce the seriousness of the situation?

Once you have made the decision to treat a situation as a true emergency, remember that **under all circumstances, you must exercise due regard for the safety of others.**

If you are involved in an accident where property damage, injury, or loss of life occurs, your actions will be evaluated and judged by your superiors. In some cases, your actions may be judged in a court of law. A court will judge your actions from at least these two aspects:

(1) was the situation a **true emergency**? And

(2) did you exercise **due regard for the safety of others**?

WHAT IS A TRUE EMERGENCY?

A true emergency allows the EV operator to exercise those exemptions to the traffic laws granted under relevant statutes. Unfortunately, the definition of a true emergency is not always clear-cut. In some situations, you will not have to decide whether or not to exercise the exemptions granted under the relevant statutes. In such cases, you should consider the following definition of an emergency, which has been accepted in several courts: “A situation in which there is a **high probability of death or serious injury to an individual or**

significant property loss, and action by an EV operator may reduce the seriousness of the situation.”

In the case of Wood v. Morris, an emergency vehicle driver was transporting a young girl with an injured arm to the hospital when he collided with another vehicle. The collision caused additional injury to the child. Although the emergency vehicle’s siren and red lights were in operation at the time of the collision, the court found him negligent, and an appellate court affirmed that finding as follows:

“The evidence showed that the defendant approached the intersection, which he knew to be one of the main traffic arteries of the city, at a speed of 45-50 mph; that he knew the speed limit at that place was 25 mph; that the street was wet with rain and was of asphalt construction, which he knew made it even more slick; that he did not apply the brakes as he approached the intersection and only slowed the vehicle perhaps 5 mph before entering the intersection; that he was operating the vehicle with his left hand while holding the microphone with his right, being right-handed; that the plaintiff’s injuries were not of a critically serious nature, being confined primarily to her arm, so that she was able to get into the emergency vehicle and talk. The above evidence was sufficient to authorize a finding of ordinary negligence on the part of the defendant driver...”

WHAT IS DUE REGARD FOR THE SAFETY OF OTHERS?

Deciding whether an EV operator has exercised “due regard for the safety of others” is always based on the specific set of circumstances. Certain principles, however, should act as guidelines for your actions. First, you must give enough notice of your vehicle’s approach to allow other motorists and pedestrians to clear a path and protect themselves. If you do not give notice of the EV’s approach until a collision is inevitable, you have probably not satisfied the principle of due regard for the safety of others. In determining whether or not an EV operator was exercising due regard in the use of signaling equipment, the courts will consider the (at least) following:

- Whether it was reasonably necessary to use signaling equipment, under all of the circumstances.
- Whether the signaling equipment was in fact used.
- Whether the signal given was audible and/or visible to the other motorists or pedestrians.

Proper use of signaling equipment does not relieve you of the duty to use caution—you must never travel at a speed that does not permit complete control of your vehicle. Even though each situation must be judged separately, an accepted definition of an act performed with “due regard” is: A reasonably careful person, performing similar duties and under similar circumstances, would act in the same manner.

Personal Vehicles and Driving Record

DRIVING YOUR PERSONAL VEHICLE

The state of Washington grants no special driving privileges to firefighters driving their own vehicles. While responding to an alarm or reporting back to work on a re-call, you must **obey all traffic laws** just as any other citizen would. It makes no difference if you are paid or volunteer.

Why take the chance of having an accident in your personal vehicle while responding to an alarm or call back to duty? The liability is tremendous. If you drive in excess of the legal limits and injure someone in an accident, the courts and juries will likely throw the book at you. You may or may not have the necessary insurance to protect you in this type of case. But why ask for trouble? Why take a chance?

You, your family, your department, your community, perhaps your whole future depends on your driving habits. Don't take chances. Obey the laws.

GREEN LIGHTS AND LICENSE PLACARDS

Green lights and license placards give you no special privileges. They only serve as a means of identification to the public and law enforcement officers at the scene of an emergency.

The fire department has an obligation to ensure that its drivers are not only qualified to drive its fire apparatus, but it also has an obligation to insure that the drivers have a good driving record.

Any fire department in the state of Washington may, when authorized by an employee (paid or volunteer), submit a request to the State of Washington Department of Licensing free of charge, for an abstract of that individual's driving record. The information released is confidential and the fire department must use care when it is in receipt of the abstract to ensure necessary confidentiality.

The fire department should know what kind of drivers it has. It has a right to insist that its drivers maintain a good driving record.



STATE OF WASHINGTON

REQUEST FOR ABSTRACT OF DRIVING RECORD

An abstract of driving record must be obtained through the Department of Licensing in Olympia. This form may be used to request a copy of **YOUR** driving record by completing the following information:

Print Full Name _____ Date of Birth _____
LAST FIRST MI

Complete Washington Driver License Number _____

Please indicate the purpose of the driving record. **IF NONE OF THE BOXES ARE MARKED, FORM WILL BE RETURNED.**

- Three-year insurance record.
- Five-year employment/commercial record.
- Five-year record (shows all convictions, accidents, and suspension/revocation actions.)

I hereby authorize the Department of Licensing to forward my driving record to the address indicated below.

Signature of Driver _____

A fee of **\$4.50** is required for each driving record requested. This should be in the form of a check or money order made payable to the Washington State Treasurer.

Please mail your request to: Department of Licensing
Driver Records Section
Olympia, WA 98504-8063

Please allow two weeks from the date of mailing to receive your record. If you should have further questions, contact Driver Records at (360) 753-6976.

Indicate the address the driving record is to be mailed to. Please print clearly or type. IF NO ADDRESSEE IS INDICATED, IT WILL BE MAILED TO THE ADDRESS ON RECORD.

Pittsburgh Press, Mon., Jan. 17, 1977

1,073% Property Tax Increase Periling Midwest Town

By JAMES J. FISHER

SALIX, Iowa — This town of 387 souls, 17 miles south of Sioux City, amid the rich bottomlands of the Missouri river, could be any of a thousand small towns in Middle America: a post office, a few stores, a feed mill, three bars, two schools and, of course, the tree-lined streets where residents, 53 per cent retired and on fixed incomes, live in scrubbed houses.

But Salix isn't one of those towns. It's unique, for today it sits on a precipice — one from which it will almost surely fall come March 15, when the new city budget is certified and the 137 real property taxpayers find their bills increased by an average of 1,073 per cent to pay off a six-year-old lawsuit against the town.

FOR ROGER HUOT, a corn farmer, that means his bill will go from \$400 to \$2,500; for Mrs. Edna Peppin, whose husband has been in poor health for eight years, the jump will be from \$200 to \$1,500, and for Rupert Thorpe, the postmaster, the bill will go from \$300 to nearly \$5,000.

Talk of money pervades this town. Not greedy talk, but talk of relief from the burden that most know is coming.

There have been fanciful suggestions to burn the town to the ground, to move it to another townsite, or for the city council of six members to resign in protest.

And some talk isn't so fanciful. "We could solve all our problems if we'd take every judge, lawyer and insurance agent in the county out and line them up and shoot them," says one farmer. He is dead serious.

Salix's problems began on the afternoon of Oct. 29, 1970, when the Salix volunteer ambulance, transporting a dying 80-year-old man to a Sioux City hospital, collided with a car in Sioux City.

The ambulance entered the intersection against the stoplight, with siren and red light on. The car, driven by Grant Welz, an attorney who specialized in insurance, had the green. Welz was injured fatally in the accident.

Subsequently, his widow, Mrs. Frances Welz, filed a \$200,000 suit against the town of Salix. Although it was a volunteer ambulance squad, court decisions concerning workman's

compensation have declared that even volunteers are employees of a city.

Salix had insurance — \$100,000 — with Western Casualty and Surety of Fort Scott, Kan.

"Western was convinced that the town didn't have a thing to worry about," says William Shuminsky, Salix attorney. "They wanted to go to court. In April 1972, the attorneys for Mrs. Welz offered to settle for \$95,000. I wrote Western's attorneys and demanded that they come to terms. But no, they went to court."

JUDGE JAMES P. KELLEY heard the suit in mid-1972 without a jury. He ruled in July 1972, awarding the Welz estate \$188,662, plus interest from the day of the accident. The decision was later affirmed by the Iowa Supreme Court. Western paid out its \$100,000, plus about \$15,000 in interest. That left Salix holding the bag for the remainder. With interest, that came to \$118,651.03.

The Iowa legislature responded to Salix's plight last year by passing a law allowing the town to pay the debt off in 10 yearly installments. That law was struck down as unconstitutional by the

Iowa courts on the grounds that it infringed on a judicial decision.

Thus, this year, Salix was ordered by the courts to budget the settlement into its city appropriations, meaning the town will spend \$129,000. The town budget is usually about \$11,000.

Shuminsky has filed suit against Western in the amount of \$118,551.03, charging that the company acted in bad faith. There is little hope the suit can come to trial before the city budget is certified.

Postmaster Rupert Thorpe, who was driving the ambulance the day the accident occurred (but who never was charged with violation of any traffic laws), said the rescue squad still operates.

"We could have just quit, but that would have meant a lot of people would have died out on the interstate, in the towns around here or out on the farms," he says. "But people depend on us. That's why we go on."

And how much insurance does the rescue squad have?

"A million bucks," says Thorpe.

Women's Heart Service

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Chapter 2: Concepts of Defensive Driving

INTRODUCTION

Defensive driving is largely a matter of attitude—the determination on your part to do everything reasonably possible to avoid being involved in a preventable accident, regardless of what the law says, what the other driver does, or the adverse driving conditions you encounter.

There are a number of attitudes that characterize the defensive driver.

Knowledge: Do you know the traffic rules and regulations of the state? Are you aware of proper procedures for passing, yielding the right of way, and other maneuvers you'll be called upon to perform when you're behind the wheel?

Alertness: Are you aware of what's going on around you? Are you conscious of traffic conditions ahead? Do you occasionally glance from side to side and at the side and rearview mirrors?

Foresight: Do you “look ahead” when you drive? Can you predict what is likely to happen? Foresight includes both short- and long-range predictions, such as getting ready to stop when you see a traffic light ahead and making a pre-trip mental inventory of driving conditions.

Judgment: Another word for good “horse sense.” Judgment involves knowing what to do and doing it at the right time—every time.

Skill: Do you know how to handle the vehicle you are driving? How to start, stop, turn, go forward and in reverse, and how to execute various emergency maneuvers? Research has shown that skill is not simply the result of practice, but the result of training, plus practice.

Admission of Guilt: If we do not create a problem for the other driver **and** are diligent and totally responsible, there will be no danger, correct? Individual drivers must be the guilty ones—we are where the problems really start. Each must admit that driving problems start with themselves.

Generally speaking, good pianists get stiff fingers if they don't practice; good batters often go into a slump because they had quit doing something that helped them become a good baseball player; good pitchers lose control because they are either doing something they shouldn't or failing to do what they should; boxers develop a bad habit and their downfall is swift; golfers develop a slice because they stop doing something they have been taught to do. All of this brings up two things which are just as true in our daily job as in the activities just mentioned. The first is that, whether we like it or not, success comes from being taught

how to drive correctly, and second, from constant practice under a critical eye to correct any faults we may have developed. There is no reason to assume that you know everything about driving, especially if you have had no special training in it. Even if we were to grant that you have had the best of training and at one time knew all there was to know about driving, there is no assurance that you will keep doing it right without frequent checking.

Experience improves your driving, provided it is the right kind of experience. Certainly, experience in running red lights, violating speed limits, passing on hills, and following too closely is not the kind of experience that will help you drive safely. You must have the right kind of experience, which comes from daily practice in the art of right driving.

Putting all the reasons together, it always comes out the same: We have to learn the right way and we have to practice it daily if we want to stay right; in driving, staying right means staying alive.

Fire Department drivers must maintain a safe driving attitude regardless of the contributing factors which may tend to influence them. A good attitude is possibly the most important requirement of being a good driver. Drivers' attitudes are reflected in their mental or emotional regard for themselves, for others, for their vehicle, and for surrounding conditions.

Some drivers are mentally unequipped to drive under emergency response conditions. Some develop a "superman" complex such as complete disregard for the rights of others, demanding and expecting the right of way under all conditions and circumstances, and others have poor driving habits, which have never been corrected.

The majority of accidents are caused by human failure. Many accidents attributed to faulty equipment or bad driving conditions are actually a matter of driver failure.

Some types of human failure include:

- Carelessness
- Incompetence
- Recklessness
- Inattentiveness
- Inability to judge distance
- Slow reaction of drivers

A driver with a poor attitude usually has some excuse for any accident he/she is involved in, such as "the street was poor," "the other driver was wrong," "the intersection was blind," "I had the right of way," etc.

Attitudes are not inborn; they are learned and therefore can be improved. Recent tests conducted by the fire service have indicated that the self-styled "Expert Driver" usually has an attitude of indifference, which may tend to cloud their judgment. This attitude often results in an excessive number of accidents that the alert driver probably would have avoided. This

lack of attention to responsibility on the part of the driver indicates a need for retraining, or the curtailment of driving assignments until his/her attitude has improved.

Every apparatus driver owes his/her fellow firefighters a safe ride each time the apparatus moves, whether on a routine inspection tour or responding to a three-alarm fire. Drivers must report to work in good physical condition and, if not, should refrain from driving and ask for a relief driver when they feel there is any impairment of their physical well being, however slight or temporary. Some reasons for such an action may be illness, fatigue, or drowsiness.

Drivers must also be mentally fit, which changes from day to day, hour to hour, and minute to minute. Mental fitness is affected by and affects attitude. A driver, who is worried over financial difficulties, domestic problems, etc., may not be mentally fit to drive. Drivers who cannot clear their mind of such distractions and concentrate on the job of driving should remove themselves from driving.

Defensive drivers expect and make allowances for the mistakes of others. They keep constantly alert and think far enough ahead to be able to take the necessary preventive action before dangerous situations cause accidents. Defensive drivers adjust their driving to meet all hazards of weather, road, traffic, and other conditions. They avoid even momentary distractions and realize the need for split-second reaction to the continuously changing conditions on the road. Professional drivers must drive defensively to survive. The public expects you to be better than you are. Here's how:

KNOW THE LAW

You must know the rules of any game or contest before you can play it properly. Each year, the rules committee changes the rules, some for baseball, basketball, and football; and you can bet that every player and 99 percent of the fans learn all the rule changes within 30 days. Most of them don't keep up with traffic rules so well though. After all, it's only their lives they are risking...or is it yours? Knowing the basic rules and all the local ground rules will help you drive defensively. Ignorance of the law is no excuse; but then, even if it were, excuses help little after the accident. Chapter I "**Some Legal Aspects of Emergency Vehicle Operation,**" is a good guide to state regulations.

DO NOT DRIVE UNCONSCIOUSLY

Habit is a wonderful thing. Good driving habits are helpful. There are many things such as shifting gears, applying brakes, feeding gas, etc., that are best done by habit, so we would be in bad shape if we had to stop and think about each particular action necessary in running a vehicle. Habits are useful in helping us do routine things—but we shouldn't drive unconsciously and expect habits to take us through.

RECOGNIZE CAUTION ZONES

School zones, parks, swimming pools, and playgrounds are caution signs to the defensive driver. In residential areas when you see Frisbees, balls, or kites flying through the air, get off the throttle and on the brakes. It's a sure sign there are kids playing near the street, even if you can't see them. Your care must be doubled—enough for you and for them, too. The defensive driver realizes that more children are killed on the streets away from schools and playgrounds than close by. This is because they are usually in groups near these places and more easily seen. To the defensive driver, a child anywhere is a danger sign, and he/she keeps the vehicle under control so that it can be stopped within the clear distance ahead.

PULLING INTO TRAFFIC

You must enter it with caution. Look both ways, and wait for traffic that is approaching close enough to constitute a hazard. One thing to remember when pulling onto a rural highway from a side road, it is difficult for you to enter from a full stop and accelerate to a reasonable driving speed in less than 15 seconds. In that time, a car going 55 mph will travel a quarter of a mile. If you obstruct that vehicle's path, you must make sure the other lane is clear.

FOLLOWING TOO CLOSE

This is amateur stuff. Any good "pro" knows that it requires a certain amount of room for safe stopping. He/she knows that people in front do some very funny things at times—stop without warning or turn without signaling. It is necessary to have ample room for stopping your vehicle or, at least, to avoid striking the one in front. On ordinary good pavement, when dry, the following distance should be one vehicle length of each 10 mph of your speed. Thus, at 50 mph you should allow 5 vehicle lengths. This distance must be greatly extended under bad weather or street conditions. Defensive drivers always allow enough room.

