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THE MILITARY COMMERCIAL DRIVER'S LICENSE DRIVER'S MANUAL

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THE MILITARY COMMERCIAL DRIVER'S LICENSE DRIVER'S MANUAL

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PREFACE

This TC is produced as a result of Congress enacting into law the Commercial Motor Vehicle Safety Act of 1986. The law mandates states to meet the same minimum licensing standards. The law also requires that each commercial motor vehicle driver obtain a CDL to operate certain vehicles. In 1988, Congress waived the CDL requirement for certain DOD military drivers. However, the waiver is based on the services meeting or exceeding the minimum standards set forth in the CMVSA of 86.

This TC parallels the FHWA approved model driver's manual used by commercial driver training institutions to qualify civilian drivers to CDL standards. This TC and a computer-assisted instruction program (CAI 551-10), are designed to enhance the knowledge and skills of military drivers. This media also supports the military driver training, testing, and licensing standardization initiatives.

These programs may be used to enhance existing unit driver training initiatives. They are adaptable to an individual or group settings. Deviations from these programs will negatively impact driver skills and standardization objectives.

These programs do not restrict their contents to any particular vehicle. They are a guide to normal highway operations under varying conditions for transporting various types of cargo. They do not include any specific geographical or theater unique requirements. However, they do conform to the basic driving criteria needed to obtain a state or federal government agency license. If you are pursuing a CDL from a particular state, contact that state's licensing authority, they may have other licensing criteria.

The US Army's environment strategy into the 21st century defines the Army's leadership commitment and philosophy for meeting present and future environmental challenges. It provides a framework to ensure that environmental stewardship ethic governs all Army activities. The Army's environmental vision is to be a national leader in environmental and natural resource stewardship for present and future generations, as an integral part of all Army missions. The Army's environmental vision statement communicates the Army's commitment to the environment.

The proponent of this publication is the US Army Transportation School. Send comments and recommendations on DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to Commandant, US Army Transportation School, ATTN: ATSP-TDX, Fort Eustis, Virginia 23604-5389.

Unless this publication states otherwise, masculine nouns and pronouns do not refer exclusively to men.

CHAPTER 1

TESTS AND SAFETY ACT RULES

This chapter explains MCDL tests and other Safety Act Rules required for all drivers. These standards were modeled after the Commercial Motor Vehicle Safety Act of 1986. It also covers the different vehicle classes, types of knowledge and skills tests, and other rules to enhance driver training programs.

1-1. VEHICLE CLASSES. There are four basic classes of wheeled vehicles. They are classified as follows:

a. **Class A.** Any combination vehicle with a GCWR of 26,001 pounds or more, provided the GVWR of the vehicle or vehicles being towed exceeds 10,000 pounds.

b. **Class B.** Any single vehicle with a GVWR of 26,001 pounds or more, or any such vehicle towing a vehicle not in excess of 10,000 pounds GVWR.

c. **Class C.** Any single vehicle, or combination of vehicles, that meets neither the definition of Class A or Class B as defined above, but are designed to transport 16 or more passengers (including the driver) or transport HAZMAT which requires placarded under HAZMAT regulation (CFR 49, Part 172).

d. **Class D.** Those military vehicles outside of the current CDL classification system.

NOTE: Class D is not a class identified in the CMVSA. Check with your state DMV if you plan to get a CDL, they may have additional vehicle definitions.

1-2. TEST PREPARATIONS. Drivers must pass a general knowledge and selected special written test(s). These tests are based on the class/type of military vehicle you are being licensed to operate. Drivers must perform an inspection and demonstrate their driving skills on the same class/type of military vehicle. An in-depth knowledge of t he vehicle and its components is essential for these tests. This manual contains general information needed to pass the tests.

1-3. KNOWLEDGE TESTS. You must take one or more knowledge tests, depending on the class of license and the endorsements you need. The knowledge tests include the following:

a. **The General Knowledge Test.** Taken by all applicants.

b. **The Passenger Transport Test.** Taken by applicants who operate vehicles (bus or truck) designed to transport 16 or more passengers (including the driver).

c. **The Air Brakes Test.** Taken by applicants whose vehicle has air brakes.

d. **The Combination Vehicles Test.** Taken by applicants who drive combination vehicles.

e. **The HAZMAT Test.** Taken by applicants who haul HAZMAT or waste.

f. **The Tanker Test.** Taken by applicants who haul liquids in bulk.

g. **The Double/Triple Trailer Test.** Taken by civilian applicants who pull double or triple trailers. The military does not administer the double/triple trailer test.

If you pass the required written knowledge tests, you will be eligible to take the skills test. There are three types of MCDL skills tests: pre-trip inspection test; basic control skills test; and road test. The following paragraphs describe each of these tests. You must take these tests on the type of vehicle for which you wish to be licensed.

1-4. PRE-TRIP INSPECTION TEST. This test is to see if you know whether the vehicle is safe to drive. The examiner will ask you to do a pre-trip inspection and to explain to him what you would inspect and why.

NOTE: Chapter 2, Section II, and Chapter 10, gives the inspection standards, identifies what you need to inspect, and explains how the inspection is to be conducted.

1-5. BASIC CONTROL SKILLS TEST. This test is to check your basic skills in controlling the vehicle. The test has various exercises marked out by lines, traffic cones, or similar objects. The exercises may include moving the vehicle forward and backwards and turning maneuvers.

NOTE: The examiner will explain how each exercise is to be done. He will score you on how well you stay within the exercise boundaries and how many pull-ups you make. Chapter 11 of this manual explains more about the test.

1-6. ROAD TEST. This test is to check your ability to drive safely in a variety of on-the-road situations. The examiner specifies the route of the test. It may include left and right turns, intersections, rail way crossings, curves, up and down grades, rural or semirural roads, city multilane streets, and expressway driving.

NOTE: You will drive over the test route following the examiner's instructions. The examiner will score specific tasks, such as turns, merging into traffic, lane changes, and speed control. Chapter 12 of this manual explains more about the test.

1-7. OTHER SAFETY ACT RULES. Other federal and state rules that affect drivers are as follows:

- You cannot have more than one license. If you break this rule, a court may fine you up to $5,000 or put you in jail. Keep your home state license and return any others.
- You must inform your employer (civilian) within 30 days and your military commander immediately of a conviction for any traffic violation (except parking) no matter what type of vehicle you were driving.
- You must inform your motor vehicle licensing agency (civilian) within 30 days and your military commander immediately if convicted of a traffic violation (except parking) no matter what type of vehicle you were driving.
- You must inform your employer (civilian or military) if your license is suspended, revoked, or cancelled, or if disqualified from driving.

- When you apply for a commercial driving job, you must give your civilian employer information on all driving jobs held for the past ten years. You must bring your DA Form 348 when upgrading your current military driver's license to a CDL or when you apply for a commercial driving job.
- No one can drive a CMV without a CDL. A court may fine you up to $5,000 or put you in jail for breaking this rule.
- Your employer may not let you drive a CMV if you have more than one license or your CDL is suspended or revoked. A court may fine the employer up to $5,000 or put them in jail for breaking this rule.
- All states will be connected to one computerized system to share information about CDL drivers. The states will check on drivers' accident records and enforce the one CDL.

NOTE: The Army Driver Standardization Office, US Army Transportation School, maintains database records on all military personnel trained and tested to MCDL standards.

You will lose your CDL for at least one year for a first offense if you--

- Drive a CMV under the influence of alcohol or a controlled substance (for example, illegal drugs).
- Leave the scene of an accident involving a CMV you were driving.
- Use a CMV to commit a felony.

If the offense occurs while you are operating a CMV placarded for HAZMAT, you will lose your CDL for at least 3 years. You will lose your CDL for life for a second offense. You will lose your CDL for life if you use a CMV to commit a felony involving a controlled substance.

You will lose your CDL for at least--

- 60 days - if you commit two serious traffic violations within a 3-year period involving a CMV.
- 120 days - for three serious traffic violations within a 3-year period.

NOTE: Serious traffic violations are excessive speeding (15 mph or more above the posted limit), reckless driving, improper or erratic lane changes, following a vehicle too closely, and traffic offenses committed in a CMV in connection with fatal traffic accidents.

If your BAC is .04 percent or more, you are driving under the influence of alcohol. You will lose your CDL for one year for your first offense, You will lose it for life for your second offense. If your BAC is less than .04 percent but you have any detectable amount, you are put out of service for 24 hours. If you operate a CMV, you shall be deemed to have given consent to alcohol testing for those violations mentioned above.

NOTE: These rules will improve highway safety for you and all highway users. Your state and the military installation in your area may have additional rules.

CHAPTER 2

SAFE DRIVING

This chapter is divided into two sections. Section I contains general information and safe driving practices. Section II contains the vehicle pre-, during-, and after-trip inspections criteria.

Section I. GENERAL INFORMATION

This section contains general information on air brakes, cargo, combination vehicles, tank vehicles, double trailers, triple trailers, passenger vehicles, and HAZMAT. To learn more about these subjects, read Chapters 3 through 9 and follow the checklists in Chapters 10 and 12.

2-1. BASIC VEHICLE CONTROL. To safely drive a vehicle you must be able to control speed and direction. Safe operation of a vehicle requires skill in accelerating, steering, and backing of a vehicle.

NOTE: Fasten your seat belt when you drive. Apply the parking brake when you leave your vehicle.

a. **Accelerating.** Perform the following procedures when driving the vehicle:

- Do not roll back when you start; you may hit someone behind you. Partly engage the clutch (manual transmission) or place automatic transmission in gear before lifting your right foot off the brake. Use the parking brake when necessary to keep from rolling back. Release the parking brake only when you have applied enough engine power to keep from rolling back.
- Speed up smoothly and gradually so the vehicle does not jerk. Rough acceleration can cause mechanical damage. When pulling a trailer, rough acceleration can damage the coupling.
- Speed up gradually when traction is poor, such as in rain or snow. If you use too much power, the drive wheels may spin and you could lose control. If the drive wheels begin to spin, take your foot off the accelerator.

b. **Steering.** Hold the steering wheel firmly with both hands on opposite sides of the wheel. If you hit a curb or pothole (chuckhole), the wheel could pull away from your hands unless you have a firm grip.

c. **Backing.** Backing is always dangerous because you cannot see everything behind your vehicle. Avoid backing whenever you can. When you park, try to park so you can pull forward when you leave. When you must back up, follow these simple safety rules:

- Look at your path. Look at the line of travel your vehicle will take before you start. Get out and walk around the vehicle. Sound your horn, activate your back-up alarm (if equipped), or turn on your emergency flashers.
- Check the side and overhead clearance in and near the path your vehicle will take.
- Backup slowly. Always backup as slow as possible. Use the lowest gear so you can easily correct steering errors. You can also stop quickly if necessary.

- Back and turn toward the driver's side whenever possible so you can see better. Backing toward the right side is very dangerous because you cannot see as well. If you back and turn toward the driver's side, you can watch your vehicle's rear by looking at your mirrors and out the side window. Use driver-side backing--even if you must go around the block to put your vehicle in this position. It is worth the added safety.
- Use a helper (ground guide) when you can, to help you backup your vehicle. A helper is important because there are some places you cannot see (blind spots). The helper should stand near your vehicle's back or front (out of the vehicle path), where you can see him. Helpers should keep at least 10 yards between themselves and the vehicle front or rear and corners. They should never be directly behind the vehicle. They should never position themselves between the vehicle being guided and another object where an inadvertent engine surge or loss of vehicle control could cause injury. Before you start backing, work out a set of hand signals that you both understand. Agree on a signal for stop. Stop immediately if you lose sight of the helper. At no time will ground guides run or walk backwards while guiding a vehicle.
- When backing a car, straight truck, or bus, turn the top of the steering wheel toward the direction you want to go. When backing with a trailer, turn the steering wheel in the opposite direction. Once the trailer starts to turn, turn the wheel the other way to follow the trailer. Follow these additional safety rules:

  - Whenever you back with a trailer, try to position your vehicle so you can back in a straight line. If you must back on a curved path, back to the driver's side so you can see. Use your mirrors correctly.
  - Backup slow. This lets you make corrections before you get too far off course.
  - Use the mirrors. The mirrors will help you see if the trailer is drifting to one side.
  - Correct drift immediately. As soon as you see the trailer getting off the proper path, correct it by turning the top of the steering wheel in the direction of the drift.
  - Make pull-ups to reposition your vehicle as needed during backing.

NOTE: Additional ground guide procedures are contained in FM 21 -305 and hand and arm signals are in FM 21-60.

Test Your Knowledge

1. Why should you back toward the driver's side?
2. What is a pull-up?
3. If stopped on a hill, how can you start moving forward without rolling back?
4. When backing, why is it important to use a helper?
5. What is the most important hand signal that you and the helper should agree on?

These questions may be on the test. If you cannot answer all questions, reread paragraph 2-1.

2-2. SHIFTING GEARS. Correct gear shifting is important. If you cannot get your vehicle into the right gear while driving, you will have less control.

Many vehicles have multispeed rear axles and auxiliary transmissions to provide extra gears. A selector knob or switch on the gearshift lever usually controls them. There are many different shift patterns. Learn the right way to shift gears in the vehicle you will drive.

Some vehicles have retarders. Retarders help slow a vehicle, reducing the need to use the brakes. They reduce brake wear and provide another way to slow down. There are many types of retarders: exhaust, engine, hydraulic, and electric. The driver can turn all retarders on or oft'. On some vehicles the retarding power can be adjusted. When turned on, retarders apply braking power (to the drive wheels only) whenever you let up on the accelerator pedal all the way. Use the service brakes in addition to the retarder for maximum braking. Study the section on retarders in the driver's manual of the vehicle you will be driving. Learn the correct procedure for operating your vehicle's retarder.

CAUTION

When your drive wheels have poor traction, the retarder may cause them to skid, and could cause an accident. Therefore, you should turn the retarder off whenever the road is icy, wet, or covered with snow.

NOTE: Service brakes must be used in addition to the retarder for maximum braking. The retarder supplements the service brake. The retarder is a slowing device, not a vehicle-stopping device.

a. **Manual Transmissions.** For manual transmissions there are two ways of knowing when to shift. They are as follows:

(1) ***Engine speed (RPM).*** Study the driver's manual for your vehicle and learn the operating RPM range. Watch the tachometer. Shift up when your engine reaches the top of the range. (Some newer vehicles use progressive shifting: the RPM at which you shift becomes higher as you move up in the gears. Find out what is right for the vehicle you will operate.)

(2) ***Road speed.*** Learn the correct speed for each gear. Then, use the speedometer to know when to shift up.

NOTE: With either method, learn to use engine sounds to know when to shift.

b. **Double Clutching.** Most heavy vehicles require double clutching to change gears. The basic method for double-clutch shifting is as follows:

- Release the accelerator. At the same time, push in the clutch and shift to neutral.
- Release the clutch.
- Let engine and gears slow to the RPM required for the next gear.
- Push in the clutch and shift to a higher gear at the same time.
- Release the clutch and press the accelerator at the same time.

Shifting gears using double clutching requires practice. If you stay in neutral too long, you may have difficulty shifting into the next gear. If so, do not use force. Return to neutral, release the clutch, and increase the engine speed to match the road speed and try again.

c. **Downshifting.** The basic procedures for downshifting are as follows:

- Release the accelerator. At the same time, push in the clutch and shift to neutral.
- Release the clutch.
- Press the accelerator. Increase the engine and gear speed to the RPM required in the lower gear.
- Push in the clutch and shift to a lower gear at the same time.
- Release the clutch and press the accelerator at the same time.

Downshifting, like upshifting, requires knowing when to shift. Use either the tachometer or the speedometer and downshift at the right RPM or road speed. The following are two special times you should downshift:

(1) ***Before you start down a hill.*** Slow down to a speed that you can control without excessive, hard use of your brakes. Otherwise, the brakes can overheat and lose their braking power. Select the proper gear and downshift before starting down the hill. With newer vehicles, the gear selection is usually lower than the gear required to climb the same hill.

(2) ***Before you enter a curve.*** Slow down to a safe speed. Downshift to the right gear before entering the curve. This lets you use some power through the curve to help stabilize the vehicle while turning. It also lets you speed up as soon as you are out of the curve.

Test Your Knowledge

1. What are the two special times when you should downshift?
2. When should you downshift automatic transmissions?
3. Retarders keep you from skidding when the road is slippery. True or False?
4. What are two ways to know when to shift?

These questions may be on the test. If you cannot answer all questions, reread paragraph 2-2.

2-3. SEEING. Safe drivers must always know what is going on around their vehicles. Not looking properly is a major cause of accidents. Observe the following when operating a vehicle.

- All drivers look ahead, but many do not look far enough ahead. Because stopping or changing lanes can take a lot of distance, you must know what traffic is doing all around you. You must look far enough ahead to make sure you have room to make moves safely. Most good drivers look 12 to 15 seconds ahead; that is, the distance they will travel in 12 to 15 seconds. At lower speeds, that is about one block; at highway speeds, about a quarter mile. If you are not looking that far ahead, you may have to stop too quickly or make quick lane changes. Looking 12 to 15 seconds ahead means you also look at things that are closer. Good drivers shift their attention back and forth, near and far.
- Look for vehicles entering the highway, your lane, or turning. Watch for brake lights from slowing vehicles. By seeing these things far enough ahead, you can change your speed or lane if necessary to avoid a problem. Look for hills, curves, and anything for which you will have to slow or change lanes. Pay attention to traffic signals and signs. If a light has been green for a long

time, it will probably change before you reach it. Start slowing down and be ready to stop. Traffic signs alert you to road conditions.

- You must know what is going on behind and to the sides of you. Check your mirrors regularly to be aware of traffic and to check the position of your vehicle in relationship to other traffic. Check more often in congested areas or special situations.

  - Check the mirror for vehicles On either side and in back of you. In an emergency, you may need to know whether you can change lanes quickly. Use your mirrors to spot vehicles approaching from behind. There are blind spots that your mirrors cannot show you. Check your mirrors regularly so you will know where other vehicles are around you and if they move into your blind spots.
  - Check your vehicle. Use the mirrors to spot tire fires. If you are carrying open cargo, check it by using the mirrors. Look for loose straps, ropes, or chains or a flapping or ballooning tarpaulin that may block your vision.

Special situations such as lane changes, turns, merges, and tight maneuvers require more than regular mirror checks. To change lanes, check your mirror to be sure no one is alongside or about to pass you. Then check your mirrors at the following times:

- Before you change lanes to make sure you have enough room.
- After you have signaled, to make sure no one has moved into your blind spot.
- Right after you start to change lanes, to be sure that your path is clear.
- After you change lanes, to be aware of traffic around you.

To turn, check your mirrors to make sure your vehicle's rear will not hit anything. To merge, use your mirrors to make sure the gap in traffic is large enough to enter safely.

Any time you are driving in close quarters, check your mirrors often. Make sure you have enough clearance to make tight maneuvers. Use mirrors correctly. Check them quickly and understand what you see.

When you use your mirrors while driving, check quickly. Look back and forth between the mirrors and the road ahead. If you focus on the mirrors for too long, you will travel too far without knowing what is happening ahead.

Many large vehicles have curved (convex, fish-eye, spot, or bug-eye) mirrors that show a wider area than flat mirrors. This often helps, but you must remember that things appear smaller in a convex mirror than if you look at them directly. Things also seem farther away in a convex mirror than they really are. Remember this and make adequate adjustments.

2-4. COMMUNICATING. Signal your intentions to alert other drivers of your planned actions. Signaling what you intend to do is important for safety. Signal when you do the following:

a. **Turning.** Three rules for using turn signals are as follows:

(1) ***Signal early.*** Signal long before you turn. It is the best way to keep others from trying to pass.

(2) ***Signal continuously.*** You need both hands on the wheel to turn safely. Do not cancel the signal until you have completed the turn.

(3) ***Cancel your signal.*** If your vehicle does not have self-canceling signals, then do not forget to turn off your turn signal after you have turned.

b. **Changing Lanes.** Put your turn signal on before changing lanes. Change lanes slowly and smoothly so that a driver you may not see will have a chance to signal with their horn or avoid your vehicle.

c. **Slowing Down.** Warn drivers behind you when you must slow down. A few light taps on the brake pedal--enough to flash the brake lights--should warn them. Use the 4-way emergency flashers when you are driving very slow or are stopped. Warn other drivers when you--

(1) ***See trouble ahead.*** Your vehicle's size may make it hard for drivers behind you to see hazards ahead. If you see a hazard that will require slowing down, flash your brake lights to warn drivers behind you.

(2) ***Must make tight turns.*** Most car drivers do not know how slow you must go to safely make a tight turn in a large vehicle. Brake early and slow gradually to warn drivers behind you.

(3) ***Stop on the road.*** Truck and bus drivers sometimes stop on the road to unload cargo or passengers or at a railroad crossing. Flash your brake lights to warn drivers behind you. Do not stop suddenly.

(4) ***Must drive slow.*** Drivers often do not realize how fast they are catching up to a slow vehicle until they are very close. If you must drive slow, alert drivers behind you by turning on your flashers if it is legal. (Laws on the use of flashers differ from state to state. Check the laws of the states where you will drive.)

WARNING

Do not direct traffic. Some drivers try to help others by signaling when it is safe to pass. You should not do this. You could cause an accident.

Communicate your presence. Other drivers may not notice your vehicle even when it is in plain sight. Signal so others know you are thereto help prevent accidents when--

- Passing. Whenever you are about to pass a vehicle, pedestrian, or bicyclist, assume they do not see you. They could suddenly move in front of you. When it is legal, tap the horn lightly or, at night, flash your lights from low to high beam and back. Drive careful enough to avoid a crash even if the vehicle you are passing does see or hear you.
- It is hard to see. At dawn, dusk, or in rain or snow, you must make it easier for you to see. If you are having trouble seeing other vehicles, others will have trouble seeing you. Turn on

your lights. Use the headlights, not just the identification or clearance lights. Use the low beams. High beams can bother people in the daytime and at night.

- Parked on the side of the road. When you pull off the road and stop, turn on the 4-way emergent y flashers, especially at night. Do not trust the taillights to give warning. Drivers have crashed into the rear of parked vehicles because they thought they were moving normally.
- You must stop on a road or its shoulder. Put out your reflective triangles within ten minutes. When putting out the triangles, hold them between yourself and the oncoming traffic for your safety. Other drivers can then see you. Place your warning devices as follows:

  - On a two-lane road carrying traffic in both directions or on an undivided highway, place warning devices within 10 feet of the front or rear corners. You must also place warning devices 100 feet behind and ahead of the vehicle on the shoulder or in the lane you stopped in to mark the vehicle location (Figure 2-1).
  - Back beyond any hill, curve, or other obstruction that keeps other drivers from seeing the vehicle within 500 feet (Figure 2-2, page 2-8).
  - 10, 100, and 200 feet toward the approaching traffic if you must stop on or by a one-way or divided highway (Figure 2-3, page 2-8).

Use your horn when needed. Your horn can tell others you are there. It can help to avoid a crash. However, it may startle others and could be dangerous when used unnecessarily.

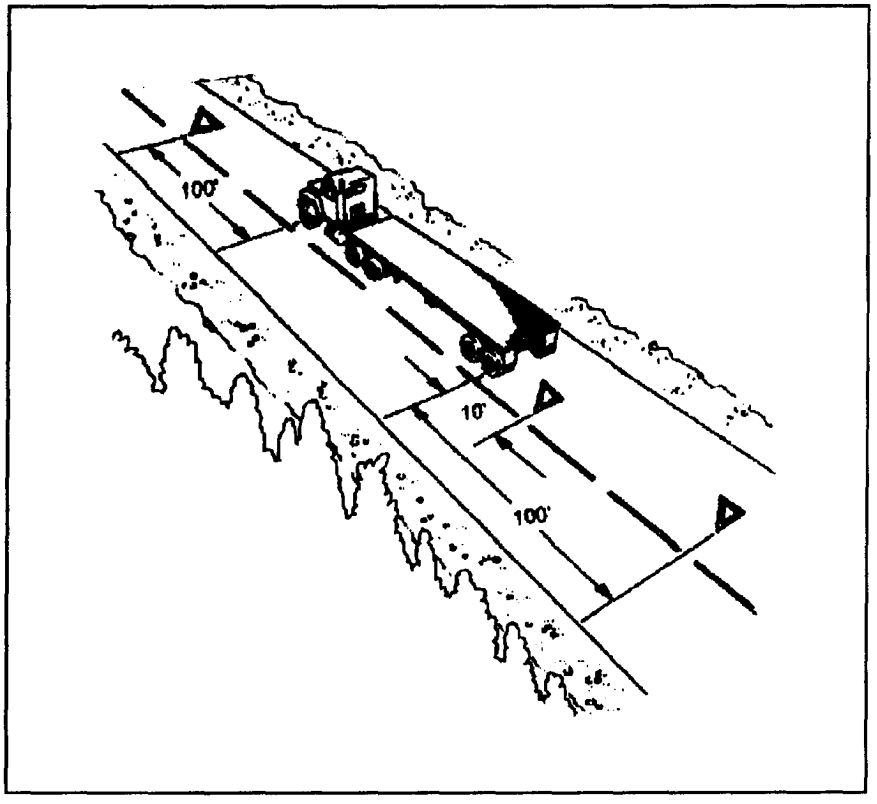


Figure 2-1. Warning device placement: two-lane or undivided highway

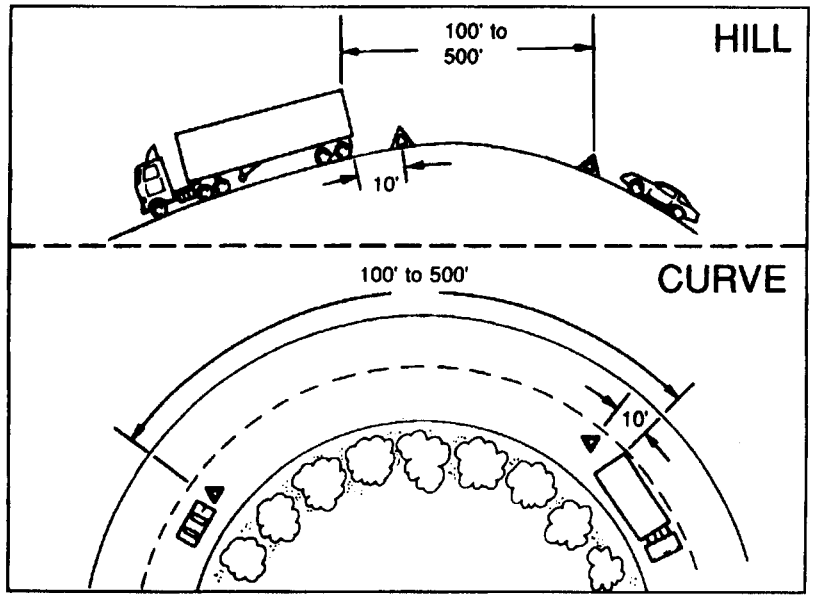


Figure 2-2. Warning device placement: obstructed view

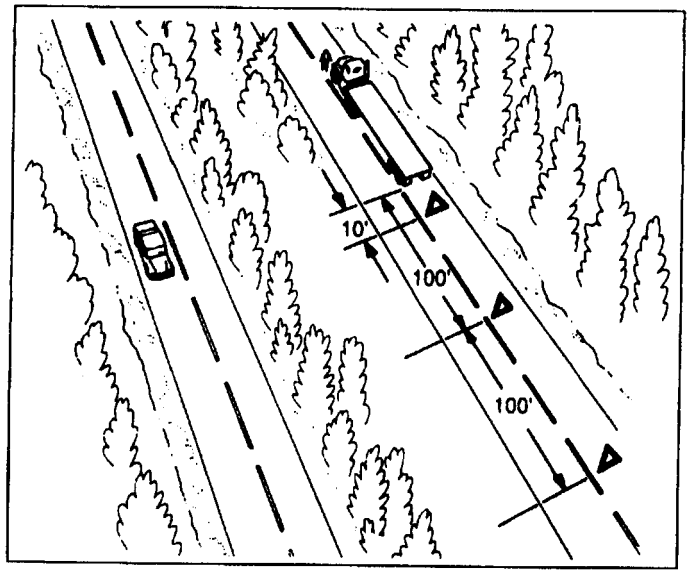


Figure 2-3. Warning device placement: one-way or divided highway

2-5. CONTROLLING SPEED. Driving too fast is a major cause of fatal crashes. You must adjust your speed to the driving conditions. These include traction, curves, visibility, traffic, and hills. Speed affects stopping distance. Whenever you double your speed, you need about four times as much distance to stop. Your vehicle will have four times the destructive power if it crashes. By

slowing down, it reduces braking distance. The three things that add up to total stopping distance are--

Perception Distance
+ Reaction Distance
+ Braking Distance
= Total Stopping Distance

a. **Perception Distance.** This is the distance your vehicle travels from the time you see a hazard until it is recognized by your brain. The perception time for an alert driver is about 3/4 second. At 55 mph, you travel 60 feet in 3/4 second.

b. **Reaction Distance.** This is the distance traveled from the time your brain tells your foot to move from the accelerator until your foot actually pushes the brake pedal. The average driver has a reaction time of 3/4 second. This accounts for an additional 60 feet traveled at 55 mph.

c. **Braking Distance.** This is the distance it takes to stop once you apply the brakes. At 55 mph on dry pavement, a heavy vehicle with good brakes takes about 170 feet and 4 1/2 seconds to stop.

d. **Total Stopping Distance.** Perception distance plus reaction distance plus braking distance equals the total stopping distance. At 55 mph, it takes about 6 seconds to stop. The total distance your vehicle will travel is about the length of a football field: 60+60+ 170= 290 feet. The heavier the vehicle, the more work the brakes must do to stop it; thus, the brakes absorb more heat. Brakes, tires, springs, and shock absorbers on heavy vehicles work best when the vehicle is full y loaded. Empty trucks require greater stopping distances because an empty vehicle has less traction. The wheels of an empty vehicle tend to bounce and cause lockup of its wheels, thus creating poorer braking action (this is not usually the case with buses).

You must match your speed to the road surface. You cannot steer or brake a vehicle unless you have traction. Traction is friction between the tires and the road. Some road conditions reduce traction and call for lower speeds. It takes longer to stop and is harder to turn without skidding when the road is slippery. You must drive slower to be able to stop in the same distance as on a dry road. Wet roads can double the stopping distance. Reduce speed by about one-third on a wet road. On packed snow, reduce speed by one-half or more. If the surface is icy, reduce speed to a crawl and stop driving as soon as it is safe to do so. Sometimes it is hard to determine if the road is slippery. Some signs of slippery roads are as follows:

- *Shaded areas.* Shady parts of the road will remain icy and slippery long after open areas have melted.
- *Bridges.* When the temperature drops, bridges freeze before the road. Be especially careful when the temperature is close to 32 degrees F; freezing may occur.
- *Melting ice.* It is more slippery than ice that is not melting.
- *Black ice.* Black ice is a clear thin layer of ice. You will be able to see the road underneath it. When temperature is below freezing and the road looks wet, watch for black ice.

- *Vehicle icing.* An easy way to check for ice is to open the window and feel the front of the mirror, mirror support, or antenna. If there is ice on these, the road surface is probably starting to ice.
- *Rains.* Right after it starts to rain, the rain mixes with the oil vehicles leave on the road making the road very slippery. If the rain continues, it will eventually wash the oil away.

In some weather, water or slush collects on the road. When this happens, your vehicle can hydroplane. Like water-skiing, the tires lose contact with the road. You may be unable to steer or brake. To regain control, release the accelerator and push in the clutch (manual transmission) or shift into neutral (automatic transmission). This will slow your vehicle and let the wheels turn freely. If the vehicle is hydroplaning, do not use the brakes. If the drive wheels start to skid, push in the clutch (manual transmission) or shift to neutral (automatic transmission), let the wheels turn freely. Hydroplaning can happen without a lot of water. If there is a lot of water, it can occur at speeds as low as 30 mph. Hydroplaning is more likely to occur if tire pressure is low or tread is worn. (The tire tread carries away the water. If tread is deep, it works well.) Be especially careful driving through puddles. The water is often deep enough to cause hydroplaning.

Drivers must adjust their speed for curves in the road. If you take a curve too fast, two things can happen. The wheels can lose their traction and continue straight ahead; or the wheels may keep their traction, and the vehicle may roll over. Tests have shown that trucks with a high center of gravity can roll over at the posted speed limit for a curve. Slow to a safe speed before you enter a curve. Braking in a curve is dangerous because it is easier to lock the wheels and cause a skid. Never exceed the posted speed limit for the curve. Select a gear that lets you accelerate slightly in the curve. This will help you maintain control.

You should always be able to stop within the distance you can see ahead. Fog, rain, or other conditions may require you to slow down so you can stop in the distance you can see. At night, you cannot see as far with low beams as with high beams. When you must use low beams, slow down.

When you are driving in heavy traffic, the safest speed is the speed of other vehicles. Vehicles going the same direction at the same speed are not likely to run into one another. Drive at the same speed as the traffic, if you can, without going at an illegal or unsafe speed. Keep a safe following distance. Going with the flow of traffic is safer and easier. The main reason drivers exceed speed limits is to save time. The risks are not worth it. If you go faster than the speed of other traffic--

- You will keep passing other vehicles. This increases the chance of a crash.
- It is more tiring, increases fatigue, and increases the chance of a crash.

Going slow is the most important and safest thing to do when going down long, steep hills. If you do not go slow enough, your brakes can become so hot they will not slow you down. Shift your transmission to a lower gear before starting down the grade and use proper braking techniques. Pay attention to signs warning of long, downhill grades. Check your brakes before starting down the hill. Select and maintain a speed that is not too fast for the total weight of the vehicle and cargo, length and steepness of the grade, road conditions, and weather. Never exceed the “Maximum Safe Speed”. Use the engine as the principal way of controlling your speed on downgrades. The braking effect of the engine is greater when it is near the governed RPMs and the transmission is in the lower gears. Paragraph 2-12 discusses how to safely go down steep hills.

Test Your Knowledge

1. How far ahead does the manual say you should look?
2. What are two main things to look for ahead?
3. What is your most important way to see to the sides and the rear?
4. What does communicating mean in safe driving?
5. Where should you place reflectors when stopped?
6. What three things equal total stopping distances?
7. If you go twice as fast, will your stopping distance increase by two or four times?
8. Empty trucks have the best braking. True or False?
9. What is hydroplaning?
10. What is black ice?

These questions may be on the test. If you cannot answer all questions, reread paragraphs 2-3, 2-4, and 2-5.

2-6. MANAGING SPACE. To drive safely, you need space all around your vehicle. When things go wrong, space gives you time to think and act. You must manage space in order to have it available when something goes wrong. While this is true for all drivers, it is very important for large vehicles. They take up more space and require more space to turn and stop. Of all the space around your vehicle, the area ahead of the vehicle--the space you are driving into--is the most important. You need space ahead in case you must make a sudden stop. According to accident reports, trucks and buses most often run into the vehicle in front of them. The most frequent cause is following too close. Remember, if the vehicle ahead of you is smaller than yours, it can probably stop faster than you can. This may cause you to crash into it if you are following too close.

- How much space should you keep in front of you? One rule says you need at least one second for each 10 feet of vehicle length at speeds up to 40 mph. At greater speeds, add one second for safety. For example, if your are driving at 40 mph in a 40-foot vehicle, you should leave 4 seconds between you and the vehicle ahead; in a 60-foot vehicle at 40 mph, you need 6 seconds. At over 40 mph, you need 5 seconds for a 40-foot vehicle and 7 seconds for a 60-foot vehicle.
- To know how much space you have, wait until the vehicle ahead passes a shadow on the road, a pavement marking, or some other clear landmark. Then count off the seconds--one thousand and one, one thousand and two, and so on--until you reach the same spot. Compare your count with the rule of one second for every 10 feet of vehicle length. If you are driving a 40-foot truck and only counted to 2 seconds, you are too close. Drop back a little and count again until you have 4 seconds (or 5, if you are going over 40 mph) of following distance. After some practice, you will know how far back you should drive. Remember, when the road is slippery, you need more space to stop.

You cannot stop others from following you too closely. To make it safer you can do the following:

- Stay to the right. People often tailgate heavy vehicles that cannot keep up with the speed of traffic. This often happens when going uphill. If a heavy load is slowing you down, stay in the right lane if possible. Going uphill, you should not pass another vehicle unless you can get around it quickly and safely.

- Deal with tailgaters safely. In a large vehicle, it is often hard to see a vehicle close behind you. You may be tailgated--

  - *When you are traveling slow*. Drivers trapped behind slow vehicles often follow closely.
  - *In bad weather*. Many car drivers follow large vehicles closely during bad weather, especially when it is hard to see the road ahead.

- If you are being tailgated, you can do the following to reduce the chance of a crash:

  - *Avoid quick changes*. If you must slow down or turn, signal early and reduce speed very gradually.
  - *Increase your following distance*. Opening up room in front of you keeps you from having to suddenly change speed or direction. It is also easier for the tailgater to get around you.
  - *Do not speed up*. It is safer to be tailgated at a low speed than a high one.
  - *Avoid tricks*. Do not turn on your taillights or flash your brake lights.

Some commercial and military vehicles are often wide and take up most of a lane; other vehicles are left with very little space. Safe drivers will manage what space they have. Keep vehicle centered in the lane. Avoid driving alongside others. Dangers in traveling alongside other vehicles are as follows:

- Another driver may change lanes suddenly and turn into you.
- You may be trapped when you need to change lanes. Find an open spot where you are not near other traffic. When traffic is heavy, it may be hard to find an open spot. If you must travel near other vehicles, keep as much space as possible between you and them. Also, drop back or pull forward so that you are sure the other driver can see you.
- Strong winds make it difficult to stay in your lane. The problem is usually worse for lighter vehicles and can be especially bad coming out of tunnels.

Make sure you have enough space to clear overhead objects. Do not assume the posted heights at bridges and overpasses are correct. Repaving or packed snow may have reduced the clearances since the heights were posted. The weight of a cargo van changes its height. An empty van is taller than a loaded one. You may be able to go under a bridge when you are loaded but not when you are empty. If you are not sure you have sufficient space overhead, check the height. If there is insufficient space overhead, take another route. Warnings are often posted on low bridges or underpasses.

Some roads can tilt a vehicle. This can cause a problem clearing objects, such as signs or trees, along the edge of the road. If this problem exists, drive closer to the center of the road.

Before you back into an area, get out and check for overhanging objects, such as trees, branches, or electric wires. It is easy to miss seeing them while you are backing. Check for other hazards at the same time. Employ a ground guide if one is available.

Many drivers forget about the space under their vehicles. That space can be very small when a vehicle is heavily loaded. Small spaces can sometimes be found at railroad tracks. Some tracks can stick up several inches. This problem often occurs on dirt roads and in unpaved yards where the surface around the tracks has worn away. Do not risk getting hung up halfway across. Also, drainage channels across roads can cause the end of a vehicle to drag. Cross such depressions carefully.

The space around a truck or bus is important in turns. Because of wide turning and off-tracking, large vehicles can hit other vehicles or objects when turning.

- Here are some rules to help prevent right-turn crashes:

  - Turn slowly to give yourself and others more time to avoid problems.
  - If you are driving a truck or bus that cannot turn right without swinging into another lane, turn wide as you complete the turn (see Figure 2-4). Keep your vehicle's rear close to the curb. This will stop other drivers from passing you on the right.
  - Do not turn wide to the left as you start the turn (see Figure 2-5). Drivers to your rear may think you are turning left and try to pass you on the right. You may crash into them as you complete your turn.
  - If you must cross into the oncoming lane to turn, look for vehicles coming toward you. Give them room to stop or go forward. However, do not backup for them; you might hit someone behind you.

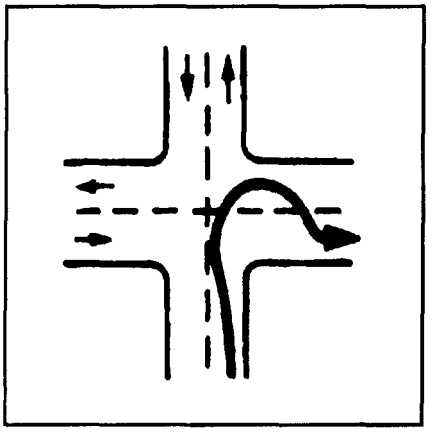


Figure 2-4. Proper right turn

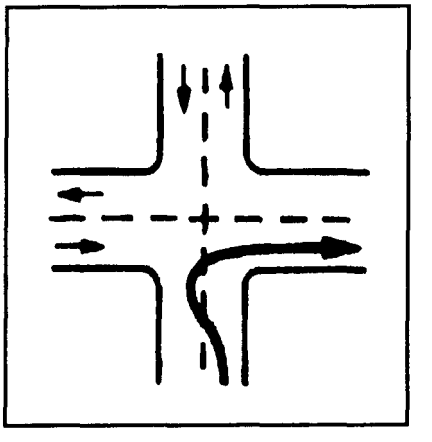


Figure 2-5. Wrong right turn

- Here are some rules for proper left turns:

  - Make sure you have reached the center of the intersection before you start the left turn. If you turn too soon, the left side of your vehicle may hit another vehicle due to off-tracking.
  - If there are two turning lanes, always take the right-hand turn lane (see Figure 2-6, page 2-14). Do not start in the inside lane because you may have to swing right to turn. You may be unable to see drivers to your rear and may crash into them.

