Emergency Vehicle Inspection, Preparation, And Driving Techniques

INTRODUCTION

The intent of this portion of the manual is to provide the candidate with the information needed to safely and efficiently operate emergency apparatus. This section includes but is not limited to vehicle knowledge and inspection, general operation and safety features of the vehicle, and proper driving techniques in normal as well as emergency operations.

The candidate must be completely knowledgeable in all aspects of the vehicle they intend to operate. It is important the candidate is able to demonstrate safe driving habits and is fully knowledgeable of the safety features .inherent to the vehicle. The candidate shall be able to identify the various components of the vehicle and explain their use. The candidate will be able to identify any defects, make minor repairs, and understand when the vehicle is to be placed out of service due to safety reasons or major defects. In turn the candidate will be able to complete the necessary documentation required by the Department.

OBJECTIVES

Upon completing this module of the Driver Training Manual, the candidate will be able to correctly identify, maintain, evaluate, adjust, and operate an emergency vehicle. This will involve: being able to identify major components of an emergency vehicle and being able to prepare the vehicle for an emergency response. These operations will include - preventive maintenance, pre-response preparation, safety checks and adjustment. The candidate will know, understand, and successfully demonstrate safe and correct handling of the vehicle in routine, emergency, and dangerous driving situations.

VEHICLE INSPECTION AND DRIVING PREPARATION

Major Motor Vehicle Components

There are many motor vehicle components to be discussed when describing any motor vehicle and some are specifically associated with emergency vehicles. The following is a list of components covered in this section:

- Vehicle characteristics – height, weight, length, and width
- Motor / engine components
- Braking systems: drum, disc, air, ABS, and engine retarders
- Exhaust systems
- Driveline
- Steering system
- Electrical system
- Suspension
- Wheels and tires

VEHICLE CHARACTERISTICS

The characteristic of an emergency vehicle affects the impact on the physical forces of the vehicle. The **height, weight, length**, and **width** of the vehicle are those items that are going to affect to the action and reaction of the vehicle while it is in motion. These items limit the direction of travel of the vehicle due to weight limitations (bridges), height constraints (overpasses), and width restrictions (tunnels).

Height: It is important to know the *overall* height of the vehicle including all lights and other equipment mounted on the top of the vehicle. The operator should be able to recognize not only structural overhangs but also other potential problems, for example tree limbs, power and phone lines, and any other low hanging objects. It is also important to understand the vehicle height plays a roll in how the vehicle is going to handle in terms of braking and turning. The taller the vehicle is the higher the center of gravity. This is important when making turns. Because the center of gravity is higher, the potential for rollover is higher if the vehicle is exceeding a safe turning speed. This higher center of gravity changes the braking on the vehicle as well.

Weight: The GVW (gross vehicle weight) is vital to know because of bridge and road limitations. It is important to remember that there is a safety factor assigned for every weight limitation on bridges. This is done to provide a GVW allowance to safely cross a given bridge. The posted weight is much less than the actual weight limit the bridge or overpass can take. However, alternate paths should be considered when possible to avoid crossing those bridges that are close to the

weight of the vehicle. As with height, the weight of the vehicle is a major influence on the vehicles handling. The weight of the vehicle has a direct impact on the braking system. The weight distribution between the front and rear axle must be appropriately distributed. When at all possible the vehicle should have approximately 1/3 the weight over the front axle and 2/3 of the weight over the rear axle. Additionally the weight should be distributed evenly from side to side when possible. If the distribution is done correctly the braking system will work to maximum capability.

Length: The length of the vehicle is important to know in terms of turning radius (wheel base contingent) and angle of approach and angle of departure. It is safe to assume that the longer the vehicle the wider the turning radius must be. The angle of approach and departure are important when moving across hills. These are the smallest angles made between the road surface and a line drawn from the point of ground contact and either the front or rear of the tire to any projection of the apparatus. This is important so that the front or rear bumpers or any object of the undercarriage of the vehicle does not come into contact with the road surface.

Width: The width of the vehicle comes into play when driving into diminished clearance environments. It is important that the width of the vehicle is the *overall* width that includes mirrors and any piece of equipment mounted to the exterior of the vehicle.

MOTOR/ENGINE COMPONENTS

There are two types of engines, gasoline and diesel. Their components are very similar in nature. The primary concern to the operator is the type of fuel used by the engine. Care should be taken to ensure the proper fuel is used. The following is a list of the basic components in the motor compartment of the vehicle.

Engine Block: The engine block is where the pistons perform the work to create the motion of the vehicle. The block becomes extremely hot during the operation of the vehicle. Oil and antifreeze pass through the block during its operation.

Radiator: The radiator contains the fluid used to keep the engine block from overheating. The cooling system is a closed system working under a vacuum. ** *NOTE* ** The fluid in this system becomes extremely hot and should not be handled until cooled.

Battery(s): The batteries are the start of the electrical system. They are used in starting the vehicle and maintain electrical components during the operation of the vehicle. The standard starting circuit contains two 12-volt batteries wired in parallel. On some vehicles there is a selector switch to opt for either or both batteries. The switch indicates which battery is being charged. It is important to note not to turn off the battery switch while the engine is running. This will cause damage to the alternator and electrical system. If the batteries need to be charged, only charge one at a time, and not both, on the selector switch. Charging both could cause one battery to receive an excessive charge, causing the contents to boil, resulting in battery damage or destruction. ** *NOTE* ** The battery (s) contain acid which will harm you if you come in contact with it.

Power Steering Pump: The power steering pump maintains the fluid used to assist in steering the vehicle. The fluid in this system can be checked either while the engine is cold or hot. There are differentiating indicator marks on the dipstick for this purpose.

Brake Master Cylinder: This unit contains the fluid used to operate the braking system. ** *NOTE* ** This is not used with air braking systems.

Fan/Accessory Belts: These belts are used to turn the cooling fan for the radiator and provide a means of recharging the batteries through the alternator.

BRAKING SYSTEMS

A vehicle's braking system is comprised of fluids that transmit forces to the vehicle wheel brakes. This is either done by a hydraulic (liquid) system or a pneumatic (air) system.

There are generally two types of braking devices that can be on the vehicle, *drum* and/or *disc* brakes. *Drum* brakes are two brake shoes that push outward and press the drums when the brakes are applied. The pressure on the brake pedal causes fluid or air to flow into the brake cylinder. The cylinder moves the brake shoe outward against the brake drum (inner surface of the metal wheel). The pressure of the shoe against the drum causes the wheel to slow or stop. *Disc* brakes are comprised of a rotor and a caliper that squeeze the brake pads to stop the vehicle. The rotor is the disc and is attached to the wheel axle. When the brake pedal is depressed, a hydraulic piston in the caliper causes the caliper to squeeze together, bringing a pair of brake shoes into contact with the rotor. The friction of the opposing brake pads as they squeeze the rotor slows the rotor rotation and causes the wheel to slow and stop.

It is important to break down the pneumatic (air) system into its components because most of the apparatus is equipped with “air brakes”. Air brakes use compressed air to make the brakes work. An air brake system is comprised of three (3) different systems: service brake, parking brake, and emergency brake systems.

- The *service brake* system applies and releases the brakes when you depress the brake pedal during normal driving operations.
- The *parking brake* system applies and releases the parking brakes when you use the parking brake control.
- The *emergency brake* system uses parts of the service and the parking brake systems to stop the vehicle in the event of a brake system failure.

There are many components of the air brake systems. The following are some parts of the system:

Air compressor – The air compressor pumps air into the air storage tanks. The compressor is connected to the engine through gears or a V-line belt. The compressor may be air or oil cooled.

Air Compressor Governor – The governor controls when the air compressor will pump air into the air storage tanks. When the air tank pressure rises to a preset level (around 125 psi) the governor stops the compressor. When the tank pressure falls below a preset level (around 100 psi) the governor allows the compressor to start pumping again.

Air Storage Tank – Air storage tanks are used to hold the compressed air. The number and the size of the tank(s) depend on the size of the vehicle. The tanks will hold enough air for the brakes to be used several times if the compressor fails to work. Compressed air usually has some moisture in it, which is bad for the air brake system. The water can freeze up in cold temperatures and make the brake system fail. The moisture tends to collect at the bottom of the air storage tanks. To ensure the moisture is removed form the tanks; each is equipped with a method of *bleeding* the tank. There is a manual method, which is done by either turning a stopcock valve located at the bottom of the tank allowing the air and moisture to be removed, or by pulling on a cable attached to a bleed off valve located at the bottom of the tank allowing the air and moisture to be removed. ***NOTE*** It is important to remember that once the tanks have been bled the system must be recharges prior to moving the vehicle. In some vehicles there is an *automatic bleed and dryer*. The automatic system responds by bleeding small amounts of air during normal operations. This has little impact on the operation of the brakes but does remove the moisture from the system. In addition there is a dryer attached to the system, which heats the air to keep the moisture level down in the system.

Safety Valve – A safety valve is installed in the first air tank the air compressor pumps air to. This valve protects the tank and the rest of the system from being over pressurized. This valve is usually set to release at 150 psi. ***NOTE*** If this safety valve releases air there is a problem that a mechanic should be notified immediately.

Brake Pedal – To apply the brakes you press down on the brake pedal. Pushing the pedal down harder applies more air pressure. Letting up on the brake pedal reduces the air pressure and releases the brakes. Releasing the brakes lets some of the compressed air to go out of the system, so the air pressure in the tanks is reduced. Pressing and releasing the pedal unnecessarily can let air out faster than the compressor can replace it. I f the pressure gets to low the brakes will not work.

Foundation Brakes – Foundation brakes are used at each wheel. The most common type is the S-cam drum brake. The following is the break down of the brake parts:

- **Brake drums, shoes, and linings** – Brake drums are located on each end of the vehicles axles. The wheels are bolted to the drums and the braking mechanism is inside the drum. To stop, the brake shoes and linings are pushed against the inside of the drum. This causes friction, which slows the vehicle (and creates heat). The heat a drum can take without damage depends on how hard and how long the brakes are used. Too much heat can make the brakes stop working.

- **S-cam Brakes** – When you push the brake pedal, air is let into each brake chamber. Air pressure pushes the rod out, moving the slack adjuster, thus twisting the brake camshaft. This turns the S-cam (named because of its S design). The S-cam forces the brake shoes away from one another and presses them against the inside of the brake drum. When you release the brake pedal, the S-cam rotates back and a spring pulls the brake shoes away from the drum, letting the wheels roll freely again.

