MOTORS TRANSPORT DIV

CAMP LEJEUNE, NC

Bus Study Guide

UPDATED 1 JAN 21

BUS NEW

Section 4

TRANSPORTING PASSENGERS SAFELY

This Section Covers
□ Vehicle Inspection □ Loading □ On the Road □ After-trip Vehicle Inspection □ Prohibited Practices □ Use of Brake-door Interlocks

Bus drivers must have a commercial driver license if they drive a vehicle designed to seat more than 16 or more persons, including the driver.

Bus drivers must have a passenger endorsement on their commercial driver license. To get the endorsement you must pass a knowledge test on Sections 2 and 4 of this manual. (If your bus has air brakes, you must also pass a knowledge test on Section 5.) You must also pass the skills tests required for the class of vehicle you drive.

4.1 – Vehicle Inspection Before driving your bus, you must be sure it is safe. You must review the inspection report made by the previous driver. Only if defects reported earlier have been certified as repaired or not needed to be repaired, should you sign the previous driver's report. This is your certification that the defects reported earlier have been fixed. You the operator are the most important factor in preventive maintenance.

4.1.1 – Vehicle Systems Make sure these things are in good working order before driving: Service brakes, including air hose couplings (if your 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 wiper or wipers. Rear-vision mirror or mirrors. Coupling devices (if present) Wheels and rims. Emergency equipment. Make sure your bus has the fire extinguisher and emergency reflectors (3 reflective triangles or at least 6 fusees or 3 liquid burning flares) required by law. The bus must also have spare electrical fuses, unless equipped with circuit breakers.
4.1.2 – Access Doors and Panels As you check the outside of the bus, close any open emergency exits. Also, close any open access panels (for baggage, restroom service, engine, etc.) before driving.

4.1.3 – Bus Interior People sometimes damage unattended buses. Always check the interior of the bus before driving to ensure rider safety. Aisles and stairwells should always 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 other time you use your outside lights.

4.1.4 – Roof Hatches You may lock some emergency roof hatches in a partly open position for fresh air. Do not leave them open as a regular practice. Keep in mind the bus's higher clearance while driving with them open.

4.1.5 – Use Your Seatbelt! The driver's seat should have a seat belt. Always use it for safety.

4.2 – Loading and Trip Start Do not allow riders to 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 avoid damage and: Allow the driver to move freely and easily.

Allow riders to exit by any window or door in an emergency. Protect riders from injury if carry-ons fall or shift.

4.2.1 – Hazardous Materials Watch for cargo or baggage containing hazardous materials. Most hazardous materials cannot be carried on a bus.

The Federal Hazardous Materials Table shows which materials are hazardous. They pose a risk to health, safety, and property during transportation. The rules require shippers to mark containers of hazardous material with the material's name, identification number, and hazard label. There are nine different four-inch, diamond-shaped hazard labels. See Figure 4.1. Watch for the diamond shaped labels. Do not transport any hazardous material unless you are sure the rules allow it.
Figure 4.1

4.2.2 – Forbidden Hazardous Materials Buses may carry small-arms ammunition labeled ORM-D, emergency hospital supplies, and drugs. You can carry small amounts of some other hazardous materials if the shipper cannot send them any other way. Buses must never carry: Division

2.3 poison gas, liquid Class 6 poison, tear gas, irritating material. More than 100 pounds of solid Class 6 poisons. Explosives in the space occupied by people, except small arms ammunition. Labeled radioactive materials in the space occupied by people. More than 500 pounds total of allowed hazardous materials, and no more than 100 pounds of any one class.

Riders sometimes board a bus with an unlabeled hazardous material. Do not allow riders to carry on common hazards such as car batteries or gasoline.

4.2.3 – Standee Line No rider may stand forward of the rear of the driver's seat. Buses designed to allow standing must have a two-inch line on the floor or some other means of showing riders where they cannot stand. This is called the standee line. All standing riders must stay behind it.