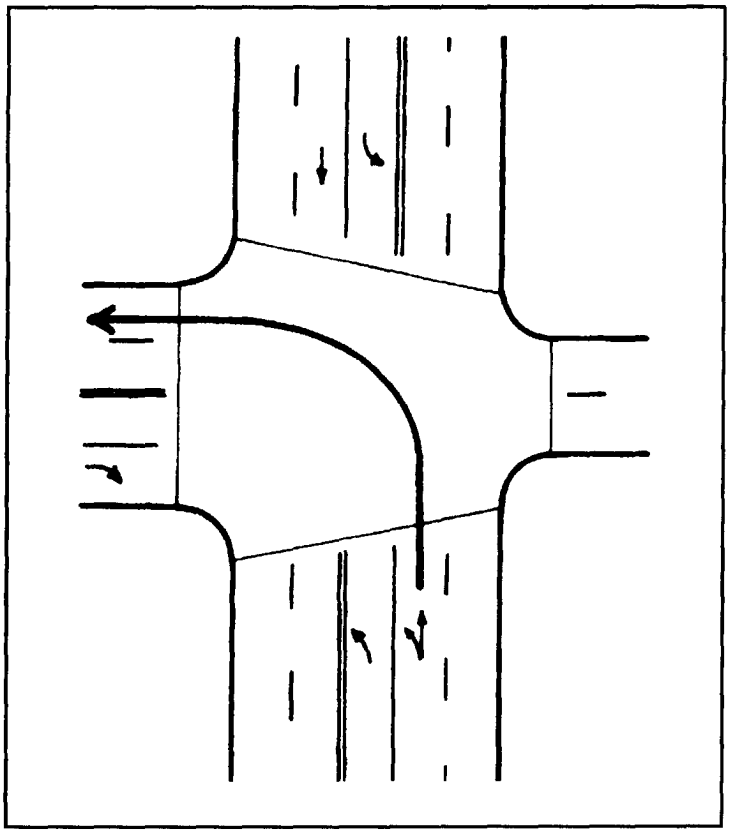


Figure 2-6. Using left-turn lanes

Be aware of the size and weight of your vehicle when you cross or enter traffic. Here are some important things to remember:

- Because large vehicles accelerate slowly and require large space, you may need a larger gap to enter traffic than you would in a car.
- Acceleration varies with the load. Allow more room if your vehicle is heavily loaded.
- Before you start across a road, make sure you can get all the way across before traffic reaches you.

Test Your Knowledge

1. How do you find out how many seconds of following distance you have?
2. If you are driving a 30-foot vehicle at 55 mph, how many seconds of following distance should you allow?
3. You should decrease your following distance if somebody is following you too closely. True or False?
4. If you swing wide to the left before turning right, another driver may try to pass you on the right. True or False?

These questions may be on the test. If you cannot answer all questions, reread paragraph 2-6.

2-7. DRIVING AT NIGHT. You are at more risk when you drive at night. Drivers cannot see hazards as soon as they can in daylight. They have less time to respond. Surprised drivers are less able to avoid a crash. The problems of night driving involve the driver, the roadway, and the vehicle. Driver factors are vision, glare, fatigue, and lack of alertness. These are described below.

- People do not see as sharply at night or in dim light as they do during normal daylight. Also, the eyes need time to adjust to seeing at night or in dim light.
- Bright light can blind drivers for a short time. It takes time to recover from this blindness. Glare especially bothers older drivers. The high beams of an oncoming vehicle have temporarily y blinded most people. It can take several seconds to recover from glare. Even two seconds of glare blindness can be dangerous. A vehicle going 55 mph will travel more than half the distance of a football field during that time. Do not look directly at bright lights when driving. Look at the right side of the road. Watch the sidelines when someone comes toward you with bright lights.
- Fatigue (being tired) and lack of alertness are bigger problems at night. The body's need for sleep is beyond a person's control. Most people are less alert at night, especially after midnight. This is particularly true if you have been driving for a long time. Drivers may not see hazards as soon or react as quickly; the chance of a crash is greater. If you are sleepy, the only safe act is to get off the road and sleep. Otherwise, you risk your life and that of others.

On most roads you will probably have to depend entirely on your headlights when driving at night. Some areas may have bright street lights, but many areas will have poor lighting. Drive slower when lighting is poor. Drive slow enough to be sure you can stop in the distance you can see ahead.

- Less light means you will be unable to see hazards as well as in daytime. Road users without lights are hard to see. Many accidents at night involve pedestrians, joggers, bicycles, and animals. Even when there are lights, the road scene can be confusing. Traffic signals and hazards can be hard to see against a background of signs, shop windows, and other lights.
- Some drivers drive under the influence of alcohol or drugs. They area hazard to themselves and to you. Be especially alert around the closing times of bars and taverns. Watch for drivers who have trouble staying in their lane or maintaining speed, stop without reason, or show other signs of alcohol or drug influence.

Vehicle factors involve parts of your vehicle. These are described below.

- At night your headlights are usually the main source of light for you to see and for others to see you. With low beams you can see about 250 feet ahead and with high beams you can see between 350 to 500 feet. You must go slow enough to be able to stop within the range of your headlights. Otherwise, by the time you see a hazard, you will not have time to stop. Night driving can be more dangerous if you have problems with your headlights. Dirty headlights may give only half the light they should. This reduces your ability to see and to be seen. Make sure your lights are clean and working. Headlights can be out of adjustment. If this occurs, a qualified person should make sure they are adjusted properly.
- The following vehicle parts must be clean and working properly so you can be easily seen:

- Reflectors.
- Marker lights.
- Clearance lights.
- Taillights.
- Identification lights.

- At night your turn signals and brake lights are even more important for telling other drivers what you intend to do. Make sure you have clean, working turn signals and stop lights.
- It is more important at night than in the daytime to have a clean windshield and mirrors. Bright lights at night can create a glare on your windshield or mirrors that blocks or distorts your view. Most people who have driven toward the sun just as it has risen or is about to set have found that they can barely see through a windshield that looked clean during daylight. Clean the inside and outside of your windshield for safe night driving.

Proper night driving procedures are as follows:

- Make sure you are rested and alert. If you are drowsy, sleep before you drive! A nap can save your life or the lives of others. If you wear eyeglasses, make sure they are clean and unscratched. Do not wear sunglasses at night. Completely inspect your vehicle, especially all lights and reflectors, before your trip. Clean lights and reflectors you can reach.
- Avoid blinding others. Glare from your headlights can cause problems for drivers coming toward you and for those going in the same direction (when your lights shine in their rear view mirrors). Dim your lights before they cause glare for other drivers, Dim your lights within 500 feet of an oncoming vehicle and when following within 500 feet of another vehicle.
- Avoid glare from oncoming vehicles. Do not look directly at the vehicle lights. Look slightly to the right lane or edge marking if available. If other drivers do not put on their low beams, do not flash your high beams. This increases glare for oncoming drivers and the chance of a crash.
- Use high beams when you can. Some drivers mistakenly always use low beams. This seriously reduces their ability to see ahead. Use high beams when it is safe and legal. Use them when you are not within 500 feet of an approaching vehicle. Do not let the inside of your cab get too bright; it is harder to see outside. Keep the interior light off and adjust your instrument lights as low as you can to still read the gauges.
- If you get sleepy, stop driving at the nearest safe place. If you just feel sleepy, stop driving! You are in a very dangerous condition. The only safe act is to sleep.

2-8. DRIVING IN FOG. Driving in fog is almost always dangerous. Do not drive in foggy conditions unless it becomes absolutely necessary. It is recommended that you pull off the road into the nearest rest area or truck stop until visibility improves. If you must drive, proceed with caution and comply with the following:

- Obey all fog-related warning signs.
- Slow down before you enter fog.
- Turn on your headlights (make sure they are on low beam).
- Be prepared to execute emergency stops.

2-9. DRIVING IN WINTER. Make sure your vehicle is ready before driving in winter weather. You should make a regular pre-trip inspection. Pay extra attention to the following:

a. **Coolant Levels.** Make sure the cooling system is full and has enough antifreeze in it to protect against freezing. A special coolant tester can check this.

b. **Defrosting and Heating Equipment.** Make sure the heater and defrosters are working and that you know how to operate them. They are needed for safe driving. If you have other types of heaters (such as mirror, battery box, or fuel tank heaters) and expect to need them, check their operation.

c. **Wipers and Washers.** Make sure the windshield wiper blades are in good condition and press against the window hard enough to wipe it clean. Make sure the windshield washer works and has washing fluid in the washer reservoir. Use windshield washer antifreeze to prevent freezing during cold weather. If your wipers fail, stop safely and fix the problem.

d. **Tires.** Make sure the tires have sufficient tread to provide traction on wet pavement and through snow. The steering tires must have traction to steer the vehicle. They should have 4/32 inch or more tread depth in every major groove on front wheels and 2/32 inch or more on other wheels. Use a gauge to determine if you have sufficient tread for safe driving.

e. **Tire Chains.** You may find conditions where you must drive with chains. Carry the right number of chains and extra cross links. (If military vehicles are being used, check the BII section of the vehicle TM for the correct size and the number of chains authorized.) Before you need the chains on ice or snow, practice mounting them to be sure they tit your drive tires. Check the chains for broken hooks, worn or broken cross links, and bent or broken side chains.

f. **Lights and Reflectors.** Make sure the lights and reflectors are clean. Lights and reflectors are especially important during bad weather. Check periodically during bad weather to make sure they are clean and working.

g. **Windows and Mirrors.** Remove ice and snow from the windshield, windows, and mirror before starting. Use a windshield scraper, snow brush, and windshield defroster.

h. **Hand Holds, Steps, and Deck Plates.** Remove all ice and snow from hand holds, steps, and deck plates which you must use to enter the cab or to move about the vehicle. This will reduce slipping.

i. **Radiator Shutters and Winter-Front.** Remove ice from the radiator shutters. Be sure the winter-front is not closed too tightly. If the shutters freeze shut or the winter-front is closed too tightly, the engine may overheat.

j. **Exhaust System.** These leaks are especially dangerous when cab ventilation is poor (for example, when the windows are up). Loose connections could let poisonous carbon monoxide leak into your vehicle. Carbon monoxide gas causes sleepiness; large amounts can kill you. Check the exhaust system for loose parts and for sounds and signs of leaks.

Drive slowly and smoothly on slippery roads. If it is slippery, you should not drive at all. Stop at the first safe place. Some safety guidelines areas follows:

- Start gently and slowly. At first, get the feel of the road. Do not hurry.
- Adjust turning and braking to the conditions. Make turns as gently as possible. Do not brake any harder than necessary. Do not use the engine brake or speed retarder; they can cause wheels to skid on slippery surfaces.
- Adjust your speed to the conditions. Do not pass slower vehicles unless necessary. Go slow and watch far enough ahead to keep a steady speed. Avoid having to slow down or speed up. Take curves at slower speeds. Do not brake while in curves. Be aware that as the temperature rises and the ice begins to melt, the road becomes more slippery.
- Adjust your space to the conditions. Do not drive alongside other vehicles. Keep a safe following distance. When you see a traffic jam ahead, slow down or stop to wait for it to clear. Try to anticipate stops early and slow down gradually.
- When driving in heavy rain or deep standing water, your brakes will get wet. Water can cause them to be weak or to grab. This can cause brakes to lose power, wheels to lockup or pull to one side, and trailers to jackknife.
- Avoid driving through deep puddles or flowing water if possible. If you must, you should do the following:

  - Slow down.
  - Place your transmission in a low gear.
  - Gently apply the brakes. This presses linings against brake drums or discs and keeps out mud, silt, sand, and water.
  - Increase the engine RPM and cross the water while keeping light pressure on the brakes.
  - When out of the water, maintain light pressure on the brakes for a short distance to dry them out.
  - Make a test stop when it is safe. Be sure no one is following you, then apply the brakes to be sure they work properly. If not, dry them out further as described above.

CAUTION

Do not accelerate and apply too much brake pressure at the same time or you can overheat brake drums and linings.

2-10. DRIVING IN VERY HOT WEATHER. Conduct a normal pre-trip inspection before driving in very hot weather. Check the following:

a. **Tires.** Check the tire mounting and air pressure. Inspect the tires every two hours or every 100 miles when driving in hot weather. Air pressure increases with temperature. Do not release air pressure or it will be too low when the tires cool. If a tire is too hot to touch, remain stopped until the tire cools. Otherwise, the tire may blow out or catch fire. Pay special attention to recapped or retreaded tires. Under high temperatures the tread may separate from the body of the tire.

b. **Engine Oil.** The engine oil helps keep the engine cool and lubricated. Make sure there is enough engine oil. If you have an oil temperature gauge, make sure the temperature is within the proper range while you are driving.

c. **Engine Coolant.** Before you start a trip, make sure the engine cooling system has water and antifreeze according to the engine manufacturer's directions. When driving, check the water or coolant temperature gauges periodically. Make sure they remain in the normal range. If the gauges go above the highest safe temperature, something may be wrong that could lead to engine failure and possible tire. Stop driving as soon as safely possible and try to identify the problem.

d. **Sight Glasses or See-Through Coolant Overflow or Coolant Recovery Containers (if so equipped).** These containers let you check the coolant level while the engine is hot. If the container is not part of the pressurized system, the cap can be safely removed and coolant added even when the engine is at operating temperature. If you can touch the radiator cap with your bare hand, it is probably cool enough to open.

WARNING

Do not remove the radiator cap or any part of the pressurized system until the system has cooled. Steam and boiling water can spray under pressure and cause severe burns.

e. **Coolant.** If coolant must be added to a system without a recovery tank or overflow tank, follow these steps:

(1) Shut off the engine.

(2) Wait until the engine has cooled.

(3) Protect your hands (use gloves or a thick cloth).

(4) Turn the radiator cap slowly to the first stop; this releases the pressure seal.

(5) Step back while the pressure is released from the cooling system.

(6) When all the pressure has been released, press down on the cap and turn it further to remove.

(7) Visually check the level of coolant. Add more coolant if necessary. (Note: Anti-freeze is toxic to the environment and should be handled IAW unit environmental SOP.)

(8) Replace the cap and turn it all the way to the closed position.

f. **Engine Belts.** Learn how to check V-belt tightness on your vehicle by pressing on the belts. Loose belts will not turn the water pump and/or fan properly; the result is overheating. Check belts for cracking or other signs of wear.

g. **Hoses.** Make sure coolant hoses are in good condition. A broken hose can lead to engine failure and even fire.

Watch for bleeding tar. Tar in the road pavement frequently rises to the surface in hot weather. Spots where tar bleeds to the surface are very slippery.

Go slow to prevent overheating. High speeds create more heat for the tires and engine. In desert conditions the heat may build to a dangerous level. The heat increases the chance of tire or engine failure or fire.

Test Your Knowledge

1. You should use low beams whenever you can. True or False?
2. What should you do before you drive if you are drowsy?
3. What problems can wet brakes cause? How can you avoid these problems?
4. You should let air out of hot tires so the pressure goes back to normal. True or False?
5. You can safely remove the radiator cap as long as the engine is not overheated. True or False?

These questions may be on the test. If you cannot answer all questions, reread paragraphs 2-7, 2-8, 2-9, and 2-10.

2-11. RAILROAD CROSSINGS. Railroad crossings are always dangerous. Approach a crossing as if a train was coming. It is extremely difficult to judge the speed of approaching trains. You should never attempt to race a train to a crossing.

When approaching railroad crossings, reduce vehicle speed so you can clearly see a train approaching from any direction. Be especially careful with double tracks. Look both ways and check all tracks to ensure no other trains are approaching. Remember, on multiple tracks, one train may hide another train, check closely. Because of the cab noise, you may not be able to hear the train approaching or its horn until it is dangerously close. Always be prepared to safely stop should it become necessary. Do not rely solely on warning signals or flagmen to warn of an approaching train.

Train yards and grade crossings in cities and towns are just as dangerous as rural crossings. Approach them with as much caution. A full-stop is required at grade crossings whenever--

- The type of cargo makes it mandatory under state and federal regulations.
- It is otherwise required by law.

Railroad crossings with steep approaches may cause your vehicle to hangup on the tracks.

Never permit traffic conditions to trap you where it becomes necessary to stop on the tracks. Be sure you can completely clear the track with your vehicle before starting across. Do not shift gears while crossing railroad tracks.

2-12. MOUNTAIN DRIVING. In mountain driving, the force of gravity plays a major role. On an upgrade, gravity slows you down. The steeper and longer the grade, and or the heavier the load, the more you will have to use lower gears to climb hills or mountains. When descending steep hills or mountains, gravity will cause your vehicle speed to increase. You must select a safe speed, use a low gear, and proper braking techniques. You should plan ahead and obtain information about your planned route.

You must go slow enough so your brakes will hold you back without getting too hot. Hot brakes may begin to fade. This means you have to apply them harder and harder to achieve the same stopping power. If the same braking procedures are continued, you will eventually be unable to slow down or stop. Your most important consideration is to select a speed that is not too fast for the total weight of the vehicle and cargo, length and steepness oft he grade, road conditions, and weather.

Obey posted speed limits. Never exceed “maximum safe speed”. Comply with warning signs indicating length and steepness of the grade. Use the braking effect of the engine as the principal way of controlling speed. The engine braking effect is greatest when it is near the governed RPM and the transmission is in the lower gears. Save brakes for slowing or stopping.

Be in the right gear before starting down a grade. Shift the transmission to a low gear before starting to descend the grade. Do not try to downshift after speed has built up. You will not be able to shift to a lower gear, and may not be able to get into any gear, and all engine braking effect will be lost. Forcing an automatic transmission into a lower gear at high speed could damage the transmission and lead to loss of engine braking effect.

A rule for choosing gears in older trucks is to select the same gear to go downhill that you would need to go uphill. However, new trucks have low friction parts and streamlined shapes for fuel economy. They may also have more powerful engines. This means they can go uphill in higher gears and have less friction and air drag to hold them back going downhill. Therefore, drivers of modern trucks may have to use lower gears to go downhill than would be needed to go uphill. Find out what is right for your vehicle.

When going downhill, brakes will always heat up. They are designed so brake shoes or pads rub against the brake drum or discs to slow the vehicle. This creates heat. Brakes are designed to take a lot of heat. However, brakes can fade or fail from excessive heat caused by using them too much and not relying on the engine braking effect.

Brake fade is also effected by adjustment. Every brake shoe must do its share of the work to safely control the vehicle. A brake that is out of adjustment will cause the correctly adjusted brake to overheat and fade, and there will not be enough braking available to control the vehicle. Brakes can get out of adjustment quickly, especially when they are used a lot. Brake linings wear faster when they are hot. Check brake adjustment frequently.

Use proper braking techniques. The use of brakes on a long and/or steep downgrade is only a supplement to the braking effect of the engine. Once the vehicle is in the proper low gear, the following braking technique steps should be employed:

- *Step 1*- Apply the brakes just hard enough to feel a definite slowdown.
- *Step 2*- When your speed has been reduced to approximately 5 mph below your "safe" speed, release the brakes. (This brake application should last for about three seconds.)
- *Step 3*- When your speed has increased to your "safe" speed, repeat steps 1 and 2.

Example: If your "safe" speed is 40 mph, you would not apply the brakes until your speed reaches 40 mob. You now apply the brakes hard enough to gradually reduce your speed to 35 mph, then release the brakes. Repeat this as often as necessary until you have reached the end of the downgrade.

Many steep mountain grades have escape ramps. Escape ramps are designed to stop runaway vehicles safely without injuring drivers and passengers. Escape ramps use a long bed of loose soft material (pea gravel), sometimes in combination with an upgrade. Know where escape ramps are located on your route. Use them if you lose your brakes.

2-13. HAZARDS. A hazard is any road condition or other road user (driver, bicyclist, pedestrian) that is a possible danger. For example, a car in front of you is headed towards the freeway exit and its brake lights come on and it begins braking hard. This could mean that the driver is not sure about exiting. He might suddenly return to the highway. This car is a hazard. If the car's driver cuts in front of you, it is no longer just a hazard; it is an emergency.

Seeing hazards makes you prepared. You will have time to react if you see hazards before they become emergencies. In the example, you might change lanes or slow down to prevent a crash if the car suddenly cuts in front of you. Seeing this hazard gives you time to check your mirrors and signal a lane change. Being prepared reduces the danger. Sudden braking or a quick lane change is more likely to lead to a crash.

Often clues will help you see hazards. The following addresses hazards that should concern you. Slow down and proceed with caution if you see any of these road hazards:

a. **Work Zones.** When people are working on the road, it is a hazard. There may be narrower lanes, sharp turns, or uneven surfaces. Other drivers are often distracted and drive unsafe. Workers and construction vehicles may get in the way.

NOTE: Drive slowly and carefully near work zones. Use 4-way flashers or brake lights to warn drivers behind you.

b. **Drop-offs.** Sometimes the pavement drops off sharply near the road's edge. Driving near the road's edge can tilt your vehicle. This can cause the top of your vehicle to hit roadside objects (signs, trees, limbs, and so on). You may have difficulty steering as you cross the drop-off or try to return to the highway.

c. **Foreign Objects.** Things that have fallen on the road can be hazards. They can damage your tires, wheel rims, and electrical and brake lines. They can become lodged between dual tires and cause severe damage. Some obstacles which appear harmless can be very dangerous. For example, cardboard boxes may be empty, but they may also contain some solid or heavy material that can cause damage. The same is true of paper and cloth sacks. You must remain alert for

objects on the highway. Recognize hazards early. Avoid them without making sudden or unsafe moves.

d. **Off- and/or On-Ramps.**Freeway and turnpike exits can be particularly dangerous for commercial vehicles. Off- and on-ramps often have speed limit signs posted. Remember, these speeds may be safe for automobiles, but not for larger or heavily loaded vehicles. Exits which go downhill and turn at the same time can be especially dangerous. The downgrade makes it difficult to reduce speed. Braking and turning at the same time can be dangerous. Make sure you are going slow enough (normally 10 to 15 mph slower than the posted ramp speed) to negotiate the curved part of an off- or on-ramp.

To protect yourself and others, you must anticipate other drivers' actions. Some clues to this type of hazard are as follows:

- Be alert for drivers whose vision is blocked. Vans, loaded station wagons, and cars with blocked rear windows are examples. Rental trucks should be watched carefully. Their drivers are often not use to the limited vision they have to the truck's sides and rear. In winter, vehicles with frosted, iced, or snow-covered windows are hazards.
- Blind intersections or alleys may partially hide vehicles. If you can see only the vehicle's rear or front end but not the driver, then the driver cannot see you. Always be prepared to maneuver around them or to stop.
- Delivery trucks can be a hazard. Packages or vehicle doors often block the driver's vision. Drivers of step vans, postal vehicles, and local delivery vehicles often are in a hurry. They may suddenly step out of, or drive, their vehicle into the traffic lane.
- Parked vehicles can be hazards when the people start to get out. Or, they may suddenly start up and drive into your way. Watch for movement of or inside the vehicle. Watch for brake or backup lights, exhaust, and other clues that a vehicle is about to move.
- Be careful of a stopped bus. Passengers may cross in front of or behind the bus. They often cannot see you.
- Pedestrians and bicyclists can also be hazards. Walkers, joggers, and bicyclists may be on the road with their back to the traffic, so they cannot see you. Sometimes, they wear portable stereos with head sets, so they cannot hear you either. On rainy days, pedestrians may not see you due to hats or umbrellas. They may be hurrying to get out of the rain and may not pay attention to the traffic.
- People may be hazards. If they are looking elsewhere, they cannot see you. Be alert even when they are looking at you. They may believe they have the right-of-way.
- Children tend to act quickly without checking traffic. Children playing together may not look for traffic.
- Drivers or pedestrians talking may not be paying close attention to traffic.
- People working on or near the roadway are a hazard clue. The work distracts other drivers, and the workers themselves may not see you.
- Someone selling ice cream is a hazard clue. Children may be nearby and may not see you.
- Drivers changing a tire or fixing their vehicles often do not pay attention to traffic. Jacked up vehicles or raised hoods are hazard clues.
- Accidents are particularly hazardous. People involved in an accident may not look for traffic. Passing drivers tend to look at the accident. People often cross the road without looking. Vehicles in your path may slow or stop.

- People around shopping areas are often not watching traffic because they are looking for stores or looking into store windows.
- Confused drivers often change direction suddenly or stop without warning. Confusion is common near freeways or major intersections. Tourists unfamiliar with the area can be very hazardous. Clues to tourists include car-top luggage and out-of-state license plates. Unexpected actions (stopping, changing lanes, backup lights suddenly going on) are clues to confusion. Hesitation is another clue; it includes driving very slow, braking often, or stopping in an intersection. You may also see drivers looking at street signs, maps, and house numbers. These drivers may not be paying attention to you.
- Motorists who fail to maintain a normal speed are hazards. Seeing slow moving vehicles early can prevent a crash. Some vehicles (such as mopeds, farm machinery, construction machinery, and tractors) are naturally slow. Some of them may display the slow moving vehicle symbol: a red triangle with an orange center. Watch for it.
- Drivers signaling a turn may be a hazard. They may reduce their speed more than expected or even stop. If they are making a tight turn into an alley or driveway, they may go very slow. If pedestrians or other vehicles block them, they may have to stop on the roadway. Vehicles turning left may have to stop for oncoming vehicles.
- Drivers may feel your large vehicle is keeping them from getting somewhere on time. These drivers may pass you without a safe gap in the oncoming traffic. They may cut too close in front of you. Drivers entering the road may pull in front of you to avoid being stuck behind you. You may need to brake. Watch for drivers who are in a hurry.
- Drivers who are ill, sleepy, on drugs, or who have had too much to drink are hazards. Some clues to these drivers areas follows:

  - Weaving from one side of the road to the other or drifting.
  - Leaving the road (dropping right wheels onto the shoulder or bumping across a curb in a turn).
  - Stopping at the wrong time (at a green light) or waiting too long at a stoplight or sign.
  - Open windows in cold weather.
  - Driving too fast or too slow or speeding up or slowing down suddenly.

CAUTION: Watch for drunk and sleepy drivers late at night.

Driver body movements are a clue. Drivers look in the direction they plan to turn. A driver's head and body movement may sometimes clue you that he is going to turn even though the turn signals are not on. Drivers making over-the-shoulder checks may plan to change lanes. These clues are most easily seen in motorcyclists and bicyclists. Watch other road users and try to anticipate their actions.

You are in conflict when you must change speed and/or direction to avoid hitting something. Conflicts occur at intersections where vehicles meet, at merges (such as turnpike on-ramps), and where there are needed lane changes. Other situations include slow moving or stalled vehicles in a traffic lane and accidents. Watch other drivers who are in conflict. When they react to this conflict, they may do something that puts them in conflict with you.

Always have a plan. Always look for hazards. Learn to recognize hazards on the road. However, do not forget why you are looking for the hazards. They may turn into emergencies. Look

for hazards so you have time to plan a way out of an emergency. When you see a hazard, think about the emergencies that could develop and how to avoid them. Always be prepared to act based on your plans. You must be a prepared, defensive driver for your safety and that of others.

Test Your Knowledge

1. What factors determine your selection of a "safe" speed when going down a long, steep downgrade?
2. Why should you be in the right gear before starting down a hill?
3. Describe the proper braking technique when going down a long, steep downgrade?
4. What is a hazard?
5. Why make emergency plans when you see a hazard?

These questions may be on the test. If you cannot answer all questions, reread paragraphs 2-11, 2-12, and 2-13.

2-14. EMERGENCIES. Traffic emergencies occur when two vehicles are about to collide. Vehicle emergencies occur when tires, brakes, or other critical parts fail. Following the safety practices in this manual can help prevent emergencies. If an emergency does happen, your chances of avoiding a crash depends on your action.

You can steer to avoid a crash. Stopping is not always the safest thing to do in an emergency. If you do not have enough room to stop, you may have to steer away from what is ahead. Remember, you can almost always turn to miss an obstacle more quickly than you can stop. (However, top-heavy vehicles and tractors with multiple trailers may turn over.) Keep both hands on the steering wheel. To turn quickly, you must have a firm grip on the steering wheel with both hands.

A quick turn can be made safely if done the right way. The following are some points that safe drivers should use:

- Do not apply the brake while you are turning. It is very easy to lock your wheels while turning. If that happens, you may skid out of control.
- Do not turn any more than needed to clear whatever is in your path. The more you turn, the greater the chances of a skid or rollover.
- Be prepared to countersteer, that is, to turn the wheel in the other direction, once you have cleared whatever was in your path. Unless you are prepared to countersteer, you will be unable to do it quickly enough. You should think of emergency steering and countersteering as two parts of one driving action.

If an oncoming driver drifts into your lane, a move to your right is best. If the driver realizes what has happened, the natural response will be to return to his lane. If your path is blocked, consider the following to determine the best direction to steer:

- If you have been using your mirrors, you will know which lane is empty and can be safely used.
- If the shoulder is clear, going right may be best. No one is likely to be driving on the shoulder, but someone may be passing you on the left. Use your mirrors.
- If you are blocked on both sides, a move to the right may be best. Then you will not force anyone into an oppsing traffic lane and a possible head-on collision.

In some emergencies, you may have to drive off the road. It may be less risky than facing a collision with another vehicle. Most shoulders are strong enough to support the weight of a large vehicle and offer an available escape route. If you do leave the road, observe the following guidelines:

- Avoid braking. If possible, avoid using the brakes until your speed has dropped to about 20 mph. Then brake very gently to avoid skidding on loose surfaces.
- Keep one set of wheels on the pavement if possible. This will help you maintain control.
- Stay on the shoulder. If the shoulder is clear, stay on it until your vehicle has stopped. Signal and check your mirrors before pulling back onto the road.
- If you must return to the road before you can stop, hold the wheel tightly with both hands and turn enough to get back on the road safely. Do not try to edge gradually back on the road. If you do, your tires might grab unexpectedly, and you could lose control. When both front tires are on the paved surface, countersteer immediately. The two turns should be a single steer-countersteer move.

You can stop quickly and safely. If somebody suddenly pulls into your lane, the natural response is to hit the brakes. This is a good response if there is enough distance to use your brakes correct] y to stop. Do not jam on the brakes. Emergency braking does not mean you push on the brake pedal too hard. That method of braking will keep the wheels locked up and cause a skid. If the wheels are skidding, you cannot control the vehicle. Brake so your vehicle will stay in a straight line and allow you to turn if necessary. Use the controlled braking or the stab braking methods. These methods are described below:

- *Controlled braking.* Apply the brakes as hard as you can without locking the wheels. Keep steering wheel movements very small while doing this. If you must make a steering adjustment or if the wheels lock, release the brakes. Reapply the brakes as soon as you can.
- *Stab braking.* Apply your brakes all the way. Release the brakes when the wheels lock up. As soon as the wheels start rolling, apply the brakes fully again. (It can take up to one second for the wheels to start rolling after you release the brakes. If the brakes are reapplied before the wheels start rolling, the vehicle will not straighten out.)

Again, do not jam on the brakes. Emergency braking does not mean pushing down on the brake pedal as hard as you can. That method of braking will keep the wheels locked up and cause a skid. If wheels are skidding, you cannot control the vehicle.

NOTE: If you drive a vehicle with anti-lock brakes, read and follow the directions found in the Owner's Manual for stopping quickly.

Brake failure is another emergency. Chapter 5 discusses air brakes. Brakes kept in good condition rarely fail. Most hydraulic brake failures occur due to loss of hydraulic pressure or brake fade on long hills.

When the system will not build up pressure, the brake pedal will feel spongy or go to the floor. The following are some ways to slow down and stop your vehicle:

- *Downshift.* Put the vehicle into a lower gear to help slow the vehicle.
- *Pump the brakes.* Sometimes pumping the brake pedal will generate enough hydraulic pressure to stop.
- *Use the parking brake.* The parking or emergency brake is separate from the hydraulic brake system. It can be used to slow the vehicle. Be sure you press the release button or pull the release lever at the same time you use the emergency brake. You can then adjust the brake pressure and keep the wheels from locking.
- *Find an escape route.* While slowing the vehicle, look for an escape route--an open field, side street, or escape ramp. Turning uphill is a good way to slow and stop the vehicle. Make sure the vehicle does not start rolling backward after you stop. Put it in a low gear. Then, apply the parking brake. If necessary, roll back into some obstacle that will stop the vehicle.

Going slow enough and braking properly will almost always prevent brake failure on long downgrades. However, once the brakes have failed, you must look outside your vehicle for something to stop it. Your best hope is an escape ramp. Use it. Ramps are usually located a few miles from the top of the downgrade. Some escape ramps use soft gravel that resists the motion of the vehicle and brings it to a stop. Others turn uphill, using the hill to stop the vehicle and soft gravel to hold it in place. A driver who loses brakes going downhill should use an escape ramp if one is available. If you do not use it, your chances of a serious crash may increase. If there is no escape ramp, take the least hazardous escape route--such as an open field or a side road that flattens out or turns uphill. Make the move as soon as you know your brakes have failed. The longer you wait to react, the faster you will travel and the harder it will be to stop.

Realizing that you have a tire failure will give you more time to react. Just a few seconds to remember what you are supposed to do can help. The major signs of tire failure are as follows:

- *Sound.* The loud bang of a blowout is easy to recognize. Because it can take a few seconds for your vehicle to react, you might think it was some other vehicle. Unless you are about to run into something, stay off the brake until the vehicle has slowed down. Then brake gently, pull off the road, and stop.
- *Vibration.* If the vehicle thumps or vibrates heavily, it may be a sign that one of the tires has gone flat. With a rear flat, that may be the only sign you get.
- *Feel.* If steering feels “heavy”, it is probably a sign that a front tire has failed. Sometimes, a rear tire failure causes the vehicle to slide back and forth or fishtail. However, rear dual tires usually prevent this.

To handle a tire failure safely, drivers must do the following:

- Be aware that a tire has failed.
- Hold the steering wheel firmly with both hands.
- Stay off the brake until the vehicle slows downs, then apply the brakes gently.
- After stopping, get out and check all the tires. Do this even if the vehicle seems to be handling all right. If one of your dual tires goes, the only way you may know it is by getting out and checking.

2-15. SKID CONTROL AND RECOVERY. A skid happens whenever the tires lose their grip on the road. The following are four causes of a skid:

a. **Overbraking.** This is braking too hard and locking up the wheels. Skids also can occur when using the speed retarder on slippery roads.

b. **Oversteering.** This is turning the steering wheel more than the vehicle can turn.

c. **Overacceleration.** This is supplying too much power to the drive wheels causing them to spin.

d. **Driving too Fast.** Most serious skids result from driving too fast for road conditions. Drivers who adjust their driving to road conditions, do not overaccelerate and do not have to overbrake or oversteer from excess speed.

The most common drive wheel skid occurs when the rear wheels lose traction through excessive braking or acceleration. Skids caused by acceleration usually happen on ice or snow. Taking your foot off the accelerator can stop this. If it is slippery, push the clutch (manual transmission) in. Otherwise the engine can keep the wheels from rolling freely and regaining traction.

Another drive-wheel braking skid is when the rear drive wheels lock. Locked wheels have less traction than rolling wheels. The rear wheels usually slide sideways in an attempt to catchup with the front wheels. In a bus or straight truck the vehicle will slide sideways in a spinout. With vehicles towing trailers, a drive wheel skid can let the trailer push the towing vehicle sideways, causing a sudden jackknife. A jackknife occurs when the angle of the trailer relative to the tractor exceeds 15 degrees (Figure 2-7).

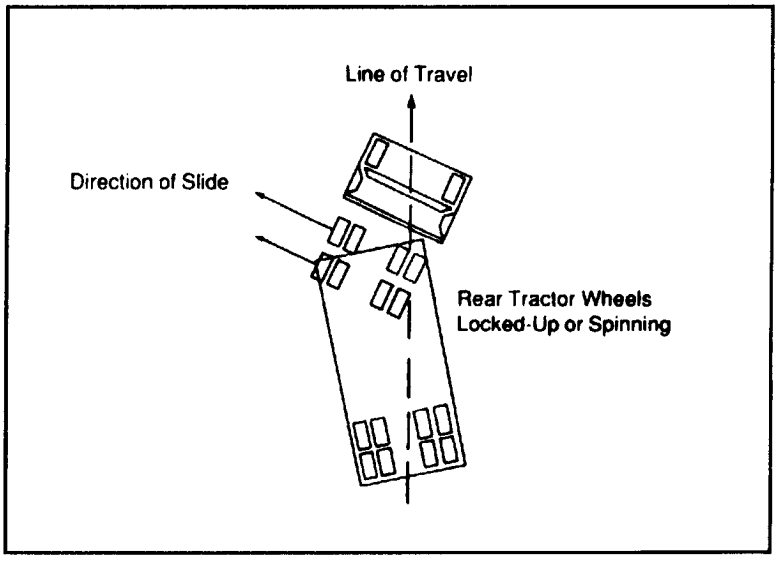


Figure 2-7. Tractor jackknife

Perform the following to correct a drive-wheel braking skid:

- *Stop braking.* This lets the rear wheels roll again and keeps them from sliding any further. If on ice, push in the clutch (manual transmission) to let the wheels turn freely.
- *Turn quickly.* When a vehicle begins to slide sideways, steer in the direction you want the vehicle to go.
- *Countersteer.* As a vehicle turns back on course, it tends to keep on turning. Unless you turn the steering wheel the other way, you may skid in the opposite direction.

Learning to stay off the brake, turn the steering wheel quickly, push in the clutch (manual transmission), and countersteer in a skid takes a lot of practice. The best place to practice is on a large driving range or skid pad.

Most front-wheel skids are caused by driving too fast for conditions. Other causes are lack of tread on the front tires and cargo loaded improperly with insufficient weight on the front axle. In a front-wheel skid, the front end tends to go straight regardless of how much you turn the steering wheel. On a slippery surface, you may be unable to negotiate a curve or turn.

When a front-wheel skid occurs, the only way to stop the skid is to let the vehicle slow down. Stop turning and/or braking so hard. Slow down as quickly as possible without skidding.

Test Your Knowledge

1. Stopping is not always the safest thing to do in an emergency. True or False?
2. What are some advantages of going right instead of left around an obstacle?
3. What is an escape ramp?
4. If a tire blows out, you should put the brakes on hard to stop quickly. True or False?

These questions may be on the test. If you cannot answer all questions, reread paragraphs 2-14 and 2-15.

2-16. ACCIDENT PROCEDURES. If you are in an accident and not seriously hurt, you must prevent further damage or injury. The basic steps to take at any accident are to protect the area, notify the authorities, and care for the injured.

a. **Protect the Area.** The first thing to do at the scene is to keep other accidents from happening. Do the following to protect the accident area:

(1) If your vehicle is involved in the accident, try to get it off the road. This will help prevent another accident and allow traffic to move.

(2) If you are stopping to help, park away from the accident. The area immediately around the accident will be needed for emergency vehicles.

(3) Put on your flashers.

(4) Set out reflective triangles to warn other traffic. Put the triangles where other drivers can see them in time to avoid the accident.

b. **Notify the Authorities.** If you have a CB radio, call the emergency channel before exiting your vehicle if possible. If not, wait until after the accident scene has been protected; [hen telephone or send someone to telephone the police. Try to determine the exact location of the accident.

c. **Care for the Injured.** If a qualified person is helping at the accident scene, stay out of the way unless asked to help. Otherwise, do the best you canto help any injured parties. Do the following when giving assistance:

(1) Do not move a severely injured person unless it is required due to the danger of fire or passing traffic.

(2) Apply direct pressure to a wound to stop heavy bleeding.

(3) Keep the injured person warm.

2-17. FIRES. Truck tires can cause damage and injury. Learn the causes of fires and how to prevent them. Know what to do to extinguish fires. The following are some causes of vehicle fires:

- Spilled fuel and/or the improper use of flares after accidents. Fuel spills also contaminate the environment. Clean up fuel spills IAW unit environmental SOP.
- Underinflated tires and duals that touch.
- Short circuits in the electrical system due to damaged insulation or loose connections.
- Fuel; that is, driver smoking, improper fueling, and/or loose fuel connections.
- Cargo; that is, flammable cargo, improperly sealed or loaded cargo, and/or poor ventilation.

Do the following to prevent fires:

- *Conduct a pre-trip inspection.* Completely inspect the electrical, fuel, and exhaust systems; tires; and cargo.
- *Inspect en route.* Check the tires, wheels, and truck body for signs of heat whenever you stop during a trip.
- *Use safety procedures.* Follow correct safety procedures for fueling vehicles, braking, handling flares, and other activities that can cause a tire.
- *Monitor your vehicle.* Check the instruments and gauges often for signs of overheating. Use the mirrors to look for signs of smoke from tires or the vehicle.

CAUTION

Use caution when handling anything flammable.

Knowing how to fight tires is important. Do the following in case of a fire:

- *Pull off the road.* The first step is to move the vehicle off the road and stop. Do this by observing the following:

  - Park in an open area away from building, trees, brush, other vehicles, or anything that might catch fire.
  - Do not pull into a service station.
  - Use your CB radio or other means to notify the emergency services of your problem or location.

- *Keep the fire from spreading.* Before trying to put out the fire, do the following to make sure it does not spread any further:

  - With an engine fire, turn off the engine as soon as possible. If it can be avoided, do not open the hood. Discharge extinguishers through louvers, the radiator, or from the vehicle's underside.
  - With a cargo fire in a van or box trailer, keep the doors shut, especially if your cargo contains HAZMAT. Opening the doors supplies the tire with oxygen and can cause it to burn very fast.

- *Use the right fire extinguisher.* Make sure you use the right fire extinguisher for the following types of fires:

  ■ The B:C type fire extinguisher is designed for electrical and liquid fires. The A:B:C type is designed for wood, paper, and cloth as well as electrical and liquid fires.
  ■ Water can be used on wood, paper, or cloth. Do not use water on an electrical (you could get shocked) or a gasoline (it will spread the flames) fire.
  ■ A burning tire must be cooled. Lots of water may be required.
  ■ If you are not sure what to use, especially on a HAZMAT tire, wait for qualified fire fighters.

- *Extinguish the fire.* Do the following to put out a fire:

  ■ Know how the fire extinguisher works. Before using, study the instructions printed on the extinguisher.
  ■ When using the extinguisher, stay as far away from the fire as possible.
  ■ Aim at the source or base of the fire, not up in the flames.
  ■ Position yourself upwind. Let the wind carry the extinguisher to the fire rather than carrying the flames to you.
  ■ Continue until the burning has been cooled. Absence of smoke or flame does not mean the fire is completely out or cannot restart.
  ■ Only try to extinguish a fire if you know what you are doing and it is safe to do so.