- **Wedge Brakes** – In this type of brake, the brake chamber push rod pushes a wedge directly between the ends of the two break shoes. This shoves them apart and against the inside of the brake drum. Wedge brakes may have a single brake chamber, or two brake chambers, pushing wedges in at both ends of the brake shoes. Wedge type brakes may be self-adjusting or may require manual adjustment.

- **Disc Brakes –** In air-operated disc brakes, air pressure acts on a brake chamber and slack adjuster, like S-cam brakes. But instead of the S-cam, a “power screw” is used. The pressure of the brake chamber on the slack adjuster turns the power screw. The power screw clamps the disc or rotor between the brake lining pads of a caliper, similar to a large C-clamp.

Supply Pressure Gauge(s) – All air-brake vehicles have a pressure gauge connected to the air tank. If the vehicle has a dual air brake system, there will be a gauge for each half of the system. (Or a single gauge with two needles). These gauges let you know how much pressure is in the tanks.

Low Air Pressure Warning – A low pressure warning signal is required on all vehicles with air brakes. A warning signal you can see must come on before the air pressure in the air tanks falls below 60 psi. The warning is usually a red light and on some vehicles a warning buzzer sounds as well.

Stop Light Switch – Drivers behind you must be warned when you put your brakes on. The air brake system does this with an electric switch that works by air pressure. The switch turns on the brake lights when you are applying the brakes.

Spring Brakes – All vehicles must be equipped with emergency brakes and parking brakes. They must be held on by mechanical force (because air pressure may leak out). Spring brakes are used to meet these needs. When driving powerful springs are held back by air pressure. If the air pressure is removed, the springs put on the brakes. A parking brake control in the cab allows the driver to let the air out of the spring brakes. This lets the spring brakes on. A leak in the air brake system, which causes all the air to be lost, will also cause the springs to put on the brakes.

Parking Brake Controls – In most vehicles, you apply the parking brakes using a *diamond-shaped, yellow, pull-push control knob.* You pull the knob out to put the parking brakes on (spring brakes), and you push it in to release them. ***NOTE*** Never push the brake pedal down when the spring brakes are on. The combined forces of the springs and the air pressure could damage the brakes.

Apparatus equipped with air brakes use two methods for parking brakes. First is a driveline brake, which is an actual disc or drum that attaches to the drive shaft and is operated by cables or levers. The second type is a spring-activated brake atop a service brake chamber that automatically applies the brake when the air pressure drops below a preset pressure.

It is important to define what a *Dual Air Brake System* is. Most new vehicles use a dual air brake system for safety reasons. A dual air brake system has two separate air brake systems that use a single set of brake controls. Each system has its own tanks, hoses, and lines, etc. One system typically operates the regular brakes on the rear axle(s). The other system operates the regular brakes on the front axle. The first system is called the primary and the other called the secondary system.

Many vehicles are equipped with *Antilock Braking Systems (ABS)*. The purpose of the *ABS* is to permit the driver of the vehicle to stop the vehicle in the shortest possible distance while maintaining full control. By preventing the

wheels from locking, *ABS* helps to improve control and stability. *ABS* allows steering during braking applications, and in most instances, reduces stopping distances, especially on wet, icy, or loose gravel surfaces. *ABS* use sensors at each of the wheels to send wheel speed information to a central computer. When the computer senses that a wheel is about to lock up, it automatically "pumps" the brakes on that wheel.

Due to the size and weight of today's apparatus, secondary or auxiliary braking systems have been added to increase the braking capabilities of the vehicles. Essentially there at three (3) types of auxiliary braking systems:

- Engine Brake
- Automatic Transmission Retarder
- Driveline Retarder

The *engine brake* is known as a compression brake. The brake mechanism uses the "compression" that the engine creates to slow the vehicle down. Essentially the system is allowing more new air into the cylinders of the engine causing it to work or bear down harder creating less horsepower and a force. The *engine brake* customarily comes with a selection switch allowing the driver to decide on the amount of work the braking system should do (2 cyl, 4 cyl, 6 cyl) or high or low. It should be noted that *engine brakes* on vehicles with automatic transmission are typically not effective below 20 miles per hour (mph) due to the low rpm's of the engine while operating at low speeds. ****NOTE**** Most manufacturers recommend the retarder be turned off during inclement weather or slippery road conditions.

The *automatic transmission retarder* is attached to the transmission either on either end of the transmission. The input retarder operates on the input end and the output retarder, which is the most prevalent on fire service apparatus, is attached to the output end of the transmission. The retarder system is self-contained and consists of a vaned rotor, which rotates in a vaned cavity. The rotor is splined to and driven by the output shaft. An external accumulator holds transmission fluid until the retarder is activated. When activated, the fluid in the accumulator is pressurized and directed into the retarder cavity. The interaction of fluid with the rotating and stationary vanes causes the retarder rotor speed, and hence the output shaft, to decrease and slow the vehicle. ****NOTE**** Most manufacturers recommend the retarder be turned off during inclement weather or slippery road conditions.

The *driveline retarder* can be divided into 2 types, hydraulic and electromagnetic. Both types are attached to the driveshaft between the transmission and the rear axle. The hydraulic type absorbs energy by pumping oil around the driveshaft slowing the vehicle down. The electromagnetic retarder sets up a magnetic field that grabs the driveline. The absorbed energy is transferred to the surrounding atmosphere as heat. ****NOTE**** Most manufacturers recommend the retarder be turned off during inclement weather or slippery road conditions.

EXHAUST SYSTEMS

The exhaust system is basic and is comprised of a muffler or mufflers, exhaust pipes, tail pipes, and or vertical stacks. It is important to note that a faulty exhaust system affects the performance of the motor and can emit poisonous fumes into the crew area causing serious illness.

DRIVELINE

The driveline consists of the transmission, front universal joint, driveshaft, rear universal joint, differential, and the rear axle. The transmission is a system of gears that allows change in the ratio of the number of engine revolutions to the number of wheel revolutions. The drive shaft connects to the rear of the transmission and is powered to turn the differential. The differential is a component of the rear axle that the rear wheels are attached to. The entire system works in unison to rotate the rear wheels.

There are two types of transmissions: standard and automatic. The standard or manual transmission uses a clutch assembly to shift the transmission gears depending on the RPMs of the motor and the desired speed requested. Computer modules control the automatic transmissions. The modules signal and influence the engines RPMs during transitional shifting.

STEERING SYSTEM

The steering wheel and column connect to steer the vehicle. They connect to a gear and linkage mechanism that changes the direction of the front wheels. In most vehicles this either “power assist” or “power steering” to ease the turning of the steering wheel. These are both hydraulic (fluid) driven systems.

ELECTRICAL SYSTEMS

The electrical system supplies power for primary and auxiliary functions. The primary functions of the electrical system include: power the generator and storage battery, generator/alternator, and voltage regulators; power distribution (via engine wiring); timing (distributor); and spark generation if equipped. Auxiliary functions include: inside/outside lighting (headlights; amber, red signaling or warning lights; turn signals; instrument panel lights; etc.); and horn, siren, and public address system.

SUSPENSION

This system is comprised of leaf springs, shock absorbers/coils, air rides, and wheels, and tires that enable the driver to handle the vehicle properly on rough terrain and sharp curves.

WHEELS AND TIRES

As mentioned before the wheels and tires are a part of the suspension system; however, it's important to define them a bit more. Both wheels and tires must have a weight rating which will accommodate the weight distributed through the axle and springs. The condition of the tires is based on inflation, tread design, and tread wear. All of these have a major impact on vehicle handling. Each tire has only about 40 square inches of contact with the road. It is imperative that both the inflation pressure and tread be in good condition to provide maximum safety. The minimum recommended tread depth for emergency vehicles is 4/32 inches.

EMERGENCY VEHICLE PRE-RESPONSE PREVENTITIVE INSPECTIONS

Emergency vehicles of all types should be inspected prior to and again within 24 hours after being used for an emergency response. Emergency vehicle accidents caused by the lack of maintenance or vehicle malfunction are preventable. Physical and visual inspections must be done on a routine basis. In the final analysis, no matter who performs the actual maintenance on the vehicle, it's the driver's responsibility to confirm the vehicle has been inspected prior to use. The driver *must* verify that the vehicle is in proper operating condition. The responsibility for the mechanical safety of the vehicle is that of the driver. *IF IT ISNT RIGHT, DON'T DRIVE IT*. The purpose of the pre-response preventive maintenance inspection is two fold – identify and correct unsafe conditions.

Inspection guidelines are broken down into nine (9) core areas to expedite the inspection process.

- Check prior maintenance records
- Conduct a vehicle overview
- Conduct an engine compartment check
- Conduct an interior cab check
- Conduct a vehicle walk around check
- Conduct a compartment and equipment check
- Conduct an undercarriage check
- Conduct a moving and driving test
- Complete inspection process

All inspections, maintenance, and repairs must be recorded by the Department. The records must include the date and description of all maintenance, repairs, and inspections performed. The following is a break down of the nine categories listed above:

Check PM Records - Each day the records of the previous days should be reviewed for defects and repairs.

Vehicle Overview – Conduct a vehicle overview including inspecting for body damage and cleanliness; and leveling of the vehicle (indicates suspension problems).

Engine Compartment – Conduct an engine compartment check with the engine off. You should check the following:

- Oil levels
- Coolant levels
- Power steering fluid level
- Transmission fluid level
- Air compression belts
- Hydraulic reservoir
- Brake fluid level
- Battery fluids both left and right
- Windshield washer fluid levels
- Belts and wiring harnesses
- Steering box not leaking
- Safety devices including hood latches and safety bars for tilt cabs

Interior Cab – Conduct an interior cab check by first properly preparing for the vehicle inspection:

- Engage the parking brake, chock the wheels, turn the batteries on, turn on the ignition master, place gears in neutral, and start the engine.
- Check the instrument/dash gauges for operating voltages, temperatures, pressures, and levels.
- Check the accelerator pedal padding, in place and not loose.
- Engage and disengage emergency air brake system.
- Conduct air/hydraulic brake test and listen for oblivious leaks, and/or blown diaphragms.
- Check steering wheel and column for centering, excessive play (greater than 10 degrees), and abnormal movement.
- Check electric/air horns for equal tone quality from each horn and blown diaphragm for moisture or oil on the windshield of the horn.
- Check electronic and mechanical sirens for excessive draw on ammeter and voltage fluctuations and electrical system problems.
- Check windshield wipers and washers as well as heating and defrosting systems.
- Transmission controls, such as the clutch catch or friction point, should be checked to ensure there is no hang up or binding and that it does not jump out of gear.
- Check radio equipment including fixed, portable, public address system, and cellular phone.
- Interior lighting systems in the cab and crew compartments should be checked to ensure they are working properly.
- Mechanisms for the seat adjustment, both mechanical and pneumatic, should be checked to ensure they are working properly.
- Check seatbelt (occupant restraints) systems.
- Check the interaxle differential locking systems, both dual and tandem axle.
- Check warning lights and buzzers systems, including oil, water, and transmission fluid level and temperature and open door compartment warning lights.
- Ensure outside mirrors, both manual and mechanical, can be adjusted and the wiring for the heating system is intact and operational.
- There should be the appropriate maps and accountability rings/systems on board.
- Internal communication devices and equipment (David Clark Systems) should be checked.
- Check the fast idle RPMs to ensure that it can maintain the electrical system.
- Check emergency lighting.