4.2.4 – At Your Destination When arriving at the destination or intermediate stops announce: The 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 of the step-down. It is best to tell them before coming to a complete stop.

Charter bus drivers should not allow riders on the bus until departure time. This will help prevent theft or vandalism of the bus.

4.3 – On the Road

4.3.1 – Passenger Supervision Many charter and intercity 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 at the start will help to avoid trouble later on.

While driving, scan the interior of your bus as well as the road ahead, to the sides, and to the rear. You may have to remind riders about rules, or to keep arms and heads inside the bus.

4.3.2 – At Stops Riders can stumble when getting on or off, and when the bus starts or stops. Caution riders to watch their step when leaving the bus. Wait for them to sit down or brace themselves before starting. Starting and stopping should be as smooth as possible to avoid rider injury.

Occasionally, you may have a drunk or disruptive rider. You must ensure this rider's safety as well as that of others. Don't discharge such riders where it would be unsafe for them. It may be safer at the next scheduled stop or a well-lighted area where there are other people. Many carriers have guidelines for handling disruptive riders.

4.3.3 – Common Accidents: The Most Common Bus Accidents. Bus accidents 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, and watch for poles and tree limbs at stops. Know the size of the gap your 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. If an accident occurs fill out and sf-91 and notify the provost marshal's office and/or local authorities.

4.3.4 – Speed on Curves Crashes on curves that kill people and destroy buses result from excessive speed, often when rain or snow has made the road 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. With good traction, the bus may roll over; with poor traction, it might slide off the curve. Reduce speed for curves! If your bus leans toward the outside on a banked curve, you are driving too fast.

4.3.5 – Railroad-highway Crossing/ Stops Stop at RR Crossings: Stop your bus between 15 and 50 feet before railroad crossings. Listen and look in both directions for trains. You should open your forward door if it improves your ability to see or hear an approaching train. Before crossing after a train has passed, make sure there isn't another train coming in the other direction on other tracks. If your bus has a manual transmission, never change gears while crossing the tracks. You do not have to stop, but must slow down and carefully check for other vehicles: At streetcar crossings. Where a policeman or flagman is directing traffic. If a traffic signal is green. At crossings marked as "exempt" or "abandoned."

4.3.6 – Drawbridges Stop at Drawbridges. 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. Look to make sure the draw is completely closed before crossing. You do not need to stop, but must slow down and make sure it's safe, when: There is a traffic light showing green. The bridge has an attendant or traffic officer who controls traffic whenever the bridge opens.

4.4 – After-trip Vehicle Inspection Inspect your bus at the end of 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 defect that would affect safety or result in a breakdown. If there are no defects, the report should say so.

Riders sometimes damage safety-related parts such as handholds, seats, emergency exits, and windows. If you report this damage at the end of a shift, mechanics can make repairs before the bus goes out again. Mass transit drivers should also make sure passenger signaling devices and brake door interlocks work properly.

4.5 – Prohibited Practices Avoid fueling your bus with riders on board unless absolutely necessary. Never refuel in a closed building with riders on board.

Don't talk with riders, or engage in any other distracting activity, while driving.

Do not tow or push a disabled bus with riders aboard the 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 on towing or pushing disabled buses.

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 in place of the parking brake.

Space for Turns (NEW)

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 during turns.

Right Turns. 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 make the right turn without swinging into another lane, turn wide as you **complete** the turn, as shown in Figure 2-11. Keep the rear of your vehicle close to the curb. This will stop other drivers from passing you on the right.

· Don't turn wide to the left as you start the turn, as shown in Figure 2-12. A following driver may think you are turning left and try to pass you on the right. You may crash into the other vehicle as you complete your turn.

· If you must cross into the oncoming lane to make a turn, watch out for vehicles coming toward you. Give them room to go by or to stop. However, don't back up for them, because you might hit someone behind you.