Test Your Knowledge

1. What are some things to do at an accident scene to prevent another accident?
2. Name two causes of tire fires.
3. For what types of fires is a B:C extinguisher used?
4. When using your extinguisher, should you get as close as possible to the fire? Why?
5. Name some causes of vehicle tires.

These questions may be on the test. If you cannot answer all questions, reread paragraphs 2-16 and 2-17.

2-18. STAYING ALERT AND FIT TO DRIVE. Driving a vehicle for long hours is tiring. Even the best of drivers will become less alert. Do the following to help stay alert and safe.

a. **Be Ready to Drive.** Get enough sleep. Leaving on a trip when you are already tired is dangerous. If you have a long trip scheduled, get enough sleep before you leave. Most people require 7 to 8 hours of sleep every 24 hours.

b. **Schedule Trips Safely.** Your body gets use to sleeping during certain hours. If you drive during those hours, you will be less alert. If possible, try to schedule trips for the hours you are normally awake. Many vehicle accidents occur between midnight and 6 a.m. Tired drivers can

easily fall asleep at these times, especially if they do not regularly drive at those hours. Trying to complete a long trip at these hours can be very dangerous.

c. **Avoid Medication.** Many medicines can make you sleepy. Avoid driving if you are taking medication (especially labels that warn against operating vehicles or machinery). The most common medicine of this type is an ordinary cold pill. If you must drive with a cold, you are better off suffering from the cold than from the effects of the medicine.

d. **Keep Cool.** A hot, poorly ventilated vehicle can make you sleepy. Keep the window or vent cracked or use the air conditioner if you have one.

e. **Take Breaks.** Short breaks keep you alert. Take them when you feel drowsy or tired. Walk around and inspect your vehicle. It may help to do some physical exercises. When you become sleepy, pushing on is far more dangerous than most drivers think. It is a major cause of fatal accidents. Below are some important rules to follow:

(1) ***Stop to sleep.*** When your body needs sleep, sleep is the only thing that will work. If you must stop anyway, do it whenever you feel the first signs of sleepiness, even if it is earlier than you planned. By getting up a little earlier the next day, you can keep on schedule without the danger of driving while you are not alert.

(2) ***Take a nap.*** If you cannot stop for the night, at least pull off the road and take a nap. A nap as short as a half hour will overcome fatigue more than a half hour coffee stop.

(3) ***Avoid drugs.*** No drugs can overcome fatigue. While they may keep you awake for a while, they will not make you alert. Eventually, you will be even more tired than if you had not taken them. Sleep is the only thing that can overcome fatigue.

(4) ***Avoid alcohol.*** Drinking alcohol and then driving is a serious problem. People who drink alcohol are involved in traffic accidents that result in over 20,000 deaths each year. You should know how alcohol works in the human body and how it affects driving and the legal, financial, and safety risks of drinking and driving.

There are many dangerous ideas about alcohol use. Drivers who believe these wrong ideas are more likely to get into trouble. Table 2-1, page 2-34, covers some of these fallacies.

The alcohol in a drink affects human performance. It does not make any difference whether that alcohol comes from two beers, two glasses of wine, or two shots of liquor. The following drinks contain the same amount of alcohol:

- A 12-ounce glass of 5 percent beer.
- A 5-ounce glass of 12 percent wine.
- A 1 l/2-ounce shot of 80 proof liquor.

Table 2-1. Alcohol fallacies and truths

FALSE	THE TRUTH
Alcohol increases your ability to drive.	Alcohol is a drug that will make you less alert and reduce your ability to drive safely.
Some people can drink a lot.	Everyone who drinks is affected by alcohol.
If you eat a lot first, you will not get drunk.	Food will not keep you from getting drunk.
Coffee and a little fresh air will help a drinker sober up.	Only time will help a drinker sober up - other methods just do not work.
Stick with beer--it is not as strong as wine or whiskey.	A few beers are the same as a few shots of whiskey or a few glasses of wine.

Alcohol goes directly from the stomach into the blood stream. Drinkers can control the amount they consume; however, they cannot control how fast the body gets rid of it. If you drink faster than your body can get rid of it, you will have more alcohol in your body. Your driving will be affected. The BAC commonly measures the amount of alcohol in your body.

The amount of alcohol you drink, how fast you drink, and your weight determines your BAC. The more you drink and the faster you drink, the higher your BAC. A small person does not have to drink as much as a large person to reach the same BAC. Alcohol affects more of the brain as the BAC builds up. The first part of the brain affected controls judgment and self-control. This can keep drinkers from knowing they are getting drunk. Good judgment and self-control are absolutely necessary for safe driving. As the BAC continues to build, muscle control, vision, and coordination are affected more. Eventually a person will pass out.

Drinking alcohol affects all drivers. Alcohol affects judgment, vision, coordination, and reaction. It causes these serious driving errors:

- Increased reaction time to hazards.
- Driving too fast, slow, or in the wrong lane.
- Running over the curb.
- Weaving.
- Straddling lanes.
- Quick, jerky starts.
- Not signaling; failing to use lights.
- Running stop signs and red lights.
- Passing improperly.

These driving errors increase the chances of a crash. Accident statistics show that the chance of a crash is greater for drivers who have been drinking than for drivers who were not.

Besides alcohol, other legal and illegal drugs are being used more often. Laws prohibit possession or use of many drugs while on duty. Laws also prohibit anyone from being under the influence of any controlled substance, an amphetamine (including pep pills and bennies), narcotics, or any other substance which can make the driver unsafe. This could include a variety of prescription and over-the-counter drugs (cold medicines) which may make the driver drowsy, thereby affecting his safe driving ability. However, possession and use of a drug that a doctor gives to a driver is permitted if the doctor tells the driver that it will not affect his safe driving ability.

Pay attention to warning labels of legitimate drugs and medicines and the doctor's orders regarding possible effects. Stay away from illegal drugs. Do not use any drug that hides fatigue; the only cure for fatigue is rest. Alcohol can make the effects of other drugs much worse. The safest rule is not to mix drugs with driving.

Use of drugs can lead to traffic accidents that result in death, injury, and property damage. Furthermore, it can lead to arrests, fines, and jail sentences. It can also end a person's driving career.

Once in a while, you may become so ill that you cannot operate a vehicle safely. If this happens, do not drive. However, in case of an emergency, you may drive to the nearest place where you can safely stop.

2-19. HAZMAT RULES. All drivers should know something about HAZMAT. You must be able to recognize hazardous cargo and know whether or not you can haul it without having a HAZMAT endorsement to your license.

HAZMAT are products that pose a risk to health, safety, property, and the environment. The nine different HAZMAT classes found in the federal rules are in Table 2-2, page 2-36.

When transporting HAZMAT you must follow many rules. The intent of the rules is to contain the product, communicate the risk, and ensure safe drivers and equipment. These are described below.

a. **Contain the Product.** Many hazardous products can injure or kill on contact. To protect drivers and others from contact, the rules tell shippers how to package safely. Similar rules tell drivers how to load, transport, and unload bulk tanks. These are know as containment rules.

b. **Communicate the Risk.** The shipper uses a shipping paper and package labels to warn dockworkers and drivers of the risk. Shipping orders, bills of lading, and manifests are all examples of shipping papers.

The shipping paper describes the HAZMAT being transported. Shippers put diamond shape hazard warning labels on most HAZMAT packages to warn others of the hazard (see Figure 2-8, page 2-37 for some examples of labels). If the diamond shape label will not fit on the container, shippers put the label on a tag. For example, compressed gas cylinders that will not hold a label will have tags or decals.

After an accident or HAZMAT leak, the driver may be unable to speak when help arrives. Fire fighters and police must know the hazards involved to prevent more damage or injury. The driver's life and the lives of others may depend on quickly finding the shipping papers for hazardous

cargo. Therefore, you must tab shipping papers related to HAZMAT or keep them on top of other shipping papers. You must also keep shipping papers in one of the following places:

- In a pouch on the driver's door.
- In clear view within reach.
- On the driver's seat.

Table 2-2. HAZMAT hazard class/division table

Class	Division	Name of Class or Division	Examples
1	1.1 1.2 1.3 1.4 1.5 1.6	Mass Explosives Projection Hazards Mass Fire Hazards Minor Hazards Very Insensitive Extremely Insensitive	Dynamite Flares Display Fireworks Ammunition Blasting Agents Explosive Devices
2	2.1 2.2 2.3	Flammable Nonflammable Poisonous/Toxic	Propane Helium Fluorine, Compressed
3	-	Flammable	Gasoline
4	4.1 4.2 4.3	No Other Characteristic Spontaneously Combustible, Spontaneously Combustible When Wet	Ammonium Pierate White Phosphorus Sodium
5	5.1 5.2	Oxidizers Organic Peroxides	Ammonium Nitrate Methyl Ethyl Ketone, Peroxide
6	6.1 6.2	Poison (toxic material) Infectious Substances	Potassium Cyanide Anthrax Virus
7	-	Radioactive	Uranium
8	-	Corrosives	Battery Fluid
9	-	Miscellaneous hazardous materials	Polychorinated Biphenyls (PCB)
None	-	ORM-D (Other Regulated Material-Domestic)	Food Flavoring's
None	-	Combustible Liquids	Fuel Oil

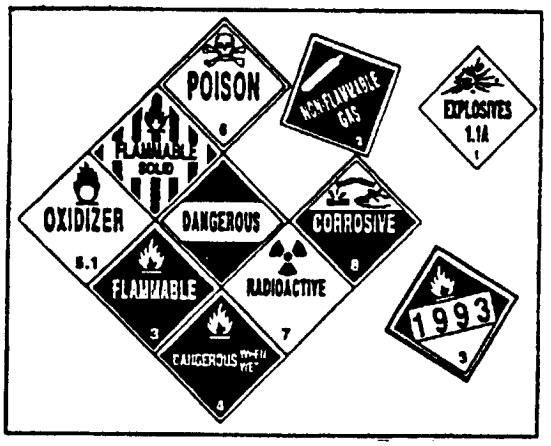


Figure 2-8. Examples of labels

Placards are used to warn others of HAZMAT. Placards are signs placed on the outside of a vehicle to show the hazard classes of products on board. A placarded vehicle must have at least four identical placards. They are put on the front, rear, and both sides. Placards must be readable from all four directions. They are 10 3/4 inches square, turned upright on a point like a diamond shape. Cargo tanks and other bulk packaging display the ID number of their contents on placards or orange panels.

Not all vehicles carrying HAZMAT must have placards. The rules about placards are in Chapter 9 of this manual. You can drive a vehicle that carries HAZMAT if it does not require placards. If it requires placards, you must not drive it unless your driver's license has the HAZMAT endorsement.

c. **Ensure Safe Drivers and Equipment.** To ensure safe drivers and equipment, the rules require all drivers of placarded vehicles to learn how to safely load and transport hazardous products. They must have a CDL with the HAZMAT endorsement.

- To receive an endorsement, you must pass a written test on material in Chapter 9. You will need a tank endorsement if transporting 1,000 gallons or more of liquid or gaseous materials in a tank, mounted on a truck.
- Drivers who need the HAZMAT endorsement must learn the placard rules. If you are not sure about the placards required for your vehicle, ask your employer. Never drive a vehicle needing placards unless you have the HAZMAT endorsement; to do so is a crime. When stopped, you will be cited and not allowed to drive your truck any further. A failure to placard, when needed, will risk your life and others if you have an accident. Emergency help will not know of your hazardous cargo.
- Drivers must also know which HAZMAT they can load together. These rules are found in Chapter 9. Before loading a truck with more than one type of product, you must know if it is safe to load them together. If you do not know, ask your employer.

Test Your Knowledge

1. Common medicines for a cold can make you sleepy. True or False?
2. What should you do if you do become sleepy while driving?
3. Coffee and a little fresh air will help a drinker sober up. True or False?
4. What is a HAZMAT placard?
5. Why are placards used?

These questions may be on the test. If you cannot answer all questions, reread paragraphs 2-18 and 2-19.

Section II. PRE-, DURING-, AND AFTER-TRIP INSPECTIONS

This section contains information on vehicle inspection that you must know in order to successfully perform a pre-trip, during-trip, and after-trip inspection. To learn more about inspecting air brakes, cargo, combination vehicles, tank vehicles, HAZMAT, double trailers, triple trailers, or passenger vehicles, read applicable paragraphs in Chapters 3 through 12.

2-20. INSPECTIONS. Safety is the most important and obvious reason to inspect your vehicle. Inspecting your vehicle ensures that it is safe to operate. Federal and state laws require inspection by the driver. Federal and state inspectors periodically inspect vehicles. An unsafe vehicle may be put out of service until the discrepancies are corrected. The following are types of inspections operators are required to perform:

- Pre-trip inspections.
- During a trip.
- After-trip inspection and report.

Check the following when performing an overall vehicle inspection.

a. **Tire Problems.** It is dangerous to drive with bad tires. Look for the following:

(1) Too much or too little air pressure. To correctly check air pressure in the tires use either a tire gauge or tire mallet.

(2) Tire tread. At least 4/32 inch of tread depth in every major groove on front wheels and 2/32 inch on other wheels. No fabric should show through the tread or sidewall.

(3) Cuts or other damage.

(4) Tread separation.

(5) Dual tires that come in contact with each other or parts of the vehicle.

(6) Mismatched sizes.

(7) Radial and bias-ply tires used together.

(8) Cut or cracked valve stems.

(9) Regrooved, recapped, or retreaded tires on the front wheels of passenger-carrying vehicles are prohibited.

b. **Wheel and Rim Problems.** Bad wheels or rims could cause an accident. A damaged rim can cause the tire to lose pressure or come off. Look for the following:

(1) Wheels or rims that have welded repairs are unsafe.

(2) Rust around wheel lug nuts may mean they are 1oose. Check tightness.

(3) After a tire has been changed, stop a short while later and recheck the tightness of the lug nuts.

(4) Missing clamps, spacers, studs, and lugs means danger.

(5) Mismatched. bent, or cracked lock rings are dangerous.

c. **Bad Brake Drums or Shoes.** Look for the following:

(1) Cracked drums.

(2) Shoes or pads with oil, grease, or brake fluid on them.

(3) Missing, broken, or dangerously thin shoes.

d. **Steering System Defects.** Figure 2-9, page 2-40, shows the key parts to the steering system. Look for the following:

(1) Missing nuts, bolts, cotter keys, or other parts.

(2) Bent, loose, or broken parts, such as the steering column, steering gear box, or tie rods.

(3) Leaks in hoses and pumps and low fluid levels, if equipped with power steering.

(4) Steering wheel play of more than 10 degrees (approximately 2 inches of movement at the rim of a 20-inch steering wheel). This can make it hard to steer.

e. **Suspension System Defects.** The suspension system holds up the vehicle and its load and keeps the axles in place. Therefore, broken suspension parts can be extremely dangerous. You should check for the following:

(1) Spring hangers (see Figure 2-10, page 2-4 1) that allow the axle to move from the proper position.

(2) Cracked or broken spring hangers.

(3) Leaking shock absorbers (see Figure 2-10).

(4) Cracked, damaged, or missing torque rods or arms, U-bolts, spring hangers, or other axle-positioning parts (see Figure 2-10).

(5) Missing or broken leaves in any leaf spring (see Figure 2-11, page 2-41). If one-fourth or more are missing, it will put the vehicle out of service. Any defect could be dangerous.

(6) Broken leaves in a multileaf spring or leaves that have shifted so they might hit a tire or other part (see Figure 2-11).

(7) Damaged and/or leaking air suspension systems (see Figure 2-12, page 2-42).

(8) Any loose, cracked, broken, or missing frame members.

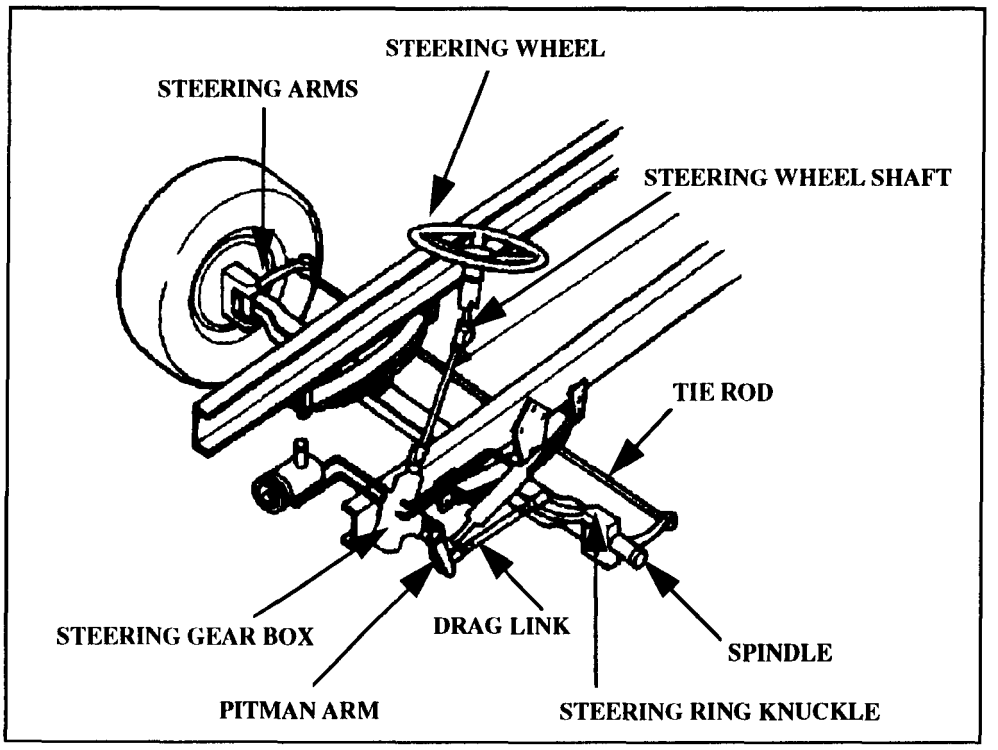


Figure 2-9. Steering system key parts

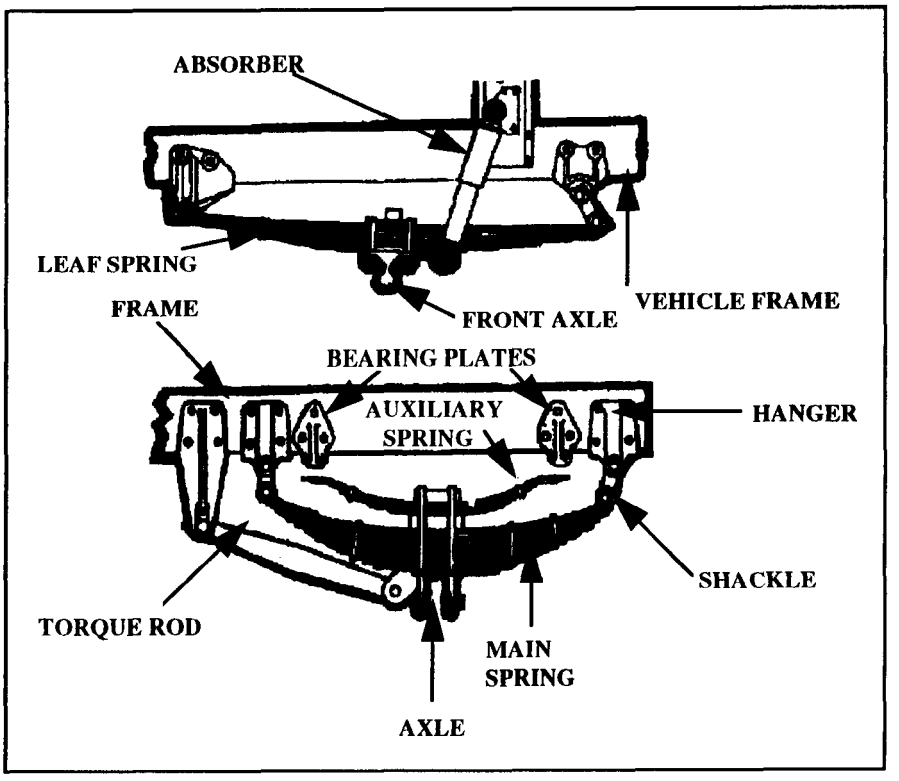


Figure 2-10. Key suspension parts

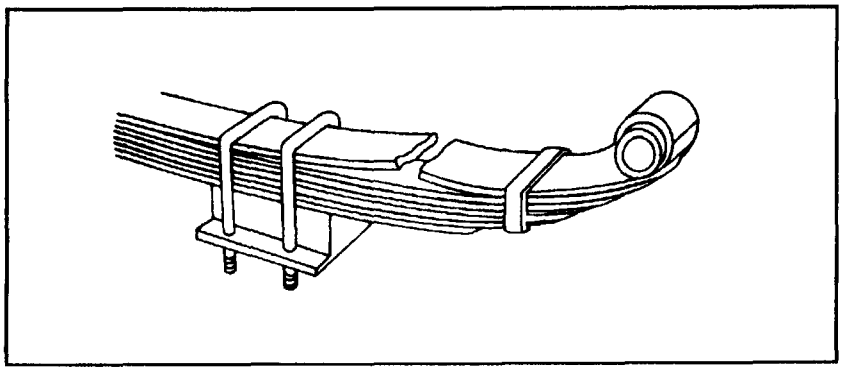


Figure 2-11. Safety defect: broken leaf in leaf spring

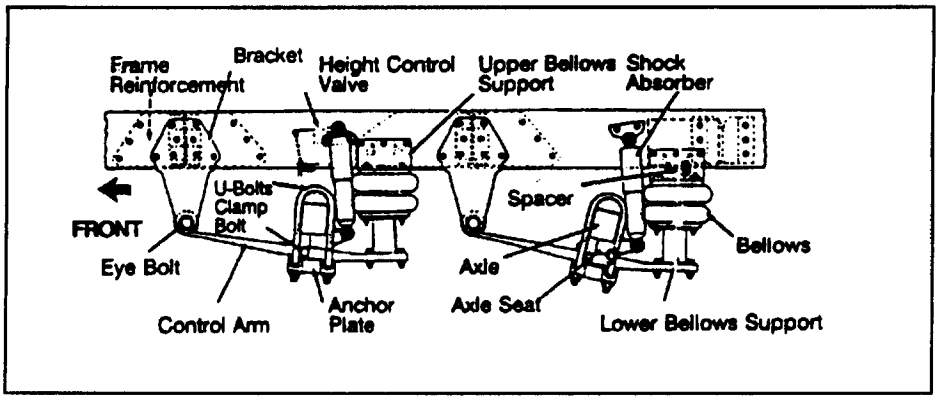


Figure 2-12. Air suspension parts

f. **Exhaust System Defects.** A broken exhaust system can let poisonous fumes into the cab or sleeper berth. You should check for the following:

(1) Loose, broken, or missing exhaust pipes, mufflers, tail pipes, or vertical stacks.

(2) Loose, broken, or missing brackets, clamps, bolts, or nuts.

(3) Exhaust system parts rubbing against fuel system parts, tires, or other moving parts of the vehicle.

(4) Leaking exhaust system parts.

g. **Emergency Equipment.** Vehicles should have the following:

(1) Serviceable fire extinguishers.

(2) Spare electrical fuses (unless equipped with circuit breakers).

(3) Warning devices for parked vehicles (such as three reflective warning triangles).

Test Your Knowledge

1. What is the most important reason for an inspection?
2. What things should you check during a trip?
3. Name some key steering system parts.
4. Name some suspension system defects.
5. What three kinds of emergency equipment must you have?
6. What is the minimum tread depth for front tires?
7. What is the minimum tread depth for other tires?

These questions may be on the test. If you cannot answer all questions, reread paragraph 2-20.

2-21. PRE-TRIP INSPECTION. You must perform a pre-trip inspection before each trip to find problems that could cause a crash or breakdown. You should do a pre-trip inspection the same way each time so you cover everything. Conduct your inspection according to the following seven-step procedure. To help you remember what to inspect, refer to Figure 2-13, Figure 2-14, and Figure 2-15 (page 2-44). An examiner will offer you a copy of the correct figure when you take the performance test. When you take your test, you must tell the examiner what vehicle parts you are inspecting and describe the defects you are looking for. Practicing the seven-step inspection procedures will help you pass the test.

VEHICLE INSPECTION MEMORY AIDS
(Key Locations to Inspect)

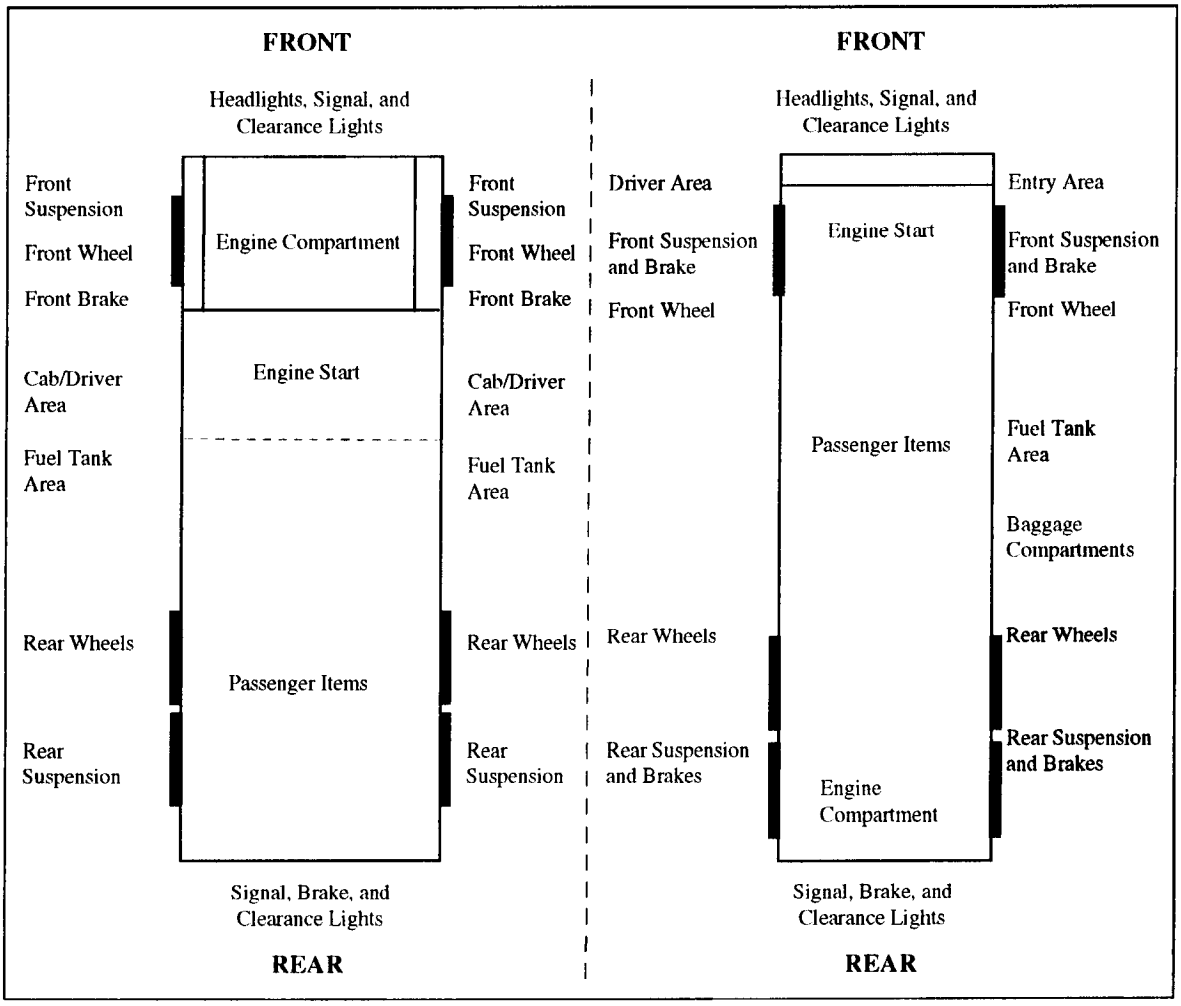


Figure 2-13. Straight truck/school bus **Figure 2-14. Coach/transit bus**

CAUTION

Always put the vehicle key in your pocket; otherwise, someone might move the vehicle while you are checking underneath it.

VEHICLE INSPECTION MEMORY AIDS
(Key Locations to Inspect)

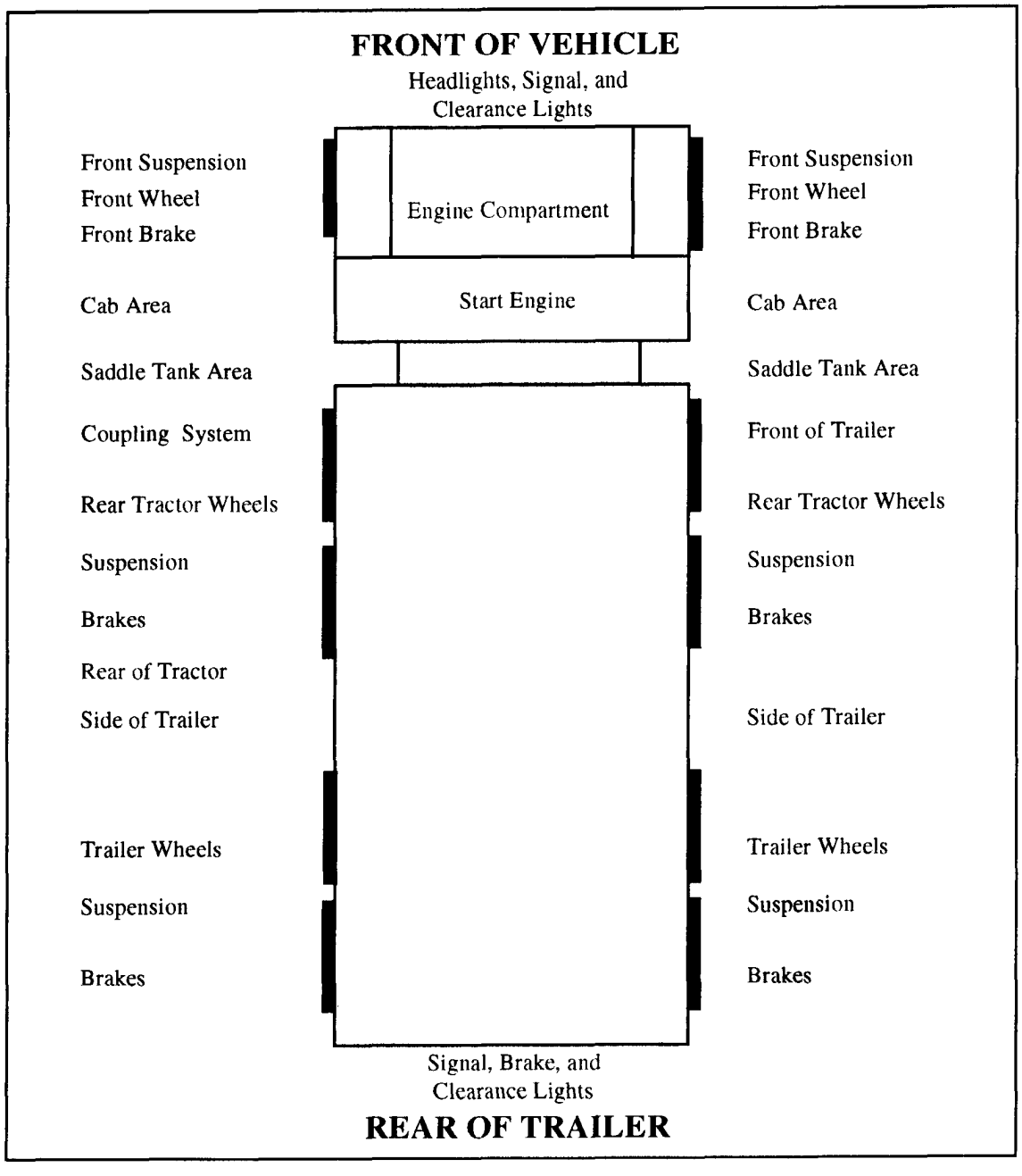


Figure 2-15. Tractor-semitrailer

CAUTION

If you are parked on a street, walk around so you face the oncoming traffic. Pay attention so you do not get run over.

a. **Step 1- Check the Vehicle's General Condition.** Check for the following:

(1) Approach the vehicle and look for damage. See if the vehicle leans to one side. Look under the vehicle for fresh oil, coolant, grease, or fuel. (Note: Cleanup any spills IAW unit environmental SOP.) Check the area around the vehicle for hazards to movement (such as animals, people, other vehicles, objects, or low-hanging wires or limbs).

(2) Review the last vehicle inspection report. Drivers may have to write a vehicle inspection report each day. Items that affect safety must be repaired. Review the last inspection report for any discrepancies. Inspect the vehicle to determine if discrepancies were corrected.

b. **Step 2- Check the Engine Compartment.** Be sure the parking brake is on and/or the wheels chocked. When you raise the hood or tilt the cab (secure loose objects so they do not fall and break). Check the following:

(1) The engine oil level.

(2) The coolant level in the radiator and the condition of hoses.

(3) The power steering fluid level and hose condition (if equipped).

(4) The windshield washer fluid level.

(5) The battery fluid level, connections, and tie-downs. (The battery may be located elsewhere.)

(6) The automatic transmission fluid level. (The engine may need to be running.)

(7) The belts (alternator, water pump, air compressor) for tightness and excessive wear. Learn how much "give" the belts should have when properly adjusted and check each.

(8) For leaks in the engine compartment (fuel, coolant, oil, power steering fluid, hydraulic fluid, and battery fluid). (Note: Clean up any spills IAW unit environmental SOP.)

(9) For cracked or worn electrical wiring insulation.

Lower and secure the hood, cab, or engine compartment door.

c. **Step 3- Get in the Vehicle.** Be sure the parking brake is engaged. Put the gearshift in neutral (or park, if automatic). Start the engine and listen for unusual noises. Inspect inside the cab.

(1) Look at the following gauges:

- *Oil pressure.* It should reach the normal range within seconds after you start the engine.
- *Ammeter and/or voltmeter*. It should be in the normal range.
- *Coolant temperature.* It should gradually rise to the normal operating range.

- *Engine oil temperature.* It should gradually rise to the normal operating range.
- *Warning lights and buzzers.* Oil, coolant, and charging circuit warning lights should go out once the engine is running.

(2) Check the condition of controls. Check these things for looseness, sticking, damage, or improper setting:

- Steering wheel.
- Clutch.
- Accelerator (gas pedal).
- Brake controls:
  - Foot and parking brakes.
  - Trailer brake (if vehicle has one).
  - Retarder control (if vehicle has one).
  - Transmission controls.
- Interaxle differential lock (if applicable).
- Horns.
- Windshield wipers and washer.
- Lights:
  - Headlights and dimmers witch.
  - Turn signals.
  - Four-way flashers.
  - Clearance, ID, and marker light switches.

(3) Inspect mirrors and windshield. Check for cracks, dirt, illegal stickers, or other obstructions. Clean and adjust if necessary.

(4) Check emergency equipment. Check for the following:

- Be sure this safety equipment is on hand:
  - Spare electrical fuses (unless the vehicle has circuit breakers).
  - Three red reflective triangles.
  - Properly charged and rated fire extinguishers.
- Check for optional items such as--
  - Tire chains (if conditions require them).
  - The-changing equipment.
  - List of emergency phone numbers.
  - Accident reporting kit (packet).

d. **Step 4- Turn Off the Engine and Check the Lights.** Set the parking brake. Turn off the engine, and take the key with you. Turn on headlights (low beams) and 4-way flashers. Exit the vehicle.

(1) Go to the front of your vehicle. Be sure the low beams are on and both 4-way flashers are working.

(2) Check the dimmer switch to ensure high beams are working.

e. **Step 5- Do a Walkaround Inspection.** Turn off headlights and 4-way hazard warning flashers. Turn on parking, clearance, side-marker, and identification lights. Turn on the right turn signal, and start walkaround inspection.

(1) Walk around and inspect. Check all lights, reflectors, and glass as you go.

(2) Check the left front side. The driver's door glass should be clean. Door latches or locks should work properly. Be sure to do the following:

- Check the left front wheel:

  ■ Check the condition of the wheel and rim for missing, bent, or broken studs, clamps, or lugs and any signs of misalignment.
  ■ Check the condition of the tires. Be sure they are properly inflated (check using a tire gauge or mallet) and have at least 4/32 inch of tread depth. The valve caps and stems should be present. There should be no serious cuts, bulges, or excessive tread wear.
  ■ Use a wrench to test rust-streaked lug nuts for looseness.
  ■ Check the hub oil level for leaks.

- Check the left front suspension. Check the condition of the spring, spring hangers, shackles, U-bolts, and shock absorber.
- Check the left front brake. Check the condition of the brake drum and hoses.

(3) Check the front:

- Check the condition of the front axle.
- Check the steering system for loose, worn, bent, damaged, or missing parts.
- Check the windshield for damage. Clean if it is dirty. Check the windshield wiper arms for proper spring tension. Check the wiper blades for damage, stiff rubber, and securement.
- Check the lights and reflectors:

  ■ Parking, clearance, and identification lights should be clean, operable, and the proper color (amber at the front).
  ■ Reflectors should be clean and the proper color (amber at the front).
  ■ Turn signal lights should be clean, operable, and the proper color (amber or white on signals facing forward).

(4) Check all items on the right front side as done on the left front side:

- Be sure primary and safety cab locks are properly engaged (if the cab is over the engine).
- Be sure the right fuel tanks are securely mounted and not damaged or leaking. Check that the--
  - Fuel crossover line is secure.
  - Tanks contain enough fuel.
  - Caps are securely on.
- Check the condition of visible parts:
  - Check the rear of the engine for leaks.
  - Check the transmission for leaks.
  - Be sure the exhaust system is secure, not leaking, and not touching wires or fuel or air lines.
  - Check the frame and cross members for bends or cracks.
  - Be sure air lines and electrical wiring are not snagging, rubbing, or wearing.
  - Check the spare tire carrier or rack for damage (if equipped).
  - Be sure the spare tire and/or wheel is securely mounted in the rack.
  - Be sure the spare tire and wheel are the proper size and properly inflated.

(5) Check the right rear side:

- Check the wheels and rims for missing, bent, or broken spacers, studs, clamps, or lugs.
- Be sure tires are properly inflated; have at least 2/32 inch of tread depth; have adequate valve stems and caps; have no serious cuts, bulges, or tread wear; are not rubbing each other; and have nothing stuck between them.
- Be sure tires are the same type (not mixed radial and bias types) and are evenly matched (same sizes).
- Be sure wheel bearings and seals are not leaking.
- Check the suspension:
  - Check the condition of springs, spring hangers, shackles, and U-bolts.
  - Be sure the axle is secure and powered axles are not leaking lubricants (gear oil).
  - Check the condition of the torque rod arms and bushings.
  - check the condition of the shock absorbers.
  - If equipped with a retractable axle, check the condition of the lift mechanism. If air powered, check for leaks.
- Check the condition of the brake drums and hoses. Look for any wear due to rubbing.

- Check the lights and reflectors:
  - Be sure side-marker lights are clean, operable, and the proper color (red at rear; others, amber).
  - Be sure side-marker reelectors are clean and the proper color (red at rear: others, amber).

(6) Check the rear:

- Check the lights and reflectors:
  - Be sure rear clearance and identification lights are clean, operable, and the proper color (red at rear).
  - Be sure reflectors are clean and the proper color (red at rear).
  - Be sure taillights are clean, operable, and the proper color (red at rear).
  - Be sure the right rear turn signal is operating and the proper color (red; amber at rear).
- Be sure license plates are present, clean, and secured.
- Be sure splash guards are present, not damaged, properly fastened, and not dragging on the ground or rubbing the tires.

(7) Check the left rear side:

- Check all items as done on the right rear side.
- Also check the battery (if not mounted in the engine compartment):
  - Be sure the battery box is securely mounted to the vehicle and has secure cover.
  - Be sure batteries are secured against movement and are not broken or leaking.
  - Be sure fluid in the batteries is at the proper level (except maintenance-free types). If maintenance-free batteries, check the sight-glass for the proper reading (green dot).
  - Be sure cell caps are present and securely tightened (except maintenance-free types).
  - Be sure vents in cell caps are free of foreign material (except maintenance-free types).

(8) Check cargo securement (trucks):

- Be sure cargo is properly blocked, braced, tied, chained, or otherwise secured.
- Be sure header and tail boards are adequate and properly secured (if required).
- Be sure side boards and/or stakes are strong enough, free of damage, and properly set in place (if equipped).
- Be sure end gates are free of damage and properly secured in stake sockets.

- Be sure canvas or tarpaulin (if required) is properly secured to prevent tearing, billowing, or blocking of mirrors or lights.
- If oversize (length and/or width), be sure all required signs and/or additional lights and/or flags are properly mounted and the driver has all required permits.
- Be sure curb-side and rear cargo compartment doors are secured, latched/locked, and have required security seals.

f. **Step 6- Check Signal Lights.** Check the following:

(1) Get in the vehicle and turn off lights. Turn on stop lights (apply trailer hand brake or have a helper put on the brake pedal). Turn on left turn signal lights.

(2) Get out of the vehicle and check lights:

- Be sure the left front turn signal light is clean, operating, and the proper color (amber or white).
- Be sure the left rear turn signal light and both stop lights are clean, operating, and the proper color (red, yellow, or amber).

g. **Step 7- Check the Brake System.** Get in the vehicle. Turn off lights not needed for driving. Check for all required papers such as trip manifests and permits. Secure all loose articles in the cab. (They might interfere with the operation of the controls or hit you in a crash.) Start the engine.