Another method used to calculate a safe following distance is called the three-second rule. To learn to recognize safe following distance, watch the vehicle ahead of you pass some definite spot in the highway or a sign, then count normally to yourself, "one thousand one, one thousand two, one thousand three." If you pass the spot before you finish the first nine syllables, you are too close. Remember, this rule is good only for ideal conditions. On slippery pavement, you will need even more room. You will have to count to one thousand four or more.

SUDDEN STOPS

The sudden stop is usually caused by one of two things: Either you have not allowed enough following distance or you have let your attention wander from the street or road while driving and then have seen the car in front too late for a smooth stop. Sudden stops confuse the driver behind you and often throw your vehicle into a skid, causing serious wrecks. Sudden stops are kid stuff, another evil the "pro" driver avoids.

TELL-TALES

The actions of other drivers can tip off the defensive driver to what is coming. Take vehicles parked at the curb for example: many accidents occur each year when some driver pulls from the curb in front of or into the side of a passing vehicle, also when the door farthest from the curb is opened in front of or into the side of a passing car. There are many possible clues to tell the observant driver that such accidents may occur: A slight movement of the wheels; lights being turned on at night; smoke coming from the exhaust. Scan the steering wheels of parked cars. If you see a wheel with a person behind it, beware. The driver could pull out in front of you or open a door. When a car up ahead of you pulls over to the curb, expect the driver's door to open. Look for the car to pull over and **anticipate** the opening of the door.

INTERSECTIONS

Intersections are dangerous because of many conflicting movements concentrated there. Pedestrian and vehicular traffic conflict or compete for the use of the intersection. In some cases, it is very difficult to see traffic approaching on the cross street. There are always a small percentage of persons who don't know the rules, some who forget, and more who deliberately disobey them. Traffic signals can get out of order and stop signs be obscured or knocked down. One-third of all collisions occur at intersections. Here are the two cardinal rules for intersections:

- Never assume the other driver will yield when you have the right of way. When in doubt, slow down or tap your horn—or both; and
- Before proceeding through an intersection, **whether you have the right of way or not**, look first to the left, then to the right, then to the left again. If you just flick your eyes back and forth, you could very well miss something.

There is a point at which you must decide whether to stop before you reach the intersection or proceed through it. At 30 mph, it is 90 feet from the intersection. On a residential street, that puts the decision point about halfway through the yard of the second house from the corner. (The average front yard is about 60 feet wide.)

You should know about the “hidden intersection.” In downtown traffic, it's the exit to a parking garage or a truck loading dock in the middle of the block. Here are some things to look for, to spot this hazard:

- A gap in the row of parked cars could indicate a mid-block driveway.
- An “EXIT” sign warns you of cars leaving a parking garage or lot.
- Some garages and loading docks have a large convex mirror mounted near the sidewalk. This can tip off to the possibility of cars or trucks coming out.

A green light can be dangerous, if you assume that other drivers will always obey their red light. Look first, even when you have the green.

When you have a green light, you probably proceed through the intersection, assuming that cross-street traffic **will** stop and **will** stay stopped. This is a dangerous assumption. Here are some of the ways you can protect yourself from the hazard of a green light:

- When your light has just changed to green—remember the left, right, and left rule. Turn your head and look left, right, and left again to make sure the way is clear **before** moving.
- When you're approaching the green light—look left, right, and left again before you **reach** the intersection.
- For cars making a right turn on red, look first for movement. If the car is even "creeping" forward, tap your horn to get the driver's attention. As you get closer, glance at the driver. If the driver is facing you, he/she probably sees you. If the driver is facing away from you, he/she may be getting ready to turn.

EXPECTING TOO MUCH PERFORMANCE

Some drivers never seem to learn how much performance to expect from a vehicle. They try to sprint out of a tight spot with a heavy load and seem surprised when they lag long enough to get into trouble or they think they can stop on a dime, no matter what the speed or pavement condition. Also, they think they can see an obstacle in the road with their headlights much farther than is practicable. These people always seem deeply hurt when their driving ability is questioned. It is (they say) due to vehicle defects rather than to the driver. In nearly every case of alleged vehicle failure, it was due to driver faults instead. Let's learn what to expect from our vehicle.

FRONT END COLLISIONS

An accident in which you hit the vehicle in front of you is never excusable. It proves that you were either inattentive to the vehicle in front, following too closely to stop, expecting too much of your brakes, or you did not watch the situation shaping up ahead of the vehicle in front. All of these are unquestionably bad and strictly "off limits" for good defensive driving.

Chapter 3: Important Physical Forces and Emergency Vehicle Control

INTRODUCTION

While driving, you can control only the velocity and direction of the vehicle. Velocity in this case means the vehicle's rate of motion or speed. As a driver, you influence the vehicle's speed by accelerating, decelerating, or braking. Directional control includes steering, turning, or following "tracking" curves. Several physical forces influence the degree of your control over vehicular speed or direction. If the limits created by the physical force are not exceeded, you can fully control the vehicle. If these forces are exceeded, control will be lost. The key is for you to know the conditions under which these limits are reached and, thus, when your ability to control the vehicle will be lost.

EFFECTS OF CHANGING VELOCITY OR DIRECTION ON WEIGHT TRANSFER

Let us suppose that we have a uniform rectangular box in which we have tightly stretched two wires that cross in the exact center of the box and from this point we have suspended a free-swinging light metal arrow. This arrow is hanging from the so-called center of gravity (the point about which the box will, if pivoted, balance in any position). If all the matter in this box could be concentrated in this point, it would behave the same way, with respect to gravitational forces, as the box does. Now, suppose that this box is resting next to you, in a level position, on the front seat of your EV. When you are coasting forward at any speed, the arrow will point straight downward. If you are traveling forward, in a straight line, and apply the brakes, the arrow will swing toward the front of the box. If you accelerate in a straight line, the arrow will swing toward the back of the box. If you turn to the right or left with no acceleration (or braking), the arrow will swing in the **opposite** direction directly along the lines shown in the diagram. If you brake and turn left at the same time, the arrow will swing toward the right front corner of the box. You may already be aware that the EV that you drive behaves in much the same way as this box.

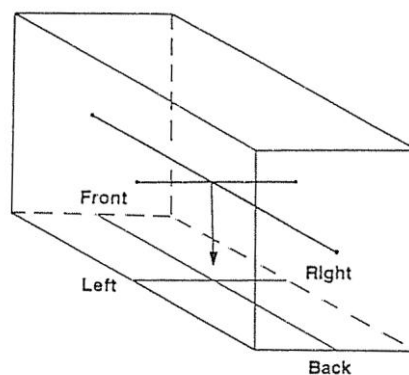


Figure 3-1

The arrow points to the place on the floor of the box where the whole force of gravity is concentrated. If, at any time, the arrow points above the edge of the base of the box in any direction, the box will start to tip over. Since it takes a moment or so to do this, you may quickly correct the situation and bring the arrow back into the confines of the base of the box and thereby stabilize the box again. This is exactly what you have to do when any moving vehicle begins to tip.

Notice that the shortest distances from the center of the base of the box to the edge are the two left and right lines. The arrow will follow these paths when the EV is doing constant speed turning. These are the real danger directions for all automotive vehicles. If you can visualize this in your mind's eye, you can understand why braking or accelerating during a turn by downshifting actually tends to stabilize the vehicle. The difficulty with braking is that in order to keep that force effective, you must eventually come to a complete stop, which is rarely desirable. If you let up on the brake, the arrow immediately swings directly to the center of the side of the box and will tend to cause the box (or vehicle) to tip (see Figures 3-1, 3-2, 3-3). It is usually recommended that you slow down when approaching the a curve and accelerate slightly as you move through the curve.

If you conceive of your EV as a box with an arrow like the one in the box we have been illustrating, you can begin to see and feel what the dangerous maneuvers are. The base of the box for an EV is made with lines drawn between the road contact points of the tires (taken in pairs and omitting the diagonals). The arrow would hang somewhere near the center of the vehicle about 3 feet above the ground.

When a stunt driver sets a car up on two side wheels, the center of gravity arrow points directly at the line drawn between the two road contact points of those tires. If, as you drive, you can keep this center of gravity arrow in mind, you can anticipate a hazardous maneuver and correct for it before you get into trouble.

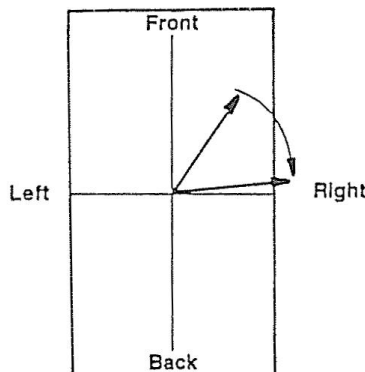


Figure 3-2

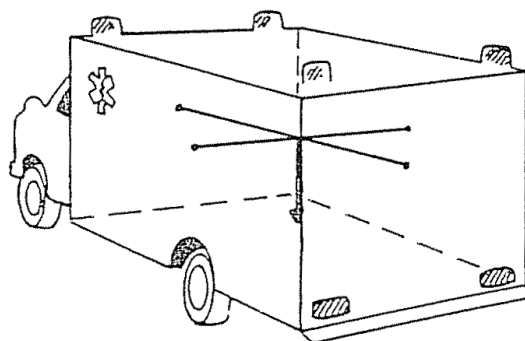


Figure 3-3

Overall, if you make a right-hand turn, it will cause a transfer of weight and the center of gravity, the downward force, will be greatest on the left side. Conversely, if you make a left-hand turn, it will cause a transfer of weight and the greatest downward force will be on a

vehicle's right side. Centrifugal force and inertia "push" the vehicle away from the center of the curve. Thus, a vehicle leans to the outside on a curve.

There are special considerations applying to vehicles with a high center of gravity or with "live" loads (such as pumpers with un baffled water) that can be pushed from the intended track as weight shifts.

Let's take one example to see what happens in a high-speed sharp right-hand turn if you were to suddenly apply the brakes. Because of the centrifugal force, most of the weight is on the left-side tires. When brakes are applied, still more of the vehicle's weight is on the left-side tires. When brakes are applied, still more of the vehicle's weight transfers to the front. Thus, most of the weight is on the front left tire. Two possibilities are:

- The left front tire can tear off the rim; and
- The front left tire will act like a pivot and the vehicle will spin out of control around that tire.

THE SUSPENSION AND WEIGHT TRANSFER

In overall road operation, the EV's suspension works to balance the forces during a change in direction or velocity. It acts to smooth out weight transfer by making it more gradual. The system also helps keep all four wheels firmly on the ground and the vehicle level. When changing the vehicle direction, good drivers work with the suspension, not against it. They slow up or widen the track if the vehicle is leaning too much. They avoid abrupt changes in direction or velocity, which could shift the vehicle's weight suddenly and cause the suspension to overreact (possible loss of control).

For review on the drawing below:

- Put an "X" on the place that the downward force would be greatest if you were accelerating through a right turn.
- Put an "O" on the place that the downward force would be greatest if you were braking.
- State the primary cause of brake fade.

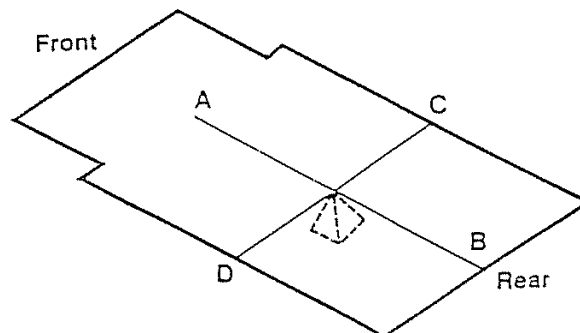


Figure 3-4

The most important physical forces for EV control are friction, momentum and inertia, and centrifugal force. Friction is the resistance to slipping. It occurs throughout the EV whenever two surfaces “rub” together. Some examples of friction in an emergency vehicle include operator’s hands on the steering wheel, engine parts rubbing together, gears meshing, tires and the road surface, and brake shoes rubbing on a drum. For vehicle control, the most important areas of friction are between the tires and the road and between the brakes and the wheels.

If there were no friction between the tires and the road, the vehicle would slide all over the place. Vehicle control would be impossible. The amount of friction between the tires and the road depends on many things, some of which you can control. For example, tire size, tread type, and inflation can easily be varied.

In principle, friction is continuous point-by-point contact without slipping. It is:

- **Greatest**—when the wheels and the vehicle are stationary.
- **Very good**—when the wheel is rolling on a dry, smooth road surface.
- **Least**—when the wheel is locked or spinning.

Friction, of course, occurs at the brakes of a vehicle. The brake shoes pressing on the drums (or pads clamping the disc) create friction and slow the wheel. Friction at the brake surfaces generates heat, and as heat increases, braking ability goes down. Brake fade is one of the worst consequences of heat due to excessive, hard braking. When sustained, hard braking heats up the brakes sufficiently, the pedal-force requirements go up dramatically. In extreme cases, during hard application of the brakes, the brakes may suddenly “disappear.” The vehicle will continue forward as if no brakes were being applied. At best, it’s a scary situation; at worst, it’s deadly. Brake fade can occur in a variety of ways. In all cases, however, the cause is excessive heat.

If the heat reaches 700° or more, the bonding material of the brake lining melts and acts like a lubricant. For some brake-lining materials, a gas is generated under high heat conditions. The gas can also act as a lubricant. If the brake fluid becomes too hot, it will expand and reduce braking effectiveness. When the brake-lining materials are more than one-half gone, the metal frame holding the lining material heats excessively and transfers the heat to the fluid.

1. **Disc brakes**—since the pad makes contact with only 15 percent of the disc surface, about 85 percent of the disc surface is cooling at any time. Obviously, disc brake design permits more cooling than drum brake design. Even if the disc were to get hot, it usually expands and makes **better** contact with the disc pads.
 1. **Drum brakes**—almost 90 percent of the total drum surface is in contact with the brake shoe at one time. Thus, only about 10 percent of the surface can be cooling off at any one time. The brake drums can heat up and expand to the point where it is impossible for the shoes to make good contact with the drums.

2. **Brake Fade** – the biggest cause of brake fade in disc brakes is worn pads, which allow heat to transfer to the hydraulic fluid. Disc pads that are 50 percent worn have a 300 percent greater chance of causing fade. In extreme cases, the heat can cause the disk to warp, leading to uneven braking.

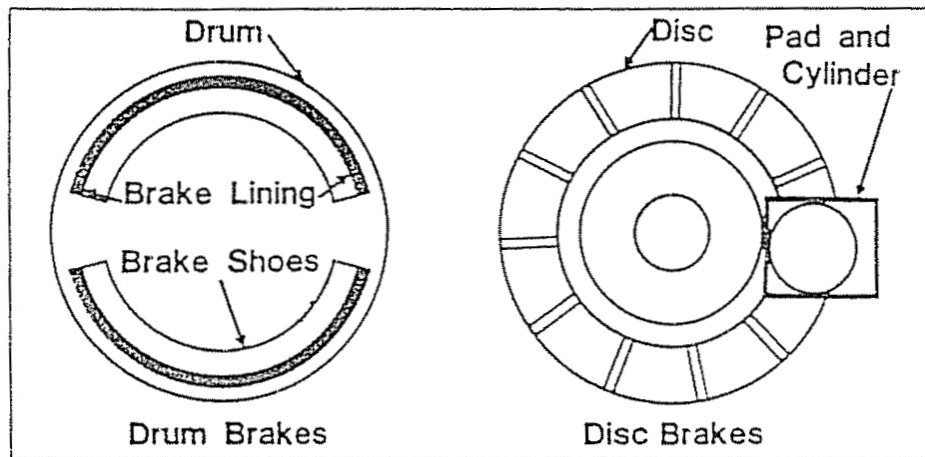


Figure 3-5

For effective braking, the shortest stopping distance is achieved by braking so that the wheels do not lock up and skid. You do this with a full knowledge of a braking system and good application on your vehicle. With any braking system, the fastest stop is made when enough resistance is applied to the rotation of the wheels to produce faint tire marks on the roadway. Once the wheels are locked, braking efficiency decreases. Power-applied brakes do not necessarily stop the apparatus quicker, but they replace muscular effort with power. Do not lock the wheels and put the vehicle into a skid because it will not be under control. Release the brakes to the point where the wheels are rotating in order to regain control of the vehicle. If in a skid, do not apply the brakes; keep the wheels rotating; let up on the throttle gradually and turn the wheels in the direction of the skid. Do not disengage the clutch until just before stopping.