Vehicle Walk Around – Conduct a vehicle walk around and operate and/or check the following:

- Windshield and windows for any cracks that may necessitate taking the vehicle out of service.
- Check headlights, both low and high beams and four way flashers.
- Check the strobe lights and all the emergency vehicle-warning lights.
- Light bars, rotating lights, and/or oscillating lights should be checked.
- Check side markers and reflectors.
- Check turn signals.
- With assistance, check to make sure all the brake lights are operational.
- Check the generator(s) and or auxiliary power devices.
- Check flood light systems.
- Inspect PTO levers/switches.
- Check electrical and mechanical throttle assemblies and extend the outriggers to the maximum positions.
- Check levers and knob controls on all panels.
- On the tires and wheels, check for oblivious gouges, slashes, cuts, bubbles, or any other damage. Make sure they are the proper size and are not mismatched. Look for indications of rust or peeling paint on non-aluminum rims. Check the condition of the lug nuts and wheel hubs. Check for any grease leaks. Inspect the rims for damage and missing weights. Make sure the tire pressure is correct and the valve stems are intact with caps. The depth of the tread should be 4/32” in the front and 2/32” in the rear.
- Check the auto chain systems for the rear wheel to make sure they function properly.
- The undercarriage should be checked for any oblivious fluid leaks in the engine area (note the color of the fluid leaking).

Compartment Check – Conduct the compartment and equipment check:

- Make sure the compartment latching mechanisms work properly.
- Ensure the power equipment (gasoline or diesel) on board is working properly.
- Compartment equipment must match the inventory and are in its proper place.
- Make sure the circuit breakers are working properly.
- Ensure there are sufficient warning devices such as cones, flares, and reflective triangles on board.
- An assortment of fire extinguishers is on board and fully charged.
- Check for appropriate documentation (accident reports, vehicle registration etc.)

- Crew equipment should include SCBA, hand lights, AED, EMS, as the basic, should be checked to ensure they are in working order.
- Ensure all other equipment (haz-mat lights, etc.) is working properly.

Undercarriage – Conduct an undercarriage check:

- On the undercarriage bleed the moisture from the air tanks as required to check the color of the fluid being emitted – light gray sludge indicates a bad compressor: leaks from system ****NOTE**** Moisture should be bled from tanks frequently during inclement weather and temperature fluctuations. The brake lines should be checked for cracks, fraying, dry rot, pulling or distortion, or wear marks. ****NOTE**** Check slack adjusters for excessive movement, not more than 1 inch, and whether they are frozen in place. Do not attempt to make slack adjustments; trained personnel should conduct the adjustments.
- The driveline (engine to differential/rear axle) should be properly greased, make sure there is no excessive movement in the joints, and the dust covers are intact.
- Check the exhaust system for soot, black smoke, clamps and hangers, and any pitting on the underside.
- On the suspension system, mechanical or pneumatic, check the leaf springs for cracks and breaks, shackles and hangers, shock towers, and leaks and air leaks (shocks or bags).
- Make sure the automatic chain systems are securely attached and lined up properly.
- Look for oblivious damage, such as rust, loose parts, shiny spots, asymmetrical parts (out of alignment), any cracks in the frame rails, and shifting body mounts.
- The inner sides of wheels and tires/ sidewalls on the tires should be checked for excessive dusting, fluid leaks, bad seals, and cracked brake drums and shoes.
- The wiring harness should be checked fro frayed or cut wire.
- Check the fuel tank for oblivious leaks that straps and grounding pad are intact, fuel lines are ok, and the overflow is not kinked.
- Check for leaks of any fluids and if there is, their point of origin, either the transmission, rear end, or plugs, vents or right side or rear axle. Do not paint over any of these areas.

Brake Test/Air Brakes - Conduct a DOT Brake Test. Note: this test is ONLY to be used on apparatus with air brakes. This test is NOT to be used on EMS units. Further information can be found on the MCFRS Quicklinks web page.

This brake test must be performed in the order shown below:

1. Chock the wheels of the vehicle.
2. Turn the ignition on and verify that all gauges/warning devices are in working order.
3. Air brake protection valve should be in the Applied (out) position. This takes the air out of the system and allows the spring brakes to hold the rear brakes.
4. Push air brake protection valve into the off position (in). This charges the air brake system.
5. Allow the air tanks to settle.
6. Observe the air gauge for one minute, look for air loss no greater than 3psi in that one minute.
7. After one minute has elapsed, place your foot on the brake pedal and apply a steady, holding pressure. Continue to hold steady pressure for one minute after air tanks settle.
8. Observe the air gauge during that minute, look for air loss no greater than 3psi.
9. Begin "fanning" the brakes. As air tanks deplete and the gauge reaches 60-90psi, you should get a low air warning light and buzzer.
10. Continue to "fan" the brakes. ***NEVER FAN YOUR BRAKES WITH THE PARKING BRAKE APPLIED!***
11. At approximately 20-40psi on your air gauge, the air protection valve should activate. Continue "fanning" the brakes until this occurs.
12. If the valve does not activate, the apparatus fails the test. The unit should be placed Out of Service.
13. If the protection valve activates, stop "fanning" the brakes.
14. Start the engine and monitor the air pressure gauge. The air pressure MUST return from 50psi to 90psi within 3 minutes at 1200rpm.
15. The quick build up system shall provide sufficient air pressure so that the apparatus has no brake drag and is able to stop under operating conditions following the 60 second build up time.
16. Check all gauges for working pressures, shut down engine, remove wheel chock and place unit back in service.
17. MCFRS Air Brake Test - Use the acronym: **COLA**

    C = Cut In Pressure-A Cut In Pressure will be approximately 100psi. Any compressor that does not cut in before 95psi must be reported to the shop immediately.

    O = Cut Out Pressure-Cut Out Pressure will be between 120-135psi. Any higher than 135psi must be reported to the shop immediately.

L = Low Pressure Warning-Low Pressure devices will activate at approximately 90psi. Any device that activates below 60psi must be reported to the shop immediately.
A = Air Leakage-with foot on or off the brake pedal, air leakage should be less than 3psi per minute (4psi per minute for a Tiller Truck).

Complete Inspection Process – Document the pre-response inspection and compare it to the previous report. Follow-up on discrepancies noted. If discrepancies are noted that influence on function, operational/directional ability, and/or safety, place the unit out-of-service and consult with the appropriate maintenance personnel before placing the unit back in service for responses.

ROUTINE MAINTENANCE ON EMERGENCY VEHICLES

Operator safety is dependant on the vehicle condition. Well-maintained vehicles have fewer malfunctions and are easier to control. The Department must identify the role of the emergency driver in the inspection and maintenance program. Routine maintenance of the vehicle is the responsibility of the driver. The Department should maintain checklists for these types of inspections and routine maintenance functions. Deficiencies should be repaired or reported in writing to the individual responsible for the maintenance. The role of the emergency driver as it pertains to preventive and routine maintenance is defined in NFPA Standard 1002, Fire Department Vehicle Driver/Operator Professional Standards. Applicable, with minor adjustments, to all emergency vehicles the standards states:

"… Prior to operating fire department vehicles the fire apparatus operator **shall** meet the job performance requirements as defined in …"

As this relates to the preventative maintenance function, it specifically states that the driver shall be able to "perform routine tests, inspections, and servicing functions on the specified systems and components and ... so that the operational status of the vehicle is verified."

The systems and components identified in NFPA 1002 are listed here. Items for consideration under each are identified as reference:

Batteries:

- Connections of the cables are clean and tight
- Battery box/compartment is clean and secure

Braking System:

- Pressure prior to starting the engine (air) should be approximately 125 psi
- Build-up time, if appropriate (air), when the engine is operating at normal RPMs, the pressure should build from 85 psi to 100 psi within 45 seconds in dual air systems. In single air systems, pressure should build up from 50 to 90 psi within 3 minutes when operating at normal RPMs.
- ABS verification (dash light)
- Braking Operation (during runs as well as at inspection time)
- Brake pedal (proper range of motion)
- Moisture in system/drain air tanks, in tanks with manual bleed valves, turn the valve ¼ turn to drain air, moisture, and dirt from system. Return valve to closed position to build up air in system again

Coolant System:

- Correct level (generally approximately 2 inches below the top of the radiator, check with local requirements)
- Hose and/or connections wear/leaks

Electrical System:

- Ensure all lights and audio equipment is operational, it bulbs need to be replaced make sure the correct bulb size and style is used and replace faulty fuse in audio system if needed.
- Voltmeter should be reading between 12 and 14 volts

Fuel:

- Correct level, if not, fill tank with proper type of fuel
- Check any power equipment levels and fill as needed with the proper fuel for that equipment

Hydraulic Fluids:

- Check for leaks on the floor under the vehicle and areas around connections of the hoses
- Ensure proper levels and add (if permissible) with the appropriate type of fluid

Lubrication:

- Check for leaks on the floor of grease droppings
- Ensure there is not grease thrown in the engine compartment or body
- Use grease gun to fill “zirc” fittings when dry or on scheduled maintenance ***Note*** Do not overfill fittings or it will splatter

Oil (Engine):

- Leaks on the floor under the vehicle
- Proper levels checked using the dipstick in the engine compartment ***Note*** The engine oil should be checked when the engine is cool or cold, when the motor is warm or hot the oil is dispersed throughout the engine. To properly check the level the

oil should be allowed to settle back into the oil pan located at the bottom of the engine. This typically takes 20 to 30 minutes after the engine is shut down

- The color and texture of the oil on the dipstick should be noted. If the oil is frothy (bubbly) or a color other than dark brown or black, it should be investigated

Tires:

- Condition (sidewalls, rims, tread)
- Correct inflation pressure, fill as needed to the rated pressure for that tire

Steering System:

- Ease of operation (power OK and no extra play)
- Correct fluid level, this may be checked while the engine is hot or cold and the fluid level should correspond to that on the dipstick

SAFETY CHECKS AND ADJUSTMENTS MADE BEFORE DRIVING

There are certain items that should be checked by the driver prior to moving the vehicle:

Occupant Restraint Systems – Restraints reduce the likelihood of serious injury or death in the event of an accident. The law requires that there be a restraint for all riders and that they be used any and all times the vehicle is in motion. The restraints keep the driver in position behind the wheel and in front of the controls during sharp turns, over excessive maneuvers, roll overs, and yaw skidding or spins.

