

# MARYLAND

## Commercial Driver's License Manual

DL-151 (03/26)

**MOT** MARYLAND DEPARTMENT OF TRANSPORTATION  
MOTOR VEHICLE ADMINISTRATION



# HUMAN TRAFFICKING IS AN EVERYWHERE PROBLEM . . .



## WITH AN EVERYBODY SOLUTION

Human trafficking is modern-day slavery. It occurs in all 50 states in the U.S., in both rural and urban settings, when people are subject to forced labor or illegally bought and sold for commercial sex. A minor being sold for sex is always a victim of human trafficking.



**EVERYDAY HEROES NEEDED.**

While the recruitment or purchase of victims may occur online, survivors may be recovered in many locations, including truck stops, bus terminals, local businesses, restaurants, hotels, strip clubs, private homes, a variety of events, etc. The movement of victims may include the use of rideshares, taxis or other modes of transportation.

As a licensed driver, you may intersect with a human trafficking situation while you're en route somewhere, stopped at a business or in a neighborhood or attending a sporting or other event where a large number of people are gathered.

### RED FLAGS TO LOOK FOR

- Signs that prostitution is taking place or if you see a minor being sexually exploited
  - Any mention of making a quota or having a pimp/daddy
  - Multiple cars and different men continually going in and out of a residence
- People looking fearful, disheveled or crying
- Someone being controlling, threatening or even violent with an individual
- People whose communication is being restricted or controlled; the person is not allowed to speak for self; being watched or followed
- Extraordinary security measures for a business or home (e.g., barred or covered windows, barbed wire, excessive exterior cameras, locked front doors with entrances in the alley, etc.)
- Workers who appear to live at the place of business or are always working
  - Excessive work hours with little to no breaks
  - Workers who exhibit signs of mental or psychological exhaustion
- Signs of branding or tattooing of trafficker's name (often on the neck)

*If you suspect someone could be a victim of human trafficking, time is of the essence.*

**1) If you're seeing a crime in progress, call 911.** When reporting a tip, provide "actionable information," including times, dates, location and address of the situation, descriptions of cars or trucks involved (make, model, color, license plate, distinguishing marks and/or USDOT number, etc.) and people (height, weight, hair color, eye color, age, etc.). Take a picture if you can. When you contact law enforcement, tell them you suspect human trafficking.



Scan this QR code to download the TAT app!

**2) To access the national human trafficking hotlines** to ascertain if you're witnessing human trafficking, to access services, make a report or share incidents that have been reported to law enforcement, **call 1-888-3737-888 in the U.S., 1-833-900-1010 in Canada or 01800-5533-000 in Mexico.**

**3) Please do not approach traffickers.** Allow law enforcement to deal with traffickers and recover victims. Approaching traffickers is not only dangerous for you and their victims but could lead to problems in the eventual prosecution of traffickers. **If you do interact with a human trafficking victim, provide support based on your comfort level.**

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# Intro

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## FMCSA Rule 49 CFR 380 – Special Training Requirements

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The new Entry-Level Driver Training (ELDT) regulations require that all entry-level drivers of commercial motor vehicles (CMVs) receive training from a provider list located on FMCSA's Training Provider Registry website. Effective February 7, 2022, to be eligible to take required skills or knowledge tests, commercial driver's license (CDL) applicants must have completed applicable entry-level driver training from a registered training provider. [Here is the link for more information on the Federal ELDT Regulation.](#)

### Who Is Affected:

New commercial motor vehicle drivers looking to obtain a Class A or Class B for the first time; current CDL holders wishing to upgrade their license by moving from a Class B to a Class A license, or those adding a school bus (S), passenger (P), or hazardous materials (H) endorsement for the first time.

### When:

Effective February 7, 2022

### What:

CDL applicants who have never held a CDL and those switching from Class B to Class A are required to take Entry-Level Driver Training prior to taking the driver's skills test. CDL Hazmat applicants must have this training prior to starting the application of the Commercial Learners Permit. CDL applicants should register on the FMCSA Training Provider Registry and successfully complete training prior to making an appointment with MDOT MVA.

### Why:

Based on a Congressional mandate to improve safety the Federal Motor Carrier Safety Administration (FMCSA) has required training for new CDL holders.

### Exceptions:

Drivers who have held an out of state CDL and drivers who previously held CDLs but who have let them lapse are not required to go through training to get a new CDL. Returning drivers who hold a

CLP prior to February 7, 2022 are not required to go through training as long as they successfully convert to a full CDL before the CLP expires.

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## Information For The Commercial Driver

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### Foreword

In 1986, the Congress of the United States passed the **Commercial Motor Vehicle Safety Act**. This Act requires the states to adopt uniform minimum licensing and testing standards for drivers of commercial motor vehicles. By April 1, 1992, all drivers of commercial vehicles needed a Commercial Driver's License. Maryland's Commercial Driver's License Program became effective January 1, 1990. This was the beginning of a new era that resulted in each commercial driver to be looked upon as a professional.

### Commercial Motor Vehicle

A "Commercial Motor Vehicle" means a motor vehicle or combination of motor vehicles used to transport passengers or cargo if the vehicle fits any of the following conditions.

- Any combination of vehicles with a Gross Combination Weight Rating (GCWR) of 26,001 or more pounds.
- A vehicle with a Gross Vehicle Weight Rating (GVWR) of 26,001 or more pounds (GVWR for a single vehicle or GCWR for a combination of vehicles means: The value specified by the manufacturer as the maximum gross weight).
- Any vehicle which is designed to transport 16 or more passengers, including the driver.
- A vehicle of any size which transports hazardous materials, which requires placarding.

**NOTE:** Gross Combination Weight Rating (GCWR) And Gross Vehicle Weight Rating (GVWR) Means The Value Specified By The Manufacturer. This Is Determined From The Manufacture Plate On The Vehicle/Trailer.

### Maryland Commercial Driver License Classes

Each driver applicant must possess and be tested on his/her knowledge and skills, for the commercial motor vehicle for which he/she desires a commercial driver's license and obtain the appropriate endorsement(s) where required.

**Class A License:** Authorizes the licensee to operate Tractor/Trailer or Combination of vehicles with a GCWR of 26,001 or more pounds if the GVWR of the vehicle being towed is in excess of 10,000 pounds.

**Class B License:** Authorizes the licensee to operate any single vehicle with a GVWR of 26,001 or more pounds; and any such vehicle towing a vehicle not in excess of 10,000 pounds GVWR.

**Class C License:** Authorizes the licensee to operate any single vehicle less than 26,001 pounds GVWR; or any such vehicle towing a vehicle not in excess of 10,000 pounds GVWR, and is designed to transport 16 or more passengers including the driver, or is used in the transportation of materials found to be hazardous for the Hazardous Materials Transportation Act and which requires the motor vehicle to be placarded under the Hazardous Materials Regulations.

## **ENDORSEMENTS:**

- T = Doubles/Triple Trailers
- P = Passenger Vehicles
- N = Tank Vehicles
- H = Hazardous Materials
- S = School Buses
- X = Tank & Hazardous Materials

## **Vehicles That Have Been Excluded**

Waivers have been granted for the operation of some commercial vehicles. You are not required to have a Commercial Driver's License to drive a vehicle that has been excluded. **However, you must have a Maryland non-commercial driver's license of the appropriate class to operate a vehicle that has been excluded. (With the exception of fire apparatus, that may be operated by the use of an Emergency Vehicle Operator Card (EVOC) and a valid State driver's license. See your fire chief for details).**

The following vehicles have been excluded from CDL requirements in Maryland:

1. Controlled and operated by a farmer;
  - Used to transport agricultural products, farm machinery, or farm supplies to or from a farm;
  - Not used in the operations of a common or contract motor carrier; and
  - Used within 150 miles of the person's farm;
2. An emergency vehicle;
  - Equipped with audible and visual signals (fire apparatus); and
  - Operated by a member of, or a person in the employ of, a volunteer or paid fire or rescue organization;

3. A vehicle owned or operated by the United States Department of Defense if it is controlled and operated by;
  - Any member of the military reserves or National Guard on active-duty including personnel on full- time National Guard duty and personnel on part-time training; or
4. A motor vehicle designed and constructed primarily to provide temporary living quarters for recreational, camping, or travel use.