(1) If the vehicle has hydraulic brakes, pump the brake pedal three times. Then firmly press the pedal and hold it for five seconds. The pedal should not move. If it does, there may be a leak or other problem. Get it fixed before driving.

(2) If the vehicle has air brakes, do the checks described in Chapters 5 and 6 of this manual.

(3) Test the parking brake. Fasten your seat belt. Let the vehicle move forward slowly. Apply the parking brake. If the parking brake does not stop the vehicle, it is faulty. Get it fixed.

(4) Test the service brake stopping action. Go about 5 mph. Push the brake pedal firmly. Pulling to one side can mean brake trouble. Any unusual brake pedal feel or delayed stopping action means trouble.

You must inspect for cargo overloading, correct balance, and securement before each trip. If the vehicle contains HAZMAT, you must inspect for proper papers and placarding.

This completes the pre-trip inspection. If you find deficiencies during inspections that make the vehicle unsafe, get them fixed. Federal and state laws forbid operating an unsafe vehicle.

2-22. DURING-TRIP INSPECTIONS. During your trip, check your vehicle operation regularly and your cargo at required intervals. Use your senses (sight, sound, smell, and touch) to check for problems during your trip. If you see, hear, smell, or feel anything that might mean trouble, check it out. During trips you should do the following:

- Watch gauges for signs of trouble.
- Check critical items when you stop:
  - Tires, wheels, and rims.
  - Brakes.
  - Lights.
  - Brake and electrical connections to the trailer.
  - Trailer coupling devices.
  - Cargo securement devices.
- While en route (during a trip), check the following:
  - Instruments.
  - Air pressure gauge (if you have air brakes).
  - Temperature gauges.
  - Pressure gauges.
  - Ammeter/voltmeter.
  - Mirrors.
  - Tires.
  - Cargo and cargo covers.
- Make safety inspections within the first 25 miles of a trip and every 150 miles or every 3 hours (whichever comes first) afterward. Check the following:
  - Cargo doors and/or cargo securement.
  - Tires for correct air pressure. Be sure they are not overheated.
  - Brakes for overheating. (Put the back of your hand near the brake drums to test.)

WARNING

Brake drums may be extremely hot. Do not touch brake drums with your bare hands. It could result in severe personal injury.

  - Coupling devices.

2-23. AFTER-TRIP INSPECTION. You must make an after-trip inspection at the end of the trip, day, or tour of duty on each vehicle you operated. The inspection may include listing any problems you find in a vehicle condition report. Report discrepancies that affect safety or could lead to mechanical breakdown. The vehicle inspection report tells the vehicle owner and maintenance personnel about problems that may need fixing. Keep a copy of your report in the vehicle for one day. That way, the next driver can learn about any problems you have found.

Test Your Knowledge

1. Name some things you should check on the front of your vehicle during the walkaround inspection.
2. Why should you check the wheel bearing seals?
3. How many red reflective triangles should you carry?
4. How do you test hydraulic brakes for leaks?
5. Can you bring the vehicle inspection memory aid with you to the test?
6. Why put the starter switch key in your pocket during the pre-trip inspection?

These questions may be on the test. If you cannot answer all questions, reread paragraphs 2-21, 2-22, and 2-23.

CHAPTER 3

SAFE CARGO TRANSPORT

This chapter contains information on safety transporting cargo. All drivers must understand basic cargo safety rules and pass the general knowledge test to receive a license.

Cargo improperly loaded can be dangerous to you and other highway users. Overload can damage your vehicle. Steering can be affected if your load is not properly distributed. If your cargo is not properly secured, it can become dislodged and damage equipment. It can also cause an injury or kill personnel during a quick stop or crash.

Drivers are responsible for their load. This is true whether you load and secure the cargo yourself or someone else does it, you are still responsible for the following:

- Inspecting the cargo.
- Recognizing overloads and poorly balanced weight.
- Knowing the cargo is securely tied down or covered.

NOTE: If you intend to carry HAZMAT that requires placards on your vehicle, you must have a HAZMAT endorsement. Chapter 9 contains information you will need to pass the HAZMAT written test.

3-1. CARGO INSPECTION. As part of the pre-trip inspection, check for overloads, poorly balanced weight, and improperly secured cargo. Inspect cargo before starting your trip. Make the necessary adjustments to your cargo before beginning the trip. Inspect the cargo and its securing devices within 25 miles after starting a trip. Make necessary adjustments if needed. Check the cargo devices as often as necessary during a trip to keep the load secure. Inspect the cargo again after you have driven for 3 hours or 150 miles and after every break taken during driving. Federal, state, and local regulations of weight, securerment, cover, and truck routes vary greatly. Know the regulations.

3-2. WEIGHT AND BALANCE. You are responsible for the load. Do not overload the vehicle. You should know the following:

a. **GVW.** The total weight of a single vehicle plus its load.

b. **GCW.** The total weight of a powered unit plus trailer plus the cargo.

c. **GVWR.** The maximum weight specified by the manufacturer for a single vehicle plus its load.

d. **GCWR.** The maximum weight specified by the manufacturer for a specific combination of vehicles plus its load.

e. **Axle Weight.** The weight transmitted to the ground by one axle or one set of axles.

f. **Tire Load.** The maximum safe weight a tire can carry at a specified pressure. The rating could be located cn the side of each tire.

g. **Suspension Systems Weight Capacity Rating.** Suspension systems have a manufacturer weight capacity rating.

h. **Coupling Device Capacity.** Coupling devices are rated for the maximum weight they can pull and/or carry.

You must keep weights within the legal limits. States have maximums for GVWs, GCWs, and axle weights. Some roadways you travel may have additional restrictions. Often, a bridge formula sets maximum axle weights. A bridge formula permits less maximum axle weight for axles that are closer together. This is to prevent overloading bridges and roadways.

Overloading can seriously affect steering, braking, and speed control. Overloaded trucks will go very slowly up grades. They may gain too much speed on downgrades causing stopping distance to increase. Brakes can fail when forced to work too hard. Use proper techniques for driving up and down grades.

During bad weather or in mountainous terrain, it may not be safe to operate at legal maximum weights. Know your route and consider the following factors before driving:

- *Do not be top-heavy*. The height of the vehicle's center of gravity is important for safe handling. A high center of gravity means you are more likely to tip over. It is dangerous in curves or if you have to swerve to avoid a hazard. You must distribute the cargo so the center of gravity is as low as possible. Put the heaviest parts of the cargo under the lightest part.
- *Balance the weight*. Poor weight balance can make vehicle handling unsafe. Too much weight on the steering axle can cause hard steering. Too much weight can also damage the steering axle and tires. Underloaded front axles can make the steering axle weight too light to steer safely. Too little weight on the driving axles can cause poor traction. This could cause the drive wheels to spin easily. During bad weather, the vehicle may be unable to keep moving. Heavy loads with a high center of gravity increases the chance of a rollover. On flatbed vehicles, heavy loads with a high center of gravity increases the chance of the load to shift to the side or fall off. Figure 3-1 shows examples of the right and wrong way to balance cargo weight.

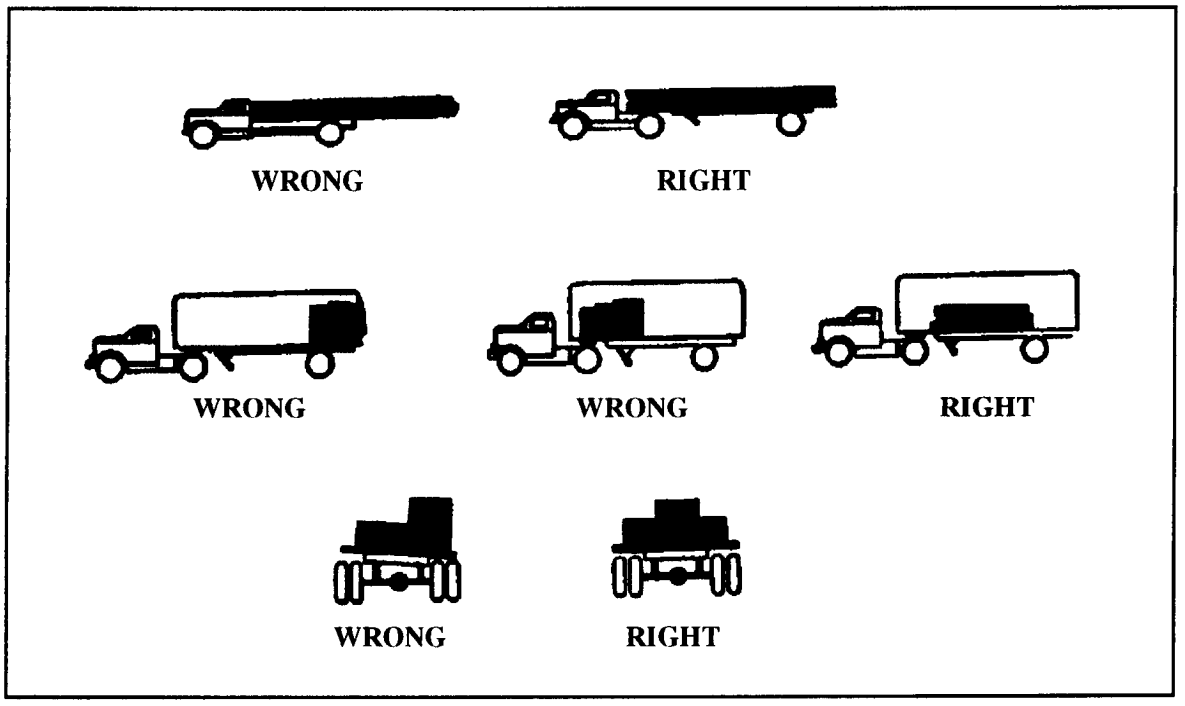


Figure 3-1. Right and wrong ways to load cargo

Test Your Knowledge

1. Drivers are responsible for what three things related to cargo?
2. How often must you stop while on the road to check the cargo?
3. How is the gross combination weight rating different from the gross combination weight?
4. Name two situations where legal maximum weights may not be safe.
5. What can happen if you do not have enough weight on the front axle?

These questions may be on the test. If you cannot answer all questions, reread paragraphs 3-1 and 3-2.

3-3. SECURING CARGO. Use blocking in front, back, and on both sides of a piece of cargo to keep it from sliding. Blocking devices should be shaped to fit snugly against cargo. Secure the devices to the cargo deck to prevent cargo movement. Use bracing to prevent cargo movement. Bracing goes from the cargo's upper part to the cargo compartment's floor and walls. On flatbed trailers or trailers without sides, cargo must be tied down to keep it from shifting and falling. In closed vans, tie-downs are also important to prevent cargo shifting that may affect the vehicle's handling.

- Use tie-downs of the proper type and strength. The combined strength of cargo tie-downs must be strong enough to lift 1 1/2 times the weight of the cargo being tied down. Proper tie-down equipment including ropes, straps, chains, and tensioning devices (winches, ratchets, and clinching components) must be used.

- Attach tie-downs to the vehicle correctly (use hooks, bolts, rails, or rings). Use at least one tie-down for each 10 feet of cargo. Make sure you have enough tie-downs to do this. No matter how small the cargo is, use at least two tie-downs.
- There are special requirements for securing various heavy pieces of metal. Find out what they are and use them if you are to carry such loads.

Front end header boards (headache racks) protect you from the cargo during a collision. Make sure the front end structure is in good condition. The front end structure should block the forward movement of any cargo you carry.

The two basic reasons for covering cargo are to protect people from spills and to protect the cargo from the weather. Spill protection is a safety requirement in many states. Be familiar with the laws of the state in which you are driving. Use your mirrors to check cargo covers from time to time while driving. A flapping cover can tear loose, uncovering the cargo and possibly blocking your view or someone else's.

You cannot inspect sealed loads, but you should check that you do not exceed gross weight and axle weight limits. Containerized loads are generally used when freight is carried part way by rail or ship. Truck delivery occurs at the beginning and/or end of the journey. Some containers have their own tie-down devices or locks that attach directly to a special frame. Others must be loaded onto flatbed trailers and secured with tie-downs just like any other large cargo.

Test Your Knowledge

1. What is the minimum number of tie-downs for any flatbed load?
2. What is the minimum number of tie-downs for a 20-foot load?
3. Name the two basic reasons for covering cargo on an open bed.
4. What must you check before transporting a sealed load?
5. What is the combined strength requirements for all tie-downs?

These questions may be on the test. If you cannot answer all questions, reread paragraph 3-3.

3-4. OTHER SPECIAL CARGO NEEDS. Observe the following precautions when transporting the below listed special types of cargo.

- Dry bulk tanks require special care because they often have a high center of gravity, and the load can shift. Be extremely cautious (slow and careful) going around curves and making sharp turns.
- Hanging meat (suspended beef, pork, and lamb) in a refrigerated truck can be unstable and have a high center of gravity. Go slowly and cautiously on sharp curves such as off- and on-ramps.

- Livestock can move around in a trailer causing unsafe handling. If hauling less than a full load, use false bulkheads to keep livestock bunched together. Even when bunched, take special care because livestock can lean on curves. This can shift the center of gravity and make rollovers more likely.
- Oversize (overlength or overwidth and/or overweight) loads require special transit permits. Driving is usually limited to certain times. Special equipment may be required, such as wide load signs, flashing lights, or flags. These special loads may require a police escort or pilot vehicles bearing warning signs and/or flashing lights. These special loads require special driving care.

Test Your Knowledge

1. What method is used to keep livestock bunched together when they are being transported in a trailer?
2. What special equipment may be necessary when hauling oversized loads?
3. What safety precautions should you use when transporting hanging meat in a refrigerated truck?
4. What types of cargo often has a high center of gravity?

These questions may be on the test. If you cannot answer all questions, reread paragraph 3-4.

CHAPTER 4

PASSENGER TRANSPORT

To comply with the law, bus drivers must have a license authorizing them to operate a passenger transport vehicle if it is designed to seat 16 or more people, including the driver.

NOTE: This manual does not address transporting passengers in a tactical wheeled vehicle.

This chapter contains information you must know to safely drive a bus. You should also study Chapter 2 of this manual. (If the bus is equipped with air brakes, you should also study Chapter 5.) Chapters 10, 11, and 12 contains information about the performance tests.

4-1. PRE-TRIP INSPECTION. Before driving a bus, make sure it is safe. During the pre-trip inspection, check defects previous drivers reported. Only if these defects have been fixed should you sign the previous driver's report. This is your certification that the defects reported earlier have been fixed. Be sure the bus is in good working order before driving. Check the following:

- Service brakes including air hose couplings (if the bus has a trailer or semitrailer).
- Parking brake.
- Steering mechanism.
- Lights and reflectors.
- Tires (front wheels must not have recapped or regrooved tires).
- Horn.
- Windshield wipers.
- Rear-vision mirrors.
- Coupling devices (if present).
- Wheels and rims.
- Emergency equipment.

As you check the outside of the bus, close any open emergency exits. Also close any open access panels (for baggage, restroom service, and engine) before driving.

People sometimes damage unattended buses. Always check the bus interior before driving to ensure rider safety. Aisles and stairwells must al ways be clear. The following parts of your bus must be in safe working condition:

- Each handhold and railing.
- Floor covering.
- Signaling devices (including the restroom emergency buzzer if the bus has a restroom).
- Emergency exit handles.

The seats must be safe for riders. All seats must be securely fastened to the bus.

Never drive with an open emergency exit door or window. The emergency exit sign on an emergency door must be clearly visible. If there is a red emergency door light, it must work. Turn it on at night or any time you use the outside lights.

You may lock some emergency roof hatches in a partly open position for fresh air. Do not leave them open as a regular practice. Remember that while driving with them open, the bus has a higher overhead clearance.

Be sure the bus has the fire extinguisher and emergency reflectors required by law. The bus must have spare electrical fuses unless it is equipped with circuit breakers.

The driver's seat will have a seat belt. Always buckle up your seat belt.

4-2. LOADS AND THE TRIP. Do not let riders leave carry-on baggage in a doorway or aisle. There should be nothing in the aisle that might trip other riders. Secure baggage and freight in ways that avoids damage and also does the following:

- Lets the driver move freely and easily.
- Lets riders exit by any window or door in an emergency.
- Protects riders from injury if carry-on baggage falls or shifts.

Look for cargo or baggage containing HAZMAT. Most HAZMAT cannot be carried on a bus. The Federal Hazardous Material Table (Appendix A) shows which materials are hazardous. These materials pose a risk to health, safety, and property during transportation. The rules require shippers to mark containers of HAZMAT with the material's name, ID number, and hazard label. Figure 4-1 shows examples of the different 4-inch, diamond-shaped hazard labels. Watch for these labels. Do not transport HAZMAT unless you are sure of the rules.

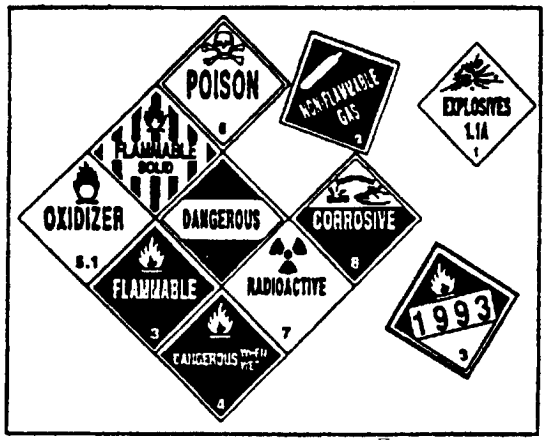


Figure 4-1. Examples of labels

Buses may carry small arms ammunition labeled ORM-D, emergency hospital supplies, and drugs. You can carry small amounts of another HAZMAT if the shipper cannot send them any other way. Buses must never carry the following:

- Class 2 poison, liquid Class 6 poison, tear gas, or irritating material.
- More than 100 pounds of solid Class 6 poisons.
- Explosives in the space people occupy, except small arms ammunition.

- Labeled radioactive materials in the space people occupy.
- More than 500 pounds total of allowed HAZMAT and no more than 100 pounds of any single class.

Riders may sometimes board a bus with an unlabeled HAZMAT. Do not let riders carry on common hazards such as car batteries or gasoline.

No rider may stand forward of the rear of the driver's seat. Buses designed to allow standing must have a 2-inch line on the floor or markings to show riders where they cannot stand. This is the standee line. All standing riders must stay behind the standee line.

When arriving at the destination or intermediate stops, announce the following:

- Location.
- Reason for stopping.
- Next departure time.
- Bus number.

Remind riders to take carry-ons with them if they get off the bus. If the aisle is on a lower level than the seats, remind riders to step down. Let them know before you come to a complete stop.

Charter bus drivers should not let riders on the bus until departure time. This helps prevent theft or vandalism of the bus.

Test Your Knowledge

1. Name some things to check in the bus during the pre-trip inspection.
2. What are some HAZMAT you can transport by bus?
3. What are some HAZMAT you cannot transport by bus?
4. What is a standee line?

These questions may be on the test. If you cannot answer all questions, reread paragraphs 4-1 and 4-2.

4-3. THE TRIP. Many charter and inter-city carriers have passenger comfort and safety rules. Mention rules about smoking, drinking, or use of radio and tape players at the start of the trip. Explaining the rules will help avoid trouble. While driving, scan the interior of the bus, the road ahead, to the sides, and to the rear. Remind riders about the rules and to keep arms and heads inside the bus.

Riders can stumble when getting on or off and when the bus starts or stops. Caution riders to watch where they step when leaving the bus. Wait for them to sit or brace themselves before starting. Starting and stopping should be smooth to avoid rider injury.

Occasionally, you may have a drunk or disruptive rider. You must ensure the safety of this rider and other passengers. Discharge such riders only where it is safe for them; for example, at the

next scheduled stop or in a well-lighted area where there are other people. Many carriers have guidelines for handling disruptive riders.

Bus crashes often happen at intersections. Use caution, even if a signal or stop sign controls other traffic. School and mass transit buses sometimes scrape off mirrors or hit passing vehicles when pulling out from a bus stop. Remember the clearance your bus needs. Watch for poles and tree limbs at stops. Know the size of the gap the bus needs to accelerate and merge with traffic. Wait for the gap to open before leaving the stop. Never assume other drivers will brake to give you room when you signal or start to pull out.

Crashes result from excessive speed, often when the road is slippery. Every banked curve has a safe design speed. In good weather, the posted speed is safe for cars, but it may be too high for many buses. Even with good traction, the bus may roll over; with poor traction it might slide off the curve. Reduce your speed for curves. If the bus leans toward the outside on a banked curve, you are driving too fast.

Stop at railroad crossings. Stop the bus between 15 and 50 feet before railroad crossings. Listen and look in both directions for trains. Open your forward door if it improves your ability to see or hear an approaching train. Before crossing, after a train has passed, be sure another train is not coming in the other direction on the other track. If the bus has a manual transmission, do not change gears while crossing tracks.

You do not have to stop, but must slow down and carefully check for other vehicles at the following locations:

- At streetcar crossings.
- At railroad tracks used only for industrial switching within a business district.
- Where a policeman or flagman is directing traffic.
- If a traffic signal shows green.
- At crossings marked abandoned or exempt crossing.

Stop at drawbridges that do not have a signal light or traffic control attendant. Stop at least 50 feet before the draw of the bridge. Be sure the draw is completely closed before crossing. You do not need to stop, but must slow down and be sure it is safe, when--

- There is a traffic light showing green.
- The bridge has an attendant or traffic officer that controls traffic whenever the bridge opens.

4-4. AFTER-TRIP VEHICLE INSPECTION. Inspect your bus after each shift. If you work for an interstate carrier, you must complete a written inspection report for each bus driven. The report must specify each bus and list any defects that would affect safety or result in a breakdown, State on your report if there are no defects.

Riders sometimes damage safety-related parts such as handholds, seats, emergency exits, and windows. Report damage after each shift so mechanics can make the repairs before dispatching it again. Mass transit drivers should make sure passenger signaling devices and brake-door interlocks work properly.

4-5. PROHIBITED PRACTICES. Be sure you observe the following:

- Do not fuel a bus with riders on board unless absolutely necessary. Never refuel in a closed building with riders on board.
- Do not talk with riders or engage in any other distracting activity while driving.
- Do not tow or push a disabled bus with riders aboard either vehicle, unless getting off would be unsafe. Only tow or push the bus to the nearest safe spot to discharge passengers. Follow your employer's guidelines.

NOTE: Cleanup any fuel spills IAW unit environmental SOP.

4-6. USE OF BRAKE-DOOR INTERLOCKS. Urban mass transit coaches may have a brake and accelerator interlock system. The interlock applies the brakes and holds the throttle in idle position when the rear door is open. The interlock releases when you close the rear door. Do not use this safety feature as the parking brake.

Test Your Knowledge

1. Does it matter where you make a disruptive passenger get off the bus?
2. How far from a railroad crossing should you stop?
3. When must you stop before crossing a drawbridge?
4. Describe from memory the prohibited practices listed in paragraph 4-5.
5. The rear door of a transit bus must be open to put on the parking brake? True or False?

These questions may be on the test. If you cannot answer all questions, reread paragraphs 4-3 through 4-6.

CHAPTER 5

AIR BRAKES

This chapter covers the air brake systems used on trucks and buses. Air brakes uses compressed air to make them work. You can apply all the braking force you need to each wheel of a heavy vehicle, even tractors pulling two or three trailers. Air brakes, if maintained and used properly, will safely stop large vehicles. You must know more about air brakes than the simpler brake systems used on light vehicles. Therefore, study this chapter closely. If you are going to pull a trailer with air brakes, also read Chapter 6. Air brake systems are three braking systems combined. They are described as follows:

a. **Service Brake System.** This system applies and releases the brakes when the brake pedal is used.

b. **Parking Brake System.** This system applies and releases the parking brakes when the parking brake control is used.

c. **Emergency Brake System.** This system uses parts of the service and parking brake systems to stop the vehicle when a brake system fails.

5-1. PARTS OF AN AIR BRAKE SYSTEM. The following describes each part of the air brake system and its function.

- The air compressor pumps air into the air storage tanks (reservoirs). Gears or a V-belt connect the air compressor to the engine. The compressor may be air cooled or coded by the engine cooling system. It may have its own oil supply or it may be lubricated by engine oil. If the compressor has its own oil supply, check the oil level before driving.
- The air compressor governor controls when the air compressor pumps air into the air storage tanks. When air tank pressure rises to the cut-out level (around 125 psi), the governor stops the compressor from pumping air. When the tank pressure falls to the cut-in pressure (around 100 psi), the governor lets the compressor start pumping again.
- Air storage tanks hold compressed air. The number and size of the air tanks vary among vehicles. The tanks will hold enough air so you can use the brakes several times even if the compressor stops working.
- Compressed air usually has some water and compressor oil in it that is bad for the air brake system. For example, the water can freeze in cold weather and cause brake failure. The water and oil tend to collect in the bottom of the air tank. Therefore, each air tank has a drain valve in the bottom. The two types are a manual drain valve and an automatic drain valve.

NOTE: When using the manual or automatic drain valves, make sure no oil leaks and contaminate the environment. Clean up any oil spill IAW unit environment SOP.

a. **Manual Drain Valve.** Manually turn the drain valve a quarter turn or pull a cable to operate the drain valve (Figure 5-1, page 5-2). Drain tanks after each day of driving.

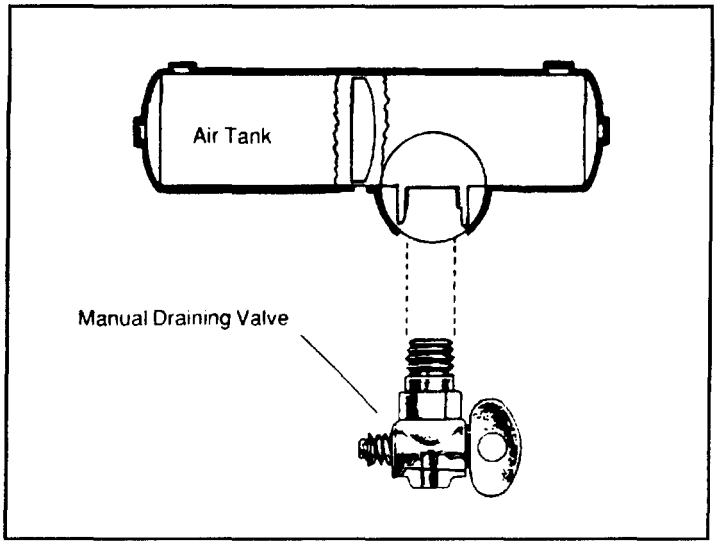


Figure 5-1. Manual drain valve

b. **Automatic Drain Valve.** This valve automatically expels the water and oil from the system. Automatic drain valves may have electric heating devices to keep them from freezing in cold weather. Automatic drain valves may also be equipped for manual draining. If so, drain tanks after each day of driving. Be sure to close tank drain valves after all moisture has been expelled.

Some air brake systems have an alcohol evaporator to put alcohol into the air system. This reduces the risk of ice in air brake valves and other brake parts during cold weather. Ice inside the system can make the brakes inoperative. Check the alcohol cent airier and till every day during cold weather, if necessary. You must still drain the air tank daily to get rid of water and oil (unless the drain valves are automatic).

A safety relief valve is installed in the first tank to which the air compressor pumps air. The safety valve protects the tank and the system from too much pressure. The valve is usually set to open at 150 psi. If the safety valve releases air, the system is defective. Contact your maintenance section and have the safety valve fixed before you operate the vehicle.

Push down on the brake pedal (also called the foot valve or treadle valve) to apply the brakes. Push the pedal down harder to apply more air pressure. Let up on the brake pedal to reduce the air pressure and release the brakes. Releasing the brakes lets some compressed air out of the system. This reduces the air pressure in the tanks. The air compressor must replace the expended air. If you press and release the pedal unnecessarily, you let out air faster than the compressor can replace it. If the pressure gets too low, the brakes will fail. When you push the brake pedal down, two forces push against your foot: one force comes from a spring; and the second, from the air pressure going to the brakes.

Each wheel uses foundation brakes. Brake drums are located on each end of the vehicle's axles. The wheels are bolted to the drums. 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 that slows the vehicle and creates heat. The heat a drum can take without damage depends on how hard and how

long you use the brakes. Too much heat can stop them from working. The following describes different types of brakes used on vehicles.

- The most common type of foundation brake is the S-cam (Figure 5-2). When you push the brake pedal, air supplied to each brake chamber. Air pressure pushes the rod out, moving the slack adjuster. This twists the brake cam shaft and turns the S-cam. The S-cam forces brake shoes away from one another and press them against the inside of the brake drum. When you release the brakae pedal, the S-cam rotates back away from the the brake drum. A spring pulls the brake shoes away from the drum. When released, the wheels can roll freely again.
- In wedge brakes, the brake chamber push rod pushes a wedge directly between the ends of two brake shoes. This forces 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 brake may be self-adjusting or need manual adjustment.
- In air-operated disc brakes, air pressure acts on a brake chamber and slack adjuster, like S-cam brakes. 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.

NOTE: Wedge brakes and disc brakes are less common than S-cam brakes.

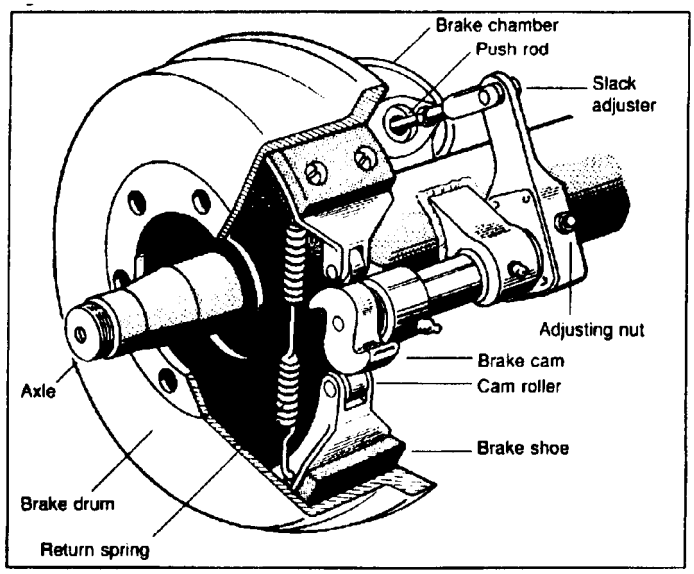


Figure 5-2. S-cam air brake

All air-braked vehicles have supply pressure gauges connected to the air tank. These gauges tell you how much pressure is in the air tanks. If the vehicle has a dual system, each system has a gauge, or there is a single gauge with two needles. Paragraph 5-2 discusses dual air brake systems.

The application pressure gauge shows how much air pressure you are applying to the brakes. This gauge is not installed on all vehicles. If you need to use increased pressure to hold the same speed going down grades, the brakes are fading. Slow down and use a lower gear. Brakes out of adjustment, air leaks, or mechanical problems can require you to increase pressure.

Vehicles with air brakes must have a low air pressure warning signal. It must activate before the air pressure in the tanks falls below 60 psi. On older model vehicles, it is half the compressor governor cut -out pressure. For example, on M52 tractors, the governor cut-out pressure is 90 psi. The warning buzzer should activate at approximately 45 psi. The warning is usually a red light or a buzzer. Another type of warning is the wig wag. This device drops a mechanical arm into view when the air pressure drops below 60 psi. An automatic wig wag will rise out of view when the air pressure goes above 60 psi. You must place the manual reset type in the out-of-view position. It will not stay in place until the pressure in the system is above 60 psi. On large buses, low pressure warning devices commonly signal at 80 to 85 psi.

You must warn drivers behind you when you apply the brakes. The air brake system does this with an electric switch that works by air pressure. The switch turns on the brake lights when you apply the air brakes.

Some older vehicles (before 1975) have a front brake limiting valve and a control in the cab. The control is usually marked normal and slippery. When the control is in the slippery position, the limiting valve cuts the normal air pressure to the front brakes by half. Limiting valves were used to reduce the chance of the front wheels skidding on slippery surfaces. However, they reduce the vehicle's stopping power. Front-wheel braking is good under all conditions. Tests have shown that front-wheel skids from braking are not likely even on ice. For normal stopping power, ensure the control is in the normal position. Many vehicles have automatic front-wheel limiting valves. They reduce the air to the front brakes, unless you apply the brakes very hard (60 psi or more application pressure). Drivers cannot control these valves.

All straight trucks, truck tractors, and buses must have emergency and parking brakes. Mechanical force must hold them on because air pressure can eventually leak away, Spring brakes are usually used to meet these needs. When driving, air pressure holds back powerful spring.. If the air pressure is removed, the springs put on the brakes. A parking brake control in the cab lets you release the air from the spring brakes. Then the springs activate the brakes. A leak in the air brake system that causes all the air to be lost will cause the springs to activate the brakes. Straight truck and truck tractor spring brakes will fully activate when air pressure drops to 20 to 45 psi. Do not wait for the brakes to come on automatically. When the low air pressure warning light and buzzer first come on, safely stop the vehicle while you can still control the brakes. The braking power of spring brakes depends on the adjustment of the brakes. If the brakes are not properly adjusted, neither the regular brakes nor the emergency parking brakes will work right.

In newer vehicles with air brakes, a yellow, diamond-shaped control knob puts on the parking brakes. Pull the knob out to engage the parking brakes (spring brakes). Push in to release. On older vehicles, a lever may control the parking brakes. Use the parking brakes whenever you park. The following describes how to apply parking brakes.

CAUTION

Never push the brake pedal down when the spring brakes are on. The combined forces of springs and air pressure could damage the brakes. Many brake systems are designed so this will not happen, but not all systems are set up that way, and those that are may not always work.

- Some vehicles have a control handle on the dash board to apply spring brakes gradually. This modulating valve is spring loaded so you can feel the braking action. The more the control lever is moved, the harder the braking. They work this way so you can control the spring brakes if the service brakes fail. When parking a vehicle with a modulating control valve, move the lever as far as it will go. Hold it in place with the locking device.
- Some vehicles have dual parking control valves. When main air pressure is lost, the spring brakes activate. Some vehicles, such as buses, have a separate air tank that can be used to release the spring brakes. This lets you move the vehicle in an emergency. One of the valves is a push-pull type to put on the spring brakes for parking. The other valve is spring loaded in the out position. When you push the control in, air from the separate air tank releases the spring brakes so you can move. When you release the button, the spring brakes are reactivated. The separate tank only has enough air to do this a few times. So, plan carefully when moving. Otherwise, you maybe stopped in a dangerous location when the separate air supply is exhausted.

Test Your Knowledge

1. Why must air brakes be drained?
2. Why is a supply pressure gauge used?
3. All vehicles with air brakes must have a low air pressure warning signal. True or False?
4. Front-wheel brakes are good under all conditions. True or False?

These questions may be on the test. If you cannot answer all questions, reread paragraph 5-1.

5-2. DUAL AIR BRAKE SYSTEMS. Most newer heavy-duty vehicles use dual air brake systems for safety. A dual air brake system has two separate air brake systems with a single set of brake controls. Each system has its own air tanks, hoses, and lines. One system operates the regular brakes on the rear axles; the other, the regular brakes on the front axle (and possibly one rear axle). Both systems supply air to the trailer (if there is one). The first system is the primary system; the other, the secondary system.

Before driving a vehicle with a dual air system, allow time for the air compressor to build up a minimum pressure of 100 psi in the primary and secondary systems. Watch the primary and secondary air pressure gauges (or needles, if the system has two needles in one gauge). Check the low air pressure warning light and buzzer. The warning light and buzzer should shut off when the air pressure in both systems rises to a value set by the manufacturer. This value must be greater than 60 psi.

The warning light and buzzer should come on before the air pressure drops below 60 psi in either system. If this happens while driving, stop right away and safely park the vehicle, If one air system is very low on pressure, either the front or rear brakes will not be operating fully. (This means you will take longer to stop.) Bring the vehicle to a safe stop. Get the air brake system fixed.

5-3. AIR BRAKE SYSTEM INSPECTION. Use the basic seven-step inspection procedure (in Chapter 2) to inspect your vehicle. A vehicle with air brakes has more things to inspect than one without them. These things are discussed in the order that they fit into the seven-step method.

- During step 2 (engine compartment checks), check the air compressor drive belt (if the compressor is belt-driven). If the air compressor is belt-driven, check the condition and tightness of the belt. The belt should be in good condition.
- During step 5 (walkaround inspection) do the following:

■ Check the manual slack adjusters on S-cam brakes. Park on level ground. Chock the wheels to keep the vehicle from moving. Disengage the parking brakes so you can move the slack adjusters. Use gloves and pull hard on each accessible slack adjuster. If a slack adjuster moves more than about one inch where the push rod attaches to it, it probably needs adjustment. Adjust it or have it adjusted. Slack adjustment on military vehicles is an organizational maintenance responsibility. Vehicles with too much brake slack can be very hard to stop. Out-of-adjustment brakes are the most common problem found in roadside inspections. Be safe. Check the slack adjusters.

■ Check brake drums (or discs), linings, and hoses. Brake drums (or discs) must not have cracks longer than half the width of the friction area. Linings (friction material) must not be hose, soaked with oil or grease, or dangerous] y thin. Mechanical parts must be in place and not broken or missing. Check the air hoses connected to the brake chambers. Be sure they are not cut or worn.

- For step 7 (brake system checks), check the following instead of checking the hydraulic brake shown in Chapter 2.

■ *Test the low pressure wining signal.* Shut the engine off when you have enough air pressure to inactivate the low pressure warning signal. Turn on the electrical power. Step on and off the brake pedal to reduce the air tank pressure. The low air pressure warning signal must come on before the pressure drops to less than 60 psi in the air tank (or the tank with the lowest air pressure in dual air systems). If the warning signal does not work, you could lose air pressure and not know it. This could cause sudden emergency braking in a single circuit air system. In dual systems, it will increase the stopping distance. Only limited braking can be done before the spring brakes are activated.

■ *Check that the spring brakes come on automatically.* Chock the wheels. Release the parking brakes when you have enough air pressure to do so. Shut off the engine. Step on and off the brake pedal to reduce the air tank pressure. The parking brake knob should pop out when the air pressure falls to the manufacturer's specification (usually between 20 to 45 psi). This activates the spring brakes.

■ *Check the air pressure buildup rate.* With the engine at operating RPM, the pressure should build from 85 to 100 psi within 45 seconds in dual air systems. (If the vehicle has larger than minimum air tanks, the buildup time can be longer and still be safe. Check the manufacturer's specifications.) In single air systems (pre-1975), typical requirements are pressure buildup from 50 to 90 psi within 3 minutes with the engine at an idle speed of 600 to 900 RPM. If the air pressure does not build up fast enough, the pressure may drop too low during driving. You may need an emergency stop. Do not drive until the problem is fixed.

■ *Test the air leakage rate.* With a fully charged air system (typically 125 psi), turn off the engine. Release the service brake. Time the air pressure drop. The loss rate should be less

than 2 psi in one minute for single vehicles and less than 3 psi in one minute for combination vehicles. Then apply 90 psi or more with the brake pedal. After the initial pressure drop (which you do not count), if the air pressure falls more than 3 psi in one minute for single vehicles or more than 4 psi for combination vehicles, the air loss rate is too much. Check for air leaks. Fix them before you drive the vehicle. Otherwise, you could lose your brakes while driving.

■ *Check the air compressor governor cut-in and cut-our pressure.* The air compressor should start pumping about 100 psi and stop about 125 psi. Check the manufacturer's specifications. Run the engine at a fast idle. The air governor should cut-out the air compressor about the manufacturer's specified pressure. With the engine idling, step on and off the brake to reduce the air tank pressure. The compressor should cut-in about the manufacturer's specified pressure. The pressure should start to rise. If the air governor does not work as described, it may need repair. A governor that does not work right may not keep enough air pressure for safe driving.

■ *Test the parking brake.* Stop the vehicle. Apply the parking brake. Gently pull against it in a low gear to test that it will hold.

■ *Test the service brakes.* Wait for normal air pressure and release the parking brake. Move the vehicle forward slowly (about 5 mph). Use the brake pedal to apply the brakes firmly. Note any pulling to one side, unusual feel, or delayed stopping action. This test may show you problems that you otherwise would not know about until you need to use the brakes.

Test Your Knowledge

1. What is a dual air brake system?
2. What are slack adjusters?
3. How can you check slack adjusters?
4. How can you test the low pressure warning signal?
5. How can you check that the spring brakes come on automatically?
6. What are the maximum leakage rates?

These questions may be on the test. If you cannot answer all questions, reread paragraphs 5-2 and 5-3.

5-4. AIR BRAKE USE. The foIlowing describes how to use the air brake in different situations.

a. **Normal Stops.** For normal stops, push the brake pedal down. Control the pressure so the vehicle comes to a smooth and safe stop. If you have a manual transmission, do not push the clutch in until the engine RPM is close to idle speed.

b. **Emergency Stops.** For emergency stops, brake so you can steer and control the vehicle to stay in a straight line. Use one of the following two methods:

- *Controlled braking (also called squeeze braking).* Put on the brakes as hard as you can without locking the wheels. Do not turn the steering wheel while doing this. If you must make large steering adjustments or if you feel the wheels sliding, release the brakes. Brake again when the tires get traction.
- *Stab braking.* Press on the brake pedal as hard as you can. Release the brakes when the wheels lock up. When the wheels start rolling, put on the brakes fully again. It can take up to

one second for the wheels to start rolling after you release the brakes. Stay off the brakes long enough to get the wheels rolling again. Otherwise, the vehicle may not stay in a straight line.

NOTE: The M939 series trucks carries with it a known risk. They have conventional air brake systems. These air brakes are very sensitive. Air brakes are unique in that braking force is proportional to pedal travel, but the driver does not experience resistance from the brake pedal. The driver undergoing training may respond to this lack of resistance by applying too much force to the brake pedal. This causes the brakes to lockup and the vehicle to become uncontrollable. Drivers of these trucks must be well trained in operating tactical trucks with air brakes.