Adjustable Head Restraints – Head restraints help prevent cervical spine and other in juries from hyperextension and hyperflexion; ie. forces resulting from rear end collisions. The proper adjustment for the head restraints is to have the center of the restraint at the center of the scull not at the base of the neck. If the restraint is to low, the neck could be broken if force of impact is great.

Seat Position – When the seat is properly adjusted, the brake and accelerator can be applied fully without fully extending the leg. The steering can be held with only a slight bend at the elbows. The seat should be fully locked into position. If the seat was to move during operation, it could cause the driver to loose control.

Mirrors – Check for proper adjustment of the inside mirror if applicable. This mirror is used to watch personnel if need be. The outside, side-view mirror should have the edge of the vehicle's rear fender and side lanes visible. Convex mirrors assist drivers by providing wide-angle views of traffic on either side of the vehicle. In all vehicles the most dangerous blind spots are by the rear quarter panels. In larger vehicles there are generally blind spots below the mirrors.

PRECAUTIONS BEFORE MOVING

The safety of the entire crew pertaining to the vehicle movement is that if the driver. Prior to moving the vehicle an audible signal from all crewmembers that they are belted and ready should be heard by the driver. Only on person (besides the driver) should be in the front seat or control cab. Prior to moving, ensure the station doors are opened, all compartments and cab doors are closed, and there are no obstacles in the path of the vehicle. If responding, ensure that all emergency lights and audible warning devices are on and sounding. Taking these precautions will provide a safe operation of the vehicle.

OPERATING AN EMERGENCY VEHICLE

Purpose of Emergency Vehicle Signaling Equipment

Lights and sirens (Emergency Vehicle Signaling Devices) are used to inform traffic, both vehicular and pedestrian, of an emergency vehicle presence and aids in clearing a path for the emergency vehicle. Warning and signaling equipment assist the operator with arriving at an incident safely. Due regard ***MUST*** always be exercised, regardless of the seriousness of the emergency.

Local Law (Maryland)

Maryland law requires an emergency vehicle operator to activate and use emergency warning and signaling devices while responding to a “bonafide” emergency call. In return for this, emergency vehicle operators are granted “qualified privilege” with regard to basic rules of the road. To respond to an emergency call, and be covered as an emergency vehicle under statue or law, the emergency vehicle operator must display all appropriate audible and visual warning and signaling devices. Responses to incidents are either emergency or non-emergency. If the operator decides to take advantage of “qualified privilege”, full use of audible and visual devices must be used. You can’t be selective. It is important to remember use of signaling equipment by the operator ***DOES NOT*** guarantee operator safety, nor does it free the driver from the possibility of civil or criminal liability if a mishap does occur.

To better understand the liability and responsibility of the driver, a few definitions will be discussed. They are as follows:

- **True Emergency** – is defined as a situation in which there is a high probability of death or serious injury to an individual or significant property loss.
- **Due Regard** – for the safety of others means that a reasonably careful person performing similar duties under similar circumstances would act in the same manner.
- **Negligence** – A legal deficiency or wrong that results whenever a person fails to exercise that degree of care that a prudent person would exercise under similar circumstances.
- **Gross Negligence** – Is the reckless disregard of the consequences of an act to another person. It occurs when a person's actions (or lack of) result in the failure to exercise even a slight degree of care.
- **Willful and Wanton** – Intentional or with careless indifference (considered the most serious for of negligence).
- **Vicarious Liability** – The legal liability placed on one person for the acts committed by another person.

Usually a court will judge the actions of an emergency vehicle driver based on two primary considerations: First, was the emergency vehicle responding to a **true emergency**? Second, did the emergency vehicle driver exercise **due regard for the safety of others**? If the answer to both questions is yes, the emergency driver has demonstrated a responsible and professional attitude through his/her subsequent action(s).

Using Emergency Vehicle Signaling Equipment

An emergency vehicle driver should use all signaling devices when responding. Remember that most emergency vehicles are taller than the average automobile on the road. You, as a driver should use all means to gain the attention of the vehicles in front of you. When approaching a vehicle from the rear at night, flick the vehicle's high beams on and off to get the attention of the vehicle in front of you.

It's a good practice while responding to an emergency to leave the drivers' and officers' windows down at least partially. This will aid in hearing other responding apparatus, trains, and approaching traffic. Pay attention to the reaction of the other drivers. They, for the most part, are trying their best to move out of your way, however; they are reacting to your actions and not paying attention to the other vehicles on the road. **PAY ATTENTION!**

BASIC EMERGENCY VEHICLE CONTROL TASKS

Steering, accelerating, and braking accomplish directional and velocity control. A competent emergency vehicle driver understands and properly completes all of the basic driving maneuvers necessary to operate the emergency vehicle they are certified to operate.

Steering – Steering an emergency vehicle, whether driving non-emergency, responding to an emergency, or making an evasive maneuver, requires certain habits. These include:

- Use both hands on the steering wheel. Exception includes operating another device on the vehicle such as shifting or turning on the windshield wipers.
- Keep arms inside the vehicle. Do not engage in other activities such as drinking, eating, smoking, or talking on the phone while operating the vehicle.
- Maintain hands in the “3 and 9” position on the steering wheel.

Braking and Stopping – Effective braking is essential to the safe operation of an emergency vehicle. The intent is to stop the vehicle in as short a distance as possible while maintaining control. In a vehicle with hydraulic brakes, this involves firmly pumping on the brake pedal and releasing it prior to the locking of the wheels. Air brakes require firm and steady pressure without pumping. To have effective braking on a vehicle with anti-lock braking system (ABS), whether installed in conjunction with a hydraulic or an air system, you must follow the procedures below:

- On vehicles equipped with air brakes, the brake pedal should be initially firmly pressed. The driver must ease up as the braking continues, and ease the pressure on the brake pedal just before stopping to avoid a jerking action.
- If the vehicle’s wheels lock, immediately release the brake pedal and steer with the skid. Reapply the brakes when control has been established.
- It is important to recognize the continuous braking over a period of time builds up a tremendous amount of heat. This could cause glazing of the brakes that greatly reduces the braking capacity of the system and could cause brake failure.
- On vehicles equipped with a secondary breaking system, apply the system in accordance with the manufacturer’s recommendations. Recognize that some applications of secondary braking systems can cause a reduction in tire traction.
- In areas where there is a high probability of braking, passing through an intersection or traveling against traffic; the driver should place their foot over (cover) the brake pedal. This action will reduce the reaction time.

Backing – Backing mishaps account for a large portion of emergency vehicle accidents. Most backing accidents are relatively minor, however, they can have a wide range of consequences. Accidents keep emergency vehicles out of service for repairs; they cause the operator a lot of paperwork and time, and cost the taxpayers money. These accidents also create a bad public image.

Techniques to minimize backing accidents require common sense. Take a few extra seconds to ensure safety in backing. Plan ahead. Some guidelines for backing an emergency vehicle include:

- Park so as to minimize the need for backing - If thought is given to the position necessary for a vehicle leaving its location, a simple adjustment in the final placement can minimize or even eliminate the need for backing.
- Give audible notice – If the vehicle is equipped with a back-up alarm, shift the vehicle into reverse while applying the brakes. This will initiate most back-up alarms. If the vehicle is not equipped with an alarm, touch the horn lightly 3 times before beginning the backing maneuver.
- Use a spotter – The spotter is to be located at the rear and left of the vehicle. Remember, the driver must be able to see the spotter and vice versa. The driver and the spotter must make mutual eye contact. If the spotter disappears from the mirror, the driver must stop immediately. *IF* a spotter is absolutely unavailable, conduct a walk around the vehicle before backing.
- Understand hand and audible signals – Ensure that the driver and spotter have the same understanding of what the signals mean.
- Use side mirrors – The driver should not attempt to lean out the window or turn around trying to see. Periodically check the right side mirror for objects in the path of the vehicle.
- Check the front corners – Either the right or left front of the vehicle may swing around and strike a fixed object that did not initially appear to be a potential problem.
- Maintain speed control – Backing should be done at an extremely slow speed. It is imperative to maintain tight control on the speed of the emergency vehicle.

The bottom line is this – when you strike something while in reverse and you do not have a spotter in place, you don't have any excuse! If it's predictable it's preventable. There are no excuses for backing accidents when spotters are available.

Parking – Good parking skills are essential. Parking is a basic control task, but requires many driving skills. When it is performed under stress, it can be difficult and time consuming. Parking in the emergency mode must be done quickly. It requires skill to do it fast and without mishap. Parking generally consists of three types – angular, perpendicular, and parallel. On an incident any one or all of these skills may be used to properly place the vehicle. Some factors to take into account when positioning an emergency vehicle are as follows:

- Position emergency vehicles at incidents so as to minimize the blinding effect of warning lights on approaching and passing vehicles.
- Identify potential hazards at the incident and the possibility of escalation.
- Identify appropriate safe distances for certain type of emergencies.
- Consider the ease of leaving the scene because of changing conditions at the emergency incident or a directive to either leave the scene and respond to another incident or be available for another potential incident.

URBAN DRIVING SKILLS

Even in normal, non-emergency conditions, operating an emergency vehicle in urban areas requires a high degree of skill. Emergency vehicle operator must present good examples to other motorists and pedestrians. The key to successful urban driving includes keeping alert for pedestrians, alleys and cross walks. Anticipate other motorist's actions – expect the unexpected! Always make an eye contact with other motorists to anticipate and communicate movement and/or intentions. If they don't see you, they can't transmit or communicate their intentions.

When driving in urban areas in an emergency mode, your speeds in excess of a posted limit are rarely justified. Excess speed should only be used in extreme cases and **ONLY** if the road conditions permit it. Reasonable speeds allow more time to react and more opportunity to control the emergency vehicle if an evasive action is required.