## Physical Qualifications (49 CFR 391.41)

A person shall not drive a commercial motor vehicle unless they are physically qualified to drive a commercial motor vehicle by obtaining a Medical Examiner's Certificate through a Medical Examiner within the National Registry of Certified Medical Examiners.

Based on a medical disqualification you may be eligible to process for an Intrastate (Maryland Only) or Interstate (Federal) Waiver. Maryland Motor Vehicle Administration will only consider issuing CDL Intrastate Waivers for the physical/medical conditions listed below.

- Amputation and loss of limb (Must have working prosthesis)
- Power grasping and prehension
- Deaf/Hard of Hearing (LIMITED Eligibility)

The Motor Vehicle Administration will not consider an intrastate waiver for an individual who maintains a Hazardous Materials, Passenger and/or School Bus endorsements.

The Federal Motor Carrier Safety Administration may issue a waiver to individuals who do not meet the qualifications of [Title 49 CFR 391.41 of the Federal Motor Carrier Safety Regulations](#) that cover amputation, loss of a limb, power grasping or prehension problems, and deaf/hard of hearing (LIMITED eligibility).

## Medical Certification and Self-Certification

### MEDICAL CERTIFICATION (FORM MCSA-5876)

As of January 30, 2014, the Maryland Motor Vehicle Administration (MVA) enacted new procedures for commercial driver's license (CDL) holders to comply with requirements implemented by the Federal Motor Carrier Safety Administration (FMCSA). As of July 8, 2015, FMCSA revised the Medical Examiner's Certificate (Med Cert - formerly DOT card). The new form (MCSA5876) will be provided to you by the Medical Examiner.

All CDL holders are required to maintain a valid updated medical certification card (Med Cert) and self-certify to the type of commerce (see below) to the MVA throughout their licensing period (where required). The MVA will add the medical certification status and the information from the medical certification documents (DOT card, waiver/exemption if required) to your commercial driving record.

As of June 23, 2025, you will no longer provide a Medical Examiner's Certificate directly to the MVA. The MVA will obtain this information directly from FMCSA's National Registry.

It is your responsibility to obtain a current and valid medical certificate before or upon expiration of the previous medical certificate. You do not need to wait to be notified, but correspondence will be sent to your residence/ mailing address on file 45 days prior to expiration requesting documentation.

If you fail to do so within the period indicated, your entire commercial driving privileges will be automatically downgraded to a non-commercial Class C license, and you will need to schedule an appointment ([mymva.maryland.gov](http://mymva.maryland.gov)) at an MVA branch office to obtain the Class C license. If you have been downgraded, you will need to schedule an appointment ([mymva.maryland.gov](http://mymva.maryland.gov)) at a MVA branch office to reinstate your CDL.

It is imperative that all CDL holders maintain a current residence/ mailing address with the MVA (provided in person) in order to receive correspondence and avoid an automatic downgrade of your commercial driving privilege. MVA mail is not forwarded and if you do not comply, you are not authorized to operate a commercial motor vehicle.

## **SCHOOL BUS ENDORSEMENT**

Under federal law and state law, the Maryland Department of Transportation Motor Vehicle Administration (MDOT MVA) must cancel a Commercial Driver's License (CDL) when the holder fails to submit the required medical certification.

As a CDL driver who holds an "S" endorsement you must obtain a new Medical Examiner's Certificate annually. If you take no action, your driving record will automatically reflect the removal of the "S" endorsement from your license.

## **SELF-CERTIFICATION**

All CDL holders will be required to select one of the categories listed below:

- **Non-Excepted Interstate (NI)** - The CDL holder is qualified to drive a commercial motor vehicle across state lines in accordance with [Title 49 CFR Part 391 of the Federal Motor Carrier Safety Regulation \(FMCSR\)](#).
- **Non-Excepted Intrastate (NA)** - The CDL holder is qualified to drive a commercial vehicle ONLY within the state of Maryland and has an approved MVA CDL Medical Waiver.
- **Excepted Interstate (EI)** - The CDL holder drives a commercial motor vehicle across state lines ONLY for specific excepted activities, such as to transport school children or staff, sick or injured persons, corpses, etc., in accordance with [Title 49 CFR Part 391 of the Federal Motor Carrier Safety Regulations \(FMCSR\)](#). Since the driver must meet all Maryland requirements without an MVA CDL Medical Waiver, the CDL holder may select NI to maximize his/her driving options
- **Excepted Intrastate (EA)** - The CDL holder drives a commercial motor vehicle ONLY within Maryland. Although exempt from the qualification requirements under [Title 49 CFR Part 391 of the Federal Motor Carrier Safety Regulations \(FMCSR\)](#) based on the type of driving

performed, the CDL holder must meet all Maryland requirements without an MVA CDL Medical Waiver and may select NI to maximize his/her driving options.

## Commercial Drivers License Learners Instructional Permit:

You will be required to provide:

- Proof of age.
- Lawful admission into the United States (for Hazardous Materials only).
- Proof of Maryland residence.
- A valid full Maryland Non-Commercial Driver's License (must be off provisional license).
  - You must be 21 years of age to drive a commercial motor vehicle across state lines (Interstate).
  - You must be 18 years of age to drive a commercial motor vehicle within Maryland (Intrastate).
  - You must be 21 years of age to haul hazardous materials.
- A Medical Examiner's Certificate (DOT Card); Intrastate/Interstate Waiver prior to taking required tests which includes passing the vision screening and any required CDL knowledge tests before a learner's instructional permit will be issued.

When you apply for a Commercial Driver's License you will also be asked to:

- Certify that you do not have a driver's license from more than one state or country,
- Surrender your current license,
- Certify that your driver's license and driving privilege is not suspended, revoked, cancelled, or disqualified or subject to any of these actions, and
- Provide information to the Motor Vehicle Administration of previous State licenses (to include Washington, D.C.) held in the previous 10 years including previous addresses and license numbers.

## Knowledge Tests/Endorsements

Depending on the class of license and what endorsements you are requesting will determine what CDL knowledge tests are required. A passing score of 80% is required per test. You must obtain a Medical Examiner's Certificate (DOT Card) and a valid Intrastate State/Interstate Waiver if applicable. If you fail any knowledge test for the second time, you must wait a minimum of seven days before you can re-take that specific test again. The following endorsements will not be listed on your CLP until you have completed and pass your skills test: Double/Triples and Hazmat.

- **General Knowledge Test** is required for all applicants. (Must be successfully passed to proceed to additional knowledge tests).
- **Air Brake Knowledge Test** is required if your vehicle is equipped with air brakes.