WARNING

When driving the M939 series truck, apply brakes gradually when stopping. Panic stops will cause vehicle wheels to lock and the engine to stall. Power steering will be lost. Failure to apply brakes gradually may result in injury or death.

NOTE: If you drive a vehicle with anti-lock brakes, you should read and follow the directions found in the Owner's Manual for stopping quickly.

Chapter 2 discussed stopping distance. Air brakes have an added delay: the time required for the brakes to work after you push the brake pedal. With hydraulic brakes (used on cars and light/medium trucks), the brakes work instantly. With air brakes, it takes time (1/2 second or more) for the air to flow through the lines to the brakes. Thus, the total stopping distance for vehicles with air brake systems has four different factors:

Perception Distance
+ Reaction Distance
+ Brake Lag Distance
+ Effective Braking Distance
= Total Stopping Distance

The air brake lag distance at 55 mph on dry pavement adds about 32 feet. So at 55 mph, an average driver under good traction and brake conditions has a total stopping distance over 300 feet (longer than a football field).

When you use the brakes, shoes or pads rub against the brake drum or discs to slow the vehicle. Braking creates heat; but, brakes are designed to take a lot of heat. They can fade or fail from excessive heat caused by using them too much and not relying on the engine braking effect.

Excessive use of service brakes results in overheating and leads to brake fade. Brake fade results from excessive heat causing chemical changes in the brake lining that reduces friction and causes expansion of the brake drums. As the overheated drums expand, the brake shoes and linings have to move farther to contact the drums and the force of this contact is reduced. Continued overuse may increase brake fade until the vehicle cannot be slowed or stopped.

Brake fade is affected by adjustment. To safely control a vehicle, each brake must do its share of the work. Brakes out of adjustment will stop doing their share before those that are

correctly adjusted. The correctly adjusted brakes can overheat and fade leaving you insufficient braking available to control the vehicle. Brakes can get out of adjustment quickly, especially when they are hot. Check them frequently for proper adjustment.

Use brakes as a supplement to the braking effect of the engine on long and/or steep downgrades, Once the vehicle is in the proper low gear, perform the following steps in proper braking techniques:

- *Step 1* - Apply the brakes just hard enough to feel a definite slowdown.
- *Step 2* - When your speed is reduced to approximately 5 mph below your safe speed, release the brakes. (This application should last about three seconds.)

When your speed has again increased to your safe speed, repeat steps 1 and 2 above. For example: If your safe speed is 40 mph, do not apply the brakes until your speed reaches 40 mph. Now apply the brakes hard enough to gradually reduce your vehicle speed to 35 mph and then release the brakes. Repeat this as often as necessary until you reach the end of the downgrade.

If the low air pressure warning activates, stop and safely park the vehicle when possible. The system may have an air leak. Controlled braking is possible only while enough air remains in the air tanks. The spring brakes will come on when the air pressure drops to 20 to 45 psi. A heavily loaded vehicle will take a long distance to stop because the spring brakes do not work on all axles. Lightly loaded vehicles or vehicles on slippery roads may skid out of control when you apply spring brakes. It is much safer to stop while the tanks have sufficient air to use the foot brake.

Any time you park your vehicle use the parking brakes, except as noted below. Pull the parking brake control knob out to apply the parking brakes. Push it in to release them. The control will be a yellow, diamond-shaped knob labeled parking brakes on newer vehicles. On older vehicles, it may be a round, blue knob or another shape (including a lever that swings from side to side or up and down).

Do not use the parking brakes if the brakes are very hot or very wet in freezing temperatures. If you use them while they are hot, the heat can damage them. If you use them in freezing temperature when they are wet, they can freeze so the vehicle cannot move. Use wheel chocks to hold the vehicle. Let hot brakes cool before you use the parking brakes. If the brakes are wet, use the brakes lightly while driving in a low gear to heat and dry them.

If your vehicle does not have automatic air tank drains, drain your air tanks after each working day. Otherwise, the brakes could fail.

CAUTION

Never leave your vehicle unattended without applying the parking brakes or chocking the wheels. Your vehicle might roll and cause injury and damage.

Test Your Knowledge

1. Why should you be in the right gear before starting down a hill?
2. What factors can cause brakes to fade or fail?
3. The use of brakes on a long steep downgrade is only a supplement to the braking effect of the engine. True or False?
4. If you are gone only a short time, you do not need to use the parking brake. True or False?
5. How often should you drain air tanks?

These questions may be on the test. If you cannot answer all questions, reread paragraph 5-4.

CHAPTER 6

COMBINATION VEHICLES

This chapter contains information on combination vehicles (tractor-trailer, double trailers, triple trailers, straight truck, and trailer). This information will give you the minimum knowledge needed for driving common combination (single trailer) vehicles. Study Chapter 7 if you need to operate a vehicle towing double and triple trailers.

6-1. SAFELY DRIVING COMBINATION VEHICLES. Combination vehicles are usually heavier, larger, and require more driving skill than single vehicles. Thus, drivers of combination vehicles need more knowledge and skill than drivers of single vehicles. The following are some important safety factors that apply specifically to combination vehicles:

- More than half of truck driver deaths are from truck rollovers. When you pile more cargo up in a truck, the center of gravity moves higher up from the road. The truck becomes easier to turnover. Fully loaded rigs are 10 times more likely to roll over in a crash than empty vehicles.

■ To help prevent rollovers, keep the cargo as close to the ground as possible. Keeping cargo low is even more important in combination vehicles than in straight trucks. Also, keep the load centered on your vehicle. If you do not center the load with proper weight distribution, a rollover is more likely to occur. Spread out your cargo as much as possible (see Chapter 3).

■ Rollovers happen when you turn too fast. To help prevent rollovers, go slowly around corners and on- and off-ramps.

■ Trucks with trailers have a dangerous crack-the-whip effect. When you quickly change lanes, this effect can turn the trailer over. Avoid quick lane changes, especially when fully loaded. Rearward amplification causes the crack-the-whip effect. Figure 6-1, page 6-3 shows eight types of combination vehicles and their rearward amplification in a quick lane change. Vehicles with the least crack-the-whip effect are at the top; those with the most, at the bottom. Rearward amplification of 2.0 means that the rear trailer is twice as likely to turn over as the tractor. Triple trailers have a rearward amplification of 3.5. This means you can roll the last trailer of triple trailers 3.5 times as easily as a five-axle tractor-semitrailer.

- Steer gently and smoothly when you are pulling trailers. If you suddenly move your steering wheel, you could tip over a trailer. Follow far enough behind other vehicles (at least one second for every ten feet of your vehicle length plus one second if going over 40 mph). Look far enough down the road to avoid surprises and the need to make sudden lane changes. At night, drive slow enough to see obstacles with your headlights before it is too late to change lanes or stop gently. Slow down to a safe speed before turning.
- Control your speed whether fully loaded or empty. Empty, large combination vehicles take longer to stop than fully loaded ones. When lightly loaded, the very stiff suspension springs and strong brakes give poor traction. The wheels lockup very easily. Your trailer can swing out and strike other vehicles. Your tractor can jackknife very quickly (Figure 6-2, page 6-3). Drive bobtail tractors (tractors without semitrailers) very carefully. Bobtails can be very hard to stop smoothly. They take longer to stop than a tractor-semitrailer loaded to maximum gross weight. In any combination vehicle (rig), allow lots of following distance and look far ahead. so you can brake early. You do not want to be surprised and need to stop in a panic.

- When a trailer's wheels lock up, the trailer will usually swing around. This is more likely to happen when the trailer is empty or lightly loaded. This type of jackknife is called a trailer jackknife. It will occur when the trailer is at a 15-degree angle in relation to the tractor (Figure 6-3, page 6-4). Do the following to stop a trailer skid:

■ *Recognize the skid.* The earliest and best way to see that the trailer has started to skid is to look in your mirrors. Any time you apply the brakes hard, check mirrors to be sure the trailer stays where it should. Once the trailer swings out of your lane, preventing a jackknife is very difficult.

■ *Stop using the brake.* Release the brakes to get traction back. Do not use the trailer hand brake (if you have one) to straighten out the rig. This is the wrong thing to do since the brakes on the trailer wheels caused the skid in the first place. Once the trailer wheels grip the road again, the trailer will start to follow the tractor and straighten out.

- When a vehicle goes around a corner, the rear wheels follow a different path than the front wheels. This is known as off-tracking or cheating. Figure 6-4, page 6-4, shows how off-tracking causes a tractor-semitrailer's path to be wider than the vehicle itself. Longer vehicles will off-track more. The powered unit's (truck or tractor) rear wheels will off-track some. The trailer's rear wheels will off-track even more. If there is more than one trailer, the last trailer's rear wheels will off-track the most. Steer the front-end wide enough around a corner so the rear end does not run over the curb, pedestrians, or other vehicles. However, keep your vehicle's rear near the curb to keep other drivers from passing you on the right. If you cannot turn without entering another traffic lane, turn wide as you complete the turn (Figure 6-5, page 6-5) rather than swinging wide to the left before starting the turn (Figure 6-6, page 6-5). This will keep other drivers from passing you on the right. If drivers pass on the right, you might crash into them when you turn.

Take special care with double and triple trailers. (This section does not apply to military drivers that may be required to get a CDL.) More things can go wrong. Double and triple trailers are less stable than other commercial vehicles. To learn more about double and triple trailers read Chapter 7.

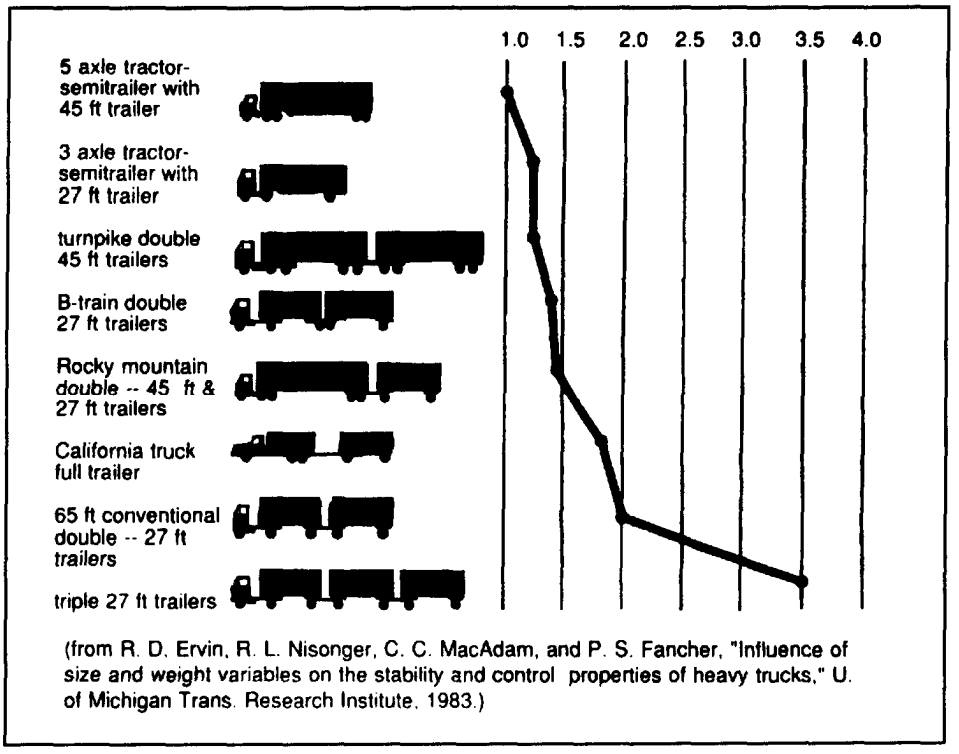


Figure 6-1. Rearward amplification of combination vehicles

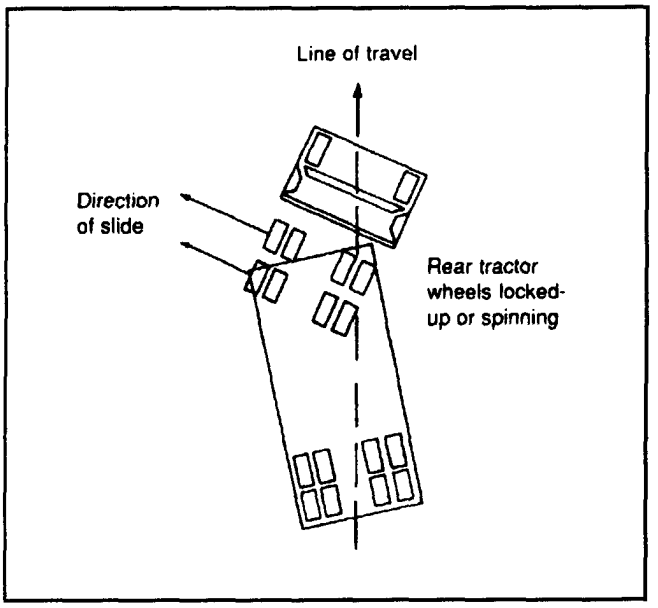


Figure 6-2. Tractor jackknife

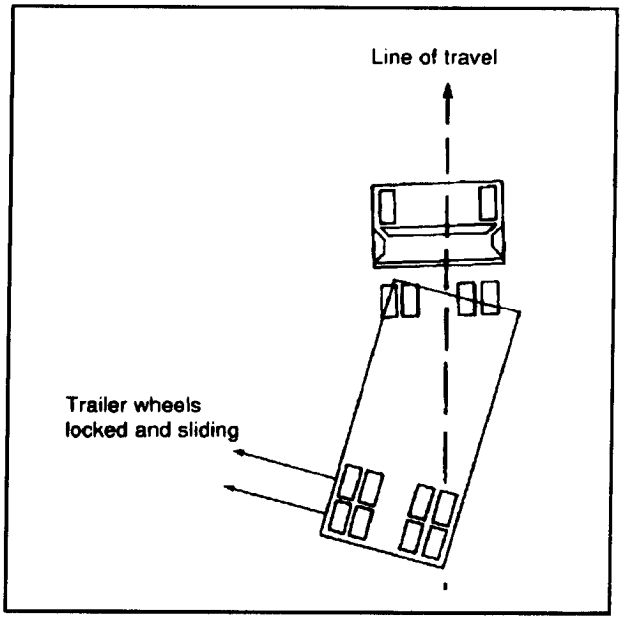


Figure 6-3. Trailer jackknife

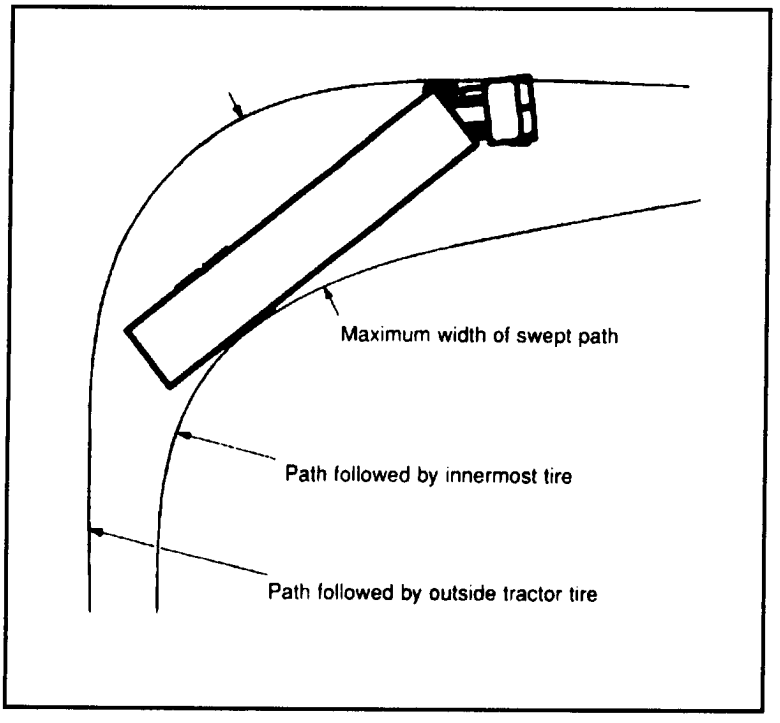


Figure 6-4. Off-tracking in a 90-degree turn

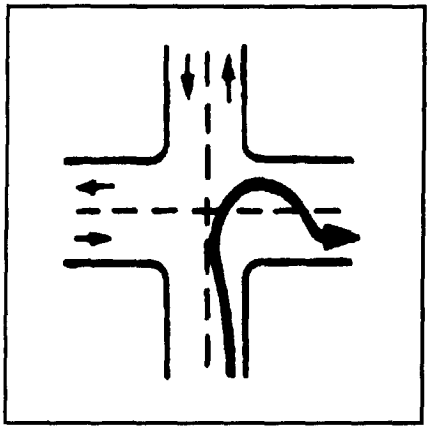


Figure 6-5. The right way to turn

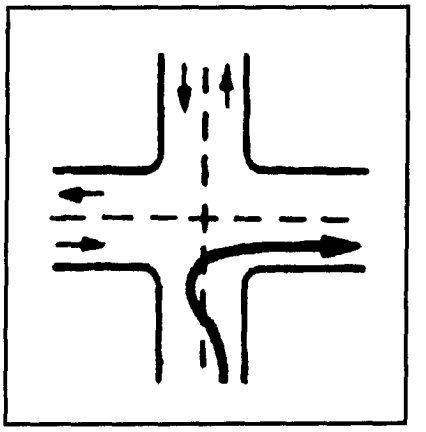


Figure 6-6. The wrong way to turn

Test Your Knowledge

1. What two things are important to prevent rollover?
2. When you turn suddenly while pulling doubles, which trailer is most likely to turn over?
3. Why should you not use the trailer hand brake to straighten out a jackknifing trailer?
4. What is off-tracking?
5. Why should you not turn as shown in Figure 6-6?

These questions may be on the test. If you cannot answer all questions, reread paragraph 6-1.

6-2. COMBINATION VEHICLE AIR BRAKES. Study Chapter 5 before reading this paragraph. In combination vehicles the braking system has pa&to control the trailer brakes, in addition to the parts described in Chapter 5.

The trailer hand valve (called trolley valve or Johnson bar) works the trailer brakes. Use the trailer hand valve to test the trailer brakes and during coupling and uncoupling procedures. Do not use it in driving, it may make the trailer skid. The foot brake sends air to all of the brakes (including the trailers'). There is less danger of causing a skid or jackknife when using just the foot brake. Never use the hand valve for parking. All the air might leak out, unlocking the brakes (in trailers that do not have spring brakes). Always use the parking brakes when parking. If the trailer does not have spring brakes, use wheel chocks to keep the trailer from moving.

The tractor protection valve keeps air in the tractor if the trailer breaks away or develops a bad leak. The trailer air supply control valve in the cab controls the tractor protection valve. The control valve lets you open and shut the tractor protection valve. The tractor protection valve will close automatically if air pressure is low (20 to 45 psi). When the tractor protection valve closes, it stops any air from leaving the tractor and lets the air out of the trailer emergency line. This makes the trailer emergency brakes come on. (Emergency brakes are covered later.)

The trailer air supply control on newer vehicles is a red, eight-sided knob used to control the tractor protection valve. Push in the knob to supply the trailer with air and pull out to shut the air off and put on the trailer emergency brakes. The valve will pop out (closing the tractor protection valve) when the air pressure drops to 20 to 45 psi. Tractor protection valve controls or emergent y valves on older vehicles may not operate automatically. They may have a lever rather than a knob. Use the normal position to pull a trailer. Use the emergency position to shut the air off and put on the trailer emergency brakes.

Every combination vehicle has two air lines: the service line and the emergency line. They run between each vehicle (tractor to trailer, trailer to dolly, dolly to second trailer).

a. **Service Line.** The service line (also called the control or signal line) carries air. The foot brake or the trailer hand brake controls the air pressure in the service line. Depending on how hard you press the foot brake or hand valve, the pressure in the service line will similarly change. The service line is connected to relay valves on the trailers to apply more or less pressure to the trailer brakes. The relay valve connects the trailer air tanks to the trailer air brakes. As pressure builds up in the service line, the relay valve opens. This sends air pressure from the trailer air tank to the trailer brake chambers and activates the trailer brakes.

b. **Emergency Line.** The emergency line (also called supply line) has two purposes:

(1) Supplies air to the trailer air tanks.

(2) Controls the emergency brakes on combination vehicles.

Loss of air pressure in the emergency line activates the trailer emergency brakes. A trailer breaking loose, tearing apart the emergency air hose could cause the pressure loss. Or, a hose, tubing, or other part could break and let the air out. When the emergency line loses pressure, it also closes the tractor protection valve (air supply knob automatically pops out). Emergency lines are often coded red (red hose, red couplers, or other parts) to keep them from being confused with the blue or yellow service line.

Hose couplers (also called glad hands) are coupling devices that connect the service and emergency air lines from the truck or tractor to the trailer. The couplers have a rubber seal which prevents air from escaping. Clean the couplers and rubber seals before connecting them. When connecting the glad hands, press the two seals together with the couplers at a 90-degree angle to each other. A turn of the glad hand attached to the hose will join and lock the couplers in position.

- Some vehicles have dead-end or dummy couplers to which the hoses maybe attached when they are not in use. This keeps water and dirt from entering the coupler and the air lines. Use the dummy couplers when the air lines are not connected to a trailer. If there are no dummy couplers, you can sometimes lock the glad hands together (depending on the couplings). You must keep the air supply clean.
- When coupling, be sure to couple the proper glad hands together. Blue or yellow is used for the service lines and red for the emergency (supply) lines. Sometimes the lines have metal tags attached with service or emergency stamped on them. If you cross the air lines, supply air will be sent to the service line instead of charging the trailer air tanks. Air will not be available to release

the trailer spring brakes (parking brakes). If the spring brakes do not release when you push the trailer air supply control, check the air line connections.

- Older trailers do not have spring brakes. If the air supply in the trailer air tank has leaked away, you will not have emergency brakes. The trailer wheels will turn freely. If you crossed the air lines, you could drive but would not have trailer brakes. Always test the trailer brakes before driving. Use the hand valve or pull the air supply (tractor protection valve) control. Pull gently against them in a low gear to be sure the brakes work.

Each trailer and converter dolly has one or more air tanks. The emergency (supply) line from the tractor fills them. They provide the air pressure used to operate trailer brakes. Relay valves send air pressure from the air tanks to the brakes. The pressure in the service line tells how much pressure the relay valves should send to the trailer brakes. The brake pedal (and the trailer hand brake) controls pressure in the service line. Do not let water and oil buildup in the air tanks or the brakes may not work properly. There is a drain valve on each tank. Drain each tank daily. If your tanks have automatic drains, they will keep most moisture out. However, you should still open the drains daily to be sure no moisture has collected.

Shutoff valves (also called cutout cocks) are used in the service and supply airlines at the back of trailers when towing other trailers. These valves permit the airlines to be closed when other trailers are not being towed. Be sure all shutoff valves are in the open position except the ones at the back of the last trailer; these must be closed.

Newer trailers have spring brakes just like trucks and truck tractors. However, converter dollies and trailers built before 1975 are not required to have spring brakes. Those that do not have spring brakes have emergency brakes which work from the air stored in the trailer air tank. The emergency brakes come on whenever air pressure in the emergency line is lost. These trailers have no parking brake. The emergency brakes come on whenever the air supply knob is pulled out or the trailer is disconnected. The brakes will hold only as long as there is air pressure in the trailer air tank. Eventually, the air will leak away; then there will be no brakes. Therefore, for safety reasons, you must use wheel chocks when you park trailers without spring brakes. A major leak in the emergency line will close the tractor protection valve and activate the trailer emergency brakes. You may not notice a major leak in the service line until you try to apply the brakes. Air loss from the leak will lower the air tank pressure quickly. Low enough pressure will activate the trailer emergency brakes.

Test Your Knowledge

1. Why should you not use the trailer hand valve while driving?
2. What does the trailer air supply control do?
3. What is the service line for?
4. What is the emergency air line for?
5. Why should you use chocks when parking a trailer without spring brakes?
6. Where are shutoff valves?

These questions may be on the test. If you cannot answer all questions, reread paragraph 6-2.

6-3. COUPLING AND UNCOUPLING. Knowing how to couple and uncouple correctly is basic to safe operation of combination vehicles. Improper coupling and uncoupling can be very dangerous. There are differences between vehicles, so learn the details of coupling and uncoupling the trucks you will operate.

To couple a tractor-semitrailer, perform the following 16 steps:

- *Step 1* - Inspect the fifth wheel for damaged and/or missing parts. Be sure the mounting to the tractor is secure and has no cracks in the frame. Be sure the fifth wheel plate is greased as required. Failure to keep the fifth wheel plate lubricated could cause steering problems due to friction between the tractor and trailer. Be sure the fifth wheel is in the proper position for coupling and is tilted down towards the rear of the tractor. Check that the jaws open. Be sure the safety unlocking handles are in the automatic lock position. If you have a sliding fifth wheel, be sure it is locked into position. Be sure the trailer kingpin is not bent or broken.
- *Step 2* - Inspect the area and chock the wheels. Be sure the area around the vehicle is clear. Chock the trailer wheels or activate the spring brakes. Be sure cargo (if any) is secured against movement when coupling.
- *Step* 3 - Put the tractor directly in front of the trailer. (Never back under the trailer at an angle. You might push the trailer sideways and break the landing gear.) Check the position using outside mirrors and looking down both sides of the trailer.
- *Step 4* - Back slowly (sound the horn and activate the backing alarm or emergency flashers) until the fifth wheel just touches the trailer. Do not hit the trailer.
- *Step 5* - Secure the tractor. Apply the parking brake. Put the transmission in neutral.
- *Step* 6 - Check the trailer height. The trailer should be low enough so that it is raised slightly when you back the tractor under it. Raise or lower the trailer as needed. (If the trailer is too low, the tractor may strike and damage the nose of the trailer. If the trailer is too high, it may not couple correctly.) Be sure the kingpin and fifth wheel are aligned.
- *Step* 7 - Connect the airlines to the trailer. Check the glad hand seals before connecting. Connect the tractor emergency air line to the trailer emergency glad hand. Connect the tractor service air line to the trailer service glad hand. Be sure air lines are safely supported and will not be crushed or caught when you back the tractor under the trailer.
- *Step* 8 - Supply air to the trailer. From the cab, push in the air supply knob or move the tractor protection valve control from the emergency to the normal position. This supplies air to the trailer brake system. Wait until the air pressure is normal. Check the brake system for crossed air lines. Shut the engine off so you can hear the brakes. Apply and release the trailer brakes. Listen for the sound of trailer brakes being applied and released. You should hear the brakes move when applied and air escape when released. Check the air brake system pressure gauge for signs of major air loss. When you are sure the trailer brakes are working, start the engine. Be sure the air pressure is up to normal.
- *Step 9* - Lock the trailer brakes. Pull out the air supply knob or move the tractor protection valve control from the normal to emergency position.
- *Step 10* - Back under the trailer. Use the lowest reverse gear. Back the tractor slowly under the trailer to avoid hitting the kingpin too hard. Stop when the kingpin is locked into the fifth wheel.
- *Step 11* - Check the connection for security. Raise the trailer landing gear slightly off the ground. Pull the tractor gently forward while the trailer brakes are still locked to check that the trailer is locked onto the tractor.

- *Step* 12 - Secure the vehicle. Put the transmission in neutral. Apply the parking brakes. Shut off the engine. Take the ignition key with you so nobody else can move the truck while you are under it.
- *Step* 13 - Inspect the coupling. Use a flashlight if necessary. Be sure there is no space between the upper and lower fifth wheel. If there is space, something is wrong. (The kingpin may be on top of the closed fifth wheel jaws. The trailer would come loose very easily.) Go under the trader. Look into the back of the fifth wheel. Be sure the fifth wheel jaws have closed around the shank of the kingpin (Figure 6-7, page 6-10). Be sure the locking lever is in the lock position. Be sure the safety catch is in position over the locking lever. (On some fifth wheels, you must put the catch in place by hand.) If the coupling is not right, do not drive the coupled unit. Get it fixed.
- *Step 14* - Connect the electrical cord. Check the air lines. Plug the electrical cord into the trailer. Fasten the safety catch. Check both air lines and the electrical line for signs of damage. Be sure the air and electrical lines will not hit any of the vehicle's moving parts.
- *Step* 15 - Raise the front trailer supports (landing gear). Use the low-gear range (if so equipped) to start raising the landing gear. Once free of weight, switch to the high-gear range. Raise the landing gear all the way. (Never drive with the landing gear only part way up. It may catch on railroad tracks or other things.) After raising the landing gear, secure the crank handle and landing pads safely. When the full weight of the trailer is resting on the tractor, check for sufficient clearance between the rear of the tractor frame and the landing gear. (When the tractor turns sharply, it must not hit the landing gear.) Also be sure there is enough clearance between the top of the tractor tires and the nose of the trailer.
- *Step 16* - Remove and store the trailer wheel chocks.

To uncouple the tractor-semitrailer, perform the following 10 steps:

- *Step 1* - Position the vehicle. Be sure the surface of the parking area can support the trailer's weight. Line up the tractor with the trailer. (Pulling out at an angle can damage the landing gear.)
- *Step 2* - Ease the pressure on locking jaws. Shut off trailer air supply to lock the trailer brakes. Back up gently to ease the pressure on the fifth wheel locking jaws. (This will help you release the fifth wheel locking lever.) Apply the parking brakes while the tractor is pushing against the kingpin. This will hold the vehicle with pressure off the locking jaws.
- *Step* 3 - Chock the trailer wheels. Chock the trailer wheels if the trailer does not have spring brakes or if you are not sure. The air could leak out of the trailer air tank, releasing its emergency brakes and allowing it to move.
- *Step 4* - Lower the landing gear. If the trailer is empty, lower the landing gear until it firmly contacts the ground or landing pads. If the trailer is loaded after the landing gear firmly contacts the ground or landing pads, turn the crank in low gear a few extra turns. This will lift some weight off the tractor. (Do not lift the trailer off the fifth wheel.) This action will make it easier to unlatch the fifth wheel.
- *Step 5* - Disconnect the airlines and electrical cable. Disconnect the air lines from the trailer. Connect the air line glad hands to dummy couplers at the back of the cab or couple them together. Attach the electrical cable with a plug to prevent moisture from entering. Be sure the lines are supported so they will not be damaged while driving the tractor.
- *Step* 6 - Unlock the fifth wheel. Raise the release handle lock. Pull the release handles to the open position. Keep your legs and feet clear of the rear tractor wheels to avoid serious injury in case the vehicle moves.

- *Step 7* - Pull the tractor partially clear of the trailer. Drive the tractor forward until the fifth wheel comes out from under the trailer. Stop with the tractor frame under the trailer. This will prevent the trailer from falling to the ground if the landing gear collapses or sinks.
- *Step 8* - Secure the tractor. Apply the parking brake. Place the transmission in neutral.
- *Step* 9 - Inspect the trailer support. Be sure the ground is supporting the trailer and the landing gear is not damaged.
- Step *10* - Drive the tractor clear of the trailer. Release the parking brakes. Check the area and drive the tractor clear.

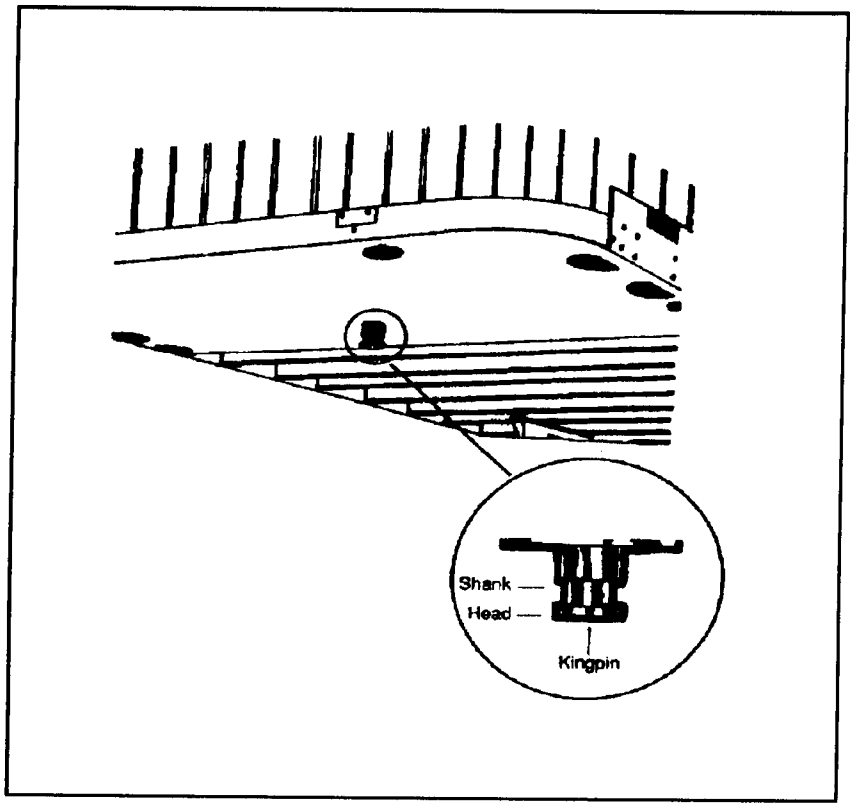


Figure 6-7. Trailer kingpin

Test Your Knowledge

1. What might happen if the trailer is too high when you try to couple?
2. After coupling, how much space should be between the upper and lower fifth wheel?
3. You should check the back of the fifth wheel to see if it is locked onto the kingpin. True or False?
4. To drive, you need to raise the landing gear only until it just lifts off the pavement. True or False?

These questions may be on the test. If you cannot answer all questions, reread paragraph 6-3.

6-4. INSPECTING COMBINATION VEHICLES. Use the seven-step inspection procedure (see Chapter 2) to inspect combination vehicles. A combination vehicle has more things to inspect than a single vehicle.

Check the following during a walkaround inspection (in addition to those listed in Chapter 2, step 5):

- ***Check the coupling system areas.***

■ *Check the fifth wheel (lower).* Be sure it is securely mounted to the frame and does not have missing or damaged parts. Check for proper amounts of grease. Be sure no visible space is between the upper and lower fifth wheel. Be sure locking jaws are around the shank, not the head, of the kingpin. Be sure the release arm is properly seated and the safety latch/lock engaged.

■ *Check the fifth wheel (upper).* Be sure the glide plate is securely mounted to the trailer frame. Be sure the kingpin is not damaged.

■ *Check the air and electric lines to the trailer.* Be sure the electrical cord is firmly plugged in and secured. Be sure the air lines are properly connected to glad hands, have no air leaks, and are secured with sufficient slack in the lines for turns. Be sure all lines are free from damage.

■ *Check the sliding fifth wheel.* Be sure the slide is not damaged or have parts missing. Check for proper amounts of grease. Be sure all locking pins are present and locked in place. If air powered, check for air leaks. Check the fifth wheel to be sure the tractor frame will not hit the landing gear or the cab will not hit the trailer during turns.

- ***Check the landing gear.*** Be sure the gear is raised, has no missing parts, and is not bent or otherwise damaged. Be sure the crank handle is in place and secured. If power operated, be sure there are no air or hydraulic leaks.

Check the combination vehicle brakes in addition to inspecting the air brake systems as described in Chapter 5.

- ***Be sure airflows to all trailers.*** Use the tractor parking brake and/or chock the wheels to hold the vehicle. Wait for the air pressure to reach normal. Then push in the red trailer air supply knob to supply air to the emergency (supply) lines. Use the trailer hand brake to provide air to the service line. Open the emergency line shutoff valve at the rear of the last trailer. You should hear

air escaping (this shows that the entire system is charged). Close the emergency line valve. Open the service line valve to check that service pressure goes through all the trailers. (This test assumes that the trailer hand brake or the service brake pedal is on.) Then close the valve. If you do not hear air escaping from both lines, be sure the shutoff valves on the other trailers and dollies are in the open position. You must have air all the way to the back.

- ***Test the tractor protection valve.*** Charge the trailer air brake system (buildup normal air pressure) and push air supply knob in. Shut the engine off. Step on and off the brake pedal to reduce the air pressure in the tanks. The trailer air supply control (also called the tractor protection valve control) should pop out (or go from the normal to emergency position) when the air pressure falls into the pressure range the manufacturer specifies (usually within 20 to 45 psi).

NOTE: If the tractor protection valve does not work right, an air hose or trailer brake leak could drain all the air from the tractor. This would cause the emergency brakes to come on, with possible loss of control.

- ***Test the trailer emergency brakes.*** Charge the trailer air brake system. Be sure the trailer rolls freely. Then, stop and pull out the trailer air supply control (also called the tractor protection valve control or trailer emergency valve) or place it in the emergency position. Pull gently on the trailer with the tractor to be sure the trailer emergency brakes are activated.
- ***Test the trailer service brakes.*** Check for normal air pressure. Release the parking brakes. Move the vehicle forward slowly and apply the trailer brakes with the hand control (trolley valve), if so equipped. You should feel the brakes engage. This tells you the trailer brakes are connected and working. (Test the trailer brakes with the hand valve, but control them in normal operation with the foot pedal. This will apply air to the service brakes at all wheels.)

Test Your Knowledge

1. Which shutoff valves should be open and which closed?
2. How can you be sure air flows to all trailers?
3. How can you test the tractor protection valve?
4. How can you test the trailer emergency brakes?
5. How can you test the trailer service brakes?

These questions may be on the test. If you cannot answer all questions, reread paragraph 6-4.

CHAPTER 7

DOUBLE AND TRIPLE TRAILERS

This chapter contains information you will need for safe driving with double all triiple trailers. It addresses the importance of safe driving when towing more than one trailer. It also explains how to couple, uncouple, inspect, and perform air brake checks.

NOTE: The military will not test you on double and triple trailers since they are not in the inventory. However, DMV will administer you the test if you are getting a double/triple trailer endorsement to drive commercial motor vehicles.

7-1. PULLING DOUBLE OR TRIPLE TRAILERS. Exercise special care when pulling double or triple trailers. They are not as stable as other vehicles and there are more things that can go wrong when pulling them.

To prevent trailers from rolling over, you must steer gently and go slowly around corners, on-ramps, off-ramps, and curves. A safe speed on a curve for a straight truck or a single tractor and trailer combination vehicle may be too fast for double and triple trailers.

Double and triple trailers are more likely to turn over because of the crack-the-whip effect. You must steer gently when pulling trailers. The last trailer in a combination is most likely to turn over. If you do not completely understand the crack-the-whip effect, study Chapter 6 and review Figure 6-1.

Inspect your vehicle correctly and completely. There are more critical parts to check when you have two or three trailers. Follow the inspection procedures in paragraph 7-3 and inspect all your trailers.

Double and triple trailers must be driven smoothly to avoid rollover or jackknife. Therefore, look far enough ahead so you can slow down or change lanes gradually when necessary.

Double and triple trailers are longer and require more space for turning or stopping suddenly than other vehicles. Increase your following distance. Make sure you have large enough gaps before entering or crossing traffic. Be sure you are clear at the sides before changing lanes.

Drive with care in adverse conditions. In bad weather, slippery conditions, and mountain driving, you must be especially careful if you are pulling double and triple bottoms. You will have greater length and more dead axles to pull with your drive axles than other drivers. This increases the chance of skids and loss of traction.

7-2. COUPLING AND UNCOUPLING. Knowing how to couple and uncouple correctly is the basis to safe operation of double and triple trailers. Incorrect coupling and uncoupling can be very dangerous. Follow the correct coupling and uncoupling steps.

a. **Coupling Twin Trailers.** Ensure you have correctly coupled the tractor and first trailer according to Chapter 6. Secure the second (rear) trailer. If the second trailer does not have spring brakes, drive the tractor close to the trailer; connect the emergency line, charge the trailer air tank,

and disconnect the emergency line. This will set the trailer emergency brakes (if the slack adjusters are correctly adjusted). Chock the wheels if you have any doubt about the brakes.

NOTE: Couple the tractor and first trailer as described in Chapter 6, paragraph 6-3.

CAUTION

For the safe handling on the road, the more heavily loaded semitrailer should be coupled first behind the tractor. The lighter semitrailer should be in the rear.

- Position the converted dolly in front of the second (rear) trailer. A converter gear or dolly is a coupling device of one or two axles and a fifth wheel by which a semitrailer can be coupled to the rear of a tractor-trailer combination, forming a double-bottom rig.
- Release the dolly brakes by opening the air tank petcock. (Or, use the parking brake control if the dolly has spring brakes.)
- If distance is not too great, wheel the dolly into position by hand in line with the kingpin or use the tractor and first semitrailer to pick up the converter dolly. Position the combination as close as possible to the converter dolly. Move the dolly to the first semitrailer's rear and couple it to the trailer pintle. Lock the pintle hook. Secure the dolly support in the raised position. Pull the dolly into position as close as possible to the nose of the second semitrailer. Unhook the dolly from the first trailer. Wheel the dolly into position in front of the second semitrailer in line with the kingpin.
- Connect the converter dolly to the front trailer. Back the first semitrailer into position in front of the dolly tongue. Hook the dolly to the front trailer. Lock the pintle hook. Secure the converter gear support in the raised position.
- Position the converter dolly in front of the second (rear) trailer. Lock the trailer brakes and/or chock the wheels. Make sure the trailer height is slightly lower than the center of the fifth wheel, so the trailer is raised slightly when the dolly is pushed under. Back the converter dolly under the rear trailer. Raise the landing gear slightly off the ground to prevent damage if the trailer moves. Test the coupling by pulling against the pin of the number two semitrailer. Make visual check of the coupling. There should be no space between the upper and lower fifth wheel and the locking jaws have closed around the kingpin. Close the converter air tank petcock and shutoff service and emergent y valves at the rear of the second trailer. Open the shutoff valves at the rear of the first trailer and dolly if equipped. Raise the landing gear completely. Charge the trailer air supply (push in the air supply knob). Check for air at the rear of the second trailer by opening the emergency line shutoff valve. If air pressure is not present, something is wrong and your brakes will not work.

b. **Uncoupling the Rear Trailer.** Park the vehicle in a straight line on firm, level ground. Apply the parking brakes to prevent vehicle movement. If the second trailer does not have spring brakes, chock its wheels. Lower the second semitrailer's landing gear enough to remove some weight from the dolly. Close the air shutoffs at the first semitrailer's rear and on the dolly, if so equipped. Disconnect all dolly air and electric lines and secure them. Release the dolly brakes. Release the converter dolly fifth wheel latch. Slowly pull the tractor, first semitrailer, and dolly forward to pull the dolly out from under the rear semitrailer.

c. **Uncoupling the Converter Dolly.** Lower the dolly landing gear. Disconnect the safety chains. Apply the converter gear spring brakes or chock the wheels. Release the pintle hook on the first semitrailer. Slowly pull clear of the dolly.