Urban driving in an emergency mode requires effective use of lights and sirens in order to warn motorists and pedestrians of the approaching emergency vehicle and to clear traffic and/or help the operator negotiate through heavy or blocked traffic. The typical motorist's reactions to lights and sirens will generally be to try to pull to the right and slow down or stop when they detect and approaching emergency vehicle. Some motorists, however, will do senseless, unexpected things. Some of the possibilities are: stopping in the middle of a lane, blocking the emergency vehicles forward progress, trying to compete (race) with the responding vehicle, or beat the emergency vehicle to and/or through an intersection. In some cases they do nothing at all and just keep traveling. Contributing factors to this could be that the radio or air conditioner is on and/or failure of the driver to check the rear-view mirror.

Backing off the siren and giving the other driver a chance to think and react is the best way to handle confused motorists. Tap the horn or flash the vehicles lights to try to establish eye contact. When following an automobile, beware of startling an unsuspecting motorist. They could respond hazardously. Vary the siren pitch and duration; use headlights, horn, siren, or spot light to get their attention. Be patient, keep signaling. Try and avoid passing on the right, unless it's the only

way. Do not cross double solid lines to pass or avoid stopped traffic. The law does not allow for this and if the emergency vehicle collides with oncoming traffic, the emergency vehicle driver will be held accountable.

Traffic blockages are unavoidable, particularly during rush hour. In these situations route planning, including alternate rush hour routes is essential. If traffic is blocked, slow down before reaching the blockage. This will give the emergency vehicle operator a better view and make it easier to detect what effect the signaling equipment is having on the other motorists. Use the siren intermittently and be patient. If traffic is unable to move, it does no good to keep the siren wailing constantly. Everyone involved is likely to become irritable and impatient.

NEGOTIATING INTERSECTIONS

Intersections are the most accident likely areas. There are two types of intersections: an *uncontrolled intersection* is any intersection that does not offer a control device (stop sign, yield sign, or traffic signal) in the direction of travel of the emergency vehicle; or when a traffic signal is in the green mode for the emergency vehicle. A *controlled intersection* is defined as any intersection that the vehicle must stop at, including stop signs and traffic signals. Some things to keep in mind for each are:

Uncontrolled

- Scan the intersection for possible hazards (right turn on red, pedestrians, vehicles traveling very fast, etc.). Observe traffic in all four directions.
- Slow down and cover the brake pedal with your foot.
- Change the siren cadence not less than 200 feet from the intersection.
- Avoid using the opposing lane of traffic, if at all possible.

Controlled

- Do not rely on warning devices to clear traffic.
- Scan the intersection for possible hazards as well as alternatives.
- Begin to slow down well before reaching the intersection and cover the brake with your foot.
- Change the siren cadence not less than 200 feet from the intersection.
- Scan the intersection for possible passing options (pass on the right, left, wait, etc.). Avoid using the opposing lane of traffic, if at all possible.
- Come to a **complete stop**.
- Establish eye contact with other vehicle drivers; have partner communicate all is clear; reconfirm all other vehicles are stopped.
- Proceed one lane of traffic at a time. Treat each lane of traffic as a separate intersection.

Some techniques best used for intersections are basic but can prevent many accidents. Before crossing an intersection, the vehicle operator must make

sure there is an adequate gap in traffic. From a full stop a small vehicle needs about four to seven seconds to cross an intersection 30 feet wide (two lanes). For larger vehicles, the time increases according to size, accelerative capability, etc. Cars approaching from either direction should be at least six seconds from the intersection. The vehicle operator should look left, then right, then left and straight ahead before crossing an intersection. When making a right turn at an intersection from a stop it takes about six seconds to turn right and accelerate to a speed of 30 mph. This time increases with the size of the vehicle. When the driver begins the turn, any vehicle approaching the intersection from the left should be at least eight seconds away from the intersection. This will allow the approaching vehicle two seconds of space between the two vehicles. Left turns at intersection require a larger gap than right turns because of the need to cross traffic lanes. Ten seconds is the minimum safe time needed.

When moving through an intersection while responding on an emergency, the vehicle operator should provide as much information as possible to other motorists. Use all means of signaling – lights, sirens, turn signals, lane position, and eye contact or hand signals. Signal the emergency vehicles intent at least one block in advance of an urban intersection and five seconds in the country. **Maryland law refers to 100' and 200'.** Check for traffic control indicators in advance of intersections, such as lane markings, signals, stop or yield signs, and crosswalks.

It's important to check for hazards well in advance of intersections. Make sure the vehicle operator's and officer's windows are partly open. This will enable detection of other emergency vehicles and traffic. Stay especially alert and search for actual hazards such as bad road surfaces and other motorists in the traffic lane, potential hazards like bicyclists or pedestrians, and finally for crossing traffic.

TURNING VEHICLES AROUND

Any type of turnabout can create a hazardous situation when performed on a street. Generally, the fastest way to turn around is to use reverse but remember to always use a spotter. In congested areas, going around the block may not only be safer, but also faster! Choosing a safe location to turnabout is important; choose an area with good visibility. You should have a clear view of the entire path of travel and all traffic lanes. Avoid hills, curves, and blind intersections.

The types of turnabouts, in order of increased hazard potential, include the U-turn, the two-point turn, and the three-point turn.

- The *U-turn* is the least hazardous type of turnabout. It is the easiest to perform but requires a wide roadway and good visibility.
- The *two-point turnabout* is made when the road is to narrow or restricted visibility wont permit a U-turn. The type or turnabout made depends on whether there is a side road or alley. The left side-road turnabout is more hazardous than the right. It should be a common practice not to use driveways to turnabout in because they may not support the weight of the larger emergency vehicles.
- The *three-point turnabout* is the most hazardous. It should only be used when the road is to narrow for a U-turn, there are not any alleys or side roads on either side, or if traffic is light.

In turnabouts in the emergency mode, if any exemptions are being exercised (e.g. U-turn where illegal) emergency-signaling equipment must be activated. The emergency mode may dictate performing more hazardous types of turnabouts. Always use regular signaling equipment, as well as emergency signaling devices.

SAFE FOLLOWING DISTANCES

A safe following distance means being able to stop safely without hitting the vehicle ahead if it stops suddenly. Rear-end collisions result from driver inattention to time and distance requirements. The law places the responsibility to maintain alertness and proper vehicle spacing on the following vehicle and its operator. If the proper distance is observed, left and right lateral evasive and other abrupt anti-collision maneuvering is minimized and unnecessary. Emergency vehicles are considerably larger in size, mass, and weight than smaller passenger conveyances, and require longer stopping distances when traveling at high speeds, especially during responses.

To accurately determine safe following distances, some factors need to be identified. First, *reaction distance* is the distance a vehicle travels from the time the driver perceives the need to stop until brake pedal movement begins. Average drivers require about ¾ to 1 second. Factors influencing reaction time are drive alertness and visual scanning. The driver's ability to perform under stress and the drivers experience are also factors that influence reaction distance. The distance traveled in ¾ to 1 second will be greater at higher speeds. Second, *braking distance* is the distance traveled from the first brake pedal movement until the vehicle comes to a full stop. There is no average breaking distance. Vehicle speed, velocity, momentum, and inertia (higher speed = greater braking distance) as well as vehicle weight (heavier vehicles tend to require greater stopping distances) all

affect the braking distance. Vehicle condition (brakes, tire tread), road surfaces, and road conditions (wet, icy, rutted) are also factors that affect braking distance.

An appropriate following distance will allow enough time to come to a full stop if the lead vehicle panic stops. A safe way to determine following distance for an emergency vehicle is the four second rule. The four second rule keeps a separation of at least four seconds between the emergency vehicle and the vehicle being at 40mph. For each additional 10mph another 1 second is added to the time. In adverse weather conditions, add another 1 second per 10mph to the time. To begin the count, pick a stationary object and as soon as the vehicle in front as passed it start counting 1001, 1002, etc. You stop counting when your vehicle reaches the same marker.

Common sense must prevail in determining when to increase following distances. Time and spacing requirements are predicated on the speed and conditions the emergency vehicle is traveling and operating in. Traffic density or volume, road surface conditions, hazards, roadway design, and speed limits influence the following and stopping distances. When conditions get bad, add more distance. The larger and heavier the vehicle is, the harder it will be to stop, and the stopping distance will be greater.

PASSING ANOTHER VEHCILE

Often it is necessary for the emergency vehicle to pass other vehicles. At highway speeds (40 to 60 mph), a safe pass can be completed in about 10 seconds. The emergency vehicle will travel about 1/6 of a mile (825 feet) at 55 mph during that 10-second period. The rule of thumb for passing and visibility distance is:

Starting Speed	Passing Distance	Visibility Distance
30 mph	**450 ft**	**900 ft**
35 mph	**525 ft**	**1050 ft**
45 mph	**675 ft**	**1350 ft**
55 mph	**825 ft**	**1650 ft**
60 mph	**900 ft**	**1800 ft**

There are some considerations that should be taken into account before initiating passing. They are as follows:

- Is it necessary to pass under emergency / non-emergency conditions?
- Is there a pressing need to “get around” the vehicles ahead, or is it related to driver impatience?
- Will vehicle traffic ahead move to the right in response to your audible/visual warning devices, negating the need for passing?
- Can it be done safely?
- Does the vehicle being driven respond to increased power demands or does it react in a sluggish manner?

Road information is critical to successful passing. Look for informational signs (No Passing, Intersection Ahead, etc.), road markings (solid centerline, broken centerline, etc.), road configurations (hills, curves, intersectioning roads, etc.). If “No Passing” is advised, there is a good reason, such as a hidden driveway, schools, damaged roads, or poor road design. A pass should never be made on a stretch of road where there are intersecting roads or driveways. Never pass a stopped car or line of cars without first finding out why they are stopped. Remember that many passing situations are potentially hazardous and involve some risk. Most motorists will attempt to pull over when confronted with a responding emergency vehicle. If the vehicle must pass the operator should do an evaluation of risk vs. benefit. In the emergency mode, the gain (saving a life) may justify increased risk. When conditions are ideal, there is a very little risk. In any situation avoiding mishaps is optimal. The following are some good tips to avoid mishaps when passing:

- If decision has been made to pass, and conditions are ok, DON’T HESITATE, conditions could deteriorate.
- Stay in the passing lane the shortest time possible.
- Constantly scan the roadway for unmarked, intersecting roadways.
- Be prepared to abort if conditions deteriorate. Most vehicles can slow up more rapidly than they can accelerate.
- Unless fully abreast of another vehicle, it is often safer to pull behind than to try accelerate.