- **Combination Vehicles Knowledge Test** is required if you want to drive combination vehicles (Trailer over 10,000 lbs. GVWR).
- **Tanker Knowledge Test** is required if you want to haul liquids in bulk.
- **Double/Triples Knowledge Test** is required to pull double or triple trailers.
- **Passenger Knowledge Test** is required for all bus drivers to include school bus operators. (You must perform a skills test in a bus of the appropriate class/endorsement).
- **School Bus Knowledge Test** is required for all school bus operators, as well as the Passenger Knowledge Test. (You must also perform skills test in a school bus of appropriate class).
- **Hazardous Materials Knowledge Test** is required if you wish to haul hazardous materials. You must pass the hazardous materials knowledge test and provide proof of U.S. Citizenship or lawful permanent resident status. Individuals are required to schedule an appointment for the completion of the electronic Hazmat application and fingerprint/background record check process. **The Administration may not issue a hazardous material endorsement to a commercial driver's license holder without the approval of the Transportation Security Administration (TSA) of the Federal Department of Homeland Security.** You are required to pay the appropriate fees. The Administration may not issue a Learner's Instructional Permit with a Hazardous Materials Endorsement.
  - Maryland law requires that each out-of-state CDL license holder with the Hazardous Materials Endorsement must complete a new TSA Hazmat Threat Assessment Background Record check here in Maryland, even if they completed one previously.
  - Additional Hazmat information may be obtained by contacting the MVA at 1-800-950-1MVA, 1-800-950-1682 or at [www.MVA.Maryland.gov](http://www.MVA.Maryland.gov) or by contacting the TSA at their website, [www.TSA.gov](http://www.TSA.gov) and inserting CDL Hazmat in the Search field.
  - Subsequent Hazardous Materials knowledge test are by appointment only if the applicant fails the first test.

## Hazmat Endorsement

Under federal law, the Maryland Department of Transportation Motor Vehicle Administration (MDOT MVA) must cancel a Commercial Driver's License (CDL) when the holder fails to submit the required TSA background or TWIC card for Hazmat. As a CDL driver who holds a "Hazmat Endorsement" you must submit a new TSA Background or TWIC card prior to the expiration date. If you take no action, your driving record will automatically reflect the removal of the "Hazmat Endorsement" from your license.

To keep your CDL and Hazmat endorsement in good standing, please schedule an appointment on our website.

For customers requiring a new TSA Background check and fingerprint services schedule an appointment at <https://mymva.maryland.gov/go/web/AddAppointment>. Select "Commercial Driver's License Services," then "Add/Renew a CDL Hazmat Endorsement." Hazmat fingerprinting and background checks are only available at MDOT MVA offices in Glen Burnie, Bel Air, Frederick, Salisbury, or Waldorf.

**NOTE:** You will be required to take the knowledge (written) test. The test is included as a part of the CDL Hazmat appointment.

For customers updating a TWIC card, a knowledge (written) test is required. Schedule CDL knowledge test at <https://mymva.maryland.gov/go/web/AddAppointment>. Select “Commercial Driver’s License Services,” then “Retake My Commercial Learner’s Permit Test.” Don’t forget to bring your new TWIC card to the appointment.

## Skills Test Are Administered by Appointment Only

The CDL Skills Test consists of a:

1. Pre-Trip Inspection to include an air brake test if vehicle is equipped with air brakes;
2. Basic Control Skills Test; and
3. Public Road Test.

**NOTE:** You Must Pass The Pre-Trip Inspection To Continue Onto The Basic Control Skills Test And You Must Pass The Basic Control Skills Test To Continue Onto A Public Road Test.

If you fail any portion of the test you must **pay a retest fee** before scheduling another appointment.

## Qualifying Scores

- A Pre-Trip Inspection score is based on the type of vehicle.
- A Basic Control Skills Test is based on total points (9 points are a failure). An automatic failure will occur if an individual hits a curb, or exceeds the time limit (see below).
- A Public Road Test is based on total points (31 points are a failure) or an automatic failure will occur if there is an accident, running a red light or stop sign, etc.

## Time Limit (All Vehicle Classes A, B, & C) (subject to change without notice):

- A Pre-Trip Inspection is 45 minutes.
- A Basic Control Skills Test is 10 minutes per maneuver.
- A Public Road Test on average is 35 to 40 minutes based on MVA location and route.

**NOTE:** Skills Tests are not available at all Motor Vehicle locations. Skills Tests are given only by appointment. Knowledge Tests are given on a walk-in basis initially, then by appointment thereafter. No test will start after 3:00 p.m. Monday through Friday. No test will start after 10:00 a.m. on Saturday.

## Driving, Drinking, and Drugs

Signing a Maryland's driver license or a learner's permit application form enters you into an agreement. It says that if you are detained by a police officer who suspects you are driving or attempting to drive under the influence or intoxicated by alcohol and/or drugs, you agree to submit to a chemical test of your blood and breath. This is called a Blood Alcohol Concentration, or BAC test.

### **An alcohol concentration of 0.04% or more when driving a Commercial Motor Vehicle will:**

- Disqualify you from driving a commercial motor vehicle for one year (three years if the vehicle was required to be placarded for HAZMAT) for the first offense, and;
- Disqualify you for life for a subsequent offense

### **An alcohol concentration of 0.08% or more while operating on a commercial driver license, regardless of the vehicle type, will:**

- Disqualify you from driving a commercial motor vehicle for one year for the first offense, and;
- Disqualify you for life for a subsequent offense.

### **IMPLIED CONSENT:**

In Maryland, any person who drives or attempts to drive a motor vehicle on a highway or on any private property used by the public in general, consents to take a test to determine alcohol concentration or a test to determine the concentration of a drug or a controlled dangerous substance. Testing is free of charge to the driver and shall be given a breath test to determine alcohol concentration, unless the driver or other persons require medical treatment for serious or life-threatening injury or the test equipment is unavailable. In that event, the test shall be a blood test. A test to determine drug or controlled dangerous substance content shall also be a blood test.

### **A refusal to submit to take a test will:**

- Disqualify you from driving a commercial motor vehicle for one year for the first offense, and;
- Disqualify you for life for a subsequent offense.

**CDL holders are also subject to driver disqualifications and penalties under Federal Motor Carrier Safety Regulation 385.51.**

## Drivers Must

- Notify their home state Motor Vehicle Administration of any convictions in other states.
- Notify their employer of any convictions.
- Notify their employer of any revocation, suspension, cancellation, or disqualification.
- Provide information to the Motor Vehicle Administration of previous State licenses (to include Washington, D.C.) held in the previous 10 years including previous addresses and license numbers.
- Maintain a valid Medical Examiner's Certificate (DOT card), and Intrastate/Interstate Waiver if applicable, during all MVA transactions.
- Maintain only one driver's license.

## Convictions

Effective September 30, 2005, any convictions you receive for moving violations will be viewed as a cause to disqualify you from driving a commercial vehicle, regardless of whether the moving violation happened while you were driving a commercial vehicle,

non-commercial vehicle or your private vehicle.

- Probation Before Judgment (PBJ) is considered a conviction under federal regulations and
- MD TA § 16-803(d).
- The Administration may not issue any type of temporary, conditional or work restricted license per [The Code of Maryland Regulations \(COMAR\) 11.11.12.07](#) and [Title 49 CFR 384.210 under the Federal Motor Carrier Safety Regulations \(FMCSR\)](#).

Maryland Motor Vehicle Administration (MVA) works closely with The American Association of Motor Vehicle Administrators (AAMVA) in testing procedures that meet Federal requirements. **Although we make every effort to ensure that the information we provide is accurate, it is not intended to take the place of published State and Federal Laws and Regulations.**

# Section 1: What You Need to Get Your CDL

## This Section Covers:

4. Commercial Motor Vehicles
5. Commercial Driver License Types & Tests
6. Medical Documentation Requirements
7. Driver Disqualifications
8. Other Safety Rules
9. International Registration Program

The federal government requires each state to have minimum standards for the licensing of commercial drivers.

This manual has information for drivers who want a commercial driver's license (CDL). This manual does NOT have information on all the federal and state requirements to drive a commercial motor vehicle (CMV).

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## 1.1 – Commercial Motor Vehicles

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There are some important words to learn to understand all the requirements to become a commercial vehicle driver. The first is understanding what a commercial vehicle is. But before we can explain that we must explain the weight ratings that help figure out what a commercial vehicle is.

**Gross Combination Weight Rating (GCWR)** is the **most** a vehicle and trailer can safely weigh **together** when fully loaded.

That includes:

- The towing vehicle (with people, fuel, and cargo)
- The trailer
- Everything on or inside the trailer

The **vehicle manufacturer** decides this limit to keep the vehicle safe and working properly.