CAUTION

Never unlock the pintle hook while the dolly is under the rear trailer. The dolly tow bar may fly up, possibly causing injury or making it very difficult to re-couple.

d. **Coupling and Uncoupling Triple Trailers.** Perform the following three steps to couple and uncouple triple trailers:

- *Step 1* - Couple the second and third trailers using the method for coupling double trailers. Uncouple the tractor and drive away from the second and third trailers.
- *Step* 2 - Couple the tractor and first trailer to the second and third trailers. Use the method for coupling tractor-semitrailers to couple the tractor to the first trailer. Move the converter dolly into position. Use the method for coupling double trailers to couple the first trailer to the second one. Triple trailers are now complete.
- *Step* 3 - To uncouple triple trailers, uncouple the third trailer by pulling the dolly out. Then use the method for uncoupling double trailers to unhitch the dolly. Uncouple the remaining trailers as you would any double-bottom using the method already described.

e. **Coupling and Uncoupling Other Combinations.** The methods addressed above apply to more common tractor-trailer combinations. However, there are other ways to couple and uncouple the many types of truck-trailer and tractor-trailer combinations. Learn the right way to couple and uncouple the vehicles you will drive according to the manufacturer's and/or owner's instructions.

7-3. INSPECTING DOUBLE AND TRIPLE TRAILERS. Use the seven-step inspection procedure (see Chapter 2) to inspect your combination vehicle. A combination vehicle has more things to inspect than a single vehicle. Many of these additional things are just more of what are on a single vehicle (for example, tires, wheels, lights, and reflectors). However, there are also some new things to check.

Check the following during a walkaround inspection (including those listed in Chapter 2, step 5):

- ***Check the coupling system areas.***

■ *Check the fifth wheel (lower).* Be sure it is securely mounted to the frame and does not have missing or damaged parts. Check for proper amounts of grease. Be sure no visible space is between the upper and lower fifth wheel. Be sure locking jaws are around the shank, not the head, of the kingpin. Be sure the release arm is properly seated and the safety latch/lock engaged.

■ *Check the fifth wheel (upper).* Be sure the glide plate is securely mounted to the trailer frame. Be sure the kingpin is not damaged.

■ *Check the air and electric lines to the trailer*. Be sure the electrical cord is plugged in and secured. Be sure the air lines are connected to glad hands, have no air leaks, and are secured with sufficient slack in the lines for turns. Be sure all lines are free from damage.

■ *Check the sliding fifth wheel.* Be sure the slide is not damaged or have parts missing. Check for proper amounts of grease. Be sure all locking pins are present and locked in place. If air powered, check for air leaks. Check the fifth wheel to be sure the tractor frame will not hit the landing gear or the cab will not hit the trailer during turns.

■ *Check the landing gear.* Be sure that it is raised all the way, has no missing parts, and is not damaged. Be sure the crank handle is in place and secured. If power operated, make sure there are no air or hydraulic leaks.

■ *Check the double and triple trailers.* When checking the double and triple trailers be sure of the following:

- The shutoff valves (at the rear of trailers and in service and emergency lines) are open at the rear of front trailers and closed at the rear of the last trailer and at the converter dolly air tank drain valve.
- Air lines are supported and glad hands are properly connected. If a spare tire is carried on the converter gear (dolly), be sure it is secured.
- The dolly's pintle-eye is inserted in the trailers' pintle hooks.
- The pintle hooks are latched.
- The safety chains are secured to the trailers.
- Light cords are firmly affixed to the trailer sockets.

- ***Check the combination vehicle brakes.*** Check the combination vehicle brakes in addition to inspecting the air brake systems as described in Chapter 5, paragraph 5-3.

7-4. DOUBLE AND TRIPLE TRAILERS AIR BRAKE CHECK. Check the brakes on a double or triple trailer the same way you do on any other combination vehicle. Chapter 6 explains how to check air brakes on a combination system. You make some additional checks on double and triple trailers.

a. **Check That Air Flows to All Trailers (Double and Triple Trailers).** Use the tractor parking brake and/or chock the wheels to hold the vehicle. Wait for the air pressure to reach normal. Then push in the red trailer air supply knob to supply air to the emergency (supply) lines. Use the trailer hand brake to provide air to the service line. Open the emergency line shutoff valve at the rear of the last trailer. You should hear air escaping, showing the entire system is charged. Close the emergency line valve. Open the service line valve to check that service pressure goes through all the trailers. (This test assumes that the trailer hand brake or the service brake pedal is on.) Then close the valve. If you do not hear air escaping from both lines, be sure the shutoff valves on the other trailers and dollies are in the open position. You must have air all the way to the back for all the brakes to work.

b. **Test the Tractor Protection Valve.** Charge the trailer air brake system; that is, build up normal air pressure and push in the air supply knob. Shut off the engine. Step on and off the brake pedal several times to reduce the air pressure in the tanks. The trailer air supply control (also called the tractor protection valve control) should pop out (or go from the normal to emergency position) when air pressure falls into the pressure range the manufacturer specifies (usually within 20 to 45 psi).

NOTE: If the tractor protection valve does not work right, an air hose or trailer brake leak could drain all the air from the tractor. This would cause the emergency brakes to come on, with possible loss of control.

c. **Test the Trailer Emergency Brakes.** Charge the trailer air brake system. Be sure the trailer rolls freely. Then stop and pull out the trailer air supply control (also called the tractor protection valve control or trailer emergency valve) or place it in the emergency position. Pull gently on the trailer with the tractor to be sure the trailer emergency brakes are activated.

d. **Test the Trailer Service Brakes.** Check for normal air pressure. Release the parking brakes. Move the vehicle forward slowly and apply the trailer brakes with the hand control (trolley valve), if so equipped. You should feel the brakes engage. This tells you the trailer brakes are connected and working. (Test the trailer brakes with the hand valve, but control them in normal operation with the foot pedal.) This will apply air to the service brakes at all wheels.

Test Your Knowledge

1. What is a converter dolly?
2. Do convertor dollies have spring brakes?
3. What three methods can you use to secure a second trailer before coupling?
4. How do you check to make sure the trailer height is correct before coupling?
5. What visual checks do you make when coupling?
6. Why should you pull a dolly out from under a trailer before you disconnect it from the trailer in front?
7. What should you check for when inspecting the converter dolly?
8. What should you check for when inspecting the pintle hook?
9. Should the shut-off valves on the rear of the last trailer be open or closed?
10. Should the shut-off valves on the rear of the first trailer in a set of doubles be opened or closed?
11. Should the shut-off valves on the middle trailer of a set of triples be open or closed?
12. How can you test that air flows to all trailers?

These questions may be on the test. If you cannot answer all questions, reread paragraphs 7-1 through 7-4.

CHAPTER 8

TANK VEHICLES

This chapter contains information you will need for safe driving, when operating tank vehicles. You should also study Chapters 2, 5, and 6. A tank vehicle is used to carry any liquid or liquid gas in a tank of 1,000 gallons or more.

Before loading, unloading, or driving a tanker, perform a thorough inspection of the vehicle. Inspect the vehicle to ensure it is safe to operate and to carry the liquid or gas.

8-1. INSPECTING TANK VEHICLES. Tank vehicles come in many types and sizes and have special items that you need to check. Check the operator's manual to make sure you know how to inspect your tank vehicle.

The most important check is under and around the vehicle for signs of any leaking. (Note: Make sure you clean up any spills IAW unit environmental SOP.) Do not transport liquids or gases in a leaking tank. Check the following during inspections:

- Check the tank's body or shell for dents or leaks.
- Check the intake, discharge, and cut-off valves. Ensure valves are in the correct position before loading, unloading, or moving the vehicle.
- Check pipes, connections, hoses, and joints for leaks.
- Check manhole covers and vents. Ensure covers have gaskets and that they close tightly. Check vents for proper operation.
- Check special purpose equipment. Check the following (if the vehicle is equipped with them) and ensure that they work properly and that they know how to be used.
    - Vapor recovery kits.
    - Grounding and bonding cables.
    - Emergency shut-off systems.
    - Built in fire extinguisher.
- Check required emergency equipment. Know what equipment is required. Inventory and check serviceability.

8-2. DRIVING TANK VEHICLES. Hauling liquids in tanks require special skills because of the high center of gravity and liquid movement.

A high center of gravity means that much of the load's weight is carried high up off the road. This makes the vehicle top-heavy and easy to roll over. Liquid tankers are especially easy to roll over. Tests have shown that tankers can turn over at the speed limits posted for curves. Go well below the posted speeds on highway curves or on- and off-ramp curves.

Liquid surge results from the liquid's movement in partially filled tanks. This movement can affect vehicle handling. For example, when stopping, the liquid will surge back and forth. When the wave hits the end of the tank, it tends to push the truck in the direction the wave is moving. If the truck is on a slippery surface such as ice, the wave can shove a stopped truck into an intersection. The driver of a liquid tanker must be familiar with the handling of the vehicle.

Bulkheads divide some liquid tanks into several smaller tanks. When loading and unloading the smaller tanks, the driver must pay attention to weight distribution. Do not put too much weight on the vehicle's front or rear.

Baffled liquid tanks have bulkheads in them with holes that lets the liquid flow through. The baffles help to control the forward and backward liquid surge. However, side-to-side surge can still occur and cause a rollover. Be extremely cautious when taking curves or making sharp turns with a partially or fully loaded liquid tanker.

Unbaffled liquid tankers (sometimes called smooth bore tanks) have nothing inside to slow down the liquid's flow. Therefore, forward and backward surge is very strong. Unbaffled tanks are usually those that transport food products (milk, for example). Sanitation regulations forbid the use of baffles because it is difficult to clean the inside of the tank. Be extremely cautious when driving smooth bore tanks, especially when starting and stopping.

Never fully load a cargo tank. Liquids expand as they warm. You must leave room for them to expand. This is called outage. Since different liquids expand by different amounts, they require different amounts of outage. You must know the outage requirement when hauling liquids in bulk.

A full tank of dense liquid (such as some acids) may exceed legal weight limits. Therefore, you may only partially fill tanks with heavy liquids. The amount of liquid loaded into a tank depends on outage, weight, and the legal weight limits.

8-3. SAFE DRIVING RULES. To drive tank vehicles safely, follow all the safe driving rules. The following are a few rules to obey:

- Because of the high center of gravity and liquid surge--start, slow down, and stop very smoothly. Also, make smooth turns and lane changes.
- If you must make a quick stop to avoid a crash, use controlled or stab braking. Review Chapter 2 if you do not remember how to stop using these methods and Chapter 5 if the vehicle has air brakes. Avoid steering quickly while braking, this may cause your vehicle to roll over.
- Slow down before curves, then accelerate slightly through the curve. The posted speed for a curve maybe too fast for a tank vehicle. Slow down.
- Know how much space you will need to stop your vehicle. Remember, wet roads double the normal stopping distance. It may take more space to stop an empty tank vehicle than it would to stop one that is full.
- Do not oversteer, overaccelerate, or overbrake. This may cause your drive wheels or trailer wheels to skid resulting in a jackknife. If this should occur, you must take action to restore traction to the wheels.

Test Your Knowledge

1. How is a bulkhead different from a baffle?
2. Should a tanker with liquid take curves and/or on- and off-ramps at the posted speed limit?
3. Are smooth bore tankers different to drive than those with baffles?
4. What three things determine how much liquid you can load?
5. What is outage?
6. What two reasons make special care needed when driving tank vehicles?

These questions may be on the test. If you cannot answer all questions, reread paragraphs 8-1 through 8-3.

CHAPTER 9

HAZARDOUS MATERIALS

This chapter is designed to assist you in understanding your role and responsibilities when hauling HAZMAT. You most also be aware of your respnsibilities as an environmental steward. An up-to-date copy of the regulations and glossary terms is essential if you transport HAZMAT. This chapter covers the intent of the HAZMAT regulation, drivers responsibilities, communication rules, loading and unloading, bulk tank loading and unloading, marking, driving, parking rules, and emergencies.

HAZMAT are dangerous and pose a risk to health, safety, and property. HAZMAT is often used as a short title and may appear on some road signs. You may also seethe initials HM used in some government regulations. HAZMAT include explosives, various types of gas, solids, flammable and combustible liquid, and other materials. Because of the risks involved and the potential consequences the risks impose, the handling of HAZMAT is regulated by all levels of government.

The HMRs are found in CFR 49, parts 171-180. The HAZMAT table in this federal regulation contains a list of these items. This list is not all inclusive. Whether or not material is considered hazardous is based on its characteristics and the shipper's decision on whether or not the materials meet a definition of a HAZMAT in the regulation. The regulation requires vehicles transporting certain types or quantities of HAZMAT to display diamond-shaped, square-on-point warning signs (called placards).

In addition to meeting all the licensing requirements to operate a vehicle, you must pass a HAZMAT written test. You must have received the required training and your license must reflect the training before driving a vehicle carrying HAZMAT which require placards. Everything you must know to pass the HAZMAT written testis in this manual. However, this is only a beginning. Most drivers must know more on the job. You can learn more by reading the rules in state and federal regulations (for example, FMCSR, 49 CFR, DOT Chart 10 (Appendix B), and if you transport HAZMAT for the military, AR 55-355). Your company, local, and federal libraries have the regulations. You may also purchase them from government printing office bookstores or industry agencies.

The regulations require training and testing for all drivers involved in transporting HAZMAT. Each driver's employer provides the training, HAZMAT employers are required to maintain records of each employee's training and retain those records for 90 days after the employee departs the job. HAZMAT employees must be trained and tested at least every two years.

The regulations require special training before driving a vehicle transporting flammable gas materials or highway controlled quantities of radioactive materials. Drivers transporting cargo tanks and portable tanks must receive employer-provided specialized training.

Some locations require permits to transport certain explosives or bulk hazardous waste. States and counties may require drivers to follow special routes. The government may require permits for special HAZMAT (for example, rocket fuel). Find out about permits and special routes before you drive.

9-1. THE REGULATION'S INTENT. The regulations cover the following topics:

a. **Contain the Materials.** The regulations are intended to protect people and the environment. To protect drivers and others, the rules tell shippers how to safely package materials. Containment rules tell drivers how to load, transport, and unload the material.

b. **Communicate the Risk.** Shippers must warn drivers and others about a material's hazards. They must put warning labels on packages and describe materials so the risk is clear. Placards identify HAZMAT and also communicate the risk.

c. **Safety of Drivers and Equipment.** Be sure drivers and equipment are safe.

- Drivers must pass a written test about transporting HAZMAT. To pass the test, you must know how to do the following:
  - Recognize shipments of HAZMAT.
  - Safely load shipments.
  - Correctly placard your vehicle.
  - Safely transport shipments.
- Drivers must learn and follow the rules. Following these rules reduces the risk of injury. Taking shortcuts by breaking rules is unsafe. Depending on the specific product, rule breakers are subject to discipline; they can be fined and/or put in jail.
- Drivers must inspect vehicles before each trip and periodically during the trip. Law enforcement officers may stop and inspect the vehicle for safety, proper markings, license, shipping papers, and your knowledge of HAZMAT.

9-2. TRANSPORTING HAZMAT. The following are the personnel (and their duties) who are responsible for transporting HAZMAT.

a. **The Shipper.** The shipper performs the following:

- Sends products by truck, railroad, ship, or airplane.
- Uses the HMRs to decide the product's proper shipping name, hazard class, ID number, correct packaging, label and markings, and placard.
- Packages the materials, labels and marks the package, prepares the shipping paper, provides emergency response information, and supplies placards.
- Certifies on the shipping paper that the shipment is prepared according to the rules.

b. **The Carrier.** The carrier performs the following:

- Takes the shipment from the shipper to its destination.
- Checks that shipper correctly named, labeled, and marked shipment.
- Refuses improper shipments.
- Reports accidents and incidents involving HAZMAT to the proper government agency.

c. **The Driver.** The driver performs the following:

- Ensures the shipper has identified, marked, and labeled the product.
- Refuses leaking shipments.
- Placards his vehicle when loading, if needed.
- Safely transports the shipment without delay.
- Follows all special rules about transporting HAZMAT.
- Keeps HAZMAT shipping papers and emergency response information in the proper place.

9-3. COMMUNICATION RULES. Some words and phrases have special meanings when talking about HAZMAT. The meanings may differ from common use. The words and phrases in this paragraph may be on your test.

- A material's hazard class reflects its risks. There are nine different hazard classes. They are listed in Chapter 2, Table 2-2, along with the exact meaning of each hazard class.
- The shipping paper describes a shipment of HAZMAT. Shipping orders, bills of lading, and manifests are all shipping papers. Figure 9-1 shows an example of a shipping paper.
- After an accident or HAZMAT leak, you may be unable to speak. Fire fighters and police can prevent more damage or injury if they know the hazards. Your life, and the lives of others, may depend on them quickly finding the shipping papers for hazardous cargo. Therefore, keep HAZMAT shipping papers easily accessible. Shippers must describe shipments correctly on shipping papers. Shipping papers must contain emergent y response telephone numbers. Carriers and drivers must tab shipping papers related to HAZMAT. Drivers must keep emergency response telephone numbers and hazardous cargo shipping papers as the top documents. Drivers must display them in a pouch on the driver's door, in clear view within reach while driving, or on the driver's seat when out of the vehicle.

SHIPPING PAPER **Page 1 of 1**

TO: _____ **FROM:** _____

QTY	HM	DESCRIPTION	WEIGHT
1 cyl	RQ	Phosgene, Poison 2, 3, UN 1076	25 lbs

This is to certify that the above named materials are properly classified, described, packaged, marked, labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.

Shipper: _____ **Carrier:** _____
Per: _____ **Per:** _____
Date: _____ **Date:** _____

Figure 9-1. Example of a shipping paper

Shippers put diamond-shaped labels on HAZMAT packages. These labels warn of the hazard. If the label will not fit on the package, shippers will put the label on a tag. For example, compressed gas cylinders that will not hold a label will have tags or decals. Figure 9-2 shows a sample label.

Placards warn of hazardous cargo. Placards are signs on the outside of a vehicle that show the cargo's hazard class. A placarded vehicle must have at least four identical placards. They are put on the vehicle's front, rear, and both sides (see Figure 9-3). Placards must be readable from all four directions. They are 10 3/4 inches square, turned upright on a point, in a diamond shape. Cargo tanks show the ID number of their contents on placards or on orange panels or white square-on-point displays. These panels or displays must be the same size of other placards.

Shippers, carriers, and drivers use three main lists of regulated products to identify HAZMAT. Before transporting a product, look for its name on both lists. Some products are on all lists; others may be on only one. Always check the HAZMAT Table and the List of Hazardous Substances and Reportable Quantities and the list of Marine Pollutants.

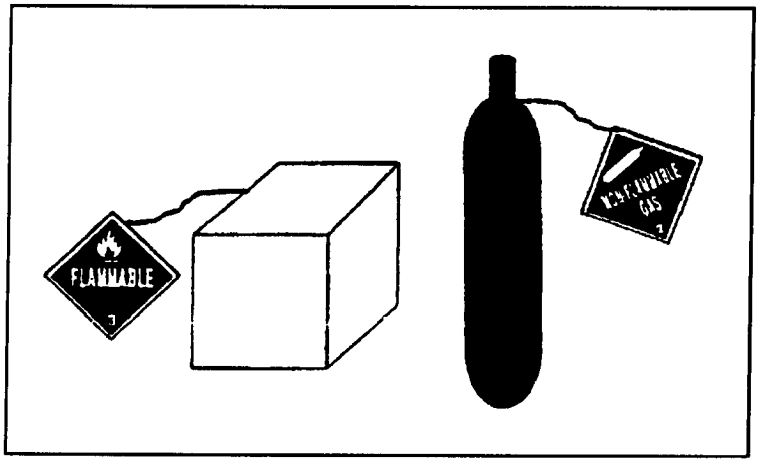


Figure 9-2. Example of labeled package

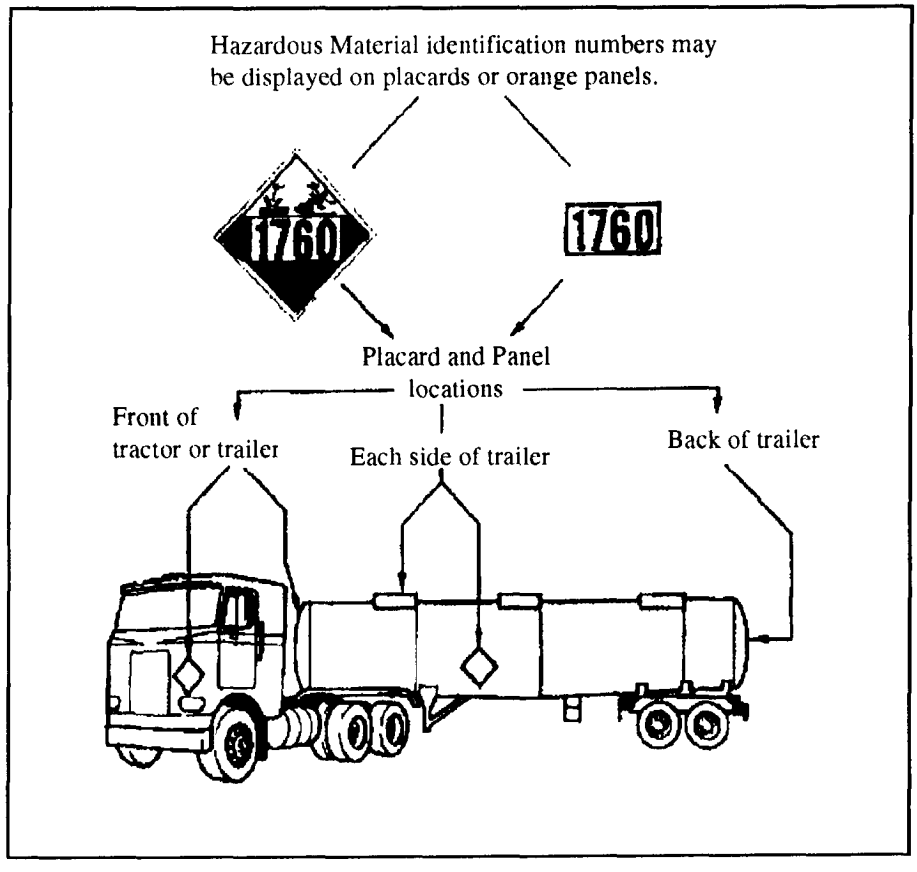


Figure 9-3. Placard and panel locations

- Figure 9-4, page 9-6, shows part of the Hazardous Materials Table. Column 1 identities which shipping mode the entry affects. The next five columns show material's shipping name, hazard class, ID number, packaging group, and required labels.

■ *Column 1.* Can show five different symbols **(+, A, W, D,** and **I).** These symbols are described as follows:

- **+** shows the shipping name, hazard class, and packaging group to use, even if the product does not match the hazard class definition.
- **A** means the entry applies only to air shipments that are not a hazardous substance or hazardous waste.
- **W** means the entry applies only to water shipments that are not a hazardous substance or hazardous waste, or marine pollutant.
- **D** means the proper shipping name for describing materials for domestic transportation, but may not be proper for international transportation.
- **I** identifies proper shipping name to describe materials in international transportation. A different shipping name may be used when only domestic transportation is involved.

■ *Column 2.* Shows the description of regulated materials and the proper shipping names. Entries are in alphabetical order so you can easily find the right entry. The table shows proper shipping names in regular type. The shipping paper must show proper shipping names. Names shown in parentheses are not proper shipping names.

■ *Column 3.* Shows each material's hazard class or division; or the word forbidden. Never transport a material that is forbidden. You can decide which placards to use if you know the material's hazard class, the amount being shipped, and the amount of all HAZMAT of all classes on your vehicle.

■ *Column 4.* Shows each material's ID number and the proper shipping name. ID numbers are preceded by the letters UN or NA. The NA is associated with proper shipping names within the United States and Canada. That number must appear on the shipping papers, packages, cargo tanks, and on other bulk packaging. Police and fire crews use the number to quickly identify the material after an accident.

■ *Column 5.* Shows the packing group assigned to a material.

■ *Column 6.* Shows the hazard warning label put on packages of HAZMAT. Due to dual hazards being present, some products require use of more than one label. No label is needed where the table shows the word NONE.

■ *Column 7.* Lists the additional (special) provisions. If there is an entry in this column, refer to the federal regulations for specific information.

■ *Column 8.* Is a three-part column showing the section numbers covering the packaging authorizations (requirements) for each HAZMAT.

§ 172.101 Hazardous Materials Table

Symbols	Hazardous materials description and proper shipping names	Hazard class or Division	Identification Numbers	Packing Group	Labeling required (if not excepted)	Special provisions	(8) Packaging authorizations (§ 173.***)		
							Exceptions	Non-bulk packaging	Bulk packaging
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8A)	(8B)	(8C)
____	*Poisonous, solids, self heating, n.o.s. ...*	6.1	UN3124	I	POISON, SPONTANEOUSLY COMBUSTIBLE	A5_____	None	211	241

Figure 9-4. Part of the hazardous materials table

Appendix A to 172.101,49 CFR contains the List of Hazardous Substances and Reportable Quantities. The DOT and the EPA want to know about spills of hazardous substances. They are named in the list of hazardous substances and reportable quantities (see Table 9-1). Column 3 of the list shows each product's RQ. When these materials are being transported in a reportable quantity or greater in one package, the shipper displays the letters RQ on the shipping paper and package. The letters RQ may appear before or after the basic description. You or your employer must report any spill of these materials which occurs in a RQ.

- If the words inhalation hazard are on the shipping paper or package, the rules require poison placards. You must use poison placards in addition to any other hazard class placard, regardless of the amount.

Table 9-1. List of hazardous substances and reportable quantities

LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES (RQ)		
Hazardous Substance	Synonyms	RQ Pounds (Kilograms)
Phenyl mercaptan @	Benzinethiol Thiophenol *	100 (45.4)
Phenylmercuric acetate	Mercury, (acetate-O) phenyl	100 (45.4)
N-Phenylthiourea	Thieurea, phenyl	100 (45.4)
Phorate	Phosphorodithioic acid, O, O-diethyl, S-(ethylthio), methylester	10 (4. 54)
Phosgene *	Carbonyl chloride	10 (4.54)
Phosphine *	Hydrogen phosphide	100 (45.4)
Phosphoric acid *		5,000 (2270)
Phosphoric acid, diethyl p-nitropenyl ester	Diethyl-p-nitrophenyl phosphate	100 (45.4)
Phosphoric acid, lead salt	Lead phosphate	1 (0.454)

NOTES: @ entries are shipped in unit quantities.
Asterisked (*) entries also appear in the Hazardous Materials Table.
You must report spills of 10 pounds or more.

The shipping paper shown in Figure 9-1 describes a shipment. The shipping paper for a HAZMAT must include the following:

- The page numbers. If the shipping paper has more than one page, the first page must tell the total number of pages. For example, Page 1 of 4.
- A proper description of the hazardous product.
- A shipper's certification signed by the shipper. This states the shipment is prepared according to the rules.

If the shipping paper describes both hazardous and nonhazardous products, the HAZMAT will be either--

- Described first.
- Highlighted in a contrasting color.
- Identified by an X placed before the shipping name in a column captioned HM. RQ may be used instead of X if a RQ is present in one package.

The basic description of a hazardous product includes the proper shipping name, hazard class or division, ID number, and packing group (if any) in that order. The packing group is displayed in Roman numerals and may be preceded by the letters PG. The shipping name, hazard class, and ID number must not be abbreviated unless specifically authorized in the hazardous materials regulations. The description must also show the following:

- The total quantity and unit of measure.
- RQ (if a RQ).
- If RQ appears, the name of the hazardous substance.
- For n.o.s. and generic descriptions, the technical names of the HAZMAT.

The shipper is responsible for listing an emergency response telephone number on the shipping papers. It can be used by emergency responders for information about any HAZMAT involved in a spill or fire. Shippers must also provide emergency response information to the motor carrier for each HAZMAT being shipped. This information must be able to be used away from the motor vehicle and must provide information on how to safely handle incidents involving the material. It must include information on the shipping name of the HAZMAT; risks to health, fire, and explosion; and initial methods of handling spills, tires, and leaks. Information can be on the shipping paper or some other document that includes the basic description and technical name of the HAZMAT. It may also be in a guidance book such as the ERG book. Motor carriers may assist shippers by keeping an ERG on each vehicle carrying HAZMAT. The driver must provide the emergency response information to any federal, state, or local authority responding to a HAZMAT incident or investigation. Total quantity must appear either before or after the basic description. The packaging type and unit of measurement may be abbreviated. For example: 10 ctns, Paint, 3, UN1263, PG II, 500 lb.

The shipper of hazardous waste must write waste before the name of the material on the shipping paper (hazardous waste manifest). For example: Waste Acetone, 3, PG II, UN 1090.

A nonhazardous material may not be described using a hazard class or an ID number.

When the shipper packages HAZMAT, he certifies that the package has been prepared according to the regulations. The signed shipper's certification appears on the original shipping paper. The only exceptions are when a shipper is a private carrier transporting its own product and when the carrier provides the package (for example, a cargo tank). The glossary shows acceptable shipper certifications. Unless a package is clearly unsafe, you may accept the shipper's certification concerning proper packaging. Some carriers have additional rules about transporting hazardous products. Follow your employer's rules when accepting shipments.

Shippers print required markings directly on the package, an attached label, or tag. The most important package marking is the name of the HAZMAT; it is the same as the one on the shipping paper. When required, the shipper will put the following on the package:

- The name and address of the shipper or consignee.
- The HAZMAT shipping name and ID number.
- The labels required.

If the rules require it, the shipper will put RQ or inhalation-hazard on the package. Packages with liquid containers inside will have package orientation markings with the arrows pointing in the correct upright position. The labels used must reflect the product's hazard class. If a package needs more than one label, the labels will be close together, near the proper shipping name.

Learn to recognize shipments of HAZMAT. To find out if the shipment includes HAZMAT, look at the shipping paper. Does it include the following:

- An entry with a proper shipping name, hazard class, and ID number?
- A highlighted entry or an X or RQ in the HAZMAT column?

What business is the shipper in? Paint dealer? Chemical supply? Scientific supply house? Pest control or agricultural supplier? Explosives, munitions, or fireworks dealer?

- Are there tanks with diamond labels or placards present?
- What type of package is being shipped? Cylinders and drums are often used for HAZMAT shipments. Does the package display a hazard class label, the proper shipping name, or an ID number?
- Are there any handling precautions?

When transporting hazardous waste, you must sign and carry a uniform hazardous waste manifest. The manifest must show the name and EPA registration number of the shipper, carriers, and destination. The shipper prepares, dates, and signs the manifest. Treat the manifest as a shipping paper when transporting the waste. Only give the waste to another registered carrier or treatment facility. Each carrier transporting the shipment must sign the manifest. Alter delivering the shipment, keep your copy of the manifest. Each copy must have all needed signatures and dates, including those of the person to whom you delivered the waste.

Attach the right placards as you load and before you drive the vehicle. You may move an improperly placarded vehicle only in an emergency to protect life or property. Placards must appear on both sides and ends of the vehicle. Each placard must be--

- Easily seen from the direction it faces.
- Placed so words or numbers are level and read from left to right.
- At least 3 inches away from any other markings.
- Kept clear of attachments or devices such as ladders, doors, and tarpaulins.
- Kept clean and undamaged so the color, format, and message is easily seen.

Always check to ensure the shipper shows the correct description on the shipping paper and verify the proper labels are shown on the packages. If you are not familiar with the material, ask the shipper or contact your company. To decide which placards to use, you must know the following:

- Shipment's hazard class.
- Amount shipped.
- Total weight of all HAZMAT in your vehicle.

There are two placard tables. They are described as follows:

- *Table 9-2.* Shows the placard description of a vehicle when transporting any amount of material.

Table 9-2. Placard any amount

IF YOUR VEHICLE CONTAINS ANY AMOUNT OF	PLACARD AS
1.1	EXPLOSIVE 1.1
1.2	EXPLOSIVE 1.2
1.3	EXPLOSIVE 1.3
2.3	POISON GAS
4.3	DANGEROUS WHEN WET
6.1 (PG I, inhalatin hazard only)	POISON
7 (Radioactive Yellow III label only) (Yellow III label only)	RADIOACTIVE

- *Table 9-3.* Shows the placards needed if the amount transported is 1,001 pounds or more (including the package). Add the amounts from all shipping papers for all the Table 9-2 products you have on board. You may use dangerous placards instead of separate placards for each Table 9-2 hazard class when the following implies:

  - You have two or more Table 9-3 hazard classes requiring different placards that total 1,001 pounds or more and you have not loaded 5,000 pounds or more of any Table 9-2 hazard class material at any one place. (You must use the specific placard for this material.)
  - If inhalation hazard is on the shipping paper or package, the rules require poison placards. Use poison placards in addition to any others needed by the product's hazard class.

Explosives 1.5, oxidizer, and dangerous placards need not be used if a vehicle contains Division 1.1 or 1.2 explosives and is placarded Explosives 1.1 or 1.2. You need not use a Division 2.2 nonflammable gas placard on a vehicle displaying Division 2.1 flammable gas or a Division 2.2 oxygen placard.

Placards used to identify the primary hazard class of material must have the hazard class or division number displayed in the lower corner of the placard. No hazard class or division number is allowed on placards used to identify a secondary hazard class of material.

Placards may be displayed for HAZMAT even if not required, as long as the placard identifies the hazard of material being transported.

Table 9-3. Placard 1,001+ pounds

Category of Material (Hazard class or Division number and additional description, as appropriate)	Placard Name
1.4	EXPLOSIVES 1.4
1.5	EXPLOSIVES 1.5
1.6	EXPLOSIVES 1.6
2.1	FLAMMABLE GAS
2.2	NONFLAMMABLE GAS
3	FLAMMABLE
Combustible liquid	COMBUSTIBLE
4.1	FLAMMABLE SOLID
4.2	SPONTANEOUSLY COMBUSTIBLE
5.1	OXIDIZER
5.2	ORGANIC PEROXIDE
6.1 (PG I or II) other than PG I inhalation hazard	POISON
6.1 (PG III)	KEEP AWAY FROM FOOD
6.2	(NONE)
8	CORROSIVE
9	CLASS 9
ORM-D	(NONE)

Test Your Knowledge

1. Shippers package in order to _____(fill in)_____ the material.
2. Drivers placard their vehicle to _____(fill in)_____ the risk.
3. What three things do you need to know, to decide which placards (if any) you need?
4. A HAZMAT ID number must appear on the _____(fill in)_____ and on the _____(fill in)_____. The ID number must also appear on cargo tanks and other bulk packaging.
5. Where must you keep shipping papers describing HAZMAT?
6. What is a shipper's certification? Where does it appear? Who signs it?
7. When may nonhazardous material be described by hazard class words or ID numbers?
8. Name five hazard classes that require placarding in any amount.
9. A shipment described on the hazardous waste manifest may only be delivered to another _____(fill in)_____ carrier or treatment facility, which then signs the _____(fill in)_____, giving you a copy which you must keep.
10. Your load includes 20 pounds of Division 2.3 gas and 1,001 pounds of flammable gas. What placards do you need, if any?

These questions may be on the test. If you cannot answer all questions, reread paragraphs 9-1 through 9-3.

9-4. LOADING AND UNLOADING. Before loading or unloading, set the parking brake. Be sure the vehicle will not move. Do all you can to protect containers of HAZMAT. Do not use hooks or tools which might damage containers or other packaging during loading. Watch for signs of leaking or damaged containers. Leaks spell trouble! Do not transport leaking packages. Depending on the material, you, your truck, and others could be in danger.

Make sure containers do not move while in transit. The following must be braced to avoid them from falling, sliding, or bouncing around.

- Containers of Class 1 (explosives).
- Class 2 (gasses).
- Class 3 (flammable liquids).
- Class 4 (flammable solids).
- Class 5 (oxidizers).
- Class 8 (corrosives).
- Division 6 poisons.

Be careful when loading containers that have valves or other fittings.

Do not open packages between the points of origin and destination. Never transfer hazardous products from one package to another. You may empty a cargo tank, but do not empty any other package while it is on the vehicle.

Many products are more hazardous in the heat. Load HAZMAT away from heat sources. When loading or unloading HAZMAT, keep away from tire. Do not let people smoke nearby. Never smoke around the following:

- Class 1 (explosives).
- Class 3 (flammables).
- Class 4 (flammable solids).
- Class 5 (oxidizers).
- Division 2.1 (flammable gas).

There are special cargo heater rules for loading Class 1 (explosives), Class 3 (flammable liquids), and Division 2.1 (flammable gas). The rules usually forbid use of cargo heaters, including automatic cargo heater/air conditioner units. Unless you have read all the related rules, do not load explosives or flammable products in a cargo space that has a heater.

Use closed cargo space. You cannot have overhang or tailgate loads of Class 1 (explosives), Class 4 (flammable solids), and Class 5 (oxidizers) materials. You must load these hazards into a closed cargo space unless all packages are either--

- Fire and water resistant.
- Covered with a fire and water resistant tarpaulin.

Turn off your enging before loading or unloading any explosive. Then check the cargo space for the following:

- You must disable cargo heaters. Disconnect heater power sources. Drain heater fuel tanks.
- The vehicle must have no sharp points on it that might damage cargo. Look for bolts, screws, nails, or broken side panels or floor boards.
- Use a floor lining with Division 1.1, 1.2, or 1.3 (Class A or B explosives). The floors must be tight. The liner must be of non-metallic material or non-ferrous metal.
- Use extra care to protect explosives. Never use hooks or other metal tools. Never drop, throw, or roll the shipment. Protect explosive packages from other cargo that might cause damage.
- Do not transfer a Division 1.1, 1.2, or 1.3 (Class A or B explosives) from one vehicle to another on a public roadway except in an emergency. If safety requires an emergency transfer, set out red warning reflectors, flags, or electric lanterns. You must warn other highway users.
- Never transport damaged packages of explosives. Do not transport a package that shows any dampness or oily stain.
- Do not transport Division 1.1 or 1.2 (Class A explosives) in triple trailers. Do not transport Division 1.1 or 1.2 (Class A explosives) in vehicle combinations if the following occurs:

  - There is a marked or placarded cargo tank in the combination.
  - The other vehicle in the combination contains Division 1.1 A (initiating explosives), packages of Class 7 (radioactive) materials labeled Yellow III, Division 2.3 (poisonous gas), Division 6.1 (poisonous) materials, or HAZMAT in a portable tank, on a DOT Spec 106A or 110A tank.

If loading Class 8 (corrosive) materials by hand, load breakable containers one by one. Keep them right side up. Do not drop or roll the containers. Load them onto an even floor surface. Only stack carboys if the lower tiers can safely handle the weight.

- Do not load nitric acid above any other product. Do not stack nitric acid more than two containers high.
- Load charged batteries so their liquid will not spill. Keep right side up. Be sure other cargo will not fall against or short circuit them.
- Never load corrosive liquids next to or above Division 1.4 (explosives C), Class 4 (flammable solids), Class 5 (oxidizers), or Division 2.3, zone B gasses.
- Never load corrosive liquids with Division 1.1 or 1.2 (Class A explosives); Division 1.2 or 1.3 (Class B explosives); Division 1.5 (blasting agents); Division 2.3 (zone A gasses); Division 4.2 (spontaneously combustible materials); or Division 6.1, PG I, zone A (poison liquids).

If your vehicle does not have racks to hold Class 2 (compressed gases), including cryogenic liquids in cylinders, the cargo space floor must be flat. The cylinders must be either--

- Held upright or braced lying down flat.
- In racks attached to the vehicle.
- In boxes that will keep them from turning over.

Never transport Division 2.3 (poisonous gas) or Division 6. 1 (poisonous) materials in containers with interconnections. Never load a package labeled poison or poison gas in the driver's cab or sleeper with food material for human or animal consumption.

Some packages of Class 7 (radioactive) materials displays a number called the transport index. The shipper labels these packages Radioactive II or Radioactive III and prints the package's transport index on the label. Radiation surrounds each package, passing through all nearby packages. To deal with this problem, the number of packages you can load together is controlled. Their closeness to people, animals, and unexposed film is also controlled. The transport index tells the degree of control needed during transportation. The total transport index of all packages in a single vehicle must not exceed 50. Appendix C has rules for each transport index. It shows for how long and how close you can load Class 7 (radioactive) materials to people, animals, or film. For example, you cannot leave a package with a transport index of 1.1 within 2 feel of people or cargo space walls.

The rules require some products to be loaded separately. Do not load them together in the same cargo space. Table 9-4 lists some examples. The regulations (CFR 49, Segregation and Separation Chart) name other materials you must keep apart.