BRAKING SYSTEM

Two different braking systems prevail in modern apparatus: Air and hydrovac. Both systems operate on the principle of multiplying force by applying a small amount of force over a large piston-like area.

Air Brakes: Air pressure is developed by a compressor driven by the vehicle's motor and stored in air tanks or reservoirs. For parking, air brake-equipped apparatus utilize one or both of two methods:

- A driveline brake (an actual disc or drum is attached to the drive shaft and activated by lever and cables).

- A spring-activated brake atop the service brake chamber automatically applies brakes when air pressure drops below a preset pressure.

Hydrovac Brakes utilize a vacuum from the engine. Since diesel engines do not produce a vacuum, hydrovacs are found on gasoline-driven vehicles only. Most hydrovac-equipped vehicles utilize driveline brakes or a lock-type device, which is applied by moving a lever and stepping on the brake.

VEHICLE RETARDERS

Retarders can be added to diesel engines to increase the stopping capacity of a vehicle's service brakes.

- An **Engine Brake** simply uses the vehicle's diesel engine as an energy-absorbing device for stopping power. During the engine's compression stroke, air is compressed. In the no-fuel mode, this compressed air, representing potential energy, will act as a spring, forcing the piston back to its bottom position, thereby imparting positive power to the driveline. The engine brake, however, opens the exhaust valve just prior to top dead center of the compression stroke, thus releasing the compressed air and its potential energy throughout the exhaust system. The energy required to return the piston to its bottom position is now derived from the momentum of the vehicle. It is this two-step process—elimination of compressed air from the cylinder, and use of vehicle momentum to move the piston—which develops the engine brake retarding capabilities.
- The **Exhaust Brake** creates extra exhaust backpressure to slow down the engine. A valve fitted into the exhaust system, between the manifold and the muffler, restricts the exhaust to build up pressure in the manifold. The resultant backpressure in the cylinder during the exhaust stroke slows the engine.
- The **Hydraulic Retarder** makes use of a fluid that is pumped through restricted passages to pressurize it and to provide a retarding effect on a vaned rotor connected to the vehicle's rear wheels. Hydraulic retarders operate on transmission oil, other viscous fluids, or even water. A control valve is actuated by the driver to introduce fluid into the cavity surrounding the rotor. The more fluid, the more braking power.
- The **Electric Retarder** is a driveline device installed between the transmission and axle. It consists of an electric dynamometer attached to the vehicle's frame. When switched on, up to 16 electromagnets exert a powerful drag force on two iron discs attached to the vehicle's drive shaft to provide retarding action.

- An **Automatic Transmission Retarder** is available. As an example, the Allison retarder is an integral part of the transmission located forward of the gear range system. The retarder works by slowing a rotor, which is mechanically connected to the vehicle wheels. Coming downhill, the rear wheels of the vehicle, being driven by gravity, are actually driving the rotor. The vaned rotor is rotating in a cavity into which the driver, by actuating the retarder control valve, can introduce transmission oil. The oil in the cavity, under pressure and working against the rotor vanes, slows the rotor and provides braking power to the rear wheels.

The more pressurized oil in the cavity, the greater the resistance to the turning vehicle's wheels and the higher the developed braking power level.

The transmission oil does all the braking work. As the braking power forces develop in the retarder, the oil absorbs the heat generated. It is then circulated to the transmission heat exchanger and the heat is dissipated through the radiator to the outside air. The cool oil circulates back to the retarder to repeat the cycle.

Each type of retarder has its particular strengths and limitations for any given application, and considerations (such as effectiveness, cost, weight, and complexity) will determine the choice.

BRAKING

An air-braked vehicle should not be moved unless the air gauge shows at least 100 pounds of air pressure in the air brake system. The wheel brakes are not safe and parking brakes are not fully released at lower pressures. Normal air operating pressure is 60-120 psi. Normal hydrovac gauge reading is 20-25 inches mercury. The driver should know these specifications for his/her vehicle. Some makes of apparatus are equipped with a dashboard warning light that stays lit or windlon flag that drops down until the pressure reaches 70 pounds. A vehicle should not be moved while such a warning is on.

Operating the brakes of an air-braked vehicle differs very little from operating the brakes of a passenger car. Because the operation of the brake pedal requires very little physical effort, proper control of the brakes is easily accomplished. The distance the brake pedal is depressed determines the amount of air pressure delivered to the brake chambers, and the brake chamber pressure determines the braking force. Thus, the driver should keep in mind that he/she is operating a brake valve capable of giving finely graduated brake control and should make full use of this control.

While operating the vehicle, the driver should periodically observe the air pressure registered by the dash gauge to be sure that pressure is being maintained properly. If the air pressure drops to a low point, or if the warning buzzer or light signifies that pressure is low, the vehicle should be stopped and the trouble corrected.

APPLICATION OF AIR BRAKES

Regular Stops Whenever possible, brake applications should be started far enough in advance so that moderate pedal pressure can be used. In making normal stops, the brake application should be hard at first and then graduated off as speed is reduced so that at the end of the stop, little pressure remains in the brake chambers and a smooth stop is assured. Never apply air brakes lightly at first and then increase the pressure as the speed diminishes. This not only makes a longer stop but also makes a rough stop because of the final high pressure. Never “fan” air brakes—this wastes air, which may be needed during heavy emergency use of brakes, air horn, wipers, etc.

Feel is important here also; be aware of the differences. Hydrovacs often require extra “pump” to stiffen them. Hard, constant pressure on air brakes often causes “nose-dive” prior to a stop. You should ease off prior to the stop to smooth out the stop.

Pumping the brakes is a technique that was taught before it was understood how heat affects stopping ability. Every time the brakes are pumped the temperature of the rotors or drums increases. The temperature continues to rise until brake fade is finally generated. On the other hand, a steady pressure on the brake pedal only allows the heat in the rotors and drums to reach a safe operating temperature.

TORQUE

Torque may be defined as “a twisting or twisting force.” An engine is most efficient when the rpm can be maintained somewhere between speeds at which maximum torque is developed and 90 percent of peak engine speed. If the engine is operating under a heavy load and the speed falls below the point at which maximum torque is developed, momentum is rapidly lost resulting in lugging and power train damage.

LUGGING

Lugging is an overload condition, where you cannot reach or maintain governed speed at full throttle. In a properly running engine, the momentum of its internal moving parts, oil pressure, and the pressure exerted on the pistons in the compression chambers stroke are in relative balance. If the engine is performing an operation which requires more horsepower than the engine is producing, such as pulling a steep grade in too high a gear, the momentum of the moving parts (e.g., the speed of the engine) is reduced. When this occurs, the engine is running in an unbalanced condition because the pressure exerted on the pistons exceeds the momentum of its moving parts. This unbalanced condition is called lugging. Lugging most often occurs when the engine rpm’s are at or near the bottom of the operating range and producing only a small portion of the total horsepower available while the engine is under excessive load.

Low-speed lugging is particularly hard on the engine because bearing pressures are highest when lubricating oil pressure is lowest. Lugging shortens engine life and robs the driver of horsepower when it is needed most.

It is easy to avoid lugging. All you have to do to get out of a lugging condition is to drive in a lower gear, so the engine can respond to increased throttle whenever you need it.

When approaching a hill, shift to a lower gear and operate against the governor to avoid high-speed lugging. Shift to a lower gear when load pulls down engine speed as much as 10 percent. Remember that you are lugging anytime you lack the ability to speed the engine up to governed rpm at full throttle. Keep it "wound up." This is important!

Some apparatus are equipped with a vacuum gauge showing the intake manifold vacuum. When the engine is being operated under a load and the vacuum gauge shows less than five inches of mercury, the engine should be considered lugging, regardless of the engine speed.

ENGINE SPEEDS

When driving the apparatus, every effort should be made to keep the engine speed within the limitations of the operating range by the use of proper gear selection. If the engine rpm's approach 90 percent of peak speed, shift into a higher gear; if the engine is under load and the rpm's fall to the bottom of the operating range, shift to a lower gear. Under ordinary driving conditions, it is not necessary to raise the engine speed to the upper limit of the operating range in each gear when shifting up through the gears. The engine speed need only be raised high enough to allow the shifting operation into the next higher gear to be completed with the engine speed still above the lower limit of the operating range. If maximum acceleration is desired or required, engine speed may then be raised to the upper limit of the operating range in each gear.

While operating in any gear, horsepower produced by an engine increases as the rpm's are raised; thus it is desirable to keep the engine speed in the upper portion of the operating range while ascending a grade during hilly driving operations. When descending grades, with the braking effect of engine compression utilized, it is good practice to hold engine speeds in the lower two-thirds of the operating range.

COEFFICIENT OF FRICTION

The coefficient of friction is a term from physics. It means the frictional force developed when two surfaces pass across one another. Figure 3-6 shows a solid block of rubber weighing 100 pounds being dragged across three different surfaces.

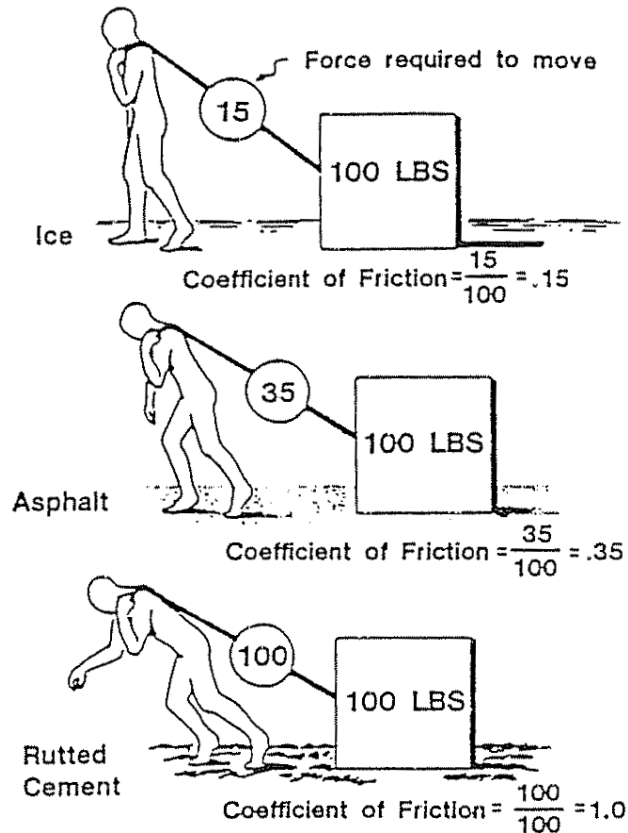


Figure 3-6

In the first example, 15 pounds of force are required to move the block of rubber; in the second example, 35 pounds of force are required; and in the third example, 100 pounds of force. The coefficients of friction are, thus, 0.15, 0.35, and 1.00. One can readily see that the force required to move the block of rubber varies with the surface across which the rubber is moved. The type and condition of surface on the road and the speed of the vehicle affect the coefficient of friction. The practical significance of the coefficient of friction is expressed in the number of feet required to stop a vehicle at a given speed, on a given road, under given conditions.

In terms of distance required to stop, an EV traveling on glare ice—where the coefficient of friction is, of course, low—will require many times the distance to stop as that same EV will require when traveling at the same speed on a dry concrete surface where the coefficient of friction is higher.

Cold and heat can also affect the coefficient of friction. Soft roads tend to liquefy in very hot weather, reducing the coefficient of friction as compared to that in cold weather. The coefficient of friction may vary widely at different points on the same road, depending on the condition of the surface, its age, and the weather.

A driver must constantly evaluate the road surface with regard to the force the tires can apply to the road at a given speed before skidding will begin. This observation is especially important in turning a corner, where an additional centrifugal force is acting on the vehicle.

If the coefficient of friction on a given road surface is low—say it is 0.4—and the EV weighs 9,200 pounds, the maximum braking force that can be developed by the EV tires is $0.4 \times 9,200$ pounds (or 3,680 pounds). If the coefficient of friction for a road surface is higher—say it is 1.00—that same EV weighing 9,200 pounds can develop a braking force of 9,200 pounds.

BRAKING

How heavily must brakes be applied to obtain the maximum braking force in order to stop within the shortest distance? If a wheel is stopped suddenly in a panic situation, the braking force drops equally rapidly because of localized heating of the rubber in the tire. The footprint area of the tire in contact with the road surface is actually floating on a layer of molten rubber. Brakes must be applied; however, to obtain maximum effect, the tire must rotate sufficiently to cool rubber in contact with the road surface.

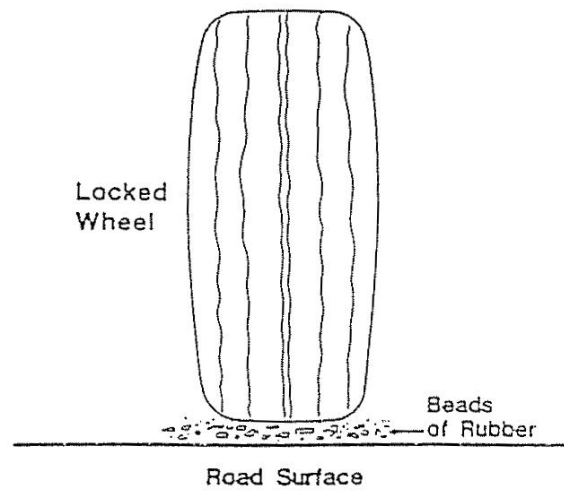


Figure 3-7

Little beads of rubber come off the locked, skidding tires and act as ball bearings for the vehicle to slide on.

Friction between the tires and the road surface is required if you are to control the EV's direction. A key principle is tires **must** be rolling to change the EV's direction. If brakes lock the front wheels, turning the steering wheel will have no impact on the direction the EV travels. Directional control is possible only **after** brakes are let off and the front wheels begin to roll again.

MOMENTUM AND INERTIA

Momentum is the product of a vehicle's mass (weight) multiplied by its velocity (speed). **Inertia** is the force that makes a moving EV tend to stay in motion in the same direction. As momentum increases, it is harder to overcome the effects of inertia. Larger (heavier) EV's, having greater mass, will have greater momentum at a given speed. Think what this means in terms of velocity and directional control.

Momentum and inertia affect velocity control. With increased momentum, stopping distance increases. With increased momentum, brakes must work harder, friction and heat must increase. Momentum and inertia affect directional control. With increased momentum, there is more **inertia** and hence will be harder to overcome. Therefore, changing direction is more difficult. As momentum increases, the track the EV will follow must be wider.

The velocity of a vehicle affects its overall control and friction; for example, accelerating by spinning a vehicle's wheels reduces friction and acceleration is slowed. Spinning the wheels smoothes the tires. Friction between the tires and the road surface will be less in the future.

CENTRIFUGAL FORCE

Every driver is familiar with the way his/her vehicle tends to skid outward on a curve and with a tendency of the body to swing over in the same direction. Centrifugal force is the force that tends to push a vehicle that is traveling around a curve away from the center of the turning radius while inertia is making the vehicle tend to go straight.

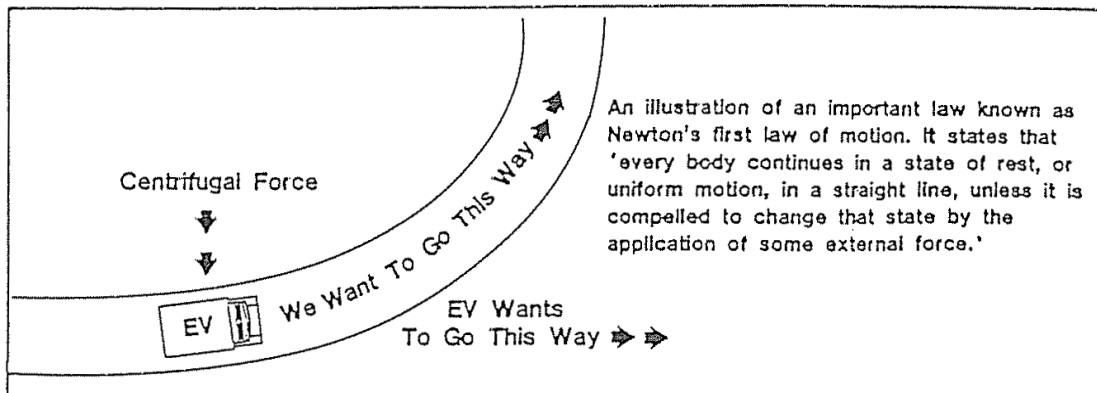


Figure 3-8

Chapter 4: Driving Conditions and Contingencies

FOLLOWING ANOTHER VEHICLE

In 1974, approximately 150,000 disabling injuries and 500 deaths resulted from accidents caused by vehicles that were following too closely. The following are things to learn in order to be able to follow at a safe, appropriate distance:

- What is a safe following distance?
- Techniques to help you judge or estimate following distance.
- When to increase following distance.