EXPRESSWAY OPERATIONS

The term expressway includes interstates, freeways, turnpikes, or any other type of limited access multi-lane highway. Entering and exiting expressways are maneuvers that place a big demand on the operator to make fast, accurate decisions in rapid succession. Driving at or above the posted speed limit requires constant awareness of the road and traffic environment. Entering and exiting expressways is generally accomplished via “cloverleafs”. Cloverleaf intersections can be one of the most difficult things to accomplish safely. One group of vehicles

is slowing down to exit while another set is accelerating to enter. The two groups must cross in the right most lanes. Whether entering or exiting the cloverleaf, you should be prepared to stop in the event the vehicle in front of you stops suddenly. The most important things to remember when entering or exiting a cloverleaf are:

- Constantly use your mirrors.
- Always be prepared to stop suddenly.
- Look well in advance of your current position.
- Get in and out of the right most lane as quick as possible
- Adhere to ramp speed limits. They are generally on curves that can cause rollover.

Emergency operations on expressways are similar to rural roads with a few exceptions. Use of lights and sirens should be avoided on entrance ramps so that motorists won't become confused. Make a normal entry, assess traffic flow conditions, and choose a lane for an emergency run or high-speed operation before activating lights and sirens. Avoid weaving from one lane to another. Motorists may be unaware the vehicle is in the emergency mode if there is low sun or glare which may interfere with the emergency lights.

DRIVING AT HIGH SPEEDS

The practice of driving at speeds in excess of the posted limit is generally not recommended; however, if you chose to exceed the posted limits you should have already done a *risk vs. benefit analysis* and have chosen the need to exceed the posted limits. In all cases, there are some primary rules that should be adhered to:

- Negotiate a curve slower than what the yellow warning sign indicates is a safe speed for the curve.
- Observe posted speed limits.
- Allow for conditions that make a lower speed necessary, e.g., wet pavement, ice, traffic conditions etc.
- Avoid heavy or excessive braking action that may lead to brake fade.

In turns, centrifugal force quadruples as speed doubles. When the centrifugal force is high enough the vehicle cannot follow the curve on the intended track. For any curve, there is a maximum speed for traveling through the curve safely. The tighter the curve, the slower the vehicle must travel. If speed in a curve is too great, physics will win and the vehicle will become out of control. A properly designed curve should slant downward to the inside of the curve. Some older roads are banked the opposite way. Some are crowned in the middle. The operator should be as familiar as possible with the road design in their response areas. Road construction plays a role in the traction a vehicle maintains in a curve. If the road is cracked and decaying the traction is reduced. The surface material (asphalt

or concrete) is a factor. Vehicles don't have nearly as much traction on blacktop roads as they do on concrete. Bumpy roads reduce the amount of surface contact between the tires and road that will reduce traction in the curve.

Due to land availability or restrictions, designers often lay out curves in a decreasing radius pattern. This is a design by which the turns start out with a relatively large radius (curve) that tightens as the vehicle passes through the curve. On decrease radius curves, the maximum entry speed is too fast for the later (tighter) portion of the curve. If the speed is too high for the tighter portion of the curve, physics will win and vehicle control will be impossible. When approaching a decreasing radius curve, the driver should elect an appropriate entry speed for the entire curve. The speed cannot be selected, unless the road configuration is known in advance. Know the area!!! The entire curve must be considered before negotiating a curve. There are three points which are critical in negotiating curves; 1) Proper speed and vehicle position for entry to curve: 2) Maintaining control in the curve; and, 3) Proper speed and vehicle position for transitioning through the curve. To better define the safe mechanics of transitioning a curve, the following is a breakdown of a curve and proper techniques to pass through it.

Entry – Brake or decelerate to the proper entry speed *before* entering the curve. Enter the curve as far to the outside as possible. Entering on the outside of the curve effectively increases the radius of the track for the vehicle. The greater the radius, the faster the turn can be safely negotiated. Begin the turn as early as possible.

Transition – If the maximum safe speed to maintain control passing through a curve has been attained, the emergency vehicle operator experiences full control of the vehicle. The maximum "safe" speed is not the maximum "possible" speed that conditions will allow. When approaching maximum possible speeds, it will feel as though the suspension is straining. Do not apply aggressive breaking. Allow natural friction of the engine and compression to slow the vehicle down. In a curve, vehicle control becomes so critical that a relatively small event (e.g. some sand or gravel on the road) can cause complete loss of control. Once in the curve, coast a speed to maintain traction and friction. Apply power carefully. TO much power can result in loss of steering control and cause the rear wheels to spin and lose rear end traction.

Exiting – Exiting curves require the vehicle operator to keep the vehicle's speed slow and steady. Maintain position on the inner surface of the curve. Exiting to a straightaway requires the operator to maintain lain positioning. Gently accelerate out of the curve after the apex has been reached and the vehicle is on a straight path.

It should be revisited, that stopping at higher speeds required more stopping distance and is harder on the braking systems. Here are some basic techniques for stopping from a high speed:

- Laws of physics, particularly generation of heat in reducing speed, are operating on brakes.
- Overdo it and the physics will make the vehicles brakes useless. Don't abuse brakes; mechanical devices will fail.
- Be particularly cautious of long down hill grades. Use a lower gear to hold speed down rather than using the brakes. Select a gear before standing a descent.
- Proper high-speed braking techniques depend on the kind of brakes the emergency vehicle has. For either disc or drum brakes, it is not advisable to lock up the wheels. The stopping distance will be increased with locked wheels and the directional control will be lost.
- Use the right foot for braking. When a stop is imminent, "cover" the brake with the right foot. Don't risk brake fade by riding the brake.

HANDLING UNUSUAL OR DANGEROUS DRIVING SITUATIONS

Driving In Adverse Conditions

Civilian drivers usually choose when and under what conditions they drive. Unfortunately, the emergency vehicle driver must operate whenever an incident occurs. Many times this involves adverse conditions. Typically, adverse conditions can be classified in terms of:

- Traction Implications
- Adverse Handling Implications
- Vision Implications

If these adverse conditions cannot be adequately handled or if other unexpected situations occur, the emergency vehicle driver may need to initiate crash avoidance procedures. Emergency drivers must adjust their driving techniques for all adverse conditions. The driver's primary responsibility is the safety of the passengers and arriving safely at the incident. Slow down and drive at a speed reasonable and appropriate for the conditions. Increase following distances and drive smoothly with any vehicle to avoid sudden and dramatic maneuvering. Prioritize the response and use common sense!

Traction Implications – The traction of a vehicle is adversely affected by a variety of environmental conditions. These include rain, snow, ice, high winds and/or leaves on the roadway.

- Rain – In addition to oil buildup, water forms a layer that builds between the tires and the road surface. As little as $1/16^{th}$ of water can cause hydroplaning of a vehicle. Standing water may also impact steering, braking, and general vehicle operation.

- Snow and Ice – Snow and ice form an extremely slippery road condition resulting in reduced traction for vehicle tires. Also, certain features such as bridges may experience snow or ice prior to the road surfaces.
- Leaves – In many areas large amounts of leaves accumulate on the road surface. They can result in slippery conditions equal to snow or ice when they become wet.

Whenever conditions have caused reduction in traction, the driver must reduce speed: and, steer, accelerate, or brake smoothly and evenly. The required stopping distances multiply depending on the condition of the road surface.

Adverse Handling Implications – Adverse handling could be caused by natural implications such as high winds, and trees or general ground terrain. Road construction and design or some man made implications. Again, reduce speed and maintain control of the vehicle.

Vision Implications – Conditions that affect the vision of the driver include night driving, precipitation, the vehicle, and the condition of the driver.

- Night Driving – Driving at night increases the potential for problems because of factors such as: hidden hazards; increased difficulty in judging the speed of other vehicles, and distance; limited highway lighting; and glare from roadside lights. Even with these limitations and possibly impaired vision, a few simple rules can help the driver compensate.
- Dim dash and cab lights.
- Reduce speed.
- Keep headlights and windshield clean.
- Watch area beyond headlights.
- Keep eyes moving and scan continuously.
- Precipitation – Rain, fog, and snow reduce visibility. In addition, rain and fog increase glare both during the day and at night. During the day when the sun is out, the snow on the ground creates a considerable glare as well. It is imperative that the vehicle be kept under strict speed control. Poor visibility conditions require the operator to:
    1. Drive slowly but keep moving.
    2. Turn headlights (low beams only) and wipers on.
    3. Use four way flashers if traveling 15 mph or more below the posted speed limit.
    4. Watch for cars ahead that are moving very slowly.
    5. Avoid decelerating suddenly.
    6. If you must pull off the road, use four way flashers.
    7. Do not pass.
    8. Use the defroster or air conditioning to minimize fogging on the inside of the windows.

CONTINGENCY SITUATIONS – CAUSES AND PREVENTION

Contingency situations can arise at any time. A contingency situation is described as a possible future event, condition, or an unforeseen occurrence that may necessitate special measures. It is something that is liable to happen as chance as a chance feature or accompaniment of something else (Webster's Third New International Dictionary, 1993). 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 contingency situations that occur most often, and to understand the actions that can be taken to minimize the likelihood of death or injury. The five primary causes of contingency situations are:

1. *Vehicle malfunction of component failure* – There are a number of things the operator can do to prevent vehicle malfunctions or component failures. Inspect the vehicle at the beginning of every shift and correct any deficiencies noted at that time. Correction is the best prevention.
2. *A sudden change or deterioration in the road* – When there is a sudden change or deterioration in the road conditions (weather, damage, construction, etc.) remain alert, scan well ahead, and look for clues like construction signs or skid marks on the road.
3. *The appearance of an obstacle in the roadway* – Be prepared for an appearance of obstacles in the road (e.g. pedestrians, other vehicles, animals, etc.). Maintain a safe and controlled speed. Watch for obvious clues like children playing or bikes near the road.
4. *A sudden change in the weather* – Road conditions change very rapidly with precipitation. Look for icy patches and remember it takes very little water on the road surface to cause a sliding situation.
5. *Driver error, inattention, and inexperience* – Begin the shift well rested with no unusual physical or mental impairment. Remain alert, know the vehicle characteristics, avoid unnecessary risks, and most of all don't panic if change occurs.

HANDLING CONTINGENCY SITUATIONS

Since vehicle operators may spend many hours driving under unusual situations, it is probable that sooner or later an unusual situation will occur. The best way to minimize the impact is to be as prepared as possible and comfortable with the evasive maneuvers available.

Such actions as evasive steering, or sudden and extreme changes in the vehicles direction, are often used to avoid pedestrians, animals, vehicles, or other obstacles. These actions are usually done because it is too late to brake to a stop. The driver needs to weight the action vs. outcome of the contingency. Is it safer to collide with a small animal rather than risk losing control due to a sudden steering or braking maneuver?