### Example:

If your truck's GCWR is **20,000 pounds**, and the truck (with fuel, driver, and cargo) weighs **7,000 pounds**, then the trailer and its load can weigh up to **13,000 pounds**.

Another term is **Gross Vehicle Weight Rating (GVWR)**. This is the **most** your vehicle can safely weigh **by itself** when fully loaded.

That includes:

- The vehicle
- The driver and passengers
- Fuel
- Cargo
- Any tools or equipment inside or on it

The **manufacturer** sets this limit to make sure the vehicle stays safe and works like it should.

**Example:**

If a van has a GVWR of **9,000 pounds**, and the van itself weighs **6,000 pounds**, then you can safely carry **up to 3,000 pounds** of people and cargo.

- A **Commercial Motor Vehicle** is any vehicle that fits the conditions below:
- Any combination of vehicles with a **GCWR** of 26,001 pounds or more
- A vehicle with a **GVWR** of 26,001 pounds or more
- Any vehicle that is designed to transport 16 or more passengers, including the driver.
- Any vehicle transporting hazardous materials which must have a placard.

You must have a CDL to drive **any** commercial motor vehicle.

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## 1.2 – Commercial Driver License Types & Tests

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### 1.2.1 – CDL Classifications

The type of CDL and endorsement you need to apply for depends on the vehicle class and the type of cargo you plan to transport. There are three basic vehicle classes:

#### **Class A - Combination Vehicles**

Any combination of vehicles with a **GCWR** of 26,001 pounds or more is in **Class A** as long as the **GVWR** of the vehicle(s) being towed is **more than** 10,000 pounds.

Most Class A vehicles are trucks or semis towing a second vehicle like a trailer. Driving a Class A vehicle takes more skill and knowledge than driving vehicles in Classes B and C. Since these skills include those required to drive a B and C vehicle, if you have a Class A license, you may also drive vehicles in Classes B and C.

## Class B - Heavy Straight Vehicles

Any single vehicle with a **GVWR** of 26,001 pounds or more or towing another vehicle with a **GVWR** of 10,000 pounds or less is in **Class B**.

Class B includes straight trucks and large buses, including articulated buses. Safely driving these heavy vehicles takes more knowledge and skill than driving the small trucks and buses found in Class C. Since they include the skills required to drive Class C vehicles, if you have qualified for a Class B license you may also drive vehicles in Class C.

## Class C - Small Vehicles

Any single vehicle with a **GVWR** less than 26,001 pounds or any such vehicle towing another vehicle weighing 10,000 pounds **GVWR** or less is in Class C. However, vehicles of this size are included in the CDL program only if they are:

1. Designed to carry 16 or more passengers, including the driver, or
2. Used to transport hazardous materials in quantities requiring placarding under [the Hazardous Materials Regulations \(49 CFR Part 172, Subpart F\)](#) or carrying material listed as a select agent or toxin in [Title 42 CFR part 73 of the Federal Motor Carrier Safety Regulations \(FMCSR\)](#).

There are many vehicles in Class C. Larger Class C vehicles may need more skill and knowledge to operate than smaller ones. However, the licensing category is mostly based on the type of cargo the vehicle carries. Crashes with hazardous materials or passengers can be very dangerous. To keep people safe, drivers of smaller Class C vehicles must have special training and CDL.

## Some Vehicles Have Been Excluded From the Requirement for a CDL

There are some vehicles you are allowed to operate without having a CDL. You must have a Maryland non-commercial driver's license of the correct class to operate a vehicle that has been excluded from the CDL requirement. However, fire apparatus can be driven with an Emergency Vehicle Operator Card (EVOC) and a valid State driver's license. Check with your fire chief for details.

## The following vehicles do not require a CDL in Maryland:

- A vehicle controlled and operated by a farmer that is used to:
  - Transport agricultural products, farm machinery, or farm supplies to or from a farm;
  - Operate within 150 miles of the person's farm; and
  - **Not** used for common or contract motor carrier operations
- An emergency vehicle
  - That is equipped with lights and sirens (fire truck); and
  - Operated by a member or employee of, or a person in the employ of, a volunteer or paid fire or rescue organization;
  - A vehicle owned or operated by the United States Department of Defense if it is driven by; a member of the military reserves or National Guard on active-duty including personnel on full- time National Guard duty or part-time training

- A motor vehicle built to provide temporary living space for recreational, camping, or travel use.

## 1.2.2 – CDL Endorsements & Restrictions

### ENDORSEMENTS

All commercial drivers who drive certain types of vehicles or haul certain types of cargo must add endorsements to their CDL and Commercial Learner's Instructional Permit (CLP). **Endorsements** show you have the knowledge needed for driving those types of vehicles and transporting those types of cargo. There are six kinds of CDL endorsements, depending on the vehicle or cargo.

#### T - Double and Triple Trailers

If you have a Class A CDL, you may want to pull double or triple trailers. A lot of knowledge and skill is needed to safely pull double and triple trailers in different traffic conditions and driving environments. You must add a T endorsement to your CDL if you want to pull double or triple trailers. An exam on the problems associated with pulling multiple trailers must be passed. Triple trailers are not permitted to be driven on Maryland roads.

#### P - Passengers

If you want to drive a vehicle made to carry 16 or more people, including the driver, you must add a passenger endorsement to your CDL/CLP. You must pass a special knowledge test on how to safely transport passengers and must pass skills tests in a passenger vehicle. The endorsement applies to drivers who want to drive a bus in any Class (A, B, or C).

#### S - School Buses

If you want to drive a school bus, you must add a school bus endorsement to your CDL/CLP. You must pass a special knowledge test on safely transporting passengers on a school bus and you must pass skills tests in a school bus. This endorsement applies to drivers who want to drive a school bus in any class (A, B, or C).

#### N - Tank Vehicle

If you drive a commercial vehicle with any number of tanks that hold liquids or gases, you need an N endorsement. This applies to:

- Any tank that holds more than 119 gallons, and
- The total capacity of all tanks is 1,000 gallons or more.

The tanks can be permanently or temporarily attached to the vehicle. This always applies to Class A and Class B vehicles. It only applies to Class C vehicles if the vehicle is hauling hazardous materials. Driving with liquids in bulk can cause driving control problems because the cargo is heavy, prone to shifting, and has a high center of gravity. You must pass an exam on the problems posed by large volume liquid cargo to add this endorsement to your CDL/CLP.

## H - Hazardous Materials

If you want to drive any Class of vehicle (A, B or C) that carries a hazardous material listed under [the Federal Hazardous Materials Transportation Law \(49 U.S.C. 5103\)](#) you must add the Hazardous Materials endorsement to your CDL. This includes materials that need a placard under [the Federal Hazardous Materials Transportation Law \(49 U.S.C. 5103\)](#) and [the Federal Motor Carrier Safety Regulations \(FMCSR\) 49 CFR part 172](#), or any amount of an agent or toxin that is listed in [Title 42 CFR part 73 of the Federal Motor Carrier Safety Regulations \(FMCSR\)](#). You must pass a special written exam on how to recognize, handle, and transport hazardous materials.

The Transportation Security Administration (TSA) and the US Department of Transportation require background checks on commercial drivers who are certified to transport hazardous materials. These background checks review criminal, immigration, and FBI records. If you are found to be a security risk, TSA will notify you and the state will not issue the hazardous materials endorsement. Maryland accepts Transportation Worker Identification Credential (TWIC) cards for the background check requirement.

## X - Combination Hazardous Materials and Tank Vehicle

If you drive tank vehicles which haul hazardous materials or waste in amounts requiring placards, you must add an X endorsement to your CDL. This endorsement shows you have passed the special knowledge tests for both tank vehicles and hazardous materials.