WHAT IS A SAFE FOLLOWING DISTANCE?

You are following at a safe distance if you can (1) stop without mishap if the vehicle in front comes to a sudden stop; or (2) take evasive action (steer around) to avoid mishap if the vehicle in front comes to a sudden stop. To estimate following distances, we can relate stopping distance to vehicle speed (and weight) and see the relationship between stopping distance and following distance. Also, there are guidelines to make judgments of the appropriate following distance easier.

REACTION DISTANCE is the distance a vehicle travels from the time the driver recognizes the need to stop until brake pedal movement begins. Average drivers need 3/4 second to react. Quite obviously, the distance traveled in 3/4 second will be greater as vehicle speed is increased. Factors influencing reaction time are driver alertness (fatigue, drugs, allergies, etc.) and driver capability (vision, performance under stress, etc.).

BRAKING DISTANCE is the distance traveled from the first brake pedal movement until the vehicle comes to a full stop. There is no “average” braking distance. Braking distance varies greatly according to vehicle speed (higher speed – greater braking distance); vehicle weight (heavier vehicles tend to require greater stopping distances); vehicle condition (brakes, tire tread); road surface, both composition (asphalt, concrete, etc.) and condition (icy, rutted, etc.).

Two ways to judge following distance:

- **Estimate car lengths**—one car length for every 10 mph. A full-sized car is approximately 20 feet long—estimating car lengths provides minimum following distance. Three seconds is a lot safer. Three seconds is recommended for larger vehicles. Car length method—focus of eyes stays constant, but proper estimates are difficult for many people.
- **Three-second rule**—keep a separation of at least three seconds between the EV and the vehicle being followed. The three-second technique works like this: Begin

counting (1001, 1002, etc.) when the vehicle in front passes a marker on or beside the road. A pole, sign, or tree would be a good marker. Stop counting when the EV reaches the same marker.

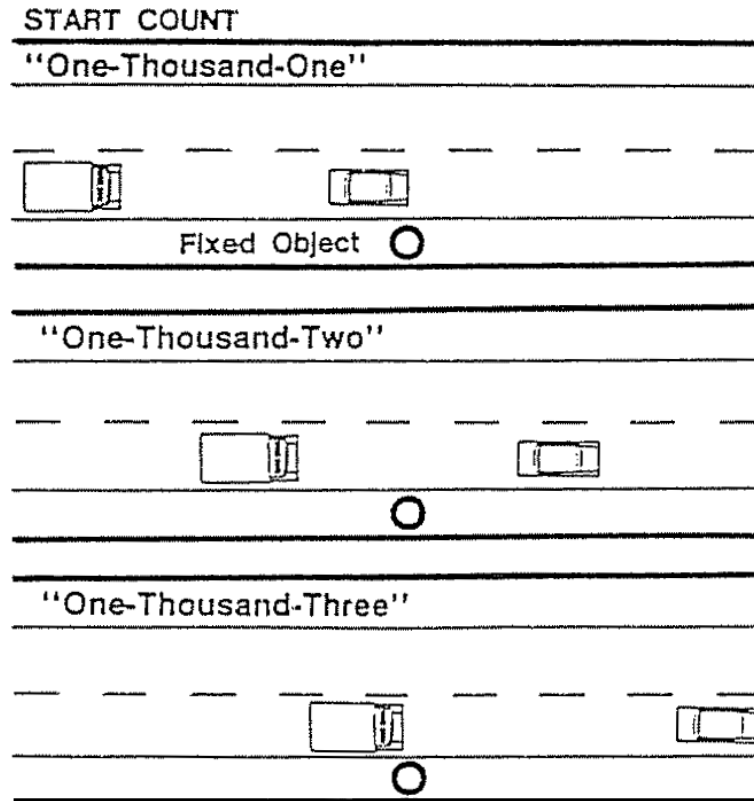


Figure 4-1

Three-second method—once learned, allows more precise estimates of adequate following distance, but the need to shift the focus of eyes can reduce operator's ability to detect hazards. It is a good idea for every operator to try both methods and select the one that works best for him/her. The two methods can be "checked" against each other to get a feel for appropriate following distance.

WHEN SHOULD FOLLOWING DISTANCE BE INCREASED?

- Increase following distance by **50 percent** if the vehicle ahead is unusual, if your vehicle is large and/or heavy, or if your vehicle is not adequately maintained.
- **Double** following distance if road surface is loose or slippery (wet, dirt, gravel), vision is obscured (rain, fog, dust, smog), or if you are not fully alert.
- **Triple** following distance if road surface is packed snow or icy.

The key realization is that you do not gain anything by reducing following distance in the emergency mode. Actually, many operators' reactions and performances get worse under

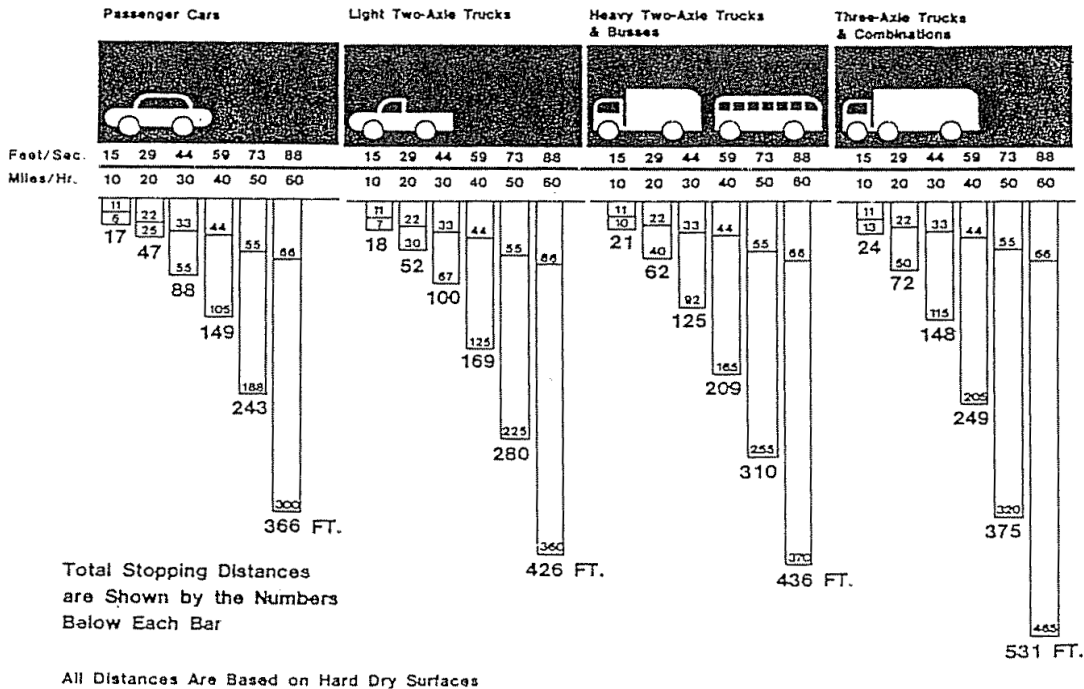
stress. Each operator must learn his/her own individual capability to respond to stress.

Motorists also may react in crazy ways to lights and sirens. If they stop or slow drastically, the EV operator needs the full amount of following distance to respond. A greater following distance permits the EV operator to get the “big picture” of the traffic situation.

A SPECIAL CONSIDERATION: FOLLOWING DISTANCE IN THE EMERGENCY MODE

In spite of the stress and urgency of an emergency run, the laws of physics do not change. It still takes 243 feet to stop a sedan from 50 mph—and longer for larger vehicles! A driver might be tempted to decrease following distance when traveling in the emergency mode.

STOPPING DISTANCES. Simply stated, it is the sum of reaction distance and braking distance. Various types of vehicles at various speeds are shown in the chart in Figure 4-2. All stopping distances on the chart assume driver uses 3/4 second to react. All stopping distances on the chart are based on “hard, dry surfaces.” Use the chart to estimate the total stopping distances for each type of vehicle at 70 mph.



Estimated Stopping Distances at Various Highway Speeds.

Figure 4-2

How to tell when you are far enough behind:

- Following at the full stopping distance (as shown on the chart) is not only unnecessary, it is also impossible! If an EV were traveling that far behind a vehicle in front, other vehicles would constantly pass the EV.
- An appropriate following distance will allow enough time to come to a complete stop if the lead vehicle panic stops (stops as fast as possible by braking). Therefore, safe following distance is greater than the distance required for reaction time, but less than total stopping distance. The general rule for calculating following distances (for sedans) is:

ADVERSE WEATHER CONDITIONS

The chart in Figure 4-2 provides an indication of relative stopping distances at different speeds and in different weather conditions. Some facts derived from the chart include:

- Stopping on wet pavement takes approximately twice the distance as stopping on dry pavement.
- Stopping on ice or sleet takes about five times the distance as stopping on dry pavement.

Accident statistics indicate that approximately six times more people are killed on wet roads than on snowy and icy roads combined. Some drivers forget (or do not know) that when it first begins to rain, roads are likely to be especially slippery. Water mixes with oil and dust to form a slippery mixture. This mixture will wash away in a while if the rain is hard and/or prolonged. The experienced driver will avoid (if at all possible) making sudden moves with the steering wheel, brakes, or accelerator in rainy weather.

Driving through large areas of water can affect brake performance and the vehicle's electrical system. Some precautions that you can take are to slow down **before** hitting water; turning wipers on **before** hitting water; tapping brakes as you exit to see if brakes are grabbing or pulling, double-checking mirrors—rain on the rear window or outside mirrors can distort or obliterate images.

Prepare in advance whenever there is a chance of encountering winter driving conditions (including sleet, freezing rain, packed snow, and ice). Engines should be in tune, heater/defrosters in good working order, and batteries should be fully charged. Emergency weather equipment should be stowed in the vehicle. Snow tires and/or chains should be ON the vehicle. Brakes should be properly adjusted.

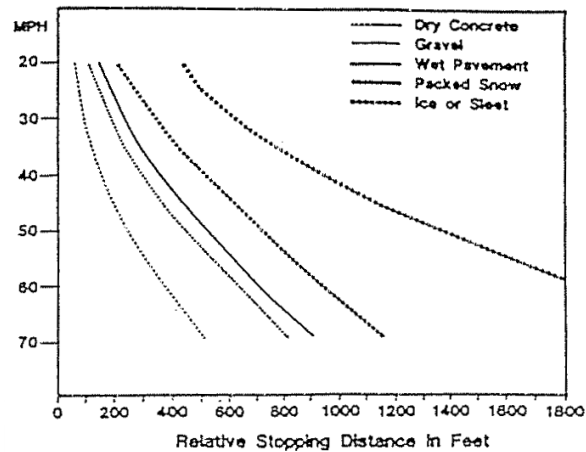


Figure 4-3

Some final tips for driving on ice and snow: Keep informed on the temperature. “Wet” ice and freezing rain create the most treacherous of all driving conditions. Wet ice and freezing rain occur when the temperature hovers around the freezing point (28°F to 40°F). Do not make any sudden moves with the steering wheel, brakes, or accelerator unless absolutely necessary. When encountering poor visibility (including fog, smog, etc.), you should do the following:

- Drive slowly, but keep moving.
- Turn lights (low beams) and wipers on.
- Use four-way flashers if traveling 15 mph or more below the speed limit.
- Stay alert for cars that are moving very slowly.
- Check the rearview mirror often.
- Avoid decelerating suddenly.
- If you must pull off the road, turn on the four-way flashers.
- Do not pass.
- Use the defroster to minimize fogging on the inside of the window.

HANDLING CONTINGENCY SITUATIONS

Contingency situations can arise at any time. When they arise, normal traffic flow may be suddenly interrupted and the safety of all persons in the general area is diminished. It is a good policy to be familiar with the contingency situations: vehicle malfunction, changes in the road, the appearance of an obstacle in the roadway, and **DRIVER ERROR**—clearly a contributing factor in most accidents. The operator of a motor vehicle can take certain precautions to minimize the chances of a contingency occurring.

OBSTACLES

As a precaution against the appearance of an obstacle in the roadway (including pedestrians, other vehicles, etc.), always maintain a safe speed—one that allows maximum vehicle control. Search for the caution zones and obvious cues referred to earlier that might indicate that obstacles are likely, such as “Watch Children” and “School” signs and heavy pedestrian traffic. Learn to spot very subtle cues that might indicate obstacles are likely, such as toys and bikes on lawns (even though no children are visible), vapor from exhaust of parked cars, and backup lights on parked cars.

DRIVER ERRORS

Do not ever forget driver errors. Begin your shift well rested, with no unusual physical or mental impairment. Personal problems resulting in mental or emotional strain can affect driver’s performance. Always remain alert. Avoid unnecessary risks, and when faced with a contingency situation, **do not panic**. Even 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 death, injury, and serious property damage.

GENERAL TECHNIQUES FOR HANDLING CONTINGENCIES

Hundreds of “possible” contingencies could arise. Since you may spend many hours driving (and travel many thousands of miles), it is probable that sooner or later a contingency will occur. Following are some general techniques that can be applied to deal with many of the possible situations.

EVASIVE STEERING means a sudden or extreme change in the vehicle’s direction. This maneuver is often used to avoid pedestrians, vehicles, or other obstacles. Usually, this action is taken because it is too late to brake to a stop. Animals in the roadway are often a problem—especially in rural or suburban areas. If a large animal (e.g., deer, bear) appears on the road, it is usually best to avoid colliding with the animal—serious damage and injury often occur. When small animals are in the roadway, however, it is often safer to collide with the animal rather than risk loss of control due to a sudden steering or braking maneuver.

The evasive steering maneuver can be executed in the following way:

- Hands should be at 2 and 10 o’clock on the steering wheel—this will allow the largest possible turn without moving the hands.
- Turn the steering wheel sharply in the direction you have chosen for an escape route.
- Counter-steer as soon as your vehicle is clear of the obstacle.
- Although it may be necessary to brake somewhat, hard braking should be avoided.
- Slow down and maintain vehicle control.

The abruptness with which an evasive steering maneuver can be made **safely** depends, somewhat, on the type of vehicle:

- **Sedan**—very abrupt maneuvers are possible **unless** wheels will hit curb, rut, etc.
- **Van**—depends on the type. Some may be “top heavy” and could roll if maneuver is excessively abrupt.
- **Large Fire Apparatus**—steering ratio of newer apparatus can allow for too much steering input, increasing the possibility of roll-over.

ESCAPE ROUTES. The driver must scan the roadway and nearby areas for escape routes and consider whether the vehicle can be safely steered off the right side or the left side of the road. Are there any obstacles on the roadside or any oncoming vehicles? A basic consideration is the stability of the road surface (e.g., gravel versus concrete) and how likely is it to contribute to loss of control. One must especially be careful when approaching the crest of a hill, rounding a curve, and when approaching intersections. These situations minimize possible escape routes.

EMERGENCY BRAKING. If there is enough room to stop, or if no escape route is available, emergency braking may be one way to avoid a collision or minimize its consequences. The goal of emergency braking is to produce the shortest possible stopping distance without locking wheels or losing control. The best method of accomplishing this is:

- **Hydraulic Brakes**—hard pressure to brake pedal without locking wheels (e.g., threshold braking). If wheels lock, **release brake pedal**. Then re-apply with less pressure. Bear in mind that rapid deceleration could cause a rear-end collision.
- **Air Brakes**—should be applied with a steady pressure at the beginning of a stop and then eased off as the vehicle slows down. Just before 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. Air brakes should not be fanned (alternately applied and released) 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, serves no useful purpose on dry pavement, and causes excess heat build-up in brake components.