Table 9-4. Prohibited loading combinations

DO NOT LOAD	IN THE SAME VEHICLE WITH
Division 6.1 or 2.3 . . . . . (poison or poison gas labeled material)	Food for animal or human consumption unless the poison package is overpacked in an approved way. Foodstuff is anything you swallow. However, mouthwash, toothpaste, and skin creams are not foodstuff.
Division 2.3 . . . . . (poisonous gas zone A or Division 6.1 (poison) liquids PG I, zone A	Division 5.1 (oxidizers), Class 3 (flammable liquids), Class 8 (corrosive liquids), Division 5.2 (organic peroxides), Division 1.1, 1.2, 1.3 (Class A or B explosives), Division 1.5 (blasting agents), Division 2.1 (flammable gas), and Class 4 (flammable solids).
Charged storage . . . . . batteries Class 1 (denoting primers)	Division 1.1 (Class A explosives). Any other explosives unless in authorized containers or packages.
Division 6.1 (cyanides . . . . . or cyanide mixtures)	Acids, corrosive materials, or other acidic materials which could release hydrocyanic acid from cyanides. Example: Cyanides, Inorganic, n.o.s.
Nitric acid . . . . . (Class B)	Other materials unless the nitric acid is not loaded above any other materials and not more than two high.

9-5. BULK PACKAGING, MARKING, LOADING, AND UNLOADING. Cargo tanks are bulk containers permanent y attached to a vehicle. Cargo tanks remain on the vehicle when you load and unload them. Portable tanks are bulk containers which are not permanent y attached to a vehicle. They are loaded or unloaded with the product while off the vehicle. Portable tanks are then put on a vehicle for transport. Many types of cargo tanks are used. The most common are MC306 for liquids and MC331 for gases.

You must display the ID number of the contents of portable tanks and cargo tanks. Product ID numbers arc in Column 4 of the Hazardous Materials Table (see Figure 9-4). The rules require black, 100 mm (3.9-inch) numbers on orange panels, DOT placards, or a white, diamond-shaped background if no placards are required. Specification cargo tanks must show retest date markings. Portable tanks must show the leasee or owner's name. They must also show the shipping name and ID number of the contents on two opposing sides. The letters of the shipping names must be at least 2 inches tall on portable tanks with capacities of more than 1,000 gallons and 1 inch tall on portable tanks with capacities of less than 1,000 gallons. The ID number must appear on each side and each end of a tank that holds 1,000 gallons or more and on two opposing sides if the portable tank holds less than 1,000 gallons. The ID numbers must show when the portable tank is on the vehicle. If they do not, you must display the ID number on both sides and ends of the vehicle.

The person in charge of loading and unloading a cargo tank must be sure a qualified person is always watching. The person watching the loading or unloading must do the following:

- Be alert.
- Have a clear view of the cargo tank.
- Be within 25 feet of the tank.
- Be aware of the hazards.
- Know the procedures to follow in an emergency.
- Be authorized and able to move the cargo tank.

Close all manholes and valves before moving a tank of HAZMAT. It does not matter how small the amount in the tank or how short the distance. Manholes and valves must not leak.

Turn off your engine before loading or unloading any flammable liquid. Only operate the engine if you must run a pump. Ground a cargo tank before filling it through an open tilling hole. Ground the tank before opening the filling hole. Maintain the grounding until after closing the filling hole.

Keep liquid discharge valves on a compressed gas tank closed except when loading and unloading. Unless your engine runs a pump for product transfer, turn it off when loading or unloading. Turn off the engine, if used, before unhooking the pump after product transfer. Unhook all loading/unloading connections before coupling, uncoupling, or moving a chlorine cargo tank. Chock trailers to prevent motion when uncoupled from the power unit.

Test Your Knowledge

1. You must NEVER smoke around which three hazard classes?
2. Which three hazard classes should not be loaded into a trailer that has a heater/air conditioner unit?
3. Should the floor liner required for Division 1.1 or 1.2 (Class A explosives) be stainless steel?
4. At the shipper's dock you are given a shipping paper for 100 cartons of battery acid. You already have 100 pounds of dry silver cyanide on board. What precautions do you take?
5. Name a hazard class that uses a transport index. What determines the amount that can be loaded in a single vehicle?
6. What are cargo tanks?
7. How is a portable tank different from a cargo tank?
8. Your engine runs a pump used to deliver compressed gas. Should you turn off the engine before or after unhooking hoses after delivery?

These questions may be on the test. If you cannot answer all questions, reread paragraphs 9-4 and 9-5.

9-6. DRIVING AND PARKING RULES. Never park with Division 1.1 or 1.3 (Class A or B explosives) within 5 feet of the traveled part of the road. Unless it is required by your work, do not park within 300 feet of the following:

- A bridge, tunnel, or building.
- A place where people gather.
- An open fire.

If you must park to do your job, do so only briefly.

Do not park on private property unless the owner is aware of the danger. Someone must always watch the parked vehicle. You may let someone else watch it for you only if your vehicle is on the shipper's, carrier's, or consignee's property.

You can leave your vehicle unattended in a safe haven. A safe haven is an approved place for parking unattended vehicles loaded with explosives. Designation of safe havens are usually made by local authorities.

You may park a placarded vehicle (not laden with explosives) within 5 feet of the traveled part of the road only if it is required by your work. Do so only briefly. Someone must always watch the vehicle when parked on a public roadway or shoulder. Do not uncouple and leave a trailer with HAZMAT on a public street. Do not park within 300 feet of an open fire. The person watching a placarded vehicle must--

- Be aware of the hazards.
- Know what to do in emergencies.

- Be able to move the vehicle if needed.
- Be awake in the vehicle and not in the sleeper berth or be within 100 feet of the vehicle and have it within clear view.

Do not use flares! You might break down and need to use vehicle signals. Use reflective triangles or red electric lights., Never use burning signals, such as flares or fuses, around a tank used for Class 3 (flammable liquids) or Division 2.1 (flammable gas) (whether loaded or empty) or a vehicle loaded with Division 1.1, 1.2, or 1.3 (Class A or B explosives).

Some states and counties require permits to transport HAZMAT or waste. They may limit the routes you can use, Local rules about routes and permits change often. You must find out if permits are needed or if special routes are required. Be sure you have all needed papers before you start your trip.

- If you work for a carrier, ask the dispatcher about route limits or permits. If you are an independent transporter and are planning a new route, check with state agencies where you plan to travel. Some locations prohibit transportation of HAZMAT through tunnels or over bridges or other roadways. Check before you start.
- Whenever placarded, avoid heavily populated areas, crowds, tunnels, narrow streets, and alleys. Take other routes, even if inconvenient, unless there is no other way. Never drive a placarded vehicle near open fires unless you can safely pass without stopping.
- If transporting Division 1.1, 1.2, or 1.3 (Class A or B explosives), you must have and follow a written route plan. Carriers prepare the route plan in advance and give the driver a copy. You may plan the route yourself if you pickup the explosives at a location other than your employer's terminal. Write out the plan in advance. Keep a copy of it with you while transporting the explosives. Deliver shipments of explosives only to authorized persons or leave them in locked rooms designed for explosives storage.
- A carrier must choose the safest route to transport placarded radioactive material. After choosing the route, the carrier must tell the driver about the radioactive materials and the route to take.

Do not smoke within 25 feet of placarded vehicles and/or tanks which contains the following:

- Class 3 (flammable liquids).
- Division 2.1 (gases).

Do not smoke or carry a lighted cigarette, cigar, or pipe within 25 feet of any vehicle which contains the following:

- Class 1 (explosives).
- Class 3 (flammable liquids).
- Class 4 (flammable solids).
- Class 5 (oxidizers).

Turn off the engine before fueling a placarded vehicle. Someone must always be at the nozzle, controlling fuel flow.

The power unit of placarded vehicles must have a fire extinguisher. The extinguisher must have an UL rating of 10 B:C or more.

Check the tires every 2 hours or 100 miles. Observe the following:

- Be sure your tires are properly inflated. Check placarded vehicles with dual tires at the start of each trip and when you park. You must stop and check the tires every 2 hours or 100 miles, whichever is less. Use a tire pressure gauge to check tire pressure.
- Do not drive with a tire that is leaking or flat except to the nearest safe place to get it repaired. Remove any overheated tires. Place them a safe distance from your vehicle. Do not drive until you fix the cause of the overheating. Follow the rules about parking and watching placarded vehicles. These roles apply even when checking, repairing, or replacing tires.

Do not take a HAZMAT shipment without a properly prepared shipping paper. A shipping paper for HAZMAT must always be easily recognized. Other people must be able to find it quickly in case of an emergency.

- Tab HAZMAT shipping papers or keep them on top of other papers to clearly distinguish them.
- When you are behind the wheel (and with your seat belt on) keep shipping papers within your reach or in a pouch on the driver's door. Someone entering the cab must be able to see them easily.
- When not behind the wheel, leave shipping papers in the driver's door pouch or as the top document on the driver's seat.

A carrier must give each driver transporting Division 1.1, 1.2, or 1.3 (Class A or B explosives) a copy of FMCSR Part 397. The carrier must give written instructions on what to do if delayed or in an accident. The written instructions must include the following:

- The names and telephone numbers of people to contact (including the carrier agents or shippers).
- The nature of the explosives transported.
- The precautions to take in emergencies such as accidents, tires, or leaks.

You must be familiar with and possess, while driving, the following:

- The shipping papers.
- Written emergency instructions.
- A written route plan.
- A COPY of FMCSR, Part 397.

A driver transporting chlorine in cargo tanks must have an approved gas mask in the vehicle. The driver must also have an emergency kit for controlling leaks in dome cover plate fittings on the cargo tank.

Stop before crossing a railroad if your vehicle--

- Is placarded.
- Carries any amount of chlorine.
- Has cargo tanks (loaded or empty) used for HAZMAT.

You must stop 15 to 50 feet before the nearest rail. Proceed only when you are sure no train is coming. Do not shift gears while crossing the tracks.

9-7. EMERGENCIES. The DOT has a guidebook for tire fighters, police, and industry personnel. The guidebook tells them what to do first to protect themselves and the public from HAZMAT. The guide is indexed by shipping name and HAZMAT ID number. Emergency personnel look for these things on the shipping paper; therefore, the shipping name, ID number, label, and placards must be correct.

WARNING

Do not smoke. Warn others. Keep people away. Avoid contact or inhaling.

Your job at the scene of an accident/incident consists of the following:

- Keeping people away from the area.
- Limiting the spread of material, if it can be done safely.
- Communicating the danger to emergency response personnel.
- Providing emergency responders with the shipping papers and emergency response information.
- Following this checklist:
  - Be sure your driving partner is not injured.
  - Keep shipping papers with you.
  - Keep people far away and upwind from the accident and/or incident.
  - Warn others of the danger.
  - Send for help.
  - Follow your employer's instructions.

You might have to control minor truck fires on the road. However, unless you have the training and equipment to do so safely, do not fight HAZMAT fires. Dealing with HAZMAT tires requires special training and protective gear. When you discover a fire, send someone for help. Use the tire extinguisher to keep minor truck fires from spreading to the cargo before fire fighters arrive. Feel the trailer doors to see if they are hot before opening them. If they are hot, you may have a cargo tire and should not open the doors. Opening doors lets air in and may make the fire flare up. Without air, many fires only smolder, doing less damage. If your cargo is already on tire, it is unsafe to fight the fire. Keep the shipping papers with you for emergency personnel as soon as they arrive. Warn other people of the danger and keep them away.

If you discover a cargo leak, identify the material using the shipping papers, labels, or package location. Do not touch any leaking material. Do not try to identify material or find the leak's source by smell. Many toxic gases destroy one's sense of smell. They can injure or kill you even if they do not smell. Do not eat, drink, or smoke around a leak or spill.

- If HAZMAT is spilling from your vehicle, do not move it any more than safety requires. You may move off the road and away from places where people gather for safety reasons. Only move your vehicle if you can do so without danger to yourself or others.
- Never drive with HAZMAT leaking from your vehicle. Remember that the carrier pays to cleanup contaminated parking lots, roadways, and drainage ditches. These costs are enormous, so do not leave a lengthy contamination trail. Do the following if HAZMAT is spilling from your vehicle:

  - Park your vehicle.
  - Secure the area.
  - Stay in the area of the vehicle.
  - Send someone for help.

- When you send someone for help, give the following to that person in writing:

  - A description of the emergency.
  - Your exact location and direction of travel.
  - Your name, the carrier's name, and the name of the community or city where your terminal is located.
  - The shipping name, hazard class, and ID number of the materials, if you know them.

This information will help the emergency response team locate you quickly, It will also alert them to bring the right equipment to handle the emergency.

- Never move your vehicle if doing so will contaminate or damage it. Keep downwind and away from roadside rests, truck stops, cafes, and businesses. Never try to repack leaking containers unless you have the training and equipment to do so safely. Call your dispatcher or supervisor and, if needed, emergency personnel for instrutions.

Responses to specific hazards include the following:

- If your vehicle breaks down or is in an accident while carrying Class 1 (explosives), warn others of the danger. Keep bystanders away. Do not allow smoking or open tire near the vehicle. Remove all explosives before trying to separate vehicles involved in a collision. Place the explosives at least 200 feet from the vehicles and occupied buildings. If there is a tire, warn of the danger of explosion. Stay a safe distance away.
- If Class 2 (compressed gas) is leaking from your vehicle, warn others of the danger. Only permit access to people removing the hazard or wreckage. You must notify the shipper of an accident. Unless you are fueling machinery used in road construction or maintenance, do not transfer a flammable compressed gas from one tank to another on any public roadway.

- If you are transporting Class 3 (flammable liquids) and have an accident or breakdown, keep people from gathering. Warn them of the danger. Keep them from smoking. Never transport a leaking cargo tank farther than needed to reach a safe place. If safe to do so, get off the roadway. Do not transfer flammable liquid from one vehicle to another on a public roadway except in an emergency.
- If Class 4 (flammable solids) or Class 5 (oxidizing materials) spills, warn others of the fire hazard. Do not open smoldering packages of flammable solids. Remove them from the vehicle if you can safely do so. Also remove unbroken packages if it will decrease the fire hazard.
- If you think Division 2.3 (poison gases) or Division 6 (poisons) are leaking, you must protect yourself, other people, and property from harm. Remember, many products classed as poison are also flammable. If you think a Division 2.3 (poison gases) or Division 6 (poison materials) might be flammable, take added precautions. Warn of the hazards of fire, of inhaling vapors, or of coming in contact with the poison. Do not allow smoking or open flames in the area. Check a vehicle involved in a leak of Division 2.3 (poison gases) or Division 6.1 (poisons) for stray poison before using it again.
- If a leak or broken package involves Class 7 (radioactive materials), tell your dispatcher or supervisor as soon as possible. If there is a spill or if an internal container is damaged, do not touch or inhale the material. Do not use the vehicle until it is cleaned and checked with a survey meter.
- If Class 8 (corrosive materials) spills or leaks while in transit, handle containers carefully to avoid further damage or injury, Parts of the vehicle exposed to a corrosive liquid must be thoroughly washed with water. Wash out the interior as soon as possible after unloading and before reloading the vehicle. If further transportation of a leaking tank would be unsafe, get off the road. If safe to do so, try to contain any liquid leaking from the vehicle. Keep bystanders away from the liquid and its fumes. Do everything possible to prevent injury to other highway users.

The NRC helps coordinate emergency response to chemical hazards. They area resource to the local police and fire fighters. The NRC maintains a 24-hour toll-free line. The NRC telephone number is (800) 424-8801. You or your employer must telephone them when any of the following occurs as a direct result of a HAZMAT incident:

- A person is killed.
- A person is injured and requires hospitalization.
- The estimated property damage exceeds $50,000.
- The general public is evacuated for one or more hours.
- One or more major transportation arteries or facilities are closed or shut down for one or more hours.
- Fire, breakage, spillage, or suspected radioactive contamination occurs.
- Fire, breakage, spillage, or suspected etiologic agents (bacteria or toxic) contamination occurs.

The person making the immediate telephone report to the NRC should be prepared to give the following:

- His name.
- Carrier's name and address.
- Telephone number where he can be reached.
- Date, time, and location of the incident.
- Extent of injuries, if any.
- Classification, name, and quantity of HAZMAT involved, if such information is available.
- Type of incident, the nature of HAZMAT involved, and whether a continuing danger to life exists at the scene.

If a reportable quantity of hazardous substance was involved, the caller should give the following:

- The name of the shipper.
- The quantity of the hazardous substance discharged.

Be prepared to give your employer the required information. Carriers must make detailed written incident reports within 15 days.

The CHEMTREC in Washington, D.C. also has a 24-hour, toll-free number. The CHEMTREC telephone number is (800) 424-9300. It was created to provide emergency personnel with technical information about the physical properties of HAZMAT. The NRC and CHEMTREC closely communicate. If you call either one, they will tell the other about the problem when appropriate.

Test Your Knowledge

1. If your placarded trailer has dual tires, how often should you check the tires?
2. What is a safe haven?
3. How close to the travelled part of the roadway can you park with Division 1.2 or 1.3 (Class B explosives)?
4. How close can you park to a bridge, tunnel, or building with Division 1.2 or 1.3 (Class B explosives)?
5. What type of fire extinguisher must placarded vehicles carry?
6. You are hauling 100 pounds of Division 4.3 (dangerous when wet) material. Do you need to stop before railroad crossings?
7. At a rest area you discover your HAZMAT shipments slowly leaking from the vehicle. There is no telephone around. What should you do?
8. What is the ERG?

These questions may be on the test. If you cannot answer all questions, reread paragraphs 9-6 and 9-7.

CHAPTER 10

PRE-TRIP VEHICLE INSPECTION TEST

During the inspection, you must show that the vehicle is safe to drive. You will inspect the vehicle according to the seven-step inspection method outlined in Chapter 2.

10-1. INSTRUCTIONS. The examiner will give you an in-depth brief on the pre-trip inspection requirements before you will be allowed to begin the inspection. You will be required to do a thorough inspection on the vehicle you will be driving. The examiner will let you know that a vehicle inspection memory aid is available and may be used during the test, if desired. You will also be required to point to or touch the items you are inspecting. You must explain each part you inspect and what you are looking for.

10-2. SCORING THE PRE-TRIP INSPECTION TEST. The examiner will use a vehicle inspection test form and will score you based on the correct explanation you give for items inspected. You must state the key features or symptoms that show if a vehicle component is safe or unsafe. The examiner will explain to you the test results at the conclusion of the pre-trip inspection.

10-3. WHEN INSPECTING ALL VEHICLES. Follow the checklist below when practicing your pre-trip inspection.

a. **Engine Compartment.** Check the following items with the engine not running.

	GO	NO GO
1. Leaks/Hoses--		
a. Look for puddles on the ground.		
b. Look for dripping fluids on underside of engine and transmission.		
c. Inspect hoses for condition and leaks.		
2. Oil level--		
a. Show where dipstick is located.		
b. Check that oil level is within safe operating range. Level must not be above fill mark.		
3. Coolant level--		
a. Inspect reservoir sight glass, or		
b. If engine is not hot, remove radiator cap and check for visible coolant level.		
4. Power steering fluid--		
a. Show where the power steering fluid dipstick is located.		
b. Check for adequate power steering fluid level. Level must not be above the fill mark.		

	GO	NO GO
5. Engine compartment belts--		
a. Check the power steering, water pump, alternator, and air compressor belts for snugness (up to 3/4 inch play at center of belt), cracks, or frays.		
b. If any of the components are not belt driven, you must inform the examiner.		
c. Make sure components (not belt driven) are operating properly, are not damaged or leaking, and are securely mounted.		

b. **Cab Check/Engine Start.** Perform the following cab checks and start the engine.

	GO	NO GO
1. Clutch/Gearshift--		
a. Depress clutch (for standard transmission).		
b. Place gearshift lever in neutral (or park, for automatic transmissions).		
c. Start engine, then release clutch slowly (if standard transmission).		
2. Oil pressure gauge--		
a. Make sure the oil pressure gauge is working.		
b. Check that pressure gauge shows increasing or normal oil pressure or that warning light goes off.		
c. If equipped, oil temperature gauge should begin a gradual rise to the normal operating range.		
3. Temperature gauge--		
a. Check that temperature gauge works.		
b. Temperature should begin to climb to the normal operating range or temperature light should be off.		
4. Ammeter/Voltmeter--		
Check that gauges show alternator and/or generator is charging or that warning light is off.		
5. Mirrors and Windshield--		
a. Mirrors should be clean and adjusted properly from the inside.		
b. Windshield should be clean with no illegal stickers, no obstructions, or damage to the glass.		
6. Emergency equipment--		
a. Check for spare electrical fuses. If vehicle is not equipped with electric fuses, inform the examiner.		
b. Check for three red reflective triangles.		
c. Check for a properly charged and rated fire extinguisher.		

	GO	NO GO
7. Steering play--		
a. Non-power steering: Check for excess play by turning steering wheel back and forth. Play should not exceed 10 degrees (or about two inches on a 20-inch wheel).		
b. Power Steering: With engine running, check for excess play by turning the steering wheel back and forth. Play should not exceed 10 degrees (or about two inches on a 20-inch wheel).		
8. Wipers/Washers--		
a. Check that wiper arms and blades are secure, not damaged, and operate smoothly.		
b. If equipped, windshield washers must operate correctly.		
9. Lighting indicators--		
a. Test that dash indicators work when corresponding lights are turned on.		
b. Check left turn signal.		
c. Check right turn signal.		
d. Check 4-way emergency flashers.		
e. Check high beam headlight.		
10. Horns--		
Check that air horn and/or electric horn works.		
11. Heater/Defroster--		
Test that the heater and defroster work properly.		
12. Parking brake check--		
Apply parking brake only and make sure that it will hold the vehicle by shifting into a lower gear and gently pulling against the brake.		
13. Hydraulic brake check--		
a. Pump the brake pedal three times, then hold it down for five seconds. The brake pedal should not move (depress) during the five seconds.		
b. If equipped with hydraulic brake reserve (back-up) system, make sure key is in off position, depress brake pedal, and listen for sounds of the reserve system electric motor.		
c. Check that the warning buzzer or light is off.		
14. Air brake check (air brake equipped vehicles only).		
a. Improperly performed brake checks is an automatic failure of the vehicle inspection. The procedure is designed to check that safety devices operate correctly as air pressure drops from normal to low. For safety purposes, in areas where an incline exists, chock wheels during the air brake check. Use proper procedures for inspecting the air brake system.		

	GO	NO GO
b. Check air compressor cut-in and cut-out. Follow manufacturer's specification. Normally cut-in occurs about 100 psi and cut-out about 125 psi. With engine idling, step on and off the brake to reduce air tank pressure. The compressor should cut-in about 100 psi. The pressure should start to rise. Cut-out should occur about 125 psi. If the air governor does not work right, it may need repair. If malfunctioning, it may not keep enough air pressure for safe driving.		
c. With engine running, build pressure to governed cut-out (100 to 125 psi). Shut off engine, chock wheels, if necessary; release tractor protection valve and parking brake; (push in) the foot brake and hold it for one minute. After the initial air loss, check air gauges to see if the air pressure drops more than three pounds in one minute (single vehicle) or four pounds in one minute (combination vehicle).		
d. Begin fanning off the air pressure by rapidly applying and releasing the foot brake. Low air warning devices (buzzer, light, flag) should activate before air pressure drops below 60 psi.		
e. Continue to fan off the air pressure. At approximately 40 psi on a tractor trailer combination vehicle, the tractor protection valve and parking brake valve should close (pop out). On other combination vehicle types and single vehicle types, the parking brake valve should close (pop out).		
15. Safety belt--		
Check that the safety belt is securely mounted and adjusts and latches properly.		
16. Lights/Reflectors. Check that all external lights and reflective equipment are clean and functional. Lights and reflectors include:		
a. Clearance lights (red on rear, amber elsewhere).		
b. Headlights (high and low beams).		
c. Taillights.		
d. Turn signal.		
e. 4-way flashers.		
f. Brake lights.		
g. Reflectors (red on rear, amber elsewhere).		

NOTE: Checks of brake, turn signal, and 4-way emergency flasher functions must be done separately.

10-4. EXTERNAL INSPECTION (BUS, TRUCK, AND TRACTOR). Follow the checklist below when practicing this portion of your pre-trip inspection test.

	GO	NO GO
1. Steering Box/Hoses--		
a. Check to be sure that the steering box is securely mounted and not leaking. Look for any missing nuts, bolts, or cotter keys.		
b. Check for power steering fluid leaks or damage to power steering hoses.		
2. Steering linkage--		
a. See that connecting links, arms, and rods from the steering box to the wheel are not worn or cracked.		
b. Check that joints and sockets are not worn or loose and that there are no missing nuts, bolts, or cotter keys.		
3. Spring/Air/Torque--		
a. Look for missing, shifted, cracked, or broken leaf springs.		
b. Look for broken or distorted coil springs.		
c. If vehicle is equipped with torsion bars, torque arms or other types of suspension components. Check that they are not damaged and are mounted securely.		
d. Air ride suspension should be checked for damage and leaks.		
4. Mounts--		
Look for cracked or broken spring hangers, missing or damaged bushings, and broken, loose, or missing bolts. Check U-bolts or other axle mounting parts. The mounts should be checked at each point where they are secured to the vehicle frame and axle.		

NOTE: Perform the same suspension components inspection on every axle (power unit and trailer, if equipped).

	GO	NO GO
5. Shock absorbers--		
Check that shock absorbers are secure and that there are no leaks.		
6. Slack adjustors--		
a. Look for broken, loose, or missing parts.		
b. The angle between the push rod and adjustor arm should be about 90 degrees when brakes are released and not less than 90 degrees when brakes are applied.		
c. When pulled by hand, the brake rod should not move more than one inch (with the brakes release).		

	GO	NO GO
7. Brake chambers--		
Check that brake chambers are not leaking, cracked, or dented and are mounted securely.		
8. Brake hoses/Lines--		
Look for cracked, worn, or leaking hoses, lines, and couplings.		
9. Drum brake--		
a. Check for cracks, dents, or holes. Also check for loose or missing bolts.		
b. Brake linings (when visible) should not be worn dangerously thin.		
10. Brake linings--		
On some brake drums, there are openings where the brake linings can be seen from outside the drum. For this type drum, check that a visible amount of brake lining is showing.		

NOTE: Perform the same brake components inspection on every axle (power unit and trailer, if equipped).

	GO	NO GO
11. Rims--		
Check for damaged or bent rims. Rims cannot have welding repairs.		
12. Inspect the following items on each tire--		
a. Tread depth: Check for minimum tread depth (4/32 on steering axle tires, 2/32 on all other tires).		
b. Tire condition: Check that tread is evenly worn and look for cuts or other damage to tread or side-walls. Also make sure that valve caps and stems are not missing, broken, or damaged.		
c. Tire inflation: Check for proper inflation by using a tire gauge or by striking tires with a mallet or other similar device.		

NOTE: You will not get credit if you kick the tires to check for proper inflation.

	GO	NO GO
13. Hub oil seals/Axle seals--		
Check that hub grease seal and axle seals are not leaking and the oil level (if wheel has a sight glass).		
14. Lug nuts--		
a. Check that all lug nuts are present, free of cracks, and show no signs of looseness, such as rust trails or shiny threads.		
b. Ensure bolt holes are not cracked or distorted.		
15. Spacer--		
a. If equipped, check that spacers are not bent, damaged, or rusted through.		
b. Spacers should be evenly centered, with the dual wheels and tires evenly separated.		
16. Doors/Mirrors--		
a. Check that doors are not damaged and they open and close properly from the outside.		
b. Hinges must be secure with seals intact.		
c. Check that mirrors and mirror brackets are not damaged and are mounted securely with no loose fittings.		
17. Fuel tank--		
Check that tanks are secure, caps are tight, and that tanks or lines are not leaking.		
18. Battery/Box--		
a. Check that batteries are secure, connections are tight, and cell caps are present.		
b. Battery connections should not show signs of excessive corrosion.		
c. Battery box and cover or door must be secure.		
19. Drive shaft--		
a. Check that drive shaft is not bent or cracked.		
b. Couplings should be secure and free of foreign objects.		
20. Exhaust system--		
a. Check system for damage and signs of leaks such as rust or carbon soot.		
b. System should be connected tightly and mounted securely.		
21. Frame--		
Look for cracks, broken welds, holes, or other damage to the longitudinal frame member, crossmember, box, and floor.		
22. Splash guards--		
If equipped, check that splash guards or mudflaps are not damaged and are mounted securely.		

	GO	NO GO
23. Doors/Ties/Lifts--		
a. Check that doors and hinges are not damaged and that they open, close, and latch properly from the outside, if equipped.		
b. Ties, straps, chains, and binders must also be secure.		
c. If equipped with a cargo lift, look for leaking, damaged, or missing parts and explain how to check it for correct operation.		
d. Lift must be retracted and latched securely.		
24. Air/Electric lines--		
a. Listen for air leaks. Check that air hoses and electric lines are not cut, chafed, spliced, or worn (steel braid should not show through).		
b. Make sure air and electrical lines are not tangled, pinched, or dragging against tractor parts.		
25. Catwalk--		
Check that the catwalk is solid, clear of objects, and securely bolted to tractor frame.		
26. Mounting bolts--		
a. Look for loose or missing mounting brackets, clamps, bolts, or nuts. Both the fifth wheel and the slide mounting must be solidly attached.		
b. On other coupling systems (such as the ball hitch, pintle hook, and so on), inspect all coupling components and mounting brackets for missing or broken parts.		
27. Locking jaws--		
a. Look into fifth wheel gap and check that locking jaws are fully closed around the kingpin.		
b. On other types of coupling systems (such as the ball hitch, pintle hook, and so on), inspect the locking mechanism for missing or broken parts, and make sure it is locked securely. If present, safety cables or chains must be secure and free of kinks and excessive slack.		
28. Platform (fifth wheel)--		
Check for cracks or breaks in the platform structure which supports the fifth wheels skid plate.		
29. Release arm (fifth wheel)--		
If equipped, make sure the release arm is in the engaged position and the safety latch is in place.		

	GO	NO GO
30. Kingpin/Apron/Gap--		
a. Check that the kingpin is not bent.		
b. Make sure the visible part of the apron is not bent, cracked, or broken.		
c. Check that the trailer is laying flat on the fifth wheel skid plate (no gap).		
31. Locking pins (fifth wheel)--		
a. If equipped, look for loose or missing pins in the slide mechanism of the fifth wheel. If air powered, check for leaks.		
b. Make sure locking pins are fully engaged.		
c. Check to be sure that the fifth wheel is positioned so that the tractor frame clears the landing gear during turns.		

10-5. INSPECTING SCHOOL BUSES. Follow the checklist below when practicing for your pre-trip inspection test.

	GO	NO GO
1. Emergency equipment--		
In addition to checking for spare electrical fuses (if equipped), also check for three red reflective triangles and a properly charged and rated fire extinguisher. School bus drivers must also inspect the three red-burning flares (fuses) and a nine-item first aid kit.		
2. Lighting indicators--		
In addition to checking the lighting indicators listed in paragraph 10-3, school bus drivers must also check the alternately flashing amber and red lights and the strobe light (if equipped).		
3. Lights/Reflectors--		
In addition to checking the lights and reflective devices listed in paragraph 10-3, school bus drivers must also check the external strobe light, stop arm light, and alternately flashing amber and red lights (if equipped).		
4. Stop arm--		
If equipped, check stop arm to see that it is mounted securely to the frame of the vehicle. Also check for loose fittings and damage.		

	GO	NO GO
5. Passenger entry/lift--		
a. Check that entry door is not damaged, operates smoothly, and closes securely from the inside.		
b. Hand rails are secure and the step light is working, if equipped.		
c. The entry steps must be clear with the treads not loose or worn excessively.		
d. If equipped with a handicap lift, look for leaking, damaged, or missing parts, and explain how lift should be checked for correct operation. Lift must be fully retracted and latched securely.		
6. Emergency exits--		
a. Make sure that emergency exits are not damaged, operate smoothly, and closes securely from inside.		
b. Check that emergency exit warning devices are working.		
7. Seating--		
a. Look for broken seat frames and check that seat frames are firmly attached to the floor.		
b. Check that seat cushions are attached securely to the seat frames.		

10-6. INSPECTING TRAILERS. Follow the checklist below when practicing for your pre-trip inspection test.

	GO	NO GO
1. Air/Electrical connections--		
a. Check that trailer air connectors are sealed and in good condition.		
b. Make sure glad hands are locked in place and free of damage or air leaks.		
c. Make sure the trailer electrical plug is firmly seated and locked in place.		
2. Header board--		
a. Check that the header board is secure, free of damage, and strong enough to contain cargo.		
b. If equipped, the canvas or tarp carrier must be mounted and fastened securely.		
c. On enclosed trailers, check the front area for signs of damage such as cracks, bulges, or holes.		

	GO	NO GO
3. Landing gear--		
a. Check that the landing gear is fully raised, has no missing parts, crankhandle is secure, and the support frame is not damaged.		
b. If power operated, check for air or hydraulic leaks.		
4. Doors/Ties/Lifts--		
a. If equipped, check that doors are not damaged, and they open, close, and latch properly from the outside.		
b. Check that ties, straps, chains, and binders are secure.		
c. If equipped with a cargo lift, look for leaking, damaged or missing parts, and explain how to check it for correct operation.		
d. Lift should be fully retracted and latched securely.		
5. Frame--		
Look for cracks, broken welds, holes, or other damage to the frame, crossmember, box, and floor.		
6. Tandem release arm/Locking pins--		
If equipped, make sure the locking pins are locked in place and release arm is secured.		
7. Remainder of trailer--		
Please refer to paragraph 10-4 for detailed inspection procedures regarding the wheels, suspension system, brakes, doors, ties, lift, and splash guards.		

10-7. INSPECTING COACHES AND TRANSIT BUSES. Follow the checklist below when practicing for your pre-trip inspection test.

	GO	NO GO
1. Passenger entry/lift--		
a. Check that entry doors operate smoothly and close securely from the inside.		
b. Check that hand rails are secure and if equipped, that the step lights are working.		
c. Check that the entry steps are clear, with treads not loose or worn excessively.		
d. If equipped with a handicap lift, look for any leaking, damaged, or missing parts, and explain how it should be checked for correct operation.		
e. Lift should be fully retracted and latched securely.		

	GO	NO GO
2. Emergency exits--		
a. Make sure that emergency exits are not damaged, operate smoothly, and close securely from the inside.		
b. Check that any emergency exit warning devices are working.		
3. Passenger seating--		
a. Look for broken seat frames and check that seat frames are firmly attached to the floor.		
b. Check that seat cushions are attached securely to the seat frames.		
4. Doors/Mirrors--		
a. Check that entry/exit doors are not damaged and operate smoothly from outside. Hinges should be secure with seats intact.		
b. Make sure that the passenger exit mirrors and all external mirrors and mirror brackets are not damaged and are mounted securely with no loose fittings.		
5. Level/Air leaks--		
Check that vehicle is sitting level (front and rear), and if air-equipped, check for audible air leaks from the suspension system.		
6. Fuel tanks--		
Check that fuel tanks are secure with no leaks from tanks or lines.		
7. Compartments--		
Check that baggage and all exterior compartment doors are not damaged, operate properly, and latch securely.		
8. Battery/Box--		
a. Wherever located, see that batteries are secure, connections are tight, and cell caps are present.		
b. Battery connections should not show signs of excessive corrosion.		
c. Check to ensure that the battery box and cover or door is not damaged and is secure.		
9. Remainder of the vehicle--		
Please refer to paragraph 10-4 for detailed inspection procedures regarding wheels.		

NOTE: Remember, you must pass the pre-trip vehicle inspection before you can proceed to the basic control skills test.

CHAPTER 11

BASIC CONTROL SKILLS TEST

This chapter covers the basic control skills test. The basic control skills test will consist of the forward stop, straight line backing, right turn, and alley dock.

11-1. INSTRUCTIONS. Before you begin the test, an examiner will explain the four events that make up the basic control skills test and the scoring standards for each one. The examiner will give you directions for each exercise in the order they are required to be negotiated.

11-2. SCORING THE BASIC CONTROL SKILLS TEST. The examiner will use a designated portion of the vehicle inspection test form to score this test. Your score will reflect on your ability to negotiate the event based on the established standards explained to you in paragraph 11-1.

- Each time you cross over or touch the exercise boundary (lines or cones) with any portion of your vehicle it will be scored as an error.
- In some of the exercises, the examiner will score the number of times you stop and change direction or pull-up during the exercise. Under those conditions, the scoring standards will be explained to you before you begin the test.

11-3. THE BASIC CONTROL SKILLS TEST. The exercises are designed to evaluate basic skills in controlling the vehicle and judging its position in relation to other objects. It also tests basic skills essential for safe control of the vehicle. The four events that makeup the basic control skills test are forward stop, straight line backing (Figure 11-1, page 11-2), right turn (Figure 11-2, page 11-3), and the alley dock (Figure 11-3, page 11-4). Both the forward stop and straight line backing are depicted in the same figure. They maybe setup together or at different locations. This may depend on the amount of maneuvering room you have for testing. Even though the forward stop and straight line backing are depicted together, they are scored as separate events. The description for the events are as follows:

a. **Forward Stop.** Begin this event with the vehicle outside the exercise boundary. Drive forward between two rows of cones or lines. Bring your vehicle to a complete stop with the front bumper between the end exercise boundary lines or set of cones. You may stop only once. Do not stop beyond the outer boundary marker (see Figure 11-1).

b. **Straight Line Backing.** Begin this event with the vehicle outside the exercise boundary. Back your vehicle in a straight line between two rows of cones or lines without touching or crossing over the exercise boundaries. Stop the vehicle when your front bumper is between the two cones or lines at the end. Do not stop beyond the outer line or cones (see Figure 11-1).

c. **Right Turn.** Drive forward and make a right turn around a cone. Drive the vehicle as close to the cone as possible without hitting it. Keep your vehicle inside the left and right exercise boundary lines or cones (see Figure 11-2).

d. **Alley Dock.** Drive your vehicle forward to the left side of the reference cone with the rear of your vehicle toward the alley dock (45 degree angle). Keep your vehicle inside the exercise

boundary lines or cones at all times. Sight-side back your vehicle into the alley, bringing it as close as possible to the rear of the alley without going beyond the end line or row of cones (see Figure 11-3).

The basic control skills test may beat a single location or a different location may be used for each event. In some cases, you may find the forward stop and straight line backing exercises combined as a single event to save space.

Remember, you must pass the pre-trip vehicle inspection and the basic control skills test before you are eligible to take the road test.