The vehicle driver must scan ahead along the roadway; shoulders and/or median to identify any potential escape routes, which can be safely used to avoid a crash. Scan carefully when approaching the crest of a hill, rounding a curve, and when approaching intersections. These situations minimize possible escape routes.

Evasive steering is used to avoid a collision or minimize the impact of a collision. Hands should be at the 9 and 3 o'clock position on the steering wheel. This will allow the largest possible turn without moving the hands. The 10 and 2 o'clock positions are more comfortable, but the 9 and 3 o'clock position allows maximal directional control. To avoid a collision, turn the steering wheel sharply in the direction of the escape route and counter steer as soon as the vehicle is clear of the obstacle. When one is sure that a collision is unavoidable, choose an object with which to collide. Always choose the course least likely to result in a serious accident. Head-on collisions are the most damaging collisions. Attempt to sideswipe or brush another object. Impact absorbing objects are better to choose than large immobile items that will not "give". Some examples of impact absorbing objects are parked cars, bushes and shrubs, and small signs. Examples of nonimpact-absorbing objects include concrete abutments, buildings, large trees, and utility poles. All collisions are preventable and therefore avoidable. They occur when the vehicle operators aren't paying attention to the roadway dynamics, other vehicles, and/or the rules of the road.

Although sometimes it may be necessary to brake, hard braking should be avoided. Hard braking can lock the wheels; locked wheels won't steer. Rear wheels tend to lock before the front wheels. Locked rear wheels tend to seek the front (skid). Slow down and maintain control. With passenger vehicles very abrupt maneuvers are possible unless the wheels will hit the curb, a rut, etc. However, skidding, yawing, and other loss of control scenarios will occur if conditions arise. A large vehicles steering ratio usually precludes excessively abrupt maneuvers.

In addition to evasive steering, there are two other forms of maneuvering to avoid collisions – *emergency braking and evasive acceleration.*

- *Emergency braking* – The goal for emergency braking is to produce the shortest possible stopping distance without locking the wheels or losing control. The threshold braking method for accomplishing this is hard pressure to the brake pedal without locking the wheels. Modulate the pressure on the pedal. Apply steady pressure to the point of locking, and then release pressure slightly to get rolling traction. If the wheels lock, **release the brake pedal.** A vehicle with ABS does not require threshold braking because the computer will not allow the brakes to lock up; a steady pressure should be maintained on the pedal. Remember that a rapid stop could cause a rear-end collision; however, this is more preferable than hitting a pedestrian. Remember the action vs. outcome formula.

- *Evasive acceleration* – Evasive acceleration means a quick burst of speed. It can be used to avoid collision with side approaching or merging vehicles. When a vehicle is approaching from the side or merging, increasing speed can often avoid a side impact collision.

HANDLING SKIDS

There are many reasons for skids; however, these are the primary ones:

- A too-sudden change of speed or direction.
- Any change of speed or direction under conditions of poor traction.
- Sudden shift in weight dynamics.
- Poor tire tread.
- Improper tire inflation.
- Driver inattention.
- Improper application of the braking system.

TO help regain control no matter what type of skid is occurring, ***STAY OFF THE BRAKE; STAY OFF THE ACCELERATOR; AND COUNTERSTEER****!* Steer in the direction to which the rear end of the vehicle is skidding. There are two points about counter steering: 1) the steering wheel does not have to be turned violently to correct a skid. This a common “panic” reaction, and further trouble arises because the rear tends to skid back and forth (fishtailing); 2) Once the wheel has been turned to counter-steer, it may be necessary to immediately counter steer in the other direction to help recover.

There are four basic types of skids. The following will describe them and methods of recovering from them:

- **Braking skids –** This skid occurs when sudden, hard brake pressure is applied causing on or more of the vehicles to lock. If the brakes are properly adjusted then all wheels should lock at the same time. Regardless of how many wheels lock, steering control will be lost. 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). 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 degrees. The vehicle may actually end up traveling in the opposite direction. The following actions should be taken if braking skid occurs:
    - Release the brakes immediately; it should then be possible to steer. Releasing the brakes allows the wheels to turn.
    - If braking is still necessary, apply with less pressure so that the wheels don’t lock again.

- **Power skid –** The power skid occurs due to sudden, hard acceleration. Since the power skid is delivered only to the rear wheels, sudden acceleration can cause the rear wheels to lose traction. The back of the vehicle may skid to one side, try9ing to overtake the front end. The tendency for the rear end to slide will be greatest if the front wheels are turned. The vehicle may even spin all the way around .To control this:
    - Ease off the accelerator.
    - Steer in the direction towards which the rear end of the vehicle is skidding.
    - Counter steer to set the vehicle straight.
    - Keep the front end up front.
    - Steer in the direction you want to go.

- **Cornering Skids** – Cornering skids (also called yaw skids), occur when speed is too great or traction is reduced (due to poor road/weather conditions) such that the vehicle cannot stay on the intended track around a curve. This is primarily seen at exit ramps from highways. The cornering skid can even occur at normal speeds if the traction is reduced by tire or road surface conditions. The vehicle may continue on a straight path and not on the intended path around the curve. In a full cornering skid all four wheels lose traction. The rear end of the vehicle may try to overtake the front end of the vehicle if just the rear wheels lose traction. This is sometimes called a “spin-out”. Actions to take if a cornering skid occur are:
    - Ease off the accelerator.
    - If the vehicle is spinning out, counter steer as space permits. This will align front and rear wheels and control may be regained.

- **Hydroplane Skids** – Hydroplane skids occur when the tire is moving to fast for the water on the road to escape (to flow around it or through the tread). Hydroplaning can occur on minimally wet surfaces at speeds of 25 mph. A small wedge of water builds up in front of the tire and lifts it off the road surface. The results of a hydroplane skid are hard to predict. As in all skids, there is loss of braking and/or steering control and unless the driver attempts to brake or steer (other than straight ahead) the driver may not know the vehicle is hydroplanning. Actions to take if hydroplaning occurs:
    - Release brake and/or accelerator.
    - Allow the vehicle to decelerate. The weight of the vehicle will drop through the water barrier and recontact the road surface. Remember: Speed initially causes hydroplaning; the second cause is tire and tread.

HANDLING OTHER VEHICLE EMERGENCIES

There are a number of other emergencies that can occur to the vehicles we use. The following are some possible emergencies and ways to control them:

- **Rapid Tire Deflations** - With rapid tire deflation, front-end occurrences are the most dangerous. The vehicle will pull to the side of the blowout or deflated tire. The driver should remove their foot from the accelerator, allowing the vehicle to slow gradually. Hold the steering wheel firmly; anticipate difficult steering. When the steering is controlled, brake lightly; avoid aggressive braking techniques. The vehicle will pull to the side of the deflated tire because the flat tire grips the road with more rubber (and more friction) an acts as a pivot. Aggressive braking will cause the rear of the vehicle to swing/skid around 180 degrees.
- **Brake Failure (conventional brakes)** – Brake failure in conventional systems generally results in negligence of the system, which in turn leads to failure. If failure occurs, let off the accelerator and pump the brake pedal rapidly. This might build up enough pressure (fluid) in the system and provide minimal braking action. If applicable leave the Jake brake / retarder system engaged. Down shift to the lowest gear on gear at a time. Additionally, apply the parking brake system pumping firmly, holding the release mechanism to prevent rear wheel lockup. As a last resort, as the vehicle slows, rub the tires against a curb for additional friction. If all else fails, look for an appropriate escape path.
- **Brake Failure (ABS/Air brakes) -** Anti-lock braking systems (ABS) are operated by a computer system. The computer rapidly applies the pumping action/friction to the pads faster than a human can with the foot. When ABS systems fail, the vehicles parking brake system reverts to conventional for the most part. However, initially, **do not pump an ABS system**. This will confuse the computer if the system is still functioning, and will not allow for even/smooth braking to occur on all four wheels. Apply firm pressure and hold in place. Down shift to the lowest gear on at a time, to slow the vehicle down. Leave the retarder system engaged. Again as a last resort rub the tires along the curb to slow the vehicle and if that fails look for an escape route. Never pump the brakes if the vehicle as air brakes. Air-brake failures are generally caused by an air-line failure or component failure. Pumping the brakes exhausts the remaining air more rapidly.
- **Transmission Malfunctions –** Transmission failures are rare in nature unless the driver shifts into reverse or park while driving. Most new apparatus as an electronic transmission that won't allow for those occurrences. Basically, vehicle operators will experience early indications of trouble in the transmission (e.g. slipping, thrusting etc.). In these situations place the unit out of service and have a mechanic look at it.
- **Steering Malfunctions / Failures -** Power steering system failure is the most common. A power-steering failure occurs when the engine stalls, fluid in the system is low, or when the belt that drives the system flips or brakes. Regardless, the steering mechanism will still work, but it will require considerable effort to steer the vehicle. Complete failure of the steering system seldom occurs. IF complete failure occurs, release the accelerator, downshift to the lowest gear, and bring the vehicle to a stop.

- **Accelerator Sticks -** If the accelerator sticks, the driver should attempt to release the pedal by tapping on it with their foot. IF this fails then the driver should attempt to stick their foot under the pedal and pull it up. This should only be done with the foot and **NOT** the driver's hands. IF that does not solve the problem, put the vehicle in neutral and apply the brakes to slow the vehicle to a stop, downshift to the lowest gear on gear at a time. If the motor is shut down, beware that many breaking and steering systems require the motor to be running. Without the motor running, both of these operations will be more difficult.
- **Impaired Visibility -** If visibility should become impaired (hood flies up, wiper or defroster malfunction, the driver should open their window and stick their head out to see where the vehicle is going. Apply the brakes slowly as not to cause a rear-end collision and pull off the road.
- **Wheels of the Road -** If the wheels were to leave the road surface, the driver will have to perform an off-road recovery. When the wheels have left the road, hold the steering wheel firmly as the vehicle may pull to one side. Reduce speed by releasing the accelerator. If the brakes must be applied, they should be done so very gradually.
- **Danger Signals -** There are many forms of "danger signals" the driver should be aware of and be able to take the appropriate action to minimize or correct the problem. It is important to remember that if responding on an emergency incident and the vehicle has a malfunction, a replacement unit should be requested immediately as not to delay the assistance longer than it has to. Some danger signals to be aware of are:
    - Fuel gauge – loss of fuel or not proper quantity to start.
    - Charging system – If this fails, (battery not charging); turn off any equipment that will drain the battery. If the motor is stopped it is unlikely to start again.
    - Brake warning light – Stop immediately. If there is a complete brake failure, use the procedure outlined in the brake failure section listed previous.
    - Oil pressure - If it drops, stop the vehicle immediately. Do not drive until maintenance has been performed.
    - Engine temperature – If it rises into the danger zone (and remains), stop immediately and do not drive the vehicle until maintenance is performed.