HANDLING SKIDS

In general terms, skidding means loss of steering and braking control. All skids are caused by two primary factors: A too sudden change of speed or direction; or any change of speed or direction under conditions of poor traction. No matter what kind of skid is occurring, the following will help you regain control:

- Stay OFF the brake.
- Stay OFF the accelerator.
- Counter-steer (i.e., steer in the direction to which the rear end of the vehicle is skidding).

Two points to remember about counter-steering:

- You do not have to turn the steering wheel violently to correct a skid.
- Once the wheel has been turned to counter-steer, do not steer “into the skid. Rather, steer the direction you want to go.

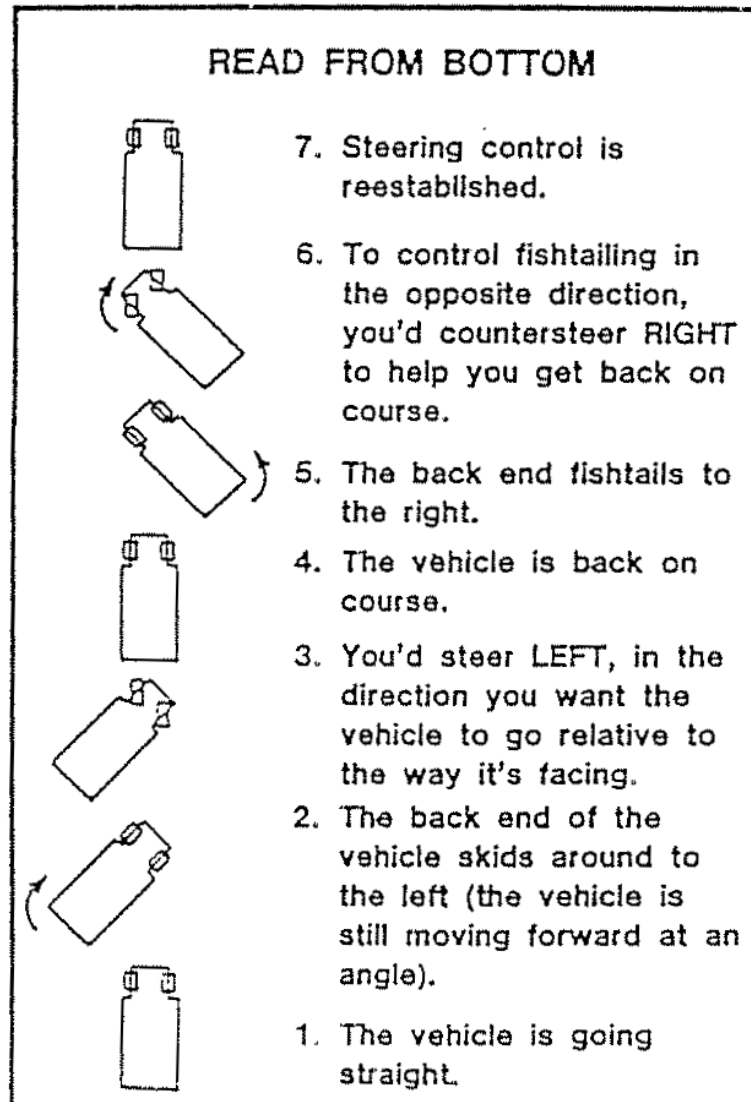


Figure 4-5

SPECIFIC SKIDS

A **BRAKING SKID** occurs when, due to sudden, hard brake pressure, one or more of the vehicle's wheels lock. If brakes are evenly adjusted, all wheels will lock at the same time. If all wheels lock evenly, or if just the front wheels lock, the vehicle will move straight ahead unless influenced by some other force (e.g., a dip in the road). A good reason to keep brakes properly adjusted—an all-wheels-locked skid is easier to control. Regardless of how many wheels lock, or how evenly, steering control will be lost. **A wheel that is not turning cannot be steered.** 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° (depending on speed, road surface, etc.). The vehicle may actually end up traveling in the opposite direction.

The action to take when a braking skid occurs is to ease off the brakes until the wheels begin to roll again (It should then be possible to steer). If braking is still necessary (to reduce speed or avoid an obstacle), apply with less pressure so that wheels do not lock again.

A **POWER SKID** occurs due to sudden, hard acceleration. Some examples of situations where power skids could occur are accelerating on wet, icy, snowy, or debris-covered streets and “jack rabbit” starts. The back end of the vehicle may skid to one side, trying to overtake the front end, and the vehicle may spin all the way around. Driver actions to take if a power skid occurs are easing off the accelerator and counter-steering in the direction you want to go.

A **CORNERING SKID** occurs when speed is too great or traction is reduced (due to poor road/weather conditions) such that the vehicle cannot stay on an intended track around a curve. In this situation, the vehicle may continue to travel straight ahead—not in the intended path of travel around the turn. This is sometimes called “understeering” and is a full cornering skid—just the front wheels lose traction. The rear end of the vehicle may try to overtake the front end, if just the rear wheels lost traction. This is referred to as “oversteering”. Actions to take if a cornering skid occurs are easing up on the accelerator and counter-steer in the direction you want to go as space permits.

HYDROPLANING SKIDS occur when the tire is moving too fast for the water on the road to escape (to flow around it or through the tread). A small wedge of water builds up on front of the tire and lifts it off the surface of the road.

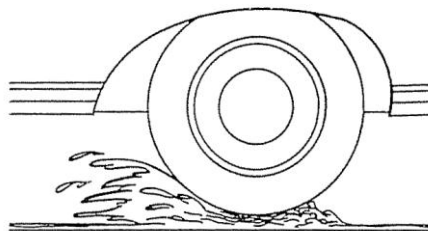


Figure 4-6

The results of a hydroplane skid are difficult to predict: As with all skids, there is loss of braking and/or steering control. Unless the operator attempts to brake or steer (other than straight ahead), he/she may not know the vehicle is hydroplaning. Driver actions to take if a hydroplane skid occurs are (1) ease off brake or accelerator; and (2) allow the vehicle to decelerate. Since hydroplane skids are difficult to detect and control, the most effective thing an EV operator can do is to **prevent** them: Inspect tires regularly to ensure they have plenty of tread (to allow water to escape) and that pressure is correct. Be alert for hydroplane-type conditions—if there is enough water on the road surface to cast reflections from trees or other cars, be especially cautious—slow down.

HANDLING OTHER SPECIFIC CONTINGENCIES

BLOWOUTS—Front tire blowouts are the most dangerous; the vehicle will pull to the side of the blown-out tire. A safe procedure is to remove your foot from the accelerator, allowing the vehicle to slow. Hold the steering wheel firmly; anticipate steering difficulty. When steering is controlled, brake gradually; avoid locking wheels.

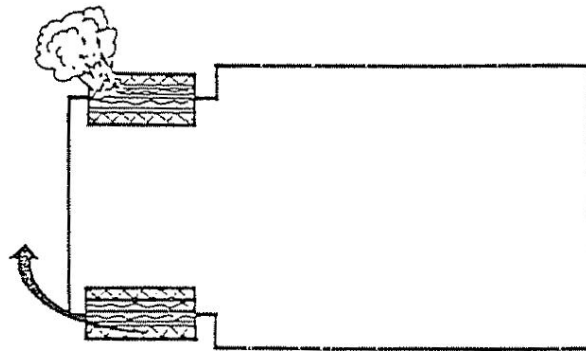


Figure 4-7

BRAKE FAILURE. In this event, shift to lowest gear, if possible. Apply the parking brake in either of the following ways: (1) In a pumping manner—steady pressure, release, etc.; or (2) as hard as possible, without locking the wheels. Pump brake pedal rapidly.

If these actions do not slow the vehicle, sound the horn to alert traffic; activate four-way flashers and/or emergency signaling devices; and **choose** an impact-absorbing object to collide with. Make every effort to avoid head-on collisions. Try to sideswipe parked cars, shrubs, even a dirt hillside—always at an angle. If the vehicle has been slowed sufficiently and there is an upgrade to further slow the vehicle, then select a path for leaving the roadway. If no upgrade is within clear distance ahead, select a path for leaving the roadway that will minimize injuries and property damage.

TRANSMISSION FAILURE. Select a safe off-road stopping place and brake gradually to a stop.

STEERING FAILURE is most likely to occur when a vehicle with power steering stalls. This

will make steering difficult, but not impossible. With a power-steering stall (steering failure), anticipate steering difficulty; grasp the steering wheel firmly, find a safe spot, and pull off the road. In a total steering failure, keep trying to steer and stay OFF the brake. Since directional control is impossible, if the brakes pull to one side, it could be deadly. This is another reason to keep brakes properly adjusted. If the vehicle does not coast to a stop, shift to a lower gear and pump the brake (same procedure as brake failure).

ACCELERATOR STICKING. If the accelerator sticks and there are **no vehicles ahead of the EV**, you should attempt to release the pedal by slipping the tip of your shoe under it and lifting it. If this method is unsuccessful, put the vehicle in “neutral” gear. In vehicles without power steering and power brakes, turn engine off. In staff vehicles, turning off the ignition locks the steering wheel. In this case, it will be necessary to turn the ignition off until the engine stops, then turn the ignition back on to unlock steering wheel. If the vehicle has power-assisted brakes, do not pump them. Pumping will exhaust the reserve capacity of power-assisted brakes when the engine is off. Instead, apply steady pressure. Select a safe off-road stopping place to pull off.

VISIBILITY IMPAIRED (off-road recovery). If at some time the vehicle’s wheel(s) leave the road surface (intentionally or unintentionally), you will have to perform an off-road recovery. This can be a dangerous maneuver unless performed properly. The correct procedure is to hold the steering wheel firmly; steering may be difficult. If there is a significant difference between the level of the roadway and the shoulder, or if the composition of the roadway and the shoulder are significantly different, the vehicle may pull to one side. Check for traffic ahead and to the rear. Reduce speed by easing off the accelerator. If brakes must be applied to reduce speed, brake VERY gradually. If shoulder is gravel or muddy, skidding is a strong possibility. Center the vehicle over the road edge. Activate appropriate turn signal. If you must avoid an obstacle, steer **sharply** toward the road, turning steering wheel about 90° while accelerating slightly.

If you do not have to avoid an obstacle, scan the road edge to find the point at which there is the least distance between the road edge and berm, then turn the wheel gradually and steer on at that point. As soon as the vehicle’s **front** right wheel touches the road edge, counter-steer to control lane position.

DANGER SIGNALS FROM GAUGES AND INDICATORS ON THE INSTRUMENT PANEL

- **Charging system fails (battery not charging)**— turn off any equipment that will drain the battery. If you stop the engine, it is unlikely it will restart.
- **Brake warning light comes on**—stop immediately. Do not drive the vehicle until maintenance has been performed.
- **Oil pressure drops**—stop immediately. Do not drive vehicle until maintenance has been performed.
- **Engine temperature rises into danger zone (and remains there)**—stop immediately. Do not drive the vehicle until maintenance has been performed.

EVASIVE ACCELERATION simply means a quick burst of speed. This maneuver can be used to avoid a collision with side approaching or merging vehicles. Drivers often do not think of this evasive maneuver. When a vehicle is approaching from the side or merging, increasing speed often can avoid collision.

UNAVOIDABLE COLLISIONS. When you are sure that a collision is unavoidable, **choose** an object to collide with. Always choose the course least likely to cause death or injury, or the course that will cause the fewest injuries. Head-on collisions are the most damaging in terms of both life and property. Instead, steer so that your vehicle sideswipes or hits the other object at an angle. Avoid hitting large, immobile objects in favor of “impact-absorbing” objects.

Some **impact**-absorbing objects are parked cars, low bushes and shrubs, small signs (e.g., stop sign, speed limit). **Nonimpact**-absorbing obstacles include concrete bridge abutments (just about anything made of concrete), buildings, large trees, and utility poles (which also pose the hazard of power lines).

Safety Off the Road

IF YOU MUST PULL OFF THE ROAD

Due to adverse weather conditions or a contingency situation, you may find that you must pull off the road. In the worst case, you will be unable to get the vehicle entirely off the road (and out of the path of surrounding traffic). Whenever this situation arises, both you and the vehicle must be protected. The principal of “protecting the scene” is to provide visible, early warning to surrounding traffic, and thus avoid a collision (or avoid causing a collision).

VEHICLE POSITION

When fire department vehicles respond to an emergency on a freeway, throughway, or other

busy thoroughfare, they should attempt to park directly behind or ahead of cars involved in the emergency. This position will minimize the interruption of traffic flow, as well as the exposure of people and apparatus to danger from collision. Avoid, as much as possible, the directing of lighted headlights and spot lights into flowing traffic.

WARNING DEVICES

The more a hazard an accident scene is, the more critical the need for rapid, effective placement of warning devices. You should select the method or combination of methods most likely to provide visible, early warning to surrounding traffic. Some possible methods include:

- **Most Effective**—emergency-warning devices (such as triangular reflectors, flares, fuses, etc.).
- **Okay**—overhead beacon, four-way flashers, cab lights.
- **Poor**—headlights, parking lights, nothing. Parking or headlights alone can actually increase the hazard. At night, tired motorists may tend to “follow” the lights right off the road into the rear end of the EV.

During daylight, if the vehicle is well off the road, activating four-way flashers is usually sufficient to protect the scene. If the vehicle is not well off the road, you should take additional precautions. In addition to taking the extra precaution of placing warning devices, operators should protect themselves by leaving the vehicle if a collision is likely.

In darkness, if the vehicle is on or near the road, warning devices should be positioned whenever the vehicle will be stopped for more than a few moments. If the length of time the vehicle will be stopped is long **or** indefinite, warning devices should be positioned (whether the vehicle is on or off the road).

NIGHT DRIVING

Driving techniques must be adjusted for all adverse conditions. Two basic steps to take are (1) slow down; and (2) increase following distance. Night driving in adverse conditions affords more opportunities for accidents. Obviously, at night there is less light to see by. Vision is somewhat restricted. Some facts you should remember are:

- Night vision varies considerably among persons.
- Older people’s night vision is not usually as good as younger people’s night vision.
- Eye-straining activities (during the day) can reduce night vision.
- Sunglasses reduce eye strain in bright sun, but they should **NEVER** be worn after sunset.
- Bright flashes of light (lightning, high-beam glare) can cause momentary blindness.

	Day	Night
Percentage of accidents	70	30
Percentage of fatalities	53	47

Nearly one-half of all fatalities occur at night; however, less than one-third of all accidents occur at night. Thus, a much higher proportion of nighttime accidents result in fatalities.

Figure 4-8

There are many more drunk drivers on the road at night than there are during the day. Take precautions to search for indications of drunk drivers and keep especially alert between 11 p.m. and 3 a.m. Some indications of a drunk driver are weaving across lanes, a delayed start at a stop sign or traffic light, or erratic speed.

For obvious reasons, many of the drivers on the road at night will be tired. Allow extra space and time for other drivers to react. Do not be a tired driver yourself. Begin the trip well rested.

PLACING FLARES OR OTHER EMERGENCY WARNING DEVICES

The obvious purpose of warning devices is to alert traffic to the stopped vehicle's presence, but another real goal is to cause as little interference as possible with the flow of traffic.

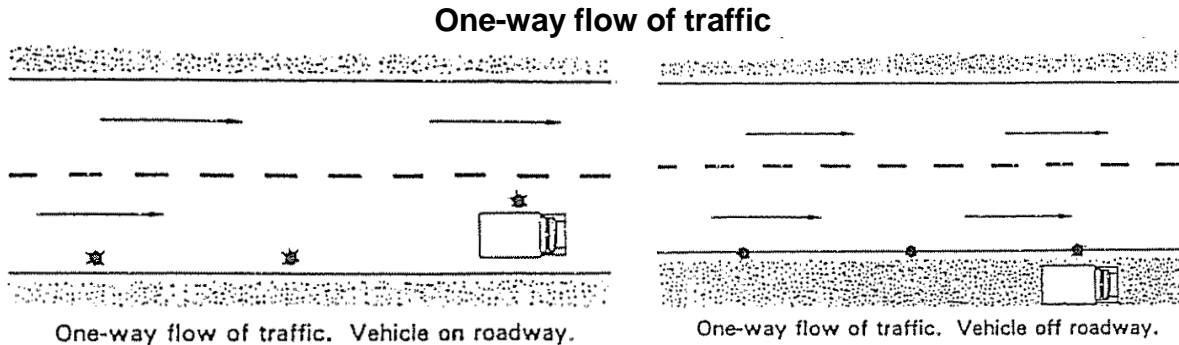


Figure 4-9

To place warning devices on one-way roads, start four-way flashers before leaving a vehicle—leave the cab light ON then place a warning device just beside the vehicle on the traffic side. Locate a second warning device 100 to 200 feet to the rear of the vehicle, on the edge of the road. If the vehicle is actually ON the roadway, the device should be placed in the middle of the lane. A third device should be placed approximately 300 feet to the rear of the vehicle, on the road edge (or in the lane if the vehicle is ON the road). You can judge road distances, approximately. When walking quickly, a normal stride is a little more than two feet.