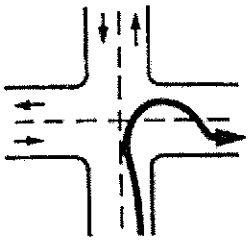


Figure 2-11
Do This

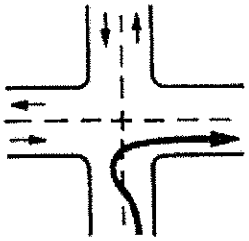


Figure 2-12
Don't Do This

Left Turns. On a left turn, 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 because of off tracking.
If there are two turning lanes, always take the right-hand turn lane, as shown in Figure 2-13. Don't start in the inside lane because you may have to swing right to make the turn. Drivers on your left can be more readily seen.

Section 5: Air Brakes

This section tells you about air brakes. If you want to drive a truck or bus
With air brakes, or pull a trailer with air brakes, you need to read this section.
If you want to pull a trailer with air brakes, you also need to read Section 6: Combination Vehicles.

Air brakes use **compressed air** to make the brakes work. Air brakes are
A good and safe way of stopping large and heavy vehicles, but the brakes must be well maintained and used properly.

Air brakes are really three different braking systems: service brake, parking brake, and emergency brake.

- The **service brake** system applies and releases the brakes when you use the brake pedal during normal driving.

- The **parking brake** system applies and releases the parking brakes when you use the parking brake control.

- The **emergency brake** system uses parts of the service and parking brake systems to stop the vehicle in the event of a brake system failure.

The parts of these systems are discussed in greater detail on the next page.

Section 5.1: The Parts of an Air Brake System

There are many parts to an air brake system. You should know about the parts discussed here.

Air Compressor

The air compressor pumps air into the air storage tanks (reservoirs). The air compressor is connected to the engine through gears or a v-belt. The compressor may be air cooled or may be cooled by the engine cooling system. It may have its own oil supply, or be lubricated by engine oil. If the compressor has its own oil supply, check the oil level before driving.

Air Compressor Governor

The governor controls when the air compressor will pump air into the air storage tanks. When air tank pressure rises to the "cut-out" level (around 125 pounds per square inch or "psi"), the governor stops the compressor from pumping air. When the tank pressure falls to the "cut-in" pressure (around 100 psi), the governor allows the compressor to start pumping again.

Air Storage Tanks

Air storage tanks are used to hold compressed air. The number and size of air tanks varies among vehicles. The tanks will hold enough air to allow the brakes to be used several times even if the compressor stops working.

Air Tank Drains

Compressed air usually has some water and some compressor oil in it which 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. Be sure that you drain the air tanks completely. Each air tank is equipped with a drain valve in the bottom.

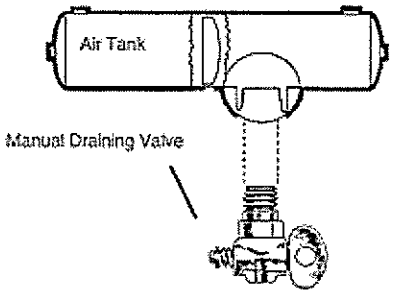
There are two types:

- Manually operated by turning a quarter turn, shown in Figure 5-1, or by pulling a cable. You must drain the tanks yourself at the end of each day of driving.

- Automatic--the water and oil is automatically expelled. They may be equipped for manual draining as well.

The automatic types are available with electric heating devices. These help prevent freeze up of the automatic drain in cold weather.

Figure 5-1
Manual Drain Valve



Alcohol Evaporator

Some air brake systems have an alcohol evaporator to put alcohol into the air system. This helps to reduce the risk of ice in air brake valves and other parts during cold weather. Ice inside the system can make the brakes stop working.

Check the alcohol container and fill up as necessary, every day during cold weather.
Daily air tank drainage is still needed to get rid of water and oil.
(Unless the system has automatic drain valves.)

Safety Valve

A safety relief valve is installed in the first tank the air compressor pumps air to. The safety valve protects the tank and the rest of the system from too much pressure. The valve is usually set to open at 150 psi. If the safety valve releases air, something is wrong. Have the fault fixed by a mechanic.