EMERGENCY PARKING PROCEDURES

Position of an emergency vehicle on and emergency incident is crucial. The more likely a hazard it represents, the more critical the need for rapid, effective placement of stationary warning devices. The most effective is the placement of reflective triangles or flares to warn drivers of the upcoming situation. Remember that is there is a potential for flammables spilled, the reflective triangles are the better choice. It is a goal to protect the scene and the personnel operating on the

scene. The goal of “protecting the scene” is to provide visible, early warning to surrounding traffic and thus avoid a collision (or avoid causing a collision).

Some simple tips to use for identifying and protecting the apparatus and personnel. During daylight hours and the vehicle is off the road the use of hazard lights (four way flashers) should be sufficient. IF the apparatus is still on the road then the use of emergency lights, hazard lights, and some other form of warning devices should be used (e.g. traffic cones, triangles, or flares). During darkness, use of as many lights as possible is the best safety. The lights generally cause traffic to slow to a safe speed around the apparatus.

If the need for additional traffic warning devices is warranted, then ensure that plenty of warning is given to oncoming traffic. Terrain and visibility may require that the additional warning devices be placed well behind the apparatus and in some cases around a curve or over a hill. Actual distances are based on the topography, buildings, and visibility conditions.

Safety Reminder – If you position yourself behind any parked emergency vehicle for the purpose of spotting and/or warning approaching traffic, you run the risk of being struck. Be vigilant, people are struck because they are not looking. **Never** turn your back on approaching traffic.

COMPETENCY COURSE PROCEDURES

PURPOSE OF COURSE

The competency course is designed to measure the proficiency of emergency vehicle drivers. The course is designed to measure a driver’s skill, knowledge, and judgment. It can also identify to the candidate the limitations of the vehicle while completing eight specific exercises. The competency course is designed to fulfill one of several purposes:

- Assist in the training of a candidate emergency vehicle driver.
- Verify the competency of an existing vehicle driver.
- Examine the proficiency of an existing emergency vehicle driver.

Driving the course requires completing each station under ideal conditions in a controlled environment. Actual driving conditions represent less than ideal conditions because of constantly changing situations. There are specific performance criteria that are crucial to achieving proficiency while completing the competency course. They are as follows:

- Comfortable seating position.

- Ease and convenience for reaching all controls of the vehicle.
- Proper hand position on the steering wheel.
- Careful vehicle control.
- Precise steering adjustments.
- Consistent vehicle speed.
- Proper adjustment and effective use of vehicle mirrors.

To successfully be evaluated as an emergency vehicle driver requires more than the completion of the competency course. It must be supplemented by other exercises including street and highway driving in order to fully comply with NFPA 1002. The candidate should be taken through a predetermined route on a public way. Some of the actual activities that must be completed as a part of the over-the-road driving portion include but are not limited to:

- Make four left and 4 right turns.
- Travel either a straight section of urban business street that is several blocks long or a minimum of one mile or a 2 lane rural road.
- Travel across at least one through intersection and a minimum of two intersections where stopping is required.
- Travel over at least one railroad crossing.
- Travel on a road with at least one curve to the left and one to the right.
- Enter and exit a limited access highway. Use a conventional ramp entrance. Travel the highway a sufficient distance so as to safely execute two lane changes, on to the right and one to the left. Exit off a conventional ramp.
- Proceed down a grade. It shall be steep enough and long enough to require braking or shifting.
- Proceed up a grade. It shall be steep enough and long enough to require shifting to maintain a constant speed.
- Travel under, over, or across an underpass or bridge. It shall present either a vertical or horizontal restriction.
- Travel along or over any unusual or unique roadways or features that present a special consideration in the operation of the vehicle.

RULES AND PROCEDURES

In order to maintain safety during the competency test it is important that certain rules be followed. Many of these rules flow into normal operation of an emergency vehicle. The following should be deemed as the course rules:

1. Vehicle performing maneuvers on the course will have their headlights on.
2. No unauthorized vehicles or drivers allowed on the course during any exercise.
3. All vehicle occupants must wear occupant restraint devices.

4. Persons assigned to reset cones will wear bright clothing, safety vests, and stand clear of the traveled area.
5. Maximum speed on the course should not exceed 20-30 mph.
6. The distances between cones in any exercise may be adjusted to accommodate different lengths or widths of vehicles.
7. Course exercises will not be held outside if the course is icy or snow covered.
8. All vehicles will have a pre-trip inspection performed on them prior to using them for the competency course or over-the-road evaluation.

COMPENTENCY COURSE DESCRIPTION

STRAIGHT LINE EXERCISE: The purpose of the straight line exercise is to familiarize the driver with operating the vehicle within close quarters both in forward and reverse; and, to enable the driver to adjust the mirrors fro proper viewing, make minor steering adjustments, and gain confidence in transversing a restricted area.

This exercise is typically the first station in the competency course. The area is 6' 8" wide and is measured from inside edge of cone to inside edge of cone. It is 200' in length and has cones spaced along the sides of the course at intervals of 20 to 25 feet.

The exercise begins upon entering the straight line at the entrance. The driver travels through the exercise by "hugging" to the left side; stopping at the end of the station; and backing out of the course without brushing or knocking over any cones.

CONFINED SPACE TURNAROUND EXERCISE – The purpose of the turnaround exercise is to allow the driver to become familiar with the turning radius of the vehicle; and, to permit the driver to interpret depth perception involving the placement of the rear of the vehicle as seen through the vehicle's mirrors.

This station is in an area 50' wide by 100' long. Cones are placed intermediately along the length of the area at 20 to 25 foot intervals. The entrance is at the center of the 50' side of the station.

The driver begins the station by entering and proceeding diagonally toward on corner of the confined space. The vehicle is then maneuvered back and forth without projecting outside of the areas boundaries until it can be driven out of the confined space. This exercise is **NOT** a three-point turn. In may take upto to 6, 7, or 8 turns for larger vehicles to accomplish the 180-degree turn.

ALLEY DOCK EXERCISE – The purpose of the alley dock exercise is to familiarize the driver with positioning of the vehicle to back into a confined space;

and, to judge depth perception and distance using the vehicle's mirrors to position the rear of the vehicle at or close to a fixed point.

This section is exactly 10 feet wide, measured from inside of one cone to the inside of a cone and 30 feet long. The 30 feet can be used for all vehicles no matter the length of the vehicle since the vehicle does not have to be all the way in the dock area.

This exercise begins when the vehicle proceeds past the alley dock so as to position it for backing into the alley. The intent of the exercise is for the vehicle to be backed into the alley and stop within 6 inches of the back of the alley.

SERPENTINE EXERCISE - The purpose of the serpentine exercise is to familiarize the driver with the location of the corners of the vehicle for maneuverability purposes and the turning radius while moving forward and backward; creating a confidence in using the mirrors for this exercise.

The serpentine is an area 50 feet wide by 200 feet long. There are 4 cones set in the center of the 50-foot width and the cones are set at 40 feet apart, measured center to center. For vehicles with a wheelbase of less than 170 inches, the distance between the centers of the cones is reduced to 34 feet.

Upon entering the exercise, the vehicle should be driven along the right side of the center cones. After passing the 3rd cone the vehicle should be cocked at a slight angle so as to position the rear of the vehicle between the 3rd and 4th cones. The driver then backs the vehicle between them, passing to the left of the 3rd cone and to the right of the 2nd cone. Then the driver should pass to the left of the first cone and back through the entrance. After backing through and stopping at the entrance, the driver travels through the serpentine in a forward position. The vehicle should pass to the right of the first cone, the left of the second cone, right of the third cone and out the exit of the exercise.

OFF-SET ALLEY EXERCISE - The purpose of the off-set alley is to allow the driver to become aware of the front and rear tracking of the vehicle; familiarizing the driver with depth perception through the vehicles mirrors, especially recognizing the location of the right rear wheel.

The distance between the two alleys is 48 feet. It must be carefully measured from edge of cone to edge of cone. An extended front bumper or other projections of the vehicle must not extend outside the alleys. In other words, treat the alley edges as if they are building walls or parked vehicles.

When transversing the exercise the driver should proceed forward through the first alley and exit it. The driver should change the track of the vehicle and enter the second alley without rubbing or knocking down any of the cones. Typical

problems involve changing the track of the vehicle too quickly or not straightening the vehicles track sufficiently before entering the second alley.

PARALLEL PARK EXERCISE - The purpose of this exercise is to allow the driver to understand the importance of vehicle positioning prior to starting a movement that requires exact right side placement; to familiarize the driver with the turning radius of the vehicle as it impacts restricted space placement; to enable the driver to locate the position of the right front extremity of the vehicle while completing a maneuver; and, to enable the driver to place the right side of the vehicle at a specific point utilizing the vehicles mirrors.

The parking space that the vehicle is to be placed in is **the length of the vehicle plus eight feet.** The depth of the parking space is eight feet and a marking of 12 inches should be marked away from the curb.

The driver shall pull the vehicle past the parking space and proceed to parallel park the vehicle in the designated space. The right side of the vehicle must be placed within 12 inches of the curb. Crossing over the curb, parking to far away from the curb, or knocking down cones that mark the parking place will result in penalty points added to the drivers score.

DIMINISHING CLEARANCE EXERCISE - The purpose of the diminishing clearance exercise is to familiarize the driver with the importance of properly aligning a vehicle when entering a very confined asymmetrical area; and, to familiarize the driver with traveling through a continually more confining restricted area.

This portion of the course uses an area approximately 100 feet in length and the entrance to the station is nine feet six inches wide, inside cone to inside cone. The end of the exercise measures eight feet two inches wide, inside cone to inside cone edge.

The vehicle is to pass through the length of cones without touching or knocking and cones over. Two of the most common errors involve speed fluctuations through the exercise and misalignment of the vehicle's track upon entering the station.

STOPPING EXERCISE - The purpose of the stopping exercise is to familiarize the driver with the position of the front of the vehicle and to require the driver to brake smoothly and precisely while bringing the vehicle to a stop at a specific point.

At approximately 40 to 60 feet beyond the end of the diminishing clearance station, two cones will be set parallel to each other and in the line of travel of the vehicle. Marks at 6 inches, 12 inches, and 18 inches from the cones will be made on the ground.

The vehicle will exit the diminishing clearance and proceed straight towards the two cones. The vehicle will then slow and come to a complete stop no more than 6 inches from the cones. The farther away from the cones will result inn more points being added to the drivers overall score.