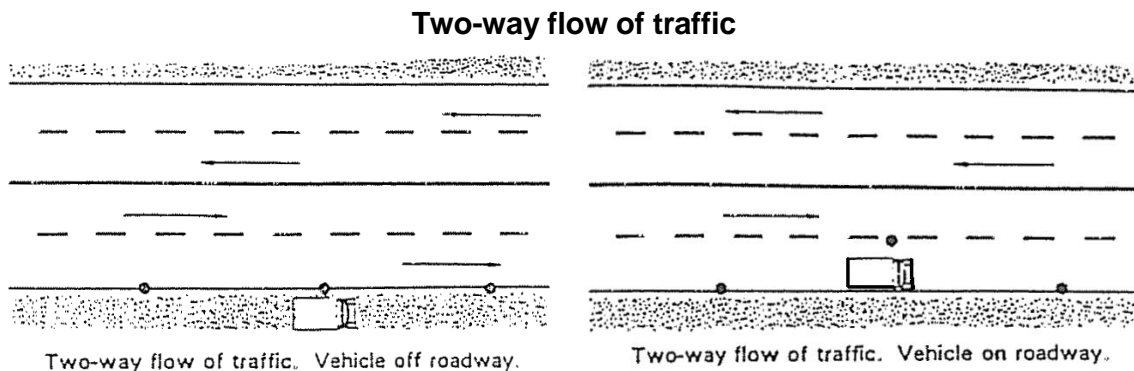


Figure 4-10

To place warning devices on two-way roads, start four-way flashers before leaving a vehicle—leave the cab light ON then place a warning device just beside the vehicle on the road side. A second device should be placed 100 to 200 feet to the rear of the vehicle, on the road side. If the vehicle is ON the road, the device should be placed in the middle of the lane. Locate a third device 100 to 200 feet to the front of the vehicle, on the road edge.

Needless to say, the person spotting flares should use extreme care in anticipating the actions of oncoming cars.

When using flares or fuses, be sure to read all directions accompanying warning devices. The following points can serve as general guidelines if no directions are present:

- Do not light a warning device until you are ready to put it down.
- Pull the tab near the top of the device to free the cap.
- Strike the matchlike head of the flare against the strike surface on the inside of the cap— point the flare or fuse **away from your body** as you do this.

If you are using flares with spiked ends and they must be placed on the roadway, push them between slabs of concrete or simply lay them on the road. Flares or fuses should NOT be used if there is an odor of gasoline or evidence of any fluid leakage or any possibility of fire. In these cases, the only safe warning devices are reflectors. The large, red-orange triangles are especially effective. Of course, the vehicle's lights (e.g., beacon, four-ways) can be used as well. Replace any warning devices that have been used as soon as the EV returns to quarters.

Headlights should be used at all times between the first signs of dusk and full daylight. Many drivers have developed the habit of putting on parking lights at dusk. This is a bad practice. As soon as daylight is noticeably diminished, **headlights** should be turned on, although many fire departments' SOP's require headlights to be on any time a vehicle is in operation. Always keep your headlights clean and properly aimed. Make sure you have burned-out lights replaced immediately. Dim your high beams whenever you are within 500 feet of approaching vehicles and whenever you are within 300 feet of overtaking or following other vehicles. Avoid high beams on right curves—they will tend to blind the oncoming driver. Do not stare directly into high beams. Guide your vehicle by using the right edge of the road. Flicking high beams up and down to signal a motorist to lower his/her beams can be dangerous; it can momentarily blind the other driver.

Some tips to improve visibility at night are to keep the windshield clean, both inside and outside. Cigarette smoke builds a film on the inside of windows. Dirty windshields make lights "sparkle." The pupils continuously expand and contract, causing eyestrain and headaches. Keep the instrument panel lights dim. Slow the vehicle considerably on curves or when turning. Headlights light up less of the roadway on curves or when turning, so keep your eyes moving. Moving eyes can pick out dim objects better than tightly focused eyes.

WHAT WOULD YOU DO? PRACTICE QUESTIONS

Each of the drawings in this practice section illustrates a potential accident. The things that could be done to avoid an accident in these examples include:

- Emergency braking
- Evasive steering
- Evasive acceleration
- No action

What would be the appropriate response for these situations?

- The EV is traveling on a four-lane road with no median. Gravel shoulders are on both sides of the road. The only other vehicle is the car that appears to be out of control—it is crossing the center line and headed for the EV.
- The EV is traveling at 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.
- The EV is traveling at about 30 mph on a busy, urban street. A car is behind the EV, following closely. Another car is approaching in the opposing lane of traffic. Parked cars are in the lane immediately on the EV's right. A small dog runs out into the roadway.
- The EV is traveling 55 mph in the right-most lane of a four-lane divided expressway. Two cars are in the left lane beside the EV. A car is about to enter the expressway from the entrance ramp; it is traveling approximately 45 mph.
- The EV 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.

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Chapter 5: Use of Red Lights and Siren

Legal Aspects of EV operation were stressed in Unit 1 of this series on emergency vehicle accident prevention. It is commonly accepted that in every emergency, lights and sirens are used to inform traffic of an EV's presence and aid in clearing a path for the EV. Unit 1 additionally stressed that due regard must always be exercised, even in the most serious of emergencies and, in the case of an accident, must be proven. State laws also require the EV to use emergency signaling equipment whenever any of the allowed exemptions are exercised. The use of signaling equipment does not guarantee operator safety, nor does it free him/her from the possibility of civil or criminal liability if a mishap does occur.

In addition to sirens, law sets the particular type and configuration of emergency lights. Local policy and operating procedures are dependent on the overall type of equipment in service. Generally, some limitations to be aware of when using emergency lights are:

- Low sun or glare can greatly reduce effectiveness.
- At night, red beacons can be confused with traffic lights and neons.
- Lights on high EV's may pass over motorists if the EV is close to the rear of the vehicle ahead.

Areas containing greater background noises (such as those made by street cars, buses, and trucks) reduce the capacity to hear a horn or siren. Furthermore, personal hearing limitations vary considerably. Some persons are more perceptive to high tones while others can hear low tones best. This is a reason for operating the siren throughout its entire tone scale, fluctuating from a high to a low pitch. A person whose hearing is impaired may be given a restricted operator's license which merely requires that his/her vehicle be equipped with adequate rear and side view mirrors.

In cold and rainy weather, most motorists drive with all windows closed. One test has pointed out that hearing ability is diminished by one-third inside a vehicle with all windows closed, compared to audibility when the driver's window is open. Noise inside a vehicle or truck, created by its engine, and noise created by a radio or conversation will also greatly reduce a driver's perception to the sound emitted by an approaching siren.

LIMITATIONS ON SIREN USAGE

Usually, the siren sound travels forward from the vehicle in a cone shape. The higher the sound frequency, the narrower the cone and the greater the distance the siren can be heard. The physical limits that establish the effectiveness of sirens are sound level and spectral content, directivity, propagation losses, vehicle background noise, and vehicle insertion loss. (**Vehicle insertion loss** is the difference in sound level observed at the driver's position in a

vehicle from that observed at the same location without the vehicle, for the same external noise source.)

Sound waves set up by sirens are directional. They have a greater intensity ahead than to the sides or rear of the emergency vehicle. Buildings deflect sound waves. Motorists approaching the intersection from right angles to the path of the EV do not receive a signal of the same strength as those motorists directly ahead. Tests have indicated that the audibility of a siren around the corner at an intersection where buildings are located is as much as two-thirds less than on a straightaway. Hills also affect the direction of siren sound waves. When an emergency vehicle is approaching the crest of a hill, the perception of siren sound waves by motorists on the other side is greatly reduced.

At high speeds, it is possible to “out run” the siren. The effectiveness of the siren under varying field conditions is not as great as might be expected. As an overall safety factor, the driver of an emergency vehicle should assume that all motorists are partially deaf, that they are inattentive to their driving, that the windows of their vehicle are closed, that a radio is playing and that conversation is taking place within their vehicle, and that they will become confused if and when they hear a siren or see a responding EV. These conditions, plus the background noise of the district and conditions at each intersection, should determine the extent to which drivers depend on their siren to clear traffic. Many officers and drivers consider the air horn an effective device to clear traffic at intersections; however, the air horn is not a legal emergency vehicle warning device and should not be used to the exclusion of the siren.

GENERAL GUIDELINES FOR USING LIGHTS AND SIREN

In general, when activating the siren, let up slightly on the accelerator. Motorists respond in strange ways to a sudden siren. This gives the operator a bit more time and room to take appropriate action. **Do not rely** on the siren to clear the traffic. Watch for the reaction of other vehicles to the siren and be prepared to maneuver accordingly. Other drivers often have difficulty in determining the location of the siren. Presume that other drivers cannot hear the siren and maneuver accordingly. This is particularly important in high-density traffic areas.

Generally, motorists will try to pull to the right and slow down or stop when they detect an approaching EV. Most motorists are more than willing to pull over to miss a light or save a life. Some, however, when confused, will do senseless, unexpected things such as:

- Stopping dead in the middle of a lane, blocking the EV’s forward progress.
- Trying to compete (race) with the EV or beat the EV through an intersection.
- Doing nothing at all. They will keep traveling at the same speed.

With a radio or air conditioner on and failing to check the rearview mirror, some motorists may be totally unaware of the presence of the EV, even though signaling equipment is in use. Get their attention by laying off the siren or varying pitch or duration, give them a

chance to think. Tap the horn and flash lights to try to establish eye contact. Once eye contact has been established, give a hand or verbal signal indicating what action the motorist should take. Be cautious—you cannot totally depend on motorists understanding hand signals. You may need to yell out instructions.

Some motorists may be totally unaware of EV's presence, even though signaling equipment is in use. Particularly, beware of startling unsuspecting motorists; they could respond hazardingly. To get the motorist's attention:

- Vary siren pitch and duration.
- Have **partner** use PA to get attention.
- Be patient, keep signaling!
- **Avoid passing on the right**, unless it is the only way.
- In extreme cases, it may be necessary for a crew member (never the driver) to get out of the vehicle and direct traffic.

Traffic blockages are often unavoidable, particularly during rush hours. Route planning, including alternate rush-hour routes, reduces the chance of encountering blocked traffic.

If traffic is blocked, slow down before reaching the blockage—it gives a better view and it is easier to detect what effect the signaling equipment is having. Use siren intermittently, keep your patience, and do not travel in opposing traffic lanes unless you **know** traffic is cleared for at least one block.

URBAN DRIVING

Even in normal, non-emergency conditions, operating an EV in an urban area requires a high degree of skill. EV operators and public servants must present good examples to other motorists and pedestrians. At any time, the EV may be called into emergency service. Accidents or delays could make the EV unavailable for service. There are keys to successful urban driving: Keep alert for children, alleys, exhaust from parked cars, and cross walks.

Do not anticipate other motorists' actions. Motorists sometimes signal turns or lane changes when they do not mean to. In spite of how they signal, note the direction the motorist looks, the way the vehicle is pointing, and whether they slow properly, etc. They may enter to cross traffic without allowing a sufficient gap. Motorists may also try to beat a light, going through as it changes.

Effective drivers are constantly thinking, "What if..." They have a general action plan in mind **before** a child pops out or a motorist pulls a crazy or unexpected stunt.

CONSIDERATIONS: URBAN DRIVING IN THE EMERGENCY MODE

Speeds in excess of the limit are rarely justified—only in the most extreme emergency. There is too much chance of unexpected motorist or pedestrian action that could lead to an accident. Reasonable speed allows more time to react to such actions and more opportunity to control the EV if evasive action is required.

Urban driving in the emergency mode requires effective use of lights and sirens to warn motorists and pedestrians of the approaching EV and clear traffic and/or help you negotiate through heavy or blocked traffic.

Of considerable importance is the psychological effect which speed has on responding personnel. The natural result of speeding to an alarm is that it encourages a lack of logical judgment. The officer and driver who make certain of the alarm location and respond with safe and sane driving will arrive with a crew prepared for effective action. If the driver of an EV has his/her vehicle under reasonable and proper control at all times—especially at street intersections—the excitement and hazards associated with dangerous speed will be reduced and replaced with cool, deliberate decisions and actions.

All drivers should regulate their actions according to a basic rule: Never exceed a speed which is reasonable and proper for existing conditions even when the law permits.

NEGOTIATING INTERSECTIONS

Intersections are the most **accident-likely areas**. There is a revealing statistic concerning accidents at intersections:

All Motor Vehicles 37%
Emergency Vehicles 50%

Over half of all EV accidents occur at intersections. Think of possible reasons and consider the following.

Many intersections restrict visibility. EV operators can misjudge a traffic situation and clearance when operating in emergency mode. Some **motorists become confused** at multi-lane or crowded intersections (especially when they have to respond to an EV). Some **motorists do not hear or see the approaching EV**. Their “responses,” therefore, are often totally unpredictable. Two or more EV’s responding to the same call often “meet at intersections.”

TECHNIQUES FOR NEGOTIATING INTERSECTIONS

Before attempting to cross an intersection, you must make sure there is an adequate gap in traffic flow. From a full stop, you need about four seconds to cross an intersection 30 feet wide (approximately two lanes). For larger vehicles, time varies according to size, accelerative capability, etc. Cars approaching from either direction should be about six seconds away from the intersection, to allow an adequate gap. Operators should look left, then right, then left again before crossing an intersection. It takes about six seconds to turn right and accelerate to 30 mph.

Right turns at an intersection (See Figure 5-1): From a stop, it takes about six seconds to turn right and accelerate to 30 mph. When you begin to turn, any vehicle approaching the intersection from the left should be at least seven to eight seconds away from the intersection. If a right turn is started with an eight-second gap, the vehicle approaching from the left will be a safe two seconds behind the EV once the turn and acceleration are completed.

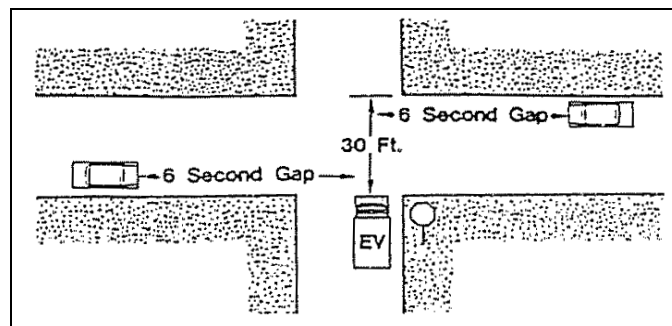


Figure 5-1

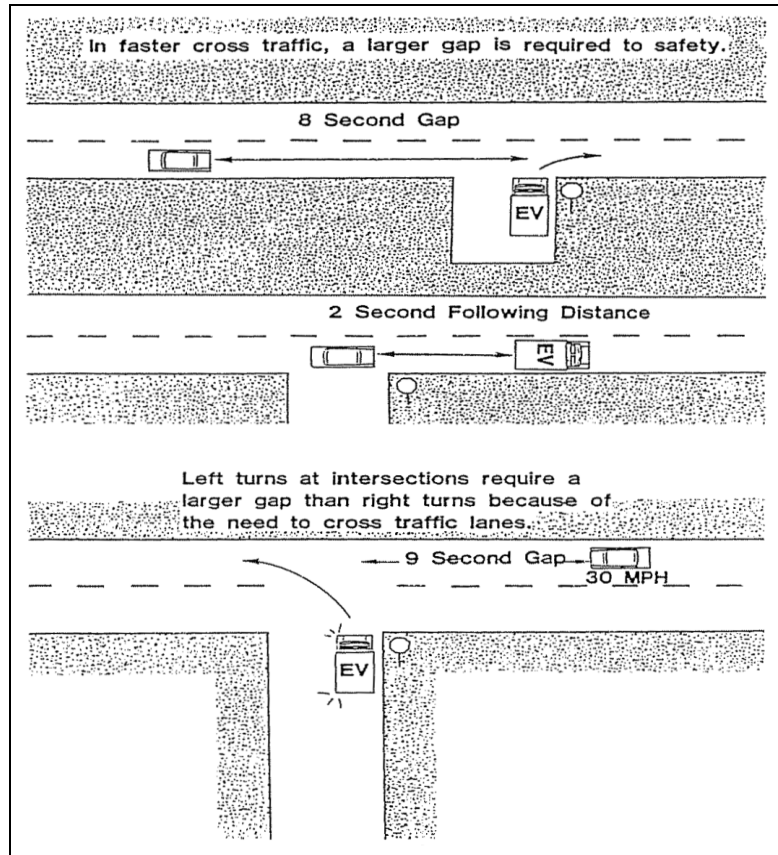


Figure 5-2

Gaps for Turning at Various Cross-Traffic Speeds						
Speed of Cross-Traffic	Sedan		Van		Large Truck	
	L	R	L	R	L	R
30						
40	9	8	10	9	11	10
50	10	9	11	10	12	11
55	12	9	13	12	14	13
	12	11	14	13	15	14
	13	12				

Some considerations for negotiating intersections in the emergency mode are:

- The siren should be manually controlled for a short period just before entering an intersection. This will allow the operator to hear other EV's and lessen the chances of a "panic" reaction by motorists at the intersection.
- Provide as much information as possible to hear other motorists. Use all means of signaling, including lights and siren. Lights and siren alone may not be sufficient warning for motorists. Recall with windows up, air conditioner, radio on, etc., audibility is reduced by as much as one-third. Also remember that siren sounds don't carry around corners very well. Additionally, low sun or glare can make emergency lights useless. Visual information can be sent by turn signals, land position, and eye contact, or hand signals.