The Brake Pedal

You put on the brakes by pushing down the brake pedal. (It is also called the foot valve or treadle valve.) Pushing the pedal down harder applies more air pressure. Letting up on the brake pedal reduces the air pressure and releases the brakes. Releasing the brakes lets some compressed air go out of the system, so the air pressure in the tanks is reduced. It must be made up by the air compressor. Pressing and releasing the pedal unnecessarily can let air out faster than the compressor can replace it. If the pressure gets too low, the brakes won't work.

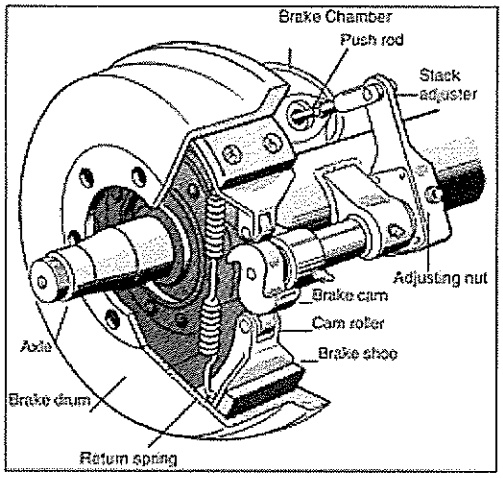
Foundation Brakes

Foundation brakes are used at each wheel. The most common type is the s-cam drum brake, shown in Figure 5-2. The parts of the brake are discussed below:

Brake Drums, Shoes, and Linings. 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 which slows the vehicle (and creates heat). The heat a drum can take without damage depends on how hard and how long the brakes are used. Too much heat can make the brakes stop working.

S-cam Brakes. When you push the brake pedal, air is let into each brake chamber (see Figure 5-2). Air pressure pushes the rod out, moving the slack adjuster, thus twisting the brake cam shaft. This turns the s-cam (so called because it is shaped like the letter "S"). The s-cam forces the brake shoes away from one another and presses them against the inside of the brake drum. When you release the brake pedal, the s-cam rotates back and a spring pulls the brake shoes away from the drum, letting the wheels roll freely again.

Figure 5-2
S-cam Air Brake



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

Disc Brakes. In air-operated disc brakes, air pressure acts on a brake chamber and slack adjuster, like s-cam brakes. But instead of the s-cam, a "power screw" is used. The pressure of the brake chamber on the slack adjuster turns the power screw. The power screw clamps the disc or rotor between the brake lining pads of a caliper, similar to a large c-clamp. Wedge brakes and disc brakes are less common than s-cam brakes.

Supply Pressure Gauges

All air-braked vehicles have a pressure gauge connected to the air tank. If the vehicle has a dual air brake system, there will be a gauge for each half of the system.

(Or a single gauge with two needles.) Dual systems will be discussed later. These gauges tell you how much pressure is in the air tanks.

Application Pressure Gauge

This gauge shows how much air pressure you are applying to the brakes. (This gauge is not on all vehicles.)
Increasing application pressure to hold the same speed means the brakes are fading. You should slow down and use a lower gear. The need for increased pressure can also be caused by brakes out of adjustment, air leaks, or mechanical problems.

Low Air Pressure Warning

A low air pressure warning signal is required on vehicles with air brakes. A warning signal you can see must come on before the air pressure in the tanks falls below 60 psi. (Or one half the compressor governor cutout pressure on older vehicles.) The warning is usually a red light. A buzzer may also come on.

Another type of warning is the "wig wag." This device drops a mechanical arm into your view when the pressure in the system drops below 60 psi. An automatic wig wag will rise out of your view when the pressure in the system goes above 60 psi. The manual reset type must be placed in the "out of view" position manually. It will not stay in place until the pressure in the system is above 60 psi.