**NOTE:** The only endorsements that may be added to a Commercial Learner's Permit (CLP) are:

- P – Passenger
- S - School Bus
- N - Tank Vehicle

## RESTRICTIONS

Restrictions may be added to Commercial Driver Licenses and Permits based on the type of vehicle and equipment you use for the Skills Test. There are ten standardized restriction codes.

## E - No Manual Transmission

If you pass the skills test in a vehicle equipped with an automatic transmission, it must be displayed on the issued CDL that you are restricted from operating a CMV equipped with a manual transmission. For the skills test and the restrictions, an automatic transmission is any transmission that does not require full use of a gear shift and clutch.

## **K - Intrastate Only**

If you certify your status as either Non-Excepted Intrastate or Excepted Intrastate, it must be shown on the issued CDL that you are restricted from operating a CMV in interstate commerce. If you are under 21, you must have this intrastate restriction.

## **L - No Air Brake Equipped CMV**

If you fail or don't take the air brake component of the knowledge test, or you take the skills test in a vehicle that does not have air brakes, the issued CLP or CDL will show that you are restricted from operating a CMV equipped with any type of air brakes. For the skills test and the restrictions, air brakes are any braking system that uses air pressure, either fully or partially.

## **M - No Class A Passenger Vehicle**

If you apply for a passenger endorsement and take the skills test in a passenger vehicle requiring a Class B CDL, it must be shown on the issued CDL that you are restricted from operating a passenger vehicle requiring a Class A CDL.

## **N - No Class A and B Passenger Vehicle**

If you apply for a passenger endorsement and take the skills test in a passenger vehicle requiring a Class C CDL, it must be shown on the issued CDL that you are restricted from operating a passenger vehicle requiring a Class A or B CDL.

**NOTE:** If a CLP is issued with an **N endorsement**, it must also contain an **X restriction** – No cargo in a CMV tank vehicle.

## **O - No Tractor Trailer CMV**

If you take the skills test in a combination vehicle for a Class A CDL with the power unit and towed unit connected with a pintle hook or other type of connection that is not fifth-wheel, it must be shown on the issued CDL that you are restricted from operating a tractor-trailer combinations connected by a fifth-wheel that requires a Class A CDL.

**NOTE:** If you pass a skills test using a combination vehicle that is NOT a **Truck Tractor Semi-Trailer** combination, but has a fifth wheel, you will be issued a CDL with an O restriction.

## **P - No Passengers in CMV Bus**

If you have a CLP with a P endorsement, you can't drive a CMV carrying passengers, unless they are Federal/State auditors and inspectors, test examiners, other trainees, and the CDL holder accompanying you according to [Title 49 CFR 383.25\(a\)\(1\) of the Federal Motor Carrier Safety Regulations\(FMCSR\)](#).

**NOTE:** If you have a CLP with an **S endorsement**, you cannot drive a school bus with passengers, unless they are Federal/State auditors and inspectors, test examiners, other trainees, and the CDL holder accompanying you according to [Title 49 CFR 383.25\(a\)\(1\) of the Federal Motor Carrier Safety Regulations\(FMCSR\)](#).

**NOTE:** If a CLP is issued with a **Passenger (P) or a School Bus (S) endorsement**, it must also contain a **P – No passengers in a CMV bus restriction**. In Maryland, the accompanying driver must hold the CDL required to operate the vehicle of that class and type for 3 years or more.

## **V - Medical Variance**

If the State is notified according to [Title 49 CFR 383.73\(o\)\(3\) of the Federal Motor Carriers Safety Regulations \(FMCSR\)](#) that you have been issued a medical variance, the State must add the V restriction on the CDL.

## **X - No Cargo in CMV Tank Vehicle**

If you have a CLP with an N endorsement, you may only operate an empty tank vehicle and cannot operate any tank vehicle that was carrying hazardous materials and has not been purged of any residue.

## **Z - No Full Air Brake Equipped CMV**

If you take the skills test in a vehicle equipped with air over hydraulic brakes, the State must add a Z restriction on the CDL. This means that you are restricted from operating a CMV equipped with any braking system operating fully on the air brake principle. Air over hydraulic brakes includes any braking system operating partially on the air brake and partially on the hydraulic brake principle.

## **1.2.3 – To Get a CDL or CLP**

### **COMMERCIAL DRIVERS LICENSE LEARNER'S INSTRUCTIONAL PERMIT:**

**To get a Commercial Driver's License Learner's Instructional Permit, you must:**

- Be able to show proof of age
- Be able to show lawful admission into the United States (for Hazardous Materials only)
- Be able to show proof of Maryland residence
- Have a valid full Maryland Non-Commercial Driver's License (must be off provisional license).
- Get a Medical Examiner's Certificate (Med Cert); Intrastate/Interstate Waiver before taking any tests which includes passing the vision screening and any required CDL knowledge tests before a learner's instructional permit will be issued.

**There are some age restrictions for getting your CDL:**

- You must be 21 years of age to drive a commercial motor vehicle across state lines (Interstate).
- You must be 18 years of age to drive a commercial motor vehicle within Maryland (Intrastate).
- You must be 21 years of age to haul hazardous materials.

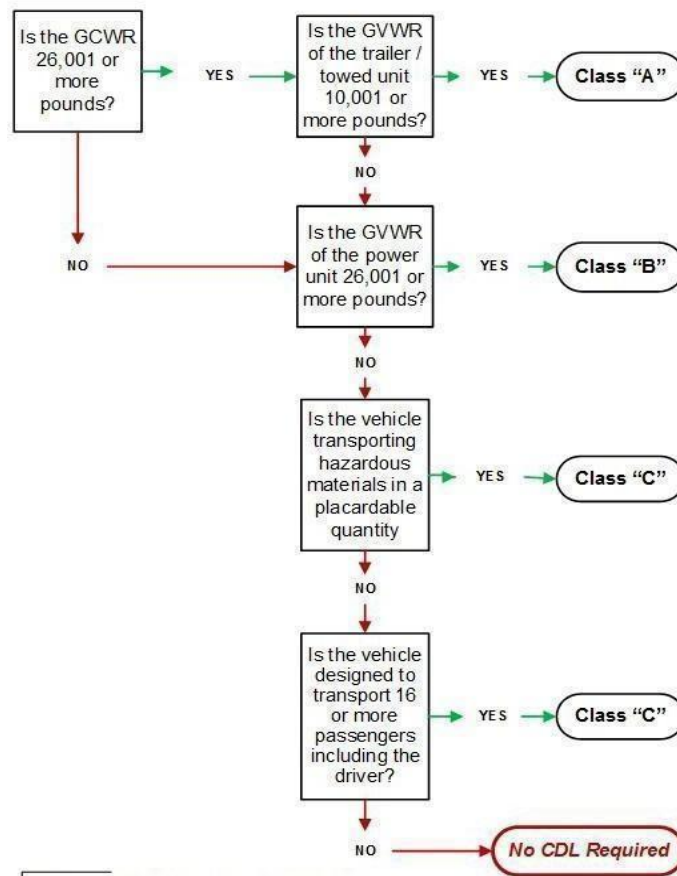
**When you apply for a Commercial Driver’s License you must:**

- Confirm you don't have a driver’s license from more than one state or country
- Certify your driver’s license and driving privileges are currently valid and not prohibited.

Provide the Motor Vehicle Administration with details of all driver’s licenses you’ve had in the past 10 years, in any state including Washington, D.C.

To get a CDL or CLP, you must pass knowledge and skills tests. This manual will help you pass the tests. It is not a substitute for a truck driver training class or program. Formal training is the most reliable way to learn the skills needed for safely driving a large commercial vehicle and becoming a professional driver in the trucking industry. Figure 1.1 and Figure 1.1A helps you determine if you need a CDL.