Drivers should signal their intent **at least** 100 feet in advance of an urban intersection (200 feet in the country). Check for traffic control indicators **in advance** of every intersection. Look for lane markings, signals, stop or yield signs, and crosswalks.

Check for hazards **well in advance** of intersections. Make sure the driver's window is partly open—this will enable detection of other EV's, if in the vicinity. Stay especially alert—search for actual hazards (e.g., bad road surface, motorists in your lane) and potential hazards (e.g., bicyclists and pedestrians).

Drivers should be instructed to brake down and downshift before entering intersections so at no time will there be the need to remove one hand from the steering wheel to make a shift while in an intersection. Drivers are also instructed to brake down and downshift, before entering a turn of any consequence, to a gear sufficiently low enough to where a slight acceleration may be accomplished through the turn and speed may be increased after the turn is negotiated without the need for further downshifting.

- Turns will be at a safe speed.
- It will not be necessary to brake in the turn.
- Shifting will not be done in the turn. Both hands are needed on the wheel, and this is quite impossible if a shift is needed in the turn.
- It takes more power to push a vehicle around a turn than it does rolling straight, so why not be in a lower gear before entering a turn? A little power to the rear wheels while cornering is beneficial safety-wise.

PASSING ANOTHER VEHICLE

HOW LONG DOES IT TAKE TO PASS?

At highway speeds of 40 to 60 mph in a sedan, a safe pass can be completed in 10 seconds. Passing time varies for different types of vehicles because of the variation in vehicles' accelerative capabilities. This assumes the starting speed is approximately the same as that of the vehicle to be passed. These figures allow a **complete** pass (including smooth return to the right lane).

In terms of distance, a 10-second pass requires 1/6 mile at 60 mph. Due to the possibility of an oncoming vehicle, you must allow a full 1/3 mile of visible roadway before initiating a pass.

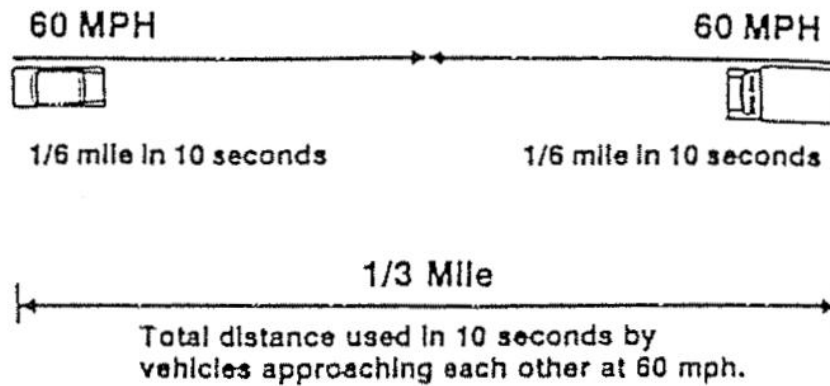


Figure 5-3

Starting Speed	Passing Distance	Visible Roadway
30 mph	450 ft.	900 ft.
35 mph	525 ft.	1,050 ft. (1/5 mile)
45 mph	675 ft.	1,350 ft.
55 mph	825 ft.	1,650 ft.
60 mph	900 ft.	1,800 ft. (1/3 mile)

Passing distance and visible roadway distance requirements for various speeds.

Some drivers have trouble building a "mental picture" of distances. One way to learn to perceive these distances is to make a mental note of vehicle size and road convergence at expressway exit points when the signs indicate the mileage to the exit. One-tenth mile markers are also useful in learning to judge distances.

Consider before passing—vehicle characteristics, road information, and traffic situations.

Vehicle Characteristics: You should be familiar with your specific vehicle. If you drive different vehicles daily, check out and familiarize yourself with the specific handling characteristics of every vehicle: (1) accelerative capacity; (2) steering precision; and (3) braking capability. Braking capability can become tremendously important should the operator unexpectedly have to abort a pass.

Road Information is critical to successful passing. Look for informational signs ("No Passing," etc.), road markings (solid center line, broken center line, etc.), road configuration (hills, blind curves in intended passing area, intersecting roads, etc.) Many road markings and signs forbid passing for no apparent reason. Usually, however, there is a good reason (hidden driveway, school, damaged road surface, poor road design, etc.). One good way for an EV operator to become a safer driver is **to become familiar with his/her area**. It is especially important to be alert for **new** road markings and signs. (See Unit 3, Route Planning.) A pass should never be attempted on a stretch of road where there are intersecting roads, even driveways.

Never pass a stopped car (or line of cars) without first determining **why** it is stopped. In Figure 5-4, the EV did not take the time to determine why the truck (B) was stopped. Had the EV driver done so, he/she never would have attempted to pass. If the operator were very familiar with the area, he/she might have known why the truck was stopped.

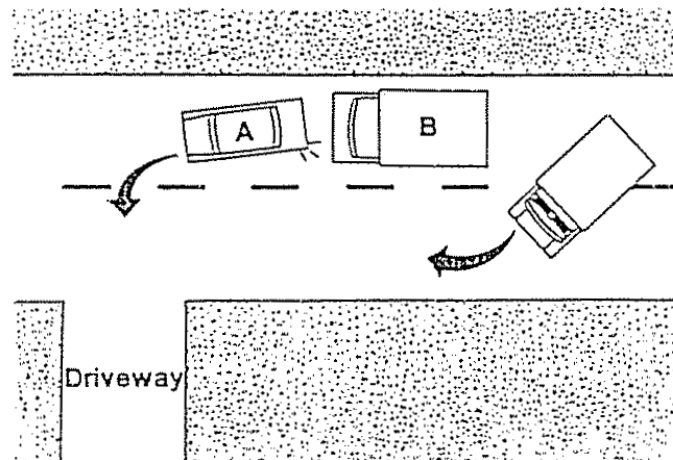


Figure 5-4

Traffic Situation: Passing a vehicle that is traveling at the maximum posted limit is **ILLEGAL** unless the EV is in emergency mode. On two- and three-lane roads, when traffic flow is heavy but moving at a constant speed, there is little to gain by passing. A driver should continually judge distance of oncoming traffic.

Question how much of the oncoming lane of traffic is visible. The following kinds of things can limit visibility: Blind curves, hillcrests, and bad weather (fog, heavy rain, etc.). It cannot be overemphasized to never pull abreast of another vehicle unless you are sure the pass can be completed safely. On two- and three-lane roads, never pass stopped traffic unless certain there is space ahead to return to the right lane. When deciding to pass a larger vehicle, it is sometimes necessary to pull slightly left (straddle the lane) in order to determine the traffic situation ahead.

TO EXECUTE A PASSING MANEUVER

- Check traffic—mirrors, blind spot.
- Signal **before** lane changes.
- Accelerate while changing lanes.
- Signal **before** returning to right lane.
- Return to right lane when the entire passed vehicle is visible in your rearview mirror.
- Cancel directional signal; resume cruising speed.

BEING PASSED

EV's are passed less often than other vehicles. When being passed, certain courtesies should be extended. Do not change speed while being passed. If the passing driver gets into a dangerous situation, try to assist. Pull as far to the right as possible. Accelerate or decelerate as necessary.

Tips for Avoiding Mishaps When Passing

- If the decision has been made to pass, and conditions are okay, **DO NOT HESITATE**—conditions could worsen.
- Stay in the passing lane for the shortest possible time.
- Constantly scan the roadway for unmarked, intersecting roads.
- Be prepared to abort if conditions worsen. Most vehicles can slow up much more quickly than they can accelerate. Unless fully abreast of another vehicle, it is often safer to pull behind than to try to accelerate.

CONSIDERATIONS: PASSING IN THE EMERGENCY MODE

Evaluation of risk vs. gain. Many passing situations are potentially hazardous, involving some risk. In the emergency mode, the gain (e.g., save a life) may justify increased risk. When conditions are ideal, there is very little risk. The ideal conditions include the vehicle being in good shape, road information being okay, and the traffic situation is light (or okay for pass).

When one or more of these conditions are questionable, risk increases. Ask yourself the following questions: How important is saving time? How much time will really be saved by passing? If passing is delayed for a few moments, might conditions improve (conditions such as lane markings change, traffic thins out, road configuration improves, e.g., from curves to straight)?

ENTERING AND EXITING FREEWAYS

Directional and velocity control are accomplished by steering, acceleration, and braking. These basic control tasks are all present in two slow-speed activities—backing and parking. While relatively simple tasks, practice is required for good performance.

Because of the size of fire apparatus, the driver's visibility is limited when attempting to back the vehicle. A known but often overlooked fact of backing is that the back wheels are leading and the front end is following. To change the direction of travel when backing, the following end must swing to the side in order to point the vehicle towards its goal. The sharper the turn, the more the following end must swing. While looking in the direction of backing, do not forget this swing; be fully aware that backward steering is different.

BACKING UP

Backing mishaps account for a large proportion of all EV accidents. Most backing accidents are relatively minor. Even minor accidents, however, can have wide-range consequences (e.g., they keep EV's out of service while repairs are made and cause the operator a lot of paperwork). Lost time and materials cost taxpayers money and create a bad public image. Remember, EV operators are taxpayers, too! The techniques that will help minimize backing accidents are common-sense techniques that require a few extra seconds—they are well worth the time.

Park so that backing is minimized or eliminated. You must plan ahead to do this. This kind of planning includes not parking head-in if departure will be hurried. Select places that require the least backing; and before entering a vehicle to be backed, survey intended path of vehicle.

When you **must** back the vehicle:

- Station a crew member outside the vehicle to direct the operation. The following signal code by the driver and guide is recommended, with use of the horn by a driver and tailboard buzzer operated by the guide:
 - 1 Blast STOP immediately
 - 2 Blasts Forward
 - 3 Blasts Back up
- Signals should be given distinctly and may originate with either the driver or the guide person. The signal for "go forward" or "back up" must be acknowledged before action is taken.
- The "back up" signifies that a backing operation is necessary. When given by the driver, the guide will then position himself or herself to assist the driver during the backing operation.
- Check (before moving) for pedestrians and obstacles; signal with horn and lights to warn other personnel, motorists, and pedestrians.
- Back SLOWLY (as if you expected to hit something).
- Constantly check mirrors for changes in the traffic situation and obstacles in your path. Properly positioned and adjusted, convex mirrors can be helpful in eliminating blind spots.
- When turning while backing, check the front fender to avoid a front collision. About 90 percent of the time, the operator should be looking to the rear.\
- When backing out of an alley, hidden driveway, etc., sound the horn or "back-up alarm" for warning.
- Use standardized hand signals.

It is the driver's responsibility to have a backup person assist when maneuvering and that he/she does exactly what they are told to do. It is also the responsibility of the backup to give clear and correct signals that the driver will obey.

RIGHT

- Point in the right 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 in the right direction.

LEFT

- Point in the left 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 in the left direction.

DIMINISHING CLEARANCE USED IN CONJUNCTION WITH STOP

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 same. Close hands as the distance narrows to a point where you indicate immediate STOP. Always allow enough for 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.

STOP

Hold hands directly in front, chest 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.

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.

AUTOMATIC TRANSMISSIONS

There are several types of automatic transmissions used on fire apparatus, but their function is similar. For the purposes of instruction, the Allison transmission will be discussed; facts covered here may be applied with slight adaptation to other makes.

The Allison automatic transmission is hydraulically operated with six forward gear ratios and one reverse. Basically, it consists of a hydraulic torque converter, a planetary gear train, and a control system to automatically change gear ratios and supply oil under pressure to the converter, retarder, and lubrication circuits. The converter multiplies the engine torque and also does the work done by the clutch on a stick transmission. Control is exercised by means of a range selector level, adjacent to the driver's hands, and a hydraulic retarder pedal, which is located where the clutch pedal usually is.

Selection of the correct range provides better control; it also avoids undue hunting by the transmission for the required gear. Here are typical range selections and when to use them

Range Selector Positions

(R) Use this to back the vehicle. Completely stop the vehicle before shifting from a forward gear to reverse or from reverse to forward. The reverse warning signal is activated when the range selector is in this position. Reverse operation provides the greatest tractive advantage. Reverse has only one gear.

(N) Use this position when you start the engine. If the engine starts in any other position, the neutral start switch is malfunctioning. Neutral position is also used during stationary operation of the power takeoff (if your vehicle is equipped with a PTO). Use neutral when the vehicle will be left unattended while the engine is running—always apply the parking brake.

(D) Use this for all normal driving conditions. The vehicle will start in 1st gear, and as the accelerator is depressed, the transmission will up shift to 2nd gear, 3rd gear, 4th gear, and 5th gear, automatically. As the vehicle slows down, the transmission will downshift to the correct gear, automatically.

(4, 3, and 2) Occasionally, the road, load, or traffic conditions will make it desirable to restrict the automatic shifting to a lower range. When conditions improve, return the range selector to the normal driving position.

WARNING—Do not allow your vehicle to coast in neutral. This practice can result in severe transmission damage. Also, no engine braking is available

(1) This is low gear—use this when pulling through mud and snow or driving up steep grades. This position provides maximum engine braking power.

In the lower ranges (1, 2, 3, and 4), the transmission will not up shift above the highest gear selected unless the engine governed speed is exceeded.

TRANSMISSION CONTROL

The pressure of your foot on the accelerator pedal influences the automatic shifting. When the pedal is fully depressed, the transmission will automatically up shift near the governed speed of the engine. A partially depressed position of the pedal will cause the up shifts to occur at a lower engine speed.

The transmission can be downshifted or up shifted, even at full throttle, and although there is no speed limitation on up shifting, there is on downshifting and reverse. Downshifting should be avoided when the vehicle is above the maximum speed attainable in the next lower gear. If a downshift or reverse shift is made at too high a speed, the hydraulic system automatically prevents the shift taking effect until a safe, lower speed is reached.

To use the engine as a braking force, shift the range selector to the next lower range or use a retarder, if available. If the vehicle is exceeding the maximum speed for a lower gear, use the service brakes to slow the vehicle to an acceptable speed where the transmission may be downshifted safely.

Towing or Pushing. Before towing or pushing a disabled vehicle, the driveline should be disconnected or the drive wheels lifted off the road. Pushing or towing cannot start the engine.

CAUTION: Failure to disconnect the driveline or lift the driving wheels before pushing or towing the vehicle can cause serious transmission damage.

There is no "park" position in the transmission shift pattern. Therefore, always put the selector in neutral and apply the parking brake to hold the vehicle when it is unattended.

If the vehicle is stuck in deep sand, snow, or mud, it may be possible to "rock" it out. Shift to (D) and apply a steady light throttle (approximately 800-900 RPM—never full throttle). Then by moving the range selector between drive and reverse, rock the vehicle free. Time the shifts to take advantage of the forward and reverse momentum. If the driving wheels spin, apply less throttle.