On large buses it is common for the low pressure warning devices to signal at 80-85 psi.

Stop Light Switch

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

Front Brake Limiting Valve

Some older vehicles (made before 1975) have a front brake limiting valve and a control in the cab. The control is usually marked "normal" and "slippery." When you put the control 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 actually reduce the stopping power of the vehicle. Front wheel braking is good under all conditions. Tests have shown front wheel skids from braking are not likely even on ice. **Make sure the control is in the "normal" position to have normal stopping power.**

Many vehicles have automatic front wheel limiting valves. They reduce the air to the front brakes except when the brakes are put on very hard (60 psi or more application pressure). These valves cannot be controlled by the driver.

Spring Brakes

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

Tractor and straight truck spring brakes will come fully on when air pressure drops to a range of 20 to 45 psi (typically 20 to 30 psi). Do not wait for the brakes to come on automatically. When the low air pressure warning light and buzzer first come on, bring the vehicle to a safe stop right away, while you can still control the brakes.

The braking power of spring brakes depends on the brakes being in adjustment. If the brakes are not adjusted properly, neither the regular brakes nor the emergency/parking brakes will work right.

Parking Brake Controls

In newer vehicles with air brakes, you put on the parking brakes using a **diamond-shaped, yellow, push-pull control knob**. You pull the knob out to put the parking brakes (spring brakes) on, and push it in to release them. On older vehicles, the parking brakes may be controlled by a lever. Use the parking brakes whenever you park.

Caution. Never push the brake pedal down when the spring brakes are on. If you do, the brakes could be damaged by the combined forces of the springs and the air pressure. 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. It is much better to develop the habit of not pushing the brake pedal down when the spring brakes are on.

Modulating Control Valves. In some vehicles a control handle on the dash board may be used to apply the spring brakes gradually. This is called a modulating valve. It is spring loaded so you have a feel for the braking action.
The more you move the control lever, the harder the spring brakes come on. 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 and hold it in place with the locking device.

Dual Parking Control Valves. When main air pressure is lost, the spring brakes come on. Some vehicles, such as buses, have a separate air tank which can be used to release the spring brakes. This is so you can move the vehicle in an emergency. One of the valves is a push-pull type and is used 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 come on again. There is only enough air in the separate tank to do this a few times. Therefore, plan carefully when moving. Otherwise, you may be stopped in a dangerous location when the separate air supply runs out.

Test Your Knowledge

- Why must air tanks be drained?
- What is a supply pressure gauge used for?
- All vehicles with air brakes must have a low air pressure warning signal. True or False?
- What are spring brakes?

- Front wheel brakes are good under all conditions. True or False?

These questions may be on your test. If you can't answer them all, re-read Section5.1.

Section 5.2: Dual Air Brakes

5.2 Dual Air Brake

Most newer heavy-duty vehicles use dual air brake systems for safety. A dual air brake system has two separate air brake systems which use a single set of brake controls. Each system has its own air tanks, hoses, lines, etc.

One system typically operates the regular brakes on the rear axle or axles. The other system operates 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 called the "primary" system. The other is called the "secondary" system.

Before driving a vehicle with a dual air system, allow time for the air compressor to build up a minimum of 100 psi pressure in both the primary and secondary systems. Watch the primary and secondary air pressure gauges (or needles, if the system has two needles in one gauge). Pay attention to the low air pressure warning light and buzzer. The warning light and buzzer should shut off when 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, you should stop right away and safely park the vehicle. If one air system is very low on pressure, either the front or the rear brakes will not be operating fully. This means it will take you longer to stop. Bring the vehicle to a safe stop and have the air brakes system fixed.

Section 5.3: Inspecting Air Brakes

You should use the basic seven-step inspection procedure described in Section 2 to inspect your vehicle. There are more things to inspect on a vehicle with air brakes than one without them. We discuss these things below, in the order that they fit into the seven-step method.