**Determining Class of CDL Required**



**Figure 1.1**

**NOTE:** A bus may be Class A, B, or C depending on whether the GVWR is over 26,001 pounds or is a combination vehicle.




VEHICLE GROUPS (FMSCR 383.91) AND ASSOCIATED CDL TESTS				
GROUP	VEHICLE DESCRIPTION	TYPICAL VEHICLE IN GROUP	KNOWLEDGE TESTS REQUIRED	SKILLS TESTS REQUIRED
A	Any combination of vehicles with a GCWR of 26,001 or more pounds provided the GVWR of the vehicle(s) being towed is in excess of 10,000 pounds.		<ul style="list-style-type: none"> <li>• General Knowledge</li> <li>• Air Brakes (if applicable)</li> <li>• Combination Vehicles</li> <li>• Passenger Transport (if applicable)</li> <li>• Hazardous Materials (if applicable)</li> <li>• Tank Vehicle (if applicable)</li> <li>• Double/Triples (if applicable)</li> </ul>	Vehicle Inspection Basic Control Skills Road
B	Any single vehicle with a GVWR of 26,001 or more pounds or any such vehicle towing a vehicle not in excess of 10,000 pounds GVWR.		<ul style="list-style-type: none"> <li>• General Knowledge</li> <li>• Air Brakes (if applicable)</li> <li>• Passenger Transport (if applicable)</li> <li>• School Bus (if applicable)</li> <li>• Hazardous Materials (if applicable)</li> <li>• Tank Vehicle (if applicable)</li> </ul>	Vehicle Inspection Basic Control Skills Road
C	Any single vehicle, or combination of vehicles, that does not meet the definition of Group A or B vehicles but that is either designed to transport 16 or more passengers including the driver; or is used to transport hazardous material as defined in 383.5.		<ul style="list-style-type: none"> <li>• General Knowledge</li> <li>• Air Brakes (if applicable)</li> <li>• Combination Vehicles</li> <li>• Passenger Transport (if applicable)</li> <li>• School Bus (if applicable)</li> <li>• Hazardous Materials (if applicable)</li> <li>• Tank Vehicle (if applicable)</li> </ul>	Vehicle Inspection Basic Control Skills Road

Figure 1.1A

## 1.2.4 – Commercial Driver License Tests

### KNOWLEDGE TESTS

You will have to take one or more knowledge tests, depending on what class of license and what endorsements you need. Everyone applying for a CDL must take the **General Knowledge Test**. The other CDL knowledge tests include:

- **Passenger Transport Test** – You must take this test if you want to drive a bus.
- **School Bus Test** – You must take this test if you want to drive a school bus.

- **Air Brakes Test** – You must take this test if your vehicle has air brakes, including air over hydraulic brakes.
- **Combination Vehicles Test** – You must take this test if you want to drive combination vehicles.
- **Doubles/Triples Test** – You must take this test if you want to pull double or triple trailers.
- **Hazardous Materials Test** – You must take this test if you want to haul hazardous materials as defined in [Title 49 CFR 383.5 of the Federal Motor Carrier Safety Regulations \(FMCSR\)](#). To get this endorsement, you are also required to pass a Transportation Security Administration (TSA) background check.
- **Tank Vehicle Test** – You must take this test if you want to haul any liquid or gaseous materials in a tank or tanks having an individual rated capacity of more than 119 gallons and an aggregate rated capacity of 1,000 gallons or more that is either permanently or temporarily attached to the vehicle or chassis

## SKILLS TESTS

If you pass the required knowledge test(s), you can take the CDL skills test when you meet all the eligibility requirements. The CDL Skills Test has three segments: **Vehicle inspection**, **basic vehicle control**, and **on-road driving**. You must take the segments in the order listed and pass each one before moving to the next. You must take these tests in the type of vehicle for which you wish to be licensed. You cannot take the CDL Skills Test with any vehicle with its components marked or labeled.

1. **Vehicle Inspection.** You will be tested to see if you know whether your vehicle is safe to drive. You will be asked to do an inspection of your vehicle. You must point to/touch and name the item you are inspecting and explain to the examiner what you would inspect and why.
2. **Basic Vehicle Control.** You will be tested on your skill to control the vehicle. You will be asked to move your vehicle forward, backward, and turn it within a defined area. These areas may be marked with traffic lanes, cones, barriers, or something similar. The examiner will tell you how each control test is to be done.
3. **On-road Driving Test.** You will be tested on your skill to safely drive your vehicle in different traffic situations. The situations may include left and right turns, intersections, railroad crossings, curves, up and down grades, single or multi-lane roads, streets, or highways. The examiner will tell you where to drive.

Figure 1.2 details which sections of this manual you should study for each class of license and for each endorsement.

What Sections Should You Study?									
	LICENSE TYPE			ENDORSEMENT					
	Class A	Class B	Class C	Hazardous Materials	Double / Triple	Tank Vehicles	Passenger	School Bus	
Sections to Study	1	X	X	X					
	2	X	X	X		X	X	X	
	3	X	X	X					
	4						X		
	5*	X	X	X		X			
	6	X				X	X		
	7					X			
	8						X		
	9				X		X		
	10							X	
	11	X	X	X				X	X
	12	X	X	X				X	X
	13	X	X	X				X	X

\*Study section 5 if you plan to operate vehicles equipped with air brakes.

Figure 1.2 – What to Study

## 1.3 – Medical Documentation Requirements

To get a CDL or CLP, you must first visit a certified medical examiner to have a medical examination to determine your fitness to be a Commercial Driver. The medical examiner will submit this information to a national registry which the MVA will be able to automatically see when you apply.

If you have a CDL, you must keep a valid updated Med Cert as long as your CDL is active. The MVA will update your commercial driving record with your medical certification status and the details from the medical certification documents, such as your DOT card or any waiver or exemption.

As of June 23, 2025, you will no longer give a Med Cert directly to the MVA. The MVA will get this information directly from FMCSA's National Registry.

It is your responsibility to get a current and valid medical certificate before or when your previous medical certificate expires. You don't need to wait to be notified, but a letter will be sent to your mailing address on file with the MVA 45 days before the expiration date to remind you.

If you don't get your new medical certificate before the old one expires, your entire commercial driving privileges will be automatically downgraded to a non-commercial Class C license. If you have been downgraded, you will need to schedule an appointment at a MVA branch office to reinstate your CDL. These appointments can be scheduled online at [mymva.maryland.gov](http://mymva.maryland.gov).

As a CDL holder, it is important to keep a current residence or mailing address with the MVA in order to receive correspondence and avoid an automatic downgrade of your commercial driving privilege. Mail from the MVA is not forwarded, so if you don't give your current address, you may miss important mail and no longer be allowed to drive a commercial motor vehicle.

**NOTE:** Physical Qualifications ([Title 49 CFR 391.41 of the Federal Motor Carrier Safety Regulations](#))

**You must not** drive a commercial motor vehicle unless you are physically qualified to drive a commercial motor vehicle. You are required to get a Medical Examiner's Certificate through a Medical Examiner within the National Registry of Certified Medical Examiners to determine if you are physically qualified.

This exam is only about your qualifications for driving a **commercial** vehicle and not about your qualifications for driving your personal vehicle. If the Medical Examiner determines you are not physically qualified, you may still be eligible for the Maryland intrastate waiver or for a Federal Intrastate Waiver.

### 1.3.1 – Self Certifying

All Commercial Drivers are required to provide a self-certification to drive a CMV. When you apply for or renew a CDL / CLP, you will be asked where you intend to drive (inside Maryland or across state boundaries) and the type of business you will be driving for.

The following information will help you decide how to self-certify.

#### **INTERSTATE OR INTRASTATE COMMERCE**

**Interstate commerce** is when you drive a CMV:

- From one State to another State or a foreign country; or

- Between two places within a State but, during part of the trip, the CMV crosses into another State or foreign country; or
- Between two places within a State, but the cargo or passengers are part of a trip that began or will end in another State or foreign country.