CAUTION: The engine should never be operated for more than 30 seconds at full throttle with the transmission in gear and the output stalled. Prolonged operation of this type will cause the transmission oil temperature to become excessively high and will result in severe overheat damage to the transmission.

TEMPERATURES

The transmission oil temperature is indicated in some vehicles by a gauge specifically designed for this purpose and in some vehicles by the engine coolant temperature indicator.

Extended operations at low vehicle speeds with the engine at full throttle can cause excessively high oil temperatures in the transmission. These temperatures may tend to overheat the engine cooling system as well as cause possible transmission damage.

HOW TO KEEP LITTLE PROBLEMS FROM BECOMING BIG PROBLEMS

Observing the operation of the transmission and making a few periodic checks can keep minor mechanical problems from becoming major overhauls.

If one of these conditions occurs, notify your vehicle maintenance personnel:

- Shifting feels odd.
- Transmission automatically up shifts or downshifts at irregular intervals.
- Overheating.
- Unusual sounds.
- Oil leaking from the transmission.

AUTOMATIC SHIFTING DO'S. A GOOD DRIVER:

- Learns what the manufacturer's recommendations are for automatic up shifting and downshifting.
- Learns what extra features the transmission may have (e.g., detent retarder) and how to use them properly.
- Attempts to learn how to manipulate the transmission with the accelerator to make it work smoothly. Learns speed ranges in each gear.

AUTOMATIC SHIFTING DON'TS. A GOOD DRIVER DOESN'T:

- Overheat the transmission. The operator must watch the temperature gauge for transmission oil.
- Try to force downshifts at speeds above those recommended by the manufacturer.

SHUTDOWN PROCEDURES

Upon returning to the station, engines, particularly large ones, should be idled at a fast idle (800-1,000 RPM) for five minutes after a run to let them cool properly. When a hot engine is shut down, the water is no longer circulating and the heavy metal continues to heat. Idling will allow circulating water and lubricating oil to carry heat away from cylinder head, valves, pistons, cylinder liners, and bearings, thus preventing warping of valve stems or distortion of other parts resulting from uneven cooling.

This rule is particularly important for obtaining best operation of turbocharged engines. The turbocharger is the one unit containing bearings and seals that are subjected to high temperature exhaust gases. While the engine is running, circulating oil carries this heat away. If the engine is stopped suddenly after a hard run, temperature of the turbocharger

may rise as much as 100° above that reached during operation. This may cause the bearings to seize or the oil seals to loosen.

AFTER STOPPING THE ENGINE

- **Set the parking brake**—Do not rely on air brakes, nor on engine compression, to hold the vehicle while parking.
- **Refuel**—The less air space in fuel tanks, the less opportunity there will be for water to condense from the air.

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Chapter 6: Traffic Safety

IDENTIFYING, ASSESSING & MANAGING RISK

When emergency responders approach an incident scene, identifying traffic/hazards and developing a plan for protecting the scene and its workers should be considered with, at least, the following variables in mind:

- Expect other drivers to make mistakes (i.e. contingencies)
- The type of roadway you are operating on (Freeway, city-street, 2 lane highway, etc.)
- Weather conditions with dry vs. wet road surface or good vs. poor visibility.
- Time of day (or night). Visibility is a concern after dark as well as the proper use of emergency and scene lighting.

Risk Assessment is defined as “Assessing or determining the possibility of suffering harm or loss, and to what extent.”

Risk Management is defined as “The development of strategy and tactical plans based on an accurate risk assessment taking into consideration current and potentially changing scene conditions.”

DRIVER REACTION TIME

As covered in Section 4, the components of reaction time are:

Mental Processing Time:

- Sensation
- Perception/Recognition
- Situational Awareness
- Response Selection
- Movement Time (The time required to perform the selected action).
- Device Response Time (The functional time of a mechanical device to activate).

STOPPING DISTANCES

- A vehicle traveling at 40 MPH is moving at 59 feet per second and requires a stopping distance of 164 feet on dry pavement.
- A vehicle traveling at 60 MPH is moving 88 feet per second and requires a stopping distance of 303 feet on dry pavement.
- These numbers are based on a passenger vehicle sedan. A significant increase in stopping distance is required for vehicles that are larger.
- This does not take into account the human factors or vehicle maintenance factors that may increase total stopping distance.
- Adverse weather and nighttime driving may also increase total stopping distance.

See Training Guide #8-4 for Seattle specific “Freeway, Limited Access Roadway & High Speed Arterial Response Guidelines”

Chapter 7: Inspecting Fire Apparatus and Other Emergency Vehicles

INTRODUCTION

Many accidents are caused by vehicle malfunction. Most, if not all, of these accidents could be prevented by a routine physical and visual inspection of the emergency vehicle.

In the final analysis, responsibility for the mechanical safety of the vehicles will rest with you, the driver/operator. You must protect yourself and the motoring public from the hazard of an unsafe vehicle. One way to do this is to perform a thorough inspection at the start of your shift.

You have four major **inspection** responsibilities:

- Inspect the vehicle every day (preferably at the beginning of a shift).
- Ensure that maintenance/repair will be performed.
- Recheck the vehicle after maintenance.
- Determine if and when an EV is unsafe (or potentially unsafe) for emergency operation.
- A basic understanding of how vehicle components work will help you make a thorough inspection of your EV.

See Training Guide #8-3 for Seattle specific apparatus inspection procedures.

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Chapter 8: Special Mission-Related Considerations

VEHICLE DYNAMICS

Vehicle dynamics are an important consideration for the operators of fire apparatus. A high center of gravity exaggerates weight transfer problems. Winding roads, sharp curves, soft shoulders, crowned roads, and negative camber corners can cause the fire apparatus to roll over as a result of weight shift. A half-full water tank can cause fire apparatus to skid out of control, as weight shift exceeds the ability of the tires to hold the road during a cornering maneuver. Policy usually requires that the pumper travel either completely full or completely empty. Baffles, of course, can make this problem much less serious.

SIZE AND WEIGHT

The length of the apparatus makes it harder to drive. A larger gap in cross-traffic is required for fire apparatus to cross an intersection. Sufficient clearance is required forward and to the back of the apparatus when parking at curbside. Corners must be taken wider to allow for apparatus' length.

The weight of the apparatus produces greater momentum than might be expected. Slowing and stopping must begin well in advance of the stopping point. Forgetting this fact can be especially hazardous at intersections. The only defense against this hazard is scan well in ahead of the vehicle, travel at speeds which allow control of the vehicle, and begin to stop well in advance of the intended stopping point.

The power-to-weight ratio of the apparatus generally makes the apparatus hard to accelerate from a stop and hard to accelerate to perform accident avoidance maneuver. The fire apparatus operator must account for the weight support capability of the roadway.

CAB PROCEDURES

Upon receiving the alarm, the driver climbs into the cab. At this point, the driver may or may not wear his/her bunker coat. This decision is left to the driver or SOP's, but it is discouraged due to its bulkiness. The driver need not wear the turnout trousers and boots. They should be carried elsewhere on the vehicle. Wearing them is a detriment to good driving, as they restrict movements and the driver cannot have the proper feeling of the accelerator and brake pedals. Also, the top of the boot will frequently catch on the forward part of the seat.

If the vehicle used has the conventional transmission, the driver will depress the clutch and determine that the transmission is in neutral, then start the engine.

Next, glance at the dash gauges, including the temperature gauge, oil pressure gauge, ammeter, and fuel to be sure all systems are functioning properly.

- **Engine Warm Up:** As soon as the engine starts, it should be idled at 800 to 1000 RPM's, until good oil pressure is built up. If the engine is idled too slowly, it does not receive proper lubrication and may result in excessive wear of pistons and cylinder walls. Too fast an idle will also cause excessive piston and cylinder wall wear due to rapid and uneven piston expansion. **DO NOT RACE OR LOAD A COLD ENGINE.**
- **Air Brakes:** While the engine is warming up, check the air pressure gauge to see that the pressure is building up. **DO NOT MOVE THE VEHICLE UNTIL AIR PRESSURE REACHES 60 PSI.** Either a low pressure warning buzzer or a wig-wag signal will be installed in the vehicle to warn the driver of too low air pressure.

Then, check the rearview mirrors to be sure of proper adjustment.

Now fasten the seat belt. Normally, this would be about the first thing to do; however, not in this case. The engines are equipped with spring-operated safety brakes that require about 60 pounds of air to release them, so engines are started as quickly as possible. However, it takes only seconds to build up sufficient air to release them.

Since the driver does not require bunkering-up time, he/she has accomplished the above and now has the opportunity to pause a second to think of the route that will be taken. It is also a good time to reflect on his/her responsibilities as a driver.

Once the officer is aboard, the driver prepares to respond, but does not move the vehicle until receiving a signal from the tailboard indicating those firefighters are belted and ready to respond. Prior to responding, the officer and driver should preplan the response route they are going to take. This takes one more problem away from the driver during the response trip.

The driver is to keep his/her left foot on the floorboard, except when actually using the clutch to make a shift. The driver is not to ride with the foot on the pedal. The driver should not look at the shift lever while shifting, nor should he/she ride with his/her right hand on the shift lever. The clutch is not to be used to hold the vehicle from rolling back during a stop on an incline. The hand-operated brake can be used for this.

BASIC CONTROL TASKS

Since you spend more time behind the wheel of your car than behind the wheel of an engine or truck, you must constantly remind yourself of the performance differences. You must also develop an awareness of the safety of the crew on board. Standard start out procedures should be established if none exist, (i.e., standard signals from the tailboard crew which indicated stop, go, and back up). The crew should ride in the cab or in enclosed areas wherever possible and turnout gear should be on, and seat belts used.

Safe, smooth responses demand coordination of steering, braking, shifting, and the perception of hazards, tempered with good working knowledge of the vehicle's dynamics.

STEERING

You should be thoroughly familiar with the steering "feel" of each vehicle you are assigned to drive. No two vehicles have the same "feel"— you should get to know it to prevent problems before they occur; for example, be familiar with the "track" the vehicle makes and the amount of room required for turns, etc. If the vehicle has an extreme overhang, as some do, you must learn the clearances.

USE OF HANDS

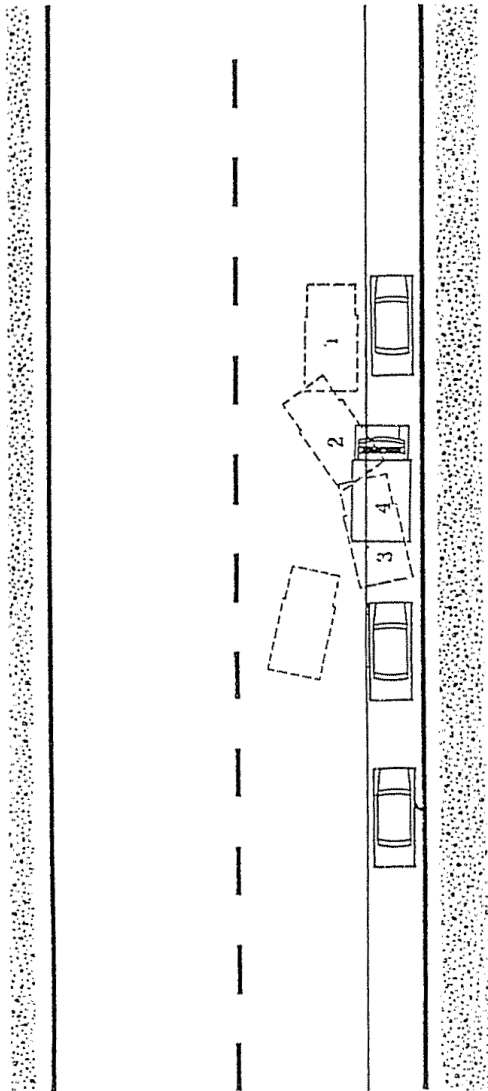
Except for those times when it is necessary to shift gears, both hands should be kept on the steering wheel. The suggested position for hands is about the ten and two o'clock position on the wheel. With the hands in this position, there is less possibility of losing control should the apparatus inadvertently strike a chuckhole or rut in the road. Turning movements should be made smoothly using the shuffle steering technique. The hands should be kept palm down with the fingers gripping the outside rim of the steering wheel.

PARKING

There are three basic types of parking maneuvers: angle, perpendicular, and parallel. Parking is a basic control task and requires many driving skills, but when performed under stress, it can be additionally difficult and time-consuming.

- **Angle Parking Procedure**—Slow to no more than 10 mph. Keep a sedan 5 to 6 feet from the rear of the other cars; in approaching a stall, an appropriate distance for larger EV's is approximately 1/3 their length. Begin turning wheels when the EV's front wheels have cleared the vehicle beside the intended space. **REMEMBER:** The front bumper and rear quarter panel will extend beyond the track of the wheels; the larger the EV, the further the extension.
- **Perpendicular Parking Procedure**—Slow to no more than 10 mph. Keep EV 7 to 8 feet from the rear of the parked vehicles in the approach. Begin turning wheels when the EV's bumper is in line with the edge of the vehicle closest to the intended parking space. **REMEMBER:** Rear wheels track to the inside of the front wheels, so to avoid mishap, enter the space straight, not at an angle.
- **Parallel ParkingParallel Parking on Slopes (Special Consideration):**
 - Set the parking brake.
 - If the vehicle has a manual transmission, leave it in gear.
 - If the EV is large or heavy, place chocks.

- Always position the front wheels so that if the vehicle starts to roll:
 - Wheels will hit the curb (and prevent rolling).
 - Vehicle cannot roll through lanes of traffic.
- Parallel Parking: Parallel parking requires a space at least 25 percent longer than the vehicle. The important thing is knowing when to turn the wheels.



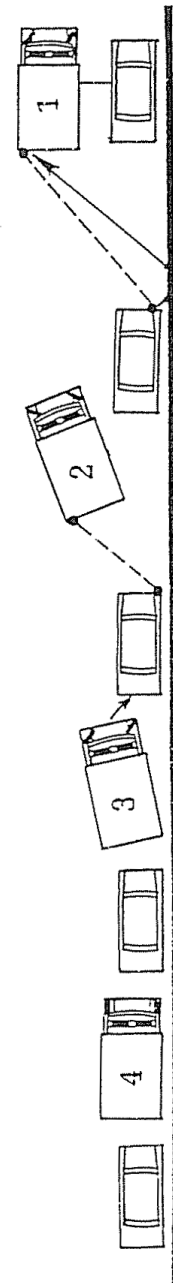
Parallel Parking

Stop 1 1/2' to 2' away from parked vehicle both vehicles even. Turn wheels right and aim left tail light towards right headlight of parked vehicle, while backing

When passenger door is even with rear bumper of parked vehicle, turn wheels left and guide into space.

Turn wheels right and align vehicle in space.

Final position



Remember, backing and parking, when in the emergency mode, must be performed quickly. It requires **skill** to be able to do it fast and without accident.

At the scene of a working fire, the parking positions of the fire equipment must facilitate, and not interfere with, performance of the mission. Suppression apparatus have the first priority in choosing a parking position. Aerial apparatus must be parked at the appropriate distance from access points to the building; clear access free of overhead obstructions is critical; space must be available for putting down the outriggers or jacks; outriggers need to be on pavement or firm ground.

Pumper apparatus must be parked at the proper distance from hydrant, standpipe, sprinkler connection, or water source. Space must be available for laying hose, tanker hookups, or setting up an auxiliary canvas tank. Proper speed during hose-laying operations will reduce damage to couplings and hose.

Support vehicles have second priority in choosing a parking position. Ambulances must be upwind of a fire and must be reasonably near the victim. Police cars are parked to allow other emergency vehicles easy access to the scene; they may also be parked to facilitate crowd control.

To avoid any possibility of a roll away, place one chock against a left rear tire—in front of the tire if headed downgrade, in back if headed upgrade. If on level terrain, place one chock in front of the left rear tire and one chock in back of the left rear tire. **IT IS THE DRIVER'S RESPONSIBILITY TO SET THE CHOCKS.** It has been found that the safest method of placing a chock block is to set the block on the ground close to the tire and shove it into position with a foot. Chock blocks must be placed square and snug against the tires to be effective. On a grade, place all blocks on the downhill side of the wheels.

The driver or operator remains with the vehicle, monitoring instruments and gauges, and must be prepared to move the vehicle efficiently if so ordered by an officer.

ACKNOWLEDGEMENTS

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