During Step 2 Engine compartment Checks

Check Air Compressor Drive Belt (if 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 Inspecting

Check Manual Slack Adjusters on S-cam Brakes. Park on level ground and chock the wheels to prevent the vehicle from moving. Turn off the parking brakes so you can move the slack adjusters. Use gloves and pull hard on each slack adjuster that you can get to. 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. 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 one half the width of the friction area. Linings (friction material) must not be loose or soaked with oil or grease. They must not be dangerously thin. Mechanical parts must be in place, not broken or missing. Check the air hoses connected to the brake chambers to make sure they aren't cut or worn due to rubbing.

Step 7 Final Air Brake Check

Do the following checks instead of the hydraulic brake check shown in Section Two "Step 7: Check Brake System."

Test Low Pressure Warning Signal. Shut the engine off when you have enough air pressure so that the low pressure warning signal is not on. Turn the electrical power on and step on and off the brake pedal to reduce 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 tank with the lowest air pressure, in dual air systems).
If the warning signal doesn't work, you could lose air pressure and you would not know it. This could cause sudden emergency braking in a single circuit air system. In dual systems the stopping distance will be increased. Only limited braking can be done before the spring brakes come on.

Check That the Spring Brakes Come on Automatically. Chock the wheels, release the parking brakes when you have enough air pressure to do it, and shut the

engine off. 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 in a range between 20-40 psi). This causes the spring brakes to come on.

Check Rate of Air Pressure Buildup. When the engine is 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 three minutes with the engine at an idle speed of 600- 900 rpm.

If air pressure does not build up fast enough, your pressure may drop too low during driving, requiring an emergency stop. Don't drive until you get the problem fixed.

Test Air Leakage Rate. With a fully-charged air system (typically 125 psi), turn off the engine, release the service brake, and time the air pressure drop. The loss rate should be less than two psi in one minute for single vehicles and less than three psi in one minute for combination vehicles. Then apply 90 psi or more with the brake pedal. After the initial pressure drop, if the air pressure falls more than three psi in one minute for single vehicles (more than four psi for combination vehicles), the air loss rate is too much. Check for air leaks and fix before driving the vehicle. Otherwise, you could lose your brakes while driving.

Check Air Compressor Governor Cut-in and Cut-out Pressures. Pumping by the air compressor should start at about 100 psi and stop at about 125 psi. (Check manufacturer's specifications.) Run the engine at a fast idle. The air governor should cut-out the air compressor at about the manufacturer's specified pressure. The air pressure shown by your gauge(s) will stop rising. With the engine idling, step on and off the brake to reduce the air tank pressure. The compressor should cut-in at about the manufacturer's specified cut-in pressure. The pressure should begin to rise.

If the air governor does not work as described above, it may need to be fixed. A governor that does not work properly may not keep enough air pressure for safe driving.

Test Parking Brake. Stop the vehicle, put the parking brake on, and gently pull against it in a low gear to test that the parking brake will hold.

Test Service Brakes. Wait for normal air pressure, release the parking brake, move

the vehicle forward slowly (about five mph), and apply the brakes firmly using the brake pedal. Note any vehicle "pulling" to one side, unusual feel, or delayed stopping action.

This test may show you problems which you otherwise wouldn't know about until you needed the brakes on the road.

Test Your Knowledge

- What is a dual air brake system?
- What are the slack adjusters?
- How can you check slack adjusters?
- How can you test the low pressure warning signal?
- What can you check that the spring brakes come on automatically?

6. What are the maximum leakage rates?

These questions may be on your test. If you can't answer them all, re-read Sections 5.2 and 5.3.

Section 5.4: Using Air Brakes

Normal Stops

Push the brake pedal down. Control the pressure so the vehicle comes to a smooth, safe stop. If you have a manual transmission, don't push the clutch in until the engine rpm is down close to idle. When stopped, select a starting gear.