**Intrastate commerce** is when you drive a CMV within a State, and you don't meet any of the descriptions above for **interstate commerce**.

If you operate in both intrastate commerce and interstate commerce, you must choose interstate commerce.

## WHAT IS THE INTRASTATE WAIVER?

If a driver **doesn't meet the federal medical requirements** to drive a commercial vehicle (like for vision, hearing loss, diabetes, or missing limbs), they might still be able to drive a **commercial motor vehicle (CMV) within one state** — this is called **intrastate driving**.

Some states offer a **waiver or variance** that lets these drivers **keep working** as long as they:

- Only drive within that state's borders
- Meet the state's own safety and medical rules

The Motor Vehicle Administration will not consider an intrastate waiver for someone who has Hazardous Materials, Passenger, or School Bus endorsements.

## SELF-CERTIFICATION STATEMENTS

When you self-certify at an MVA location, you will be asked to choose from one of the four following options:

- **Non-Excepted Interstate (NI)** – You are qualified to drive a commercial motor vehicle across state lines according to [Title 49 CFR Part 391 of the Federal Motor Carrier Safety Regulation \(FMCSR\)](#).
- **Non-Excepted Intrastate (NA)** – You are qualified to drive a commercial vehicle ONLY within the state of Maryland and have an approved MVA CDL Medical Waiver.
- **Excepted Interstate (EI)** – You drive a commercial motor vehicle across state lines ONLY for specific excepted activities, such as transporting school children or staff, sick or injured persons, corpses, etc., according to [Title 49 CFR Part 391 of the Federal Motor Carrier Safety Regulation \(FMCSR\)](#). Since you must meet all Maryland requirements without an MVA CDL Medical Waiver, you may select NI to maximize your driving options.
- **Excepted Intrastate (EA)** – You only drive a commercial motor vehicle within Maryland which makes you exempt from the qualification requirements under [Title 49 CFR Part 391 of the Federal Motor Carrier Safety Regulation \(FMCSR\)](#) based on the type of driving you do. However, you must still meet all Maryland requirements without needing an MVA CDL Medical Waiver. You can choose NI (Non-Excepted) to give you more driving options.

**CDL Self-Certification**

Which of the type of commercial driving will you be performing?

- EA - Intrastate (within MD) without a valid MVA CDL Intrastate Waiver (i.e. under 21 years of age without a waiver)
- EI - Interstate and restricted to specific job duties (NI may also be chosen in MD)
- NA - Intrastate (within MD) with a valid MVA CDL Intrastate Waiver
- NI - Interstate and have a valid Medical Examiner's Certificate (most CDL applicants)

**Figure 1.3**

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## 1.4 – CDL Disqualifications

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### 1.4.1 – General

**There are important rules you must follow to keep your CDL. If you break these rules, your CDL can become disqualified.** You may not drive a commercial motor vehicle if you are disqualified for any reason.

### 1.4.2 – Alcohol, Leaving the Scene of an Accident, and Commission of a Felony

**When you sign** a Maryland's driver license or learner's permit application, you agree to certain conditions. If a police officer thinks you are driving drunk or on drugs, you agree to a Blood Alcohol Concentration (BAC) test.

If your BAC test shows **any detectable amount of alcohol under 0.04%, this will:**

- Put you out-of-service for 24 hours.

If your BAC test **shows an alcohol concentration of 0.04% or more when driving a Commercial Motor Vehicle, this will:**

- Disqualify you from driving a commercial motor vehicle for one year if this was your first offense,
- Disqualify you from driving a commercial vehicle for three years if the vehicle was required to be placarded for HAZMAT
- Disqualify you from driving a commercial vehicle for life if this was a second offense.

If your BAC test shows **an alcohol concentration of 0.08% or more while operating on a commercial driver license, regardless of the vehicle type, this will:**

- Disqualify you from driving a commercial motor vehicle for one year if this is your first offense, and;
- Disqualify you for life if this is your second offense.

### **Implied Consent:**

If a police officer asks you to take a BAC test, you must agree to take it.

- A breath test is used to check alcohol concentration, unless:
  - the driver or other persons need medical treatment for serious or life-threatening injury
  - the test equipment is unavailable.
- In these cases, a blood test will be used instead.
- A test to determine drug or controlled substances is always a blood test.

### **If you refuse to take a test, this will:**

- Disqualify you from driving a commercial motor vehicle for one year if this is your first offense, and
- Disqualify you for life if this is your second offense.

You will lose your CDL for at least one year for a first offense for:

- Driving a CMV under the influence of alcohol.
- Driving any vehicle while under the influence of a controlled substance.
- Leaving the scene of a crash involving a CMV.
- Committing a felony involving the use of a CMV.
- Driving a CMV when the CDL is suspended.
- Causing a fatality through negligent operation of a CMV. Negligent operation includes driving in a way that is reckless and puts other people and property in danger.

You will lose your CDL for at least three years if the offense occurs while you are operating a CMV that is placarded for hazardous materials.

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 controlled substances.

## **1.4.3 – Serious Traffic Violations**

**Serious traffic violations are:**

- excessive speeding (driving 15 mph or more above the posted limit)
- reckless driving
- improper or erratic lane changes
- following a vehicle too closely
- traffic offenses committed in a CMV in connection with fatal traffic accidents
- driving a CMV without getting a CDL or having a CDL in the driver's possession and
- driving a CMV without the proper class of CDL or endorsements.

**You will lose your CDL:**

- For at least 60 days if you have committed two serious traffic violations within a three-year period involving a CMV.
- For at least 120 days for three or more serious traffic violations within a three-year period involving a CMV.

### 1.4.4 – Violation of Out-of-Service Orders

**An out-of-service order means a driver, vehicle, or motor carrier operation is not safe and cannot be on the road until the problems are fixed.**

You will lose your CDL:

- For at least 90 days if you have committed your first violation of an out-of-service order.
- For at least one year if you have committed two violations of an out-of-service order in a ten-year period.
- For at least three years if you have committed three or more violations of an out-of-service order in a ten-year period.

### 1.4.5 – Railroad-highway Grade Crossing Violations

All CMV vehicles in Maryland are required to stop at every railroad highway grade crossing. There are four types of violations which can happen at a railroad-highway grade crossing:

- Failing to stop before driving onto the crossing.
- Failing to have sufficient space to drive completely through the crossing without stopping.
- Failing to obey a traffic control device or the directions of an enforcement official at the crossing.
- Failing to negotiate a crossing because of insufficient undercarriage clearance.

You will lose your CDL:

- For at least 60 days for your first violation.

- For at least 120 days for your second violation within a three-year period.
- For at least one year for your third violation within a three-year period.

## 1.4.6 – Hazardous Materials Endorsement Background Check and Disqualifications

If you need a hazardous materials endorsement, you must submit your fingerprints and undergo a background check. You will be denied or lose your hazardous materials endorsement if you:

- Are not a lawful permanent resident of the United States.
- Renounce your United States citizenship.
- Are wanted or under indictment for certain felonies.
- Have a conviction in military or civilian court for certain felonies.
- Have been legally declared mentally incompetent or have been involuntarily committed to a mental health facility as stated in [Title 49 CFR 1572.109 of the Federal Motor Carrier Safety Regulations \(FMCSR\)](#).
- Are considered to pose a security threat as determined by the Transportation Security Administration.

If you need a TSA Background check and fingerprint services, you can schedule an appointment at <https://mymva.maryland.gov/go/web/AddAppointment>.

Select “Commercial Driver’s License Services,” then “Add/Renew a CDL Hazmat Endorsement.”

Hazmat fingerprinting and background checks are only available at MDOT MVA branch offices in Glen Burnie, Bel Air, Frederick, Salisbury, or Waldorf.