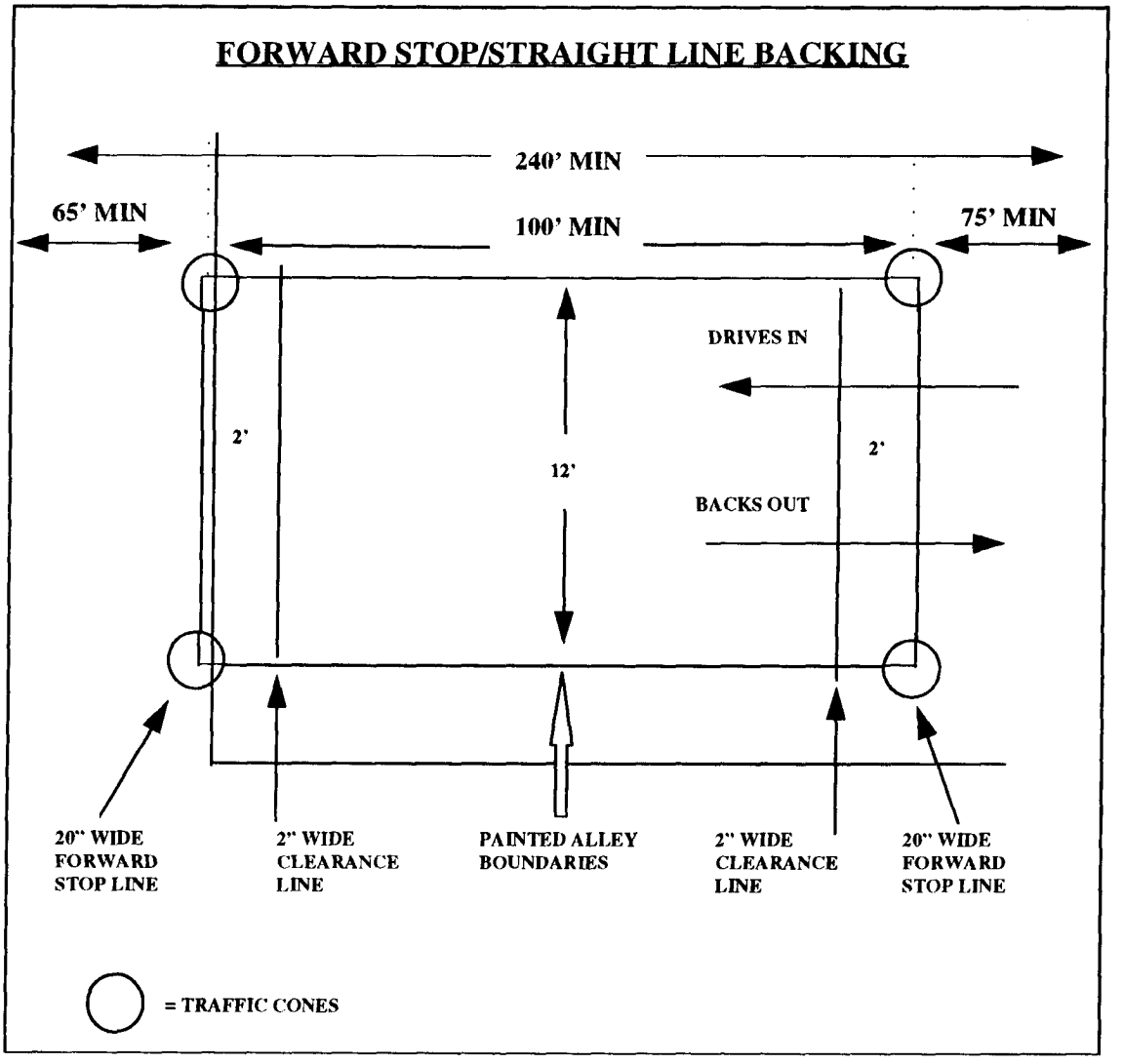


Figure 11-1. Forward stop/straight line backing

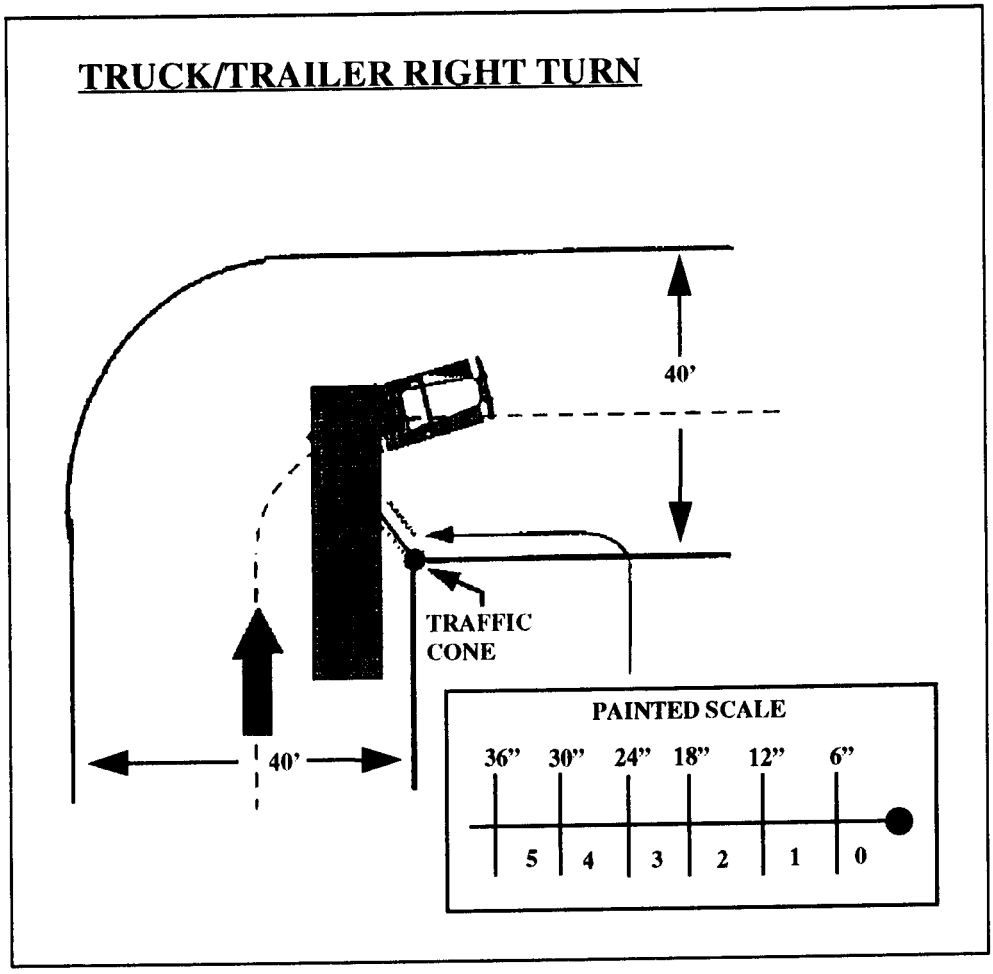


Figure 11-2. Right turn

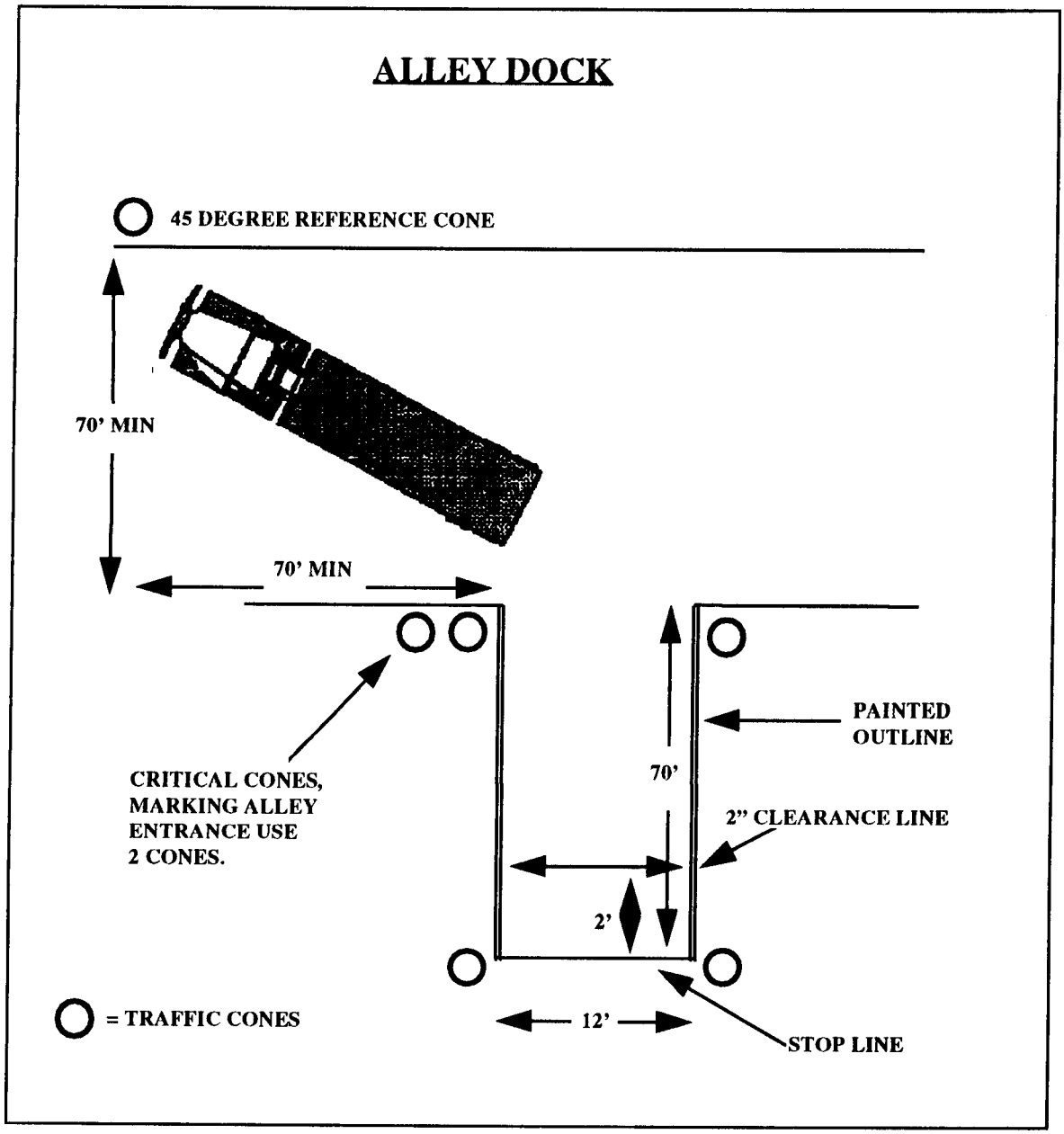


Figure 11-3. Alley dock

CHAPTER 12

DRIVING TEST

This chapter covers the performance road test. You are required to drive over a designated test route that has a variety of traffic situations. You will be evaluated on your ability to safely negotiate all the maneuvers along the designed route. You must drive in a safe and responsible manner at all times during the test.

12-1. INSTRUCTIONS. Before you begin the road test, an examiner will brief you on the entire route. He will explain the maneuvers you will be required to execute and the scoring standards. You will be given additional directions and instructions as you proceed through the route.

12-2. SCORING THE TEST. The examiner will be scoring you on specific driving maneuvers and also your general driving behavior. Directions and instructions will be given to you by the examiner in sufficient time for you to execute a driving maneuver. You will not be asked to drive in an unsafe manner.

If your test route does not have certain traffic situations, you maybe asked to simulate a traffic situation. Explain to the examiner what you are doing (or would be doing) if you were in that traffic situation.

The examiner will be making various marks on the road test form. This does not necessarily mean you have done anything wrong. It is in your best interest to concentrate on driving. The examiner will explain the test results to you at the conclusion of the road test.

12-3. DRIVING THE TEST ROUTE. Follow the checklist below when practicing the road test.

	GO	NO GO
1. When preparing to make a turn--		
a. Check traffic in all directions.		
b. Use turn signals and safely get into the lane needed for the turn.		
2. When approaching a turn--		
a. Use turn signals to warn others of your turn.		
b. Slow down smoothly, change gears as needed to keep power. Do not coast. Unsafe coasting occurs when your vehicle is out of gear (clutch depressed or gearshift in neutral) for more than the vehicle length.		
3. If you must stop before making a turn--		
a. Come to a smooth stop without skidding.		
b. Stop behind the stop line, crosswalk, or stop sign.		

	GO	NO GO
c. If stopping behind another vehicle, stop when you can see the rear tires on the vehicle ahead of you (safe gap).		
d. Do not let your vehicle roll.		
e. Keep the front wheels aimed straight ahead.		
4. When you are ready to negotiate a turn--		
a. Check traffic in all directions.		
b. Keep both hands on the steering wheel during the turn.		
c. Do not change gears during the turn.		
d. Check mirrors. Make sure the vehicle does not hit anything on the inside of the turn.		
e. Check that vehicle does not move into oncoming traffic.		
f. Check that vehicle finishes in correct lane.		
5. After you have completed a turn--		
a. Make sure turn signal is off.		
b. Get up to speed of traffic, use turn signal, and move into right-most lane when safe to do so (if not already there).		
6. When you approach an intersection--		
a. Check traffic in all directions.		
b. Decelerate gently.		
c. Brake smoothly and, if necessary, change gears.		
d. If necessary, come to a complete stop (no coasting) behind any stop signs, signals, sidewalks, or stop lines. Maintain a safe gap behind the vehicle in front of you.		
e. Your vehicle must not roll forward or backward.		
7. When driving through an intersection--		
a. Check traffic in all directions.		
b. Decelerate and yield to pedestrians and traffic in the intersection.		
c. Do not change lanes or shift gears while proceeding through the intersection.		
d. Keep your hands on the wheel.		
8. When you have gone through the intersection--		
a. Continue checking traffic.		
b. Accelerate smoothly and change gears as necessary.		
9. During the urban/rural straight portion of a test you must make regular traffic checks and maintain a safe following distance. Your vehicle should be centered in the proper lane (right-most lane) and you should keep up with the flow of traffic but not exceed the posted speed limit.		

	GO	NO GO
10. During the urban/rural portion you will be asked to change lanes to the left, and then back to the right. You should make the necessary traffic checks first, then use proper signals and smoothly change lanes when it is safe to do so.		
11. Actions required before you enter an expressway--		
a. Check traffic.		
b. Use proper signals.		
c. Merge smoothly into the proper lane of traffic.		
12. Actions required after you enter an expressway--		
a. Maintain proper lane positioning, spacing, and speed.		
b. Continue to check traffic in all directions.		
13. Actions required when instructed to change lanes--		
a. Make necessary traffic checks.		
b. Use proper signals.		
c. Change lanes smoothly when it is safe to do so.		
14. Actions required when exiting an expressway--		
a. Make necessary traffic checks.		
b. Use proper signals.		
c. Decelerate smoothly in the exit lane.		
d. Once on a ramp, continue to decelerate within the lane markings, and maintain adequate spacing between your vehicle and other vehicles.		
15. For stopping and starting maneuvers--		
a. Pull your vehicle to the side of the road.		
b. Stop as if you were going to exit and check your vehicle and its load.		
c. Check traffic in all directions and move to the right-most lane or shoulder of the road.		
16. Actions required when preparing to stop--		
a. Check traffic.		
b. Activate your right turn signal.		
c. Decelerate and brake smoothly, and downshift if necessary.		
d. Bring your vehicle to a stop without coasting.		
17. Actions required after you have stopped--		
a. Ensure vehicle is parallel to the curb or shoulder of the road and safely out of the traffic flow.		
b. Ensure vehicle is not blocking driveways, fire hydrants, intersections, signs, and so on.		
c. Cancel your turn signal.		

	GO	NO GO
d. Activate 4-way emergency flashers.		
e. Apply the parking brake.		
f. Move the gear shift to neutral or park.		
g. Remove your feet from the brake and if equipped, from the clutch pedal.		
18. Actions required when you resume--		
a. Check mirrors and traffic in all directions.		
b. Turn off 4-way emergency flashers.		
c. Activate the left turn signal.		
d. When traffic permits, release the parking brake and pull straight ahead.		
e. Do not turn the wheel before your vehicle moves.		
f. Check traffic from all directions, especially to the left.		
g. Steer and accelerate smoothly into the proper lane when safe to do so.		
h. Once your vehicle is back into the flow of traffic, cancel left turn signal.		
19. Actions to be taken when you approach a curve--		
a. Check traffic in all directions.		
b. Before entering the curve, reduce speed so further braking or shifting is not required.		
c. Keep vehicle in the lane.		
d. Continue checking traffic in all directions.		
20. Actions required when you approach an upgrade--		
a. Select the proper gear to maintain speed and not lug the engine.		
b. Check traffic in all directions and move to the right-most or curb lane.		
c. If legal to do so, use 4-way emergency flashers if travelling too slow for the flow of traffic.		
21. Actions required before you start down a grade:		
a. Downshift as needed to help control engine speed. Test brakes by gently applying the foot brake to ensure they work properly. As vehicle moves down the grade, continue checking traffic in all directions, stay in the right-most or curb lane, and if legal to do so, use 4-way emergency flashers if moving too slow for traffic. Increase following distance and observe the downhill braking procedures below:		
- Select a safe speed that is not too fast for the weight of the vehicle, length and steepness of the grade, weather, and road conditions.		
- Once a safe speed is reached, apply the brake hard enough to feel a definite slowdown.		

	GO	NO GO
- When speed has been reduced to 5 mph below the safe speed, release the brakes. (This application should last for about three seconds.)		
- Once speed has increased to the safe speed, repeat the procedures above.		
Example: If your safe speed is 40 mph, apply the brakes once your vehicle speed reaches 40 mph. Your brakes should be applied hard enough to reduce your speed to 35 mph. Once you vehicle speed reaches 35 mph, release your brakes. Repeat procedures as often as necessary until you have reached the end of the downgrade. This braking technique is called snubbing.		
b. When operating any vehicle, do not ride the clutch, race the engine, change gears, or coast while driving down grades. At the bottom of the grade, be sure to cancel 4-way emergency flashers.		
NOTE: Not all test routes will contain an area of sufficient grade to test your skills adequately. Therefore, you may be asked to simulate (verbally) driving up and down a steep hill. You must be familiar with the upgrade/downgrade procedures so that you can explain and/or demonstrate them to the examiner.		
22. Before reaching a railroad crossing--		
a. Decelerate, brake smoothly, and shift gears as necessary.		
b. Look and listen for the presence of trains.		
c. Check traffic in all directions.		
d. Do not stop, change gears, pass another vehicle, or change lanes while any part of your vehicle is in the crossing.		
e. If you are driving a bus, a school bus, or a vehicle displaying placards, observe the following procedures at every railroad crossing (unless the crossing is exempt):		
- As vehicle approaches a railroad crossing, activate the 4-way emergency flashers.		
- Stop the vehicle within 50 feet but not less than 15 feet from the nearest rail.		
- Listen and look in both directions along the track for an approaching train and for signals indicating the approach of a train. If operating a bus, you may be required to open the window and door before crossing tracks.		
- Keep hands on the steering wheel as the vehicle crosses the tracks.		
- Do not stop, change gears, or change lanes while any part of your vehicle is proceeding across the tracks.		
- Turn off 4-way emergency flashers after vehicle crosses the tracks.		
NOTE: Not all road test routes will have a railroad crossing. You may be asked to explain and demonstrate the proper railroad crossing procedures to the examiner at a simulated location.		

	GO	NO GO
23. After you have driven across a bridge or under an overpass, the examiner may require you to explain the posted weight limits, clearance, or height restrictions. If your test route does not have a bridge or overpass, you may be asked to explain other traffic signs on the route.		
24. During the driving test you must--		
a. Wear your safety belt.		
b. Obey all traffic signs, signals, and laws.		
c. Complete the test without an accident or moving violation.		
25. You will be scored on your total performance in the general driving behavior categories:		
a. Using your clutch correctly (manual transmission):		
- Always use clutch to shift.		
- Double-clutch if the vehicle is equipped with non-synchronized transmission.		
- Do not race or lug the engine.		
- Do not ride the clutch to control speed, coast with the clutch depressed, or pop the clutch.		
b. Using your gears correctly (for manual transmission):		
- Do not grind or clash gears.		
- Select gear that does not rev or lug engine.		
- Do not shift in turns and intersections.		
c. Using your brake correctly--		
- Do not ride or pump brake.		
- Do not brake harshly. Brake smoothly using steady pressure.		
d. Use your lane correctly--		
- Do not put vehicle over curbs, sidewalks, or lane markings.		
- Stop behind stop lines, crosswalks, or stop signs.		
- Complete turns in the proper lane on a multiple lane road (finish a left turn in the lane directly to the right of the center line). If there are multiple left turn lanes, always use the right-hand turn lane.		
- Finish a right turn in the right-most (curb) lane.		
- Move to or remain in right-most lane unless lane is blocked.		

APPENDIX A

TABLE OF HAZARD CLASS DEFINITIONS

Kinds of Hazardous Materials. Hazardous materials are categorized into nine major hazard classes and additional categories for consumer commodities and combustible liquids. The classes of hazardous materials are as follows:

Table A-1. Table of hazard class definitions

CLASS	CLASS NAME	EXAMPLE
1	Explosives	Ammunition, Dynamite, Fireworks
2	Gases	Propane, Oxygen, Helium
3	Flammable	Gasoline Fuel, Acetone
4	Flammable Solids	Matches, Fuses
5	Oxidizers	Ammonium Nitrate, Hydrogen Peroxide
6	Poisons	Pesticides, Arsenic
7	Radioactive	Uranium, Plutonium
8	Corrosives	Hydrochloric Acid, Battery Acid
9	Miscellaneous Harardous Materials	Formaldehyde, Asbestos
None	ODM-D (Other Regulated Material-Domestic)	Hair Spray or Charcoal
None	Domestic Combustible Liquids	Fuel Oils, Lighter Fluid

NOTE: You will not be tested on this table.

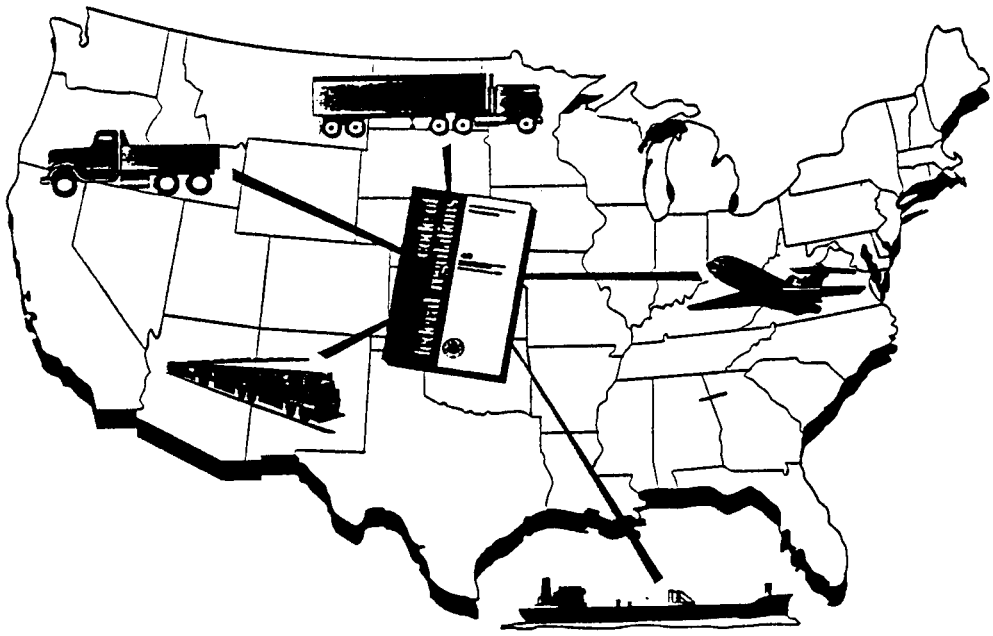
APPENDIX B

DOT CHART 10
HAZARDOUS MATERIALS MARKING, LABELING & PLACARDING GUIDE

U.S. Department of Transportation
Research and Special Programs Adminstration

D O T C H A R T 1 0

Hazardous Materials Marking, Labeling & Placarding Guide



Refer to 49 CFR, Part 172:

Marking - Subpart D

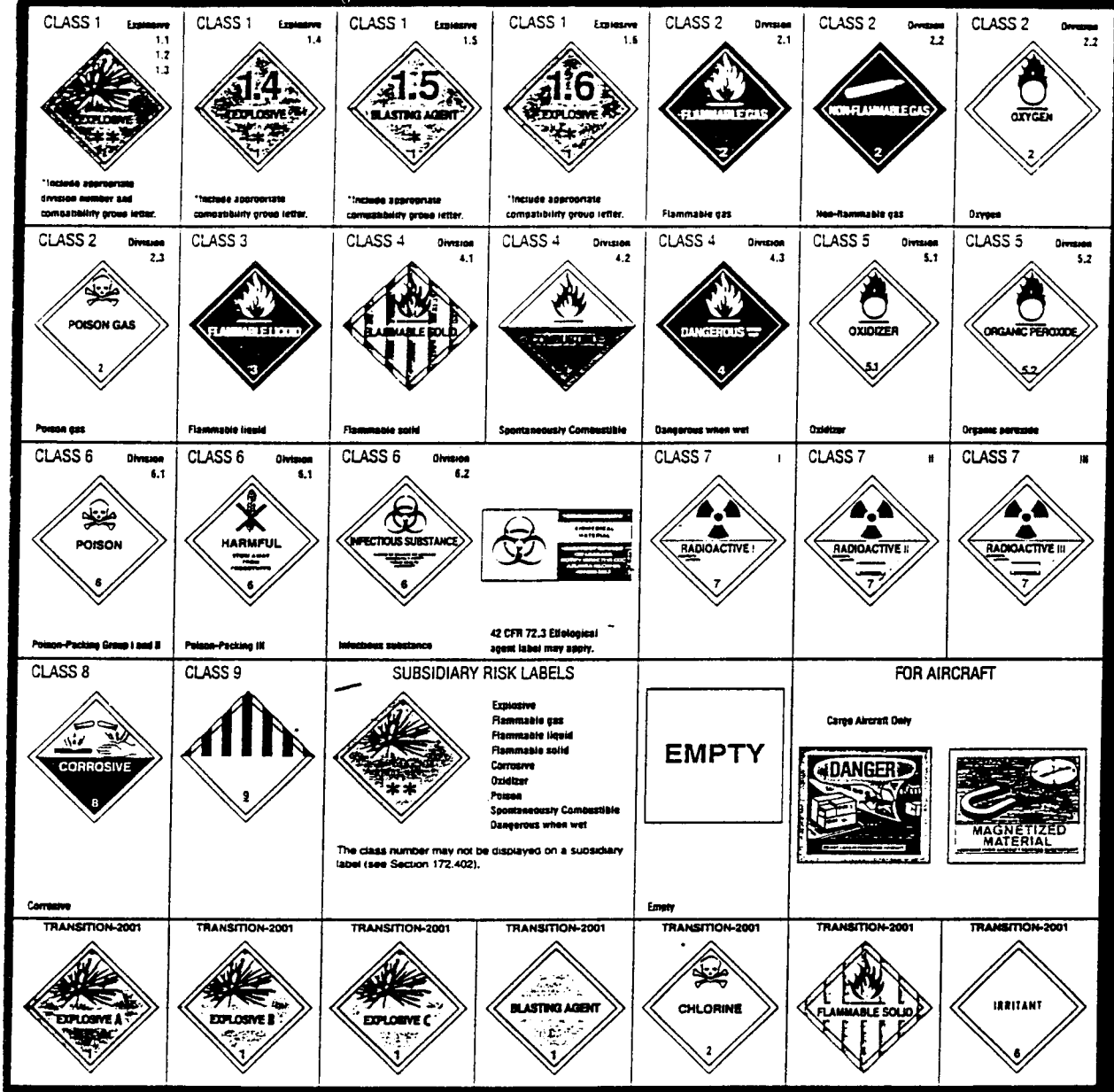
Labeling - Subpart E

Placarding - Subpart F

Emergency Response - Subpart G

NOTE: **This document is for general guidance only and must not be used to determine compliance with 49 CFR, Parts 100-199.**

Hazardous Materials Warning Labels



Keep a copy of the DOT Emergency Response Guidebook handy!

Hazardous Materials Warning Placards

CLASS 1

EXPLOSIVES
*Enter Division number 1.1, 1.2, or 1.3 and compatibility group letter, when required. Placard any quantity.

CLASS 1

EXPLOSIVES 1.4
*Enter compatibility group letter, when required. Placard 454 kg (1,001 lbs) or more.

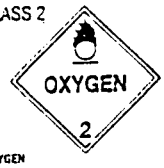
CLASS 1

EXPLOSIVES 1.5
*Enter compatibility group letter, when required. Placard 454 kg (1,001 lbs) or more.

CLASS 1

EXPLOSIVES 1.6
*Enter compatibility group letter, when required. Placard 454 kg (1,001 lbs) or more.

CLASS 2



OXYGEN
Placard 454 kg (1,001 lbs) or more, gross weight of either compressed gas or refrigerated liquid.

CLASS 2

FLAMMABLE GAS
Placard 454 kg (1,001 lbs) or more.

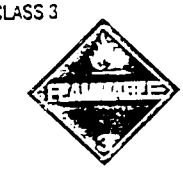
CLASS 2

NON-FLAMMABLE GAS
Placard 454 kg (1,001 lbs) or more gross weight.

CLASS 2

POISON GAS
Placard any quantity of Division 2.3 material.

CLASS 3



FLAMMABLE
Placard 454 kg (1,001 lbs) or more.

CLASS 3

GASOLINE
May be used in the place of FLAMMABLE on a placard displayed on a cargo tank or a portable tank being used to transport gasoline by highway.

CLASS 3

COMBUSTIBLE
Placard a combustible liquid when transported in bulk. See §172.504(f)(2) for use of FLAMMABLE placard in place of COMBUSTIBLE placard.

CLASS 3

FUEL OIL
May be used in place of COMBUSTIBLE on a placard displayed on a cargo tank or portable tank being used to transport by highway fuel oil not classed as a flammable liquid.

CLASS 4

FLAMMABLE SOLID
Placard 454 kg (1,001 lbs) or more.

CLASS 4

SPONTANEOUSLY COMBUSTIBLE
Placard 454 kg (1,001 lbs) or more.

CLASS 4

DANGEROUS WHEN WET
Placard any quantity of Division 4.3 material.

CLASS 5

OXIDIZER
Placard 454 kg (1,001 lbs) or more.

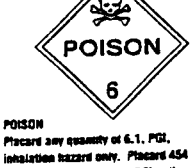
CLASS 5

ORGANIC PEROXIDE
Placard 454 kg (1,001 lbs) or more.

CLASS 6

KEEP AWAY FROM FOOD
Placard 454 kg (1,001 lbs) or more.

CLASS 6



POISON
Placard any quantity of 6.1, PGI, inhalation hazard only. Placard 454 kg (1,001 lbs) or more of PGI or II, other than PGI inhalation hazard.

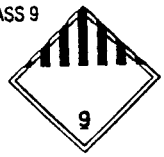
CLASS 7

RADIOACTIVE
Placard any quantity of packages bearing the RADIOACTIVE III label. Certain low specific activity radioactive materials in "exclusive use" will not bear the label, but RADIOACTIVE placard is required.

CLASS 8

CORROSIVE
Placard 454 kg (1,001 lbs) or more.

CLASS 9



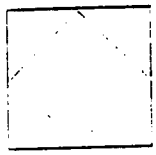
MISCELLANEOUS
Not required for domestic transportation. Placard 454 kg (1,001 lbs) or more gross weight of a material which presents a hazard during transport, but is not included in any other hazard class.

DANGEROUS
Placard 454 kg (1,001 lbs) gross weight of two or more categories of hazardous materials listed in Table 2. A freight container, unit load device, motor vehicle, or rail car which contains non-bulk packagings with two or more categories of hazardous materials that require placards specified in Table 2 may be placarded with a DANGEROUS placard instead of the separate placarding specified for each of the materials in Table 2. However, when 2,268 kg (5,000 lbs) or more of one category of material is loaded at one facility, the placard specified in Table 2 must be applied.

SUBSIDIARY RISK PLACARD

Class numbers do not appear on subsidiary risk placard.

RAIL
Placard empty tank cars for residue of material last contained.



Required background for placards on rail shipments of certain explosives and poisons. Also required for highway route-controlled quantities of radioactive materials (see §§172.507 and 172.510).

UN or NA Identification Numbers

MUST BE DISPLAYED ON TANK CARS, CARGO TANKS, PORTABLE TANKS AND OTHER BULK PACKAGINGS

PLACARDS OR ORANGE PANELS

and

Appropriate Placard must be used.

Response begins with identification!

General Guidelines on Use of Warning Labels and Placards

LABELS

See 49 CFR, Part 172, Subpart E for complete labeling regulations.

- Until October 1, 1993, all of the labels appearing on the Hazardous Materials Warning Labels chart may be used to satisfy the labeling requirements contained in Subpart E.
- On and after October 1, 1993, those labels in boxes marked "TRANSITION-2001" on the chart will not be authorized for use under Subpart E. (NOTE: these labels may be used IF they were affixed to a package offered for transportation and transported prior to October 1, 2001, and the package was filled with hazardous materials prior to October 1, 1991.)
- For classes 1,2,3,4,5,6 and 8, text indicating a hazard (e.g., "CORROSIVE") IS NOT required on a label. The label must otherwise conform to Subpart E [Section 172.405].
- Any person who offers a hazardous material for transportation MUST label the package, if required [Section 172.400(a)].
- The Hazardous Materials Table [Section 172.101] identifies the proper label(s) for the hazardous material listed.
- When required, labels must be printed on or affixed to the surface of the package near the proper shipping name [Section 172.406(a)].
- When two or more labels are required, they must be displayed next to each other [Section 172.406(c)].
- Labels may be affixed to packages when not required by regulations, provided each label represents a hazard of the material contained in the package [Section 172.401].

PLACARDS

See 49 CFR, Part 172, Subpart F for complete placarding regulations.

- All of the placards appearing on the Hazardous Materials Warning Placards chart may be used to satisfy the placarding requirements contained in Subpart F.
- Each person who offers for transportation or transports any hazardous material subject to the Hazardous Materials Regulations shall comply with all applicable requirements of Subpart F.
- Placards may be displayed for a hazardous material even when not required, if the placarding otherwise conforms to the requirements of Subpart F.
- For other than Class 7 or the OXYGEN placard, text indicating a hazard (e.g., "CORROSIVE") is not required on a placard [Section 172.519(b)].
- Any transport vehicle, freight container, or rail car containing any quantity of material listed in Table 1 (Section 172.504) must be placarded.
- When the gross weight of all hazardous materials covered in Table 2 is less than 454 kg (1,001 lbs), no placard is required on a transport vehicle or freight container [Section 172.504].

Effective October 1, 1994, and extending through October 1, 2001, these placards may be used for HIGHWAY TRANSPORTATION ONLY.

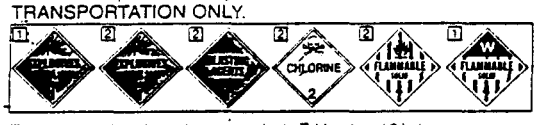


Illustration numbers in each square refer to Tables 1 and 2 below.

Poisonous Materials

§172.554

§172.313

Materials which meet the inhalation toxicity criteria have additional "communication standards" prescribed by the HMR. First, the words "Poison-Inhalation Hazard" must be entered on the shipping paper, as required by Section 172.203(m)(3). Second, packagings must be marked "Inhalation Hazard" in accordance with Section 172.313(a). Lastly, transport vehicles, freight containers, portable tanks and unit load devices that contain a poisonous material subject to the "Poison-Inhalation Hazard" shipping description, must be placarded with a POISON or POISON GAS placard, as appropriate. This shall be in addition to any other placard required for that material in Section 172.504.

Table 1 (Placard any quantity)

Hazard class or division	Placard name
1.1	EXPLOSIVES 1.1
1.2	EXPLOSIVES 1.2
1.3	EXPLOSIVES 1.3
2.3	POISON GAS
4.3	DANGEROUS WHEN WET
6.1 (PGI, PIH only)	POISON
7 (Radioactive Yellow III)	RADIOACTIVE

Table 2 (Placard 1,001 pounds or more)

1.4	EXPLOSIVES 1.4
1.5	EXPLOSIVES 1.5
1.6	EXPLOSIVES 1.6
2.1	FLAMMABLE GAS
2.2	NON-FLAMMABLE GAS
3	FLAMMABLE
Combustible Liquid	COMBUSTIBLE
4.1	FLAMMABLE SOLID
4.2	SPONTANEOUSLY COMBUSTIBLE
5.1	OXIDIZER
5.2	ORGANIC PEROXIDE
6.1 (PGI or II, other than PGI PIH)	POISON
6.1 (PGIII)	KEEP AWAY FROM FOOD
6.2	NONE
8	CORROSIVE
9	CLASS 9
ORM-D	NONE

For complete details, refer to one or more of the following:

- Code of Federal Regulations, Title 49, Transportation, Parts 100-199, (All modes)
- International Civil Aviation Organization (ICAO) Technical Instructions for Safe Transport of Dangerous Goods by Air (Air)
- International Maritime Organization (IMO) Dangerous Goods Code (Water)
- "Transportation of Dangerous Goods Regulations" of Transport Canada, (All Modes)

U.S. Department of Transportation
Research and Special Programs Administration

Copies of this Chart can be obtained by writing OHMIT/DHM-51, Washington, D.C. 20590

CHART 10
REV. FEBRUARY 1994

APPENDIX C

RADIOACTIVE SEPARATION TABLE

Do not leave radioactive Yellow II or III labeled packages near people, animals, or film longer than shown in this table.

Table C-1. Radioactive separation table

Total Transport Index	Minimum Distance in Feet to Nearest Undeveloped Film					To People or Cargo Compartment Partitions
	0 -2 hours	2-4 hours	4-8 hours	8-10 hours	over 12 hours	
None	0	0	0	0	0	0
0.1 to 1.0	1	2	3	4	5	1
1.1 to 5.0	3	4	6	8	11	2
5.1 to 10.0	4	6	9	11	15	3
10.1 to 20.0	5	8	12	16	22	4
20.1 to 30.0	7	10	15	20	29	5
30.1 to 40.0	8	11	17	22	33	6
40.1 to 50.0	9	12	19	24	36	7

NOTE: You will not be tested on the numbers in this table.

GLOSSARY

a.m. ante meridiem (before noon)
AR Army regulation
ARNG Army National Guard
axle weight the weight one axle or a set of axles transmits to the ground
BAC blood alcohol concentration
BII basic issue items
bulk packaging (HAZMAT) a packaging, other than vessel, or a barge, including a transport vehicle or freight container, in which hazardous materials are loaded with no intermediate form of containment and which has--

- A maximum capacity greater than 450L(119 gallons) as a receptacle for a liquid.
- A maximum net mass greater than 454 kg (882 pounds) or a maximum capacity greater than 450 L (119 gallons) as a receptacle for a solid.
- A water capacity greater than 454 kg (1,000 pounds) as a receptacle for a gas as defined in Sec 173.115.

CAI computer-assisted instruction
carboy a bottle or rectangular container that holds from 5 to 15 gallons of liquid. Carboys are made of glass, plastic, or metal and are often cushioned in a wooden box.
cargo tank is a bulk packaging which:

- Is a tank intended primarily for the carriage of liquids or gases and includes appurtenances, reinforcements, fittings and closures. (For tanks, see 49 CFR 178.345-1(c), 178-337-1, or 178.338-1.
- Is permanently attached to or forms a part of a motor vehicle, or is not permanently attached to a motor vehicle but which, by reason of its size, construction or attachment to a motor vehicle is loaded or unloaded without being removed from the vehicle.
- Is not fabricated under a specification for cylinders, portable tanks, tank cars or multi-unit tank car tanks.

carrier a person who transports passengers or property by land or water (as a common, contract, or private carrier) or civil air.
CB citizens band
CDL commercial driver's license
CFR Code of Federal Regulations
CHEMTREC Chemical Transportation Emergency Center
CMV commercial motor vehicle
CMVSA Commercial Motor Vehicle Safety Act
compressed gas any material kept in a container whose pressure exceeds 40 psi at 70 degrees For 104 psi at 130 degrees F.
consignee the business or person to whom a shipment is delivered.
cryogenic liquid a refrigerated liquified gas whose boiling point is colder than -130 degrees F.
ctns cartons
cyl cylinder
cylinder a pressure vessel designed for pressures higher than 40 psi.
DA Department of the Army
D.C. District of Columbia
Division a subdivision of a hazard class.
DMV Division of Motor Vehicles

DOD Department of Defense
DOT Department of Transportation
EPA Environmental Protection Agency
ERG Emergency Response Guide
etiologic agents a living microorganism, or its toxin, which causes or may cause human disease.
F Fahrenheit
FHWA Federal Highway Administration
FM field manual
FMCSR Federal Motor Carrier Safety Regulations
freight container a reusable container having a volume of 64 cubic feet or more, designed and constructed so it can be lifted with its contents intact. It is intended primarily to contain packages in unit form during transport.
ft feet / foot
gross weight the weight of the packaging plus the weight of its contents.
GCW gross combination weight; the total weight of a powered unit plus trailers plus the cargo.
GCWR gross combination weight rating (the maximum GCW specified by the manufacturer for a specific combination of vehicles plus its load).
GVW gross vehicle weight; the total weight of a single vehicle plus its load.
GVWR gross vehicle weight rating (the maximum GVW specified by the manufacturer for a single vehicle plus its load).
HAZMAT hazardous materials
HM hazardous material; any material that poses an unreasonable risk to health, safety, and property during transport. The DOT names these materials in the Hazardous Materials Table.
HMR hazardous materials regulation
IAW in accordance with
ID identification
lb pound(s)
lbs pounds
limited quantity the maximum amount of hazardous materials for which there maybe specific labeling, or packaging exceptions.
kg kilograms
marking means the descriptive name, identification number, instructions, cautions, weight, or UN marks or combinations there of, required on the outer packaging of hazardous materials.
MCDL military commercial driver's license
MIN minimum
mixture a material containing more than one chemical compound or element.
mph miles per hour
NA North America
name of contents the proper shipping name as specified in Sec 172.101.
no. number
n.o.s. not otherwise specified
NRC National Response Center
ORM-D other regulated material-domestic
outage the amount by which a packaging falls short of being full of liquid, usually expressed in percent by volume.
overpack an enclosure used by a single shipper to protect or ease handling of a package or to combine two or more packages. Overpack does not include freight containers.

PCB polychorinated biphenyle
PG package
PGI poison gas-inhalation
PIH poison-inhalation hazard
portable tank any package (except a cylinder with a 1,000-pound or less water capacity) designed primarily to be loaded onto, on, or temporarily attached to, a transport vehicle, or ship and equipped with skids, mountings, or accessories to ease handling of the tank by mechanical means. It does not include cargo tank, tank car, multi-unit tank car tank, or trailer carrying 3AX, 3AAX, or 3T cylinders.
proper shipping name the name of the hazardous material shown in Roman print (not italics) in Sec 172.101.
psi pounds per square inch
pull-up movement forward after a stop; restarting forward.
qty quantity
RPM revolutions per minute
RQ reportable quantity; the quantity specified in Column 3 of the Appendix to Sec 172.101 for any material listed in Column 1 of the Appendix.
rqr requirement
RSPA the Research and Special Programs Administration. U.S. Department of Transportation, Washington, D.C. 20590
shipper's certification a statement on a shipping paper that the shipper signs saying he prepared the shipment properly according to law. "This is to certify that the above named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation." or "I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked and labeled, and are in all respects in proper condition for transport by* according to applicable international and national governmental regulations." **NOTE:** *Words may be inserted hereto indicate mode of transportation (such as rail, aircraft, motor vehicle, vessel, and so forth).
shipping paper a shipping order, bill of lading, manifest, or other shipping document serving a similar purpose and containing the information required by Sec 172.202, 172.203, 172.204.
SOP standing operating procedure
TC training circular
technical name a recognized chemical or microbiological name currently used in scientific and technical handbooks, journals, and texts.
tire load the maximum safe weight a tire can carry at a specified pressure. It is stated on the side of each tire.
TM technical manual
transport vehicle a cargo-carrying vehicle such as an automobile, van, tractor, truck, semitrailer, tank car, or railcar used to transport cargo by any mode. Each cargo-carrying body (such as a trailer or railcar) is a separate transport vehicle.
UL underwriters laboratory
UN standard packaging a specification packaging conforming to the requirements in Subpart L and M of Part 178.
UN United Nations

US United States (of America)
USAR United States Army Reserve
water reactive material (solid) any solid material (including sludges and pastes) which when mixed with water, is likely to ignite or give off flammable or toxic gases in dangerous quantities. Water reactive material must have dangerous when wet and flammable solid labels.

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DOCUMENT NEEDED

These documents must be available to the intended users of this publication.

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DA Form 2028. *Recommended Changes to Publications and Blank Form.* 1 February 1974.

READINGS RECOMMENDED

These readings contain relevant supplemental information.

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