Emergency Stops

If somebody suddenly pulls out in front of you, your natural response is to hit the brakes. This is a good response if there's enough distance to stop and you use the

brakes correctly. You should brake in a way that will keep your vehicle in a straight line and allow you to turn if it becomes necessary. You can use the "controlled braking" method or the "stab braking" method.

Controlled Braking. With this method, you apply the brakes as hard as you can **without** locking the wheels. Keep steering wheel movements very small while doing this. If you need to make a larger steering adjustment or if the wheels lock, release the brakes. Re-apply the brakes as soon as you can.

Stab Braking.

- Apply your brakes all the way.
- Release brakes when 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 you re-apply the brakes before the wheels start rolling, the vehicle won't straighten out.)

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

Stopping Distance

We talked about stopping distance in Section 2 under "Speed and Stopping Distance." With air brakes there is an added delay: the time required for the brakes to work after the brake pedal is pushed. With hydraulic brakes (used on cars and light/medium trucks), the brakes work instantly. However, with air brakes, it takes a little time (one half 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 is made up of **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 for an average driver under good traction and brake conditions, the total stopping distance is over 300 feet. This is longer than a football field.

Brake Fading or Failure

Brakes are designed so brake shoes or pads rub against the brake drum or disks to slow the vehicle. Braking creates heat, but 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.

Excessive use of the service brakes results in overheating and leads to brake fade. Brake fade results from excessive heat causing chemical changes in the brake lining which reduce friction and also causing 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 also reduced. Continued overuse may increase brake fade until the vehicle cannot be slowed down or stopped at all.

Brake fade is also affected by adjustment. To safely control a vehicle, every brake must do its share of the work. Brakes out of adjustment will stop doing their share before those that are in adjustment. The other brakes can then overheat and fade and there will not be sufficient braking available to control the vehicle(s). Brakes can get out of adjustment quickly, especially when they are hot. Therefore, brake adjustment must be checked frequently.

Proper Braking Technique

Remember: 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 is the proper braking technique:

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

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

Low Air Pressure If the low air pressure warning comes on, **stop and safely park your vehicle as soon as possible.** There might be an air leak in the system. Controlled braking is possible only while enough air remains in the air tanks. The spring brakes will come on when the air pressure drops into the range of 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 the spring brakes come on. It is much safer to stop while there is enough air in the tanks to use the foot brakes.

Parking Brakes **Any time you park, 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, diamondshaped knob labeled "parking brakes" on newer vehicles. On older vehicles, it may be a round blue knob or some other shape (including a lever that swings from side to side or up and down).

Don't use the parking brakes if the brakes are very hot (from just having come down a steep grade), or if the brakes are very wet in freezing temperatures. If they are used while they are very hot, they can be damaged by the heat. If they are used in freezing temperatures when the brakes are very wet, they can freeze so the vehicle cannot move. Use wheel chocks to hold the vehicle. Let hot brakes cool before using 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 at the end of each working day to remove moisture and oil. Otherwise, the brakes could fail.
Never leave your vehicle unattended without applying the parking brakes or chocking the wheels. Your vehicle might roll away and cause injury and damage.

Test Your Knowledge

- Why should you be in the proper gear **before** starting down a hill?
- What factors can cause brakes to fade or fail?
- The use of brakes on a long steep downgrade is only a supplement to the braking effect of the engine. True or False?

- If you are away from your vehicle only a short time, you don't need to use the parking brake. True or False?

- How often should you drain air tanks?

These questions may be on your test. If you can't answer them all, re-read Section 5.4.

13 PRE OPERATIONS CHECKS

YOU MUST KNOW ALL OF THSES IN ORDER TO PASS THE ROAD TEST. NO EXCEPTIONS!

1. INSPECT TIRES
2. USE CURBSIDE DOOR (IF Practicable)
3. Adjust seat
4. Adjust mirror
5. Sound horn
6. Check head and tail lights
7. Check stop lights
8. Test foot break
9. Test hand break
10. Check doors for proper closing
11. Disengage clutch and gears
12. Warm motor properly
13. Test windshield wiper