## 1.4.7 – Traffic Violations in Your Personal Vehicle

You will be disqualified from operating a commercial motor vehicle if you have been convicted of certain types of moving violations in your personal vehicle:

- If your privilege to drive your personal vehicle is revoked, cancelled, or suspended because of violations of traffic control laws (other than parking violations), you will also lose your CDL driving privileges.
- If your privilege to drive your personal vehicle is revoked, cancelled, or suspended because of alcohol, controlled substance or felony violations, you will lose your CDL for 1 year.
- If you are convicted of a second violation in your personal vehicle or CMV, you will lose your CDL for life.
- If your license to drive your personal vehicle is revoked, cancelled, or suspended, you may not get a “hardship” license to operate a CMV.

- If you are required to operate a vehicle equipped with an interlock, you will be disqualified from driving a CMV. You cannot put an interlock device on a CMV.

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## 1.5 – Other CDL Rules

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All states are connected to one computerized system to share information about CDL drivers. There are other federal and state rules that affect drivers operating CMVs in all states. Some of them are:

- You cannot have more than one license.
- Your employer may not let you drive a commercial motor vehicle if you have more than one license or if 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.
- You must notify your employer within 30 days of conviction of any traffic violations (except parking). This is true no matter what type of vehicle you were driving.
- You must notify your employer within two business days if your license is suspended, revoked, or canceled, or if you are disqualified from driving.
- You must give your employer information on all driving jobs you have held for the past 10 years. You must do this when you apply for a commercial driving job.
- You cannot drive a commercial motor vehicle without a CDL.
- If you have a hazardous materials endorsement, you must notify the state that issued your CDL and surrender your hazardous materials endorsement within 24 hours if any of the following apply:
  - You are convicted, indicted or found not guilty by reason of insanity in any jurisdiction, civilian or military for a disqualifying crime listed [in Title 49 CFR 1572.103 of the Federal Motor Carrier Safety Regulations \(FMCSR\)](#).
  - You are legally declared mentally incompetent or have been involuntarily committed to a mental institution as stated in [Title 49 CFR 1572.109 of the Federal Motor Carrier Safety Regulations \(FMCSR\)](#).
  - You renounce your U.S. citizenship.
- When driving, you cannot hold a mobile phone to make a call or press more than one button to dial a call.
- You are not allowed to send or read text messages while driving.
- You must always wear a seatbelt while operating a CMV. If you don't wear a seatbelt, you are four times more likely to be fatally injured if you are thrown from the vehicle.

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## 1.6 – International Registration Plan and International Fuel Tax Agreement

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**The International Registration Plan (IRP) and the International Fuel Tax Agreement (IFTA) are programs that collect and distribute vehicle license fees and motor fuels taxes for CMVs traveling through the 48 contiguous United States and 10 Canadian provinces.**

If you operate a CDL-required vehicle in **interstate commerce**, you must register it under the **IRP** and the **IFTA**. There are some exceptions to this rule for vehicles that are government-owned, recreational vehicles, and vehicles with restricted plates. The IRP registrant and the IFTA licensee may be the vehicle owner or the vehicle operator.

The 48 American states and 10 Canadian provinces are all individual **jurisdictions** of the IRP. Under the IRP, jurisdictions must:

- Register vehicles. This process includes issuing license plates and cab cards or proper credentials.
- Calculate, collect, and distribute IRP fees
- Audit carriers for accuracy of reported distance and fees and
- Enforce IRP requirements.

The **base jurisdiction** is the US state or Canadian province where a motor carrier has established their place of business or residency and where their CMVs are registered.

As a registrant, you have several responsibilities under the IRP including:

- applying for registration with base jurisdiction,
- providing proper documentation for registration,
- paying appropriate registration fees,
- properly displaying registration credentials,
- maintaining accurate distance records,
- and making records available for jurisdiction review.

The basic concept behind IFTA is to allow a licensee (motor carrier) to license in a base jurisdiction for the reporting and payment of motor fuel use taxes.

Under the IFTA, a licensee is given one set of credentials which will let them operate through all IFTA member jurisdictions.

The fuel use taxes collected under the IFTA are calculated based on the distance traveled and the volume of fuel consumed in the member jurisdictions.

The licensee files one quarterly tax return with the base jurisdiction by which the licensee will report all operations through all IFTA member jurisdictions.

It is the base jurisdiction's responsibility to pay the taxes collected to other member jurisdictions and to represent the other member jurisdictions in the tax collection process. This includes audits.

An IFTA licensee must keep records to support the information reported on the IFTA quarterly tax return

The requirement for getting IRP plates for a vehicle and IFTA license for a motor carrier is determined by the definitions from the IRP Plan and the IFTA for Qualified Vehicle and Qualified Motor Vehicle:

## For Purposes of IRP:

A **Qualified Vehicle** is (except as provided below) any Power Unit used or intended for use in two or more member jurisdictions and used for the transportation of persons for hire or designed, used, or maintained primarily for the transportation of property, and:

- has two Axles and a Gross Vehicle Weight or registered Gross Vehicle Weight more than 26,000 pounds (11,793.401 kilograms), **or**
- has three or more axles, regardless of weight, **or**
- is used in combination, and the Gross Vehicle Weight of the combination is more than 26,000 pounds (11,793.401 kilograms).

While similar, the **Qualified Motor Vehicle** in IFTA means a motor vehicle used, designed, or maintained for transportation of persons or property and:

- Having two axles and a gross vehicle weight or registered gross vehicle weight exceeding 26,000 pounds or 11,793 kilograms; or
- is used in combination, when the weight of such combination exceeds 26,000 pounds or 11,793 kilograms gross vehicle or registered gross vehicle weight. Qualified Motor Vehicle does not include recreational vehicles.

If your vehicle is registered under IRP and you are a motor carrier licensed under IFTA, then you must follow the mandatory record keeping requirements for operating the vehicle.

A universally accepted method of capturing this information is using an **Individual Vehicle Distance Record (IVDR)**, sometimes referred to as a Driver Trip Report. This document shows the distance traveled and fuel purchased for a vehicle that operates interstate under IRP registration and IFTA fuel tax credentials.

Although the actual format of the IVDR may vary, the information it needs for record keeping does not.

To meet the requirements for IVDR, you must include the following information:

- **Distance:** Per Article IV of the IRP Plan
  - Date of trip (starting and ending)
  - Trip origin and destination – City and State or Province
  - Route(s) of travel

- Beginning and ending odometer or hubometer reading of the trip
- Total distance traveled
- Distance traveled In-Jurisdiction
- Power unit number or vehicle identification number.
- **Fuel:** Per Section P560 of the IFTA Procedures Manual. An acceptable receipt or invoice must include, but shall not be limited to, the following:
  - Date of purchase
  - Seller's name and address
  - Number of gallons or liters purchased
  - Fuel type
  - Price per gallon or liter or total amount of sale
  - Unit number or another unique vehicle identifier
  - Purchaser's name

An example of an IVDR that must be completed in its entirety for each trip can be found in **Figure 1.4** below. One IVDR should be filled out for only one vehicle. The rules to follow when trying to determine how and when to log an odometer reading are the following:

- At the beginning of the day
- When leaving the state or province
- At the end of the trip/day

You must document fuel purchases. You must get a receipt for all fueling and include it with your completed IVDR.

Make sure any trips you enter are always filled out in descending order.

Make sure your trips include all states/provinces you traveled through on your route.

There are different routes you can take, and most of the miles may be within one state or province. All information for the trip must be recorded, no matter how far or how many jurisdictions you travel through. This includes the dates, routes, odometer readings, and fuel purchases. By completing the IVDR and keeping all required records, you will keep you and your company in compliance with all State and Provincial laws surrounding fuel and distance record keeping.

The IVDR is the source document for calculating fees and taxes owed to the jurisdictions where the vehicle is operated, so these original records must be maintained for at least four years.

These records are subject to audit by the taxing jurisdictions. Failure to maintain complete and accurate records could result in fines, penalties and suspension or revocation of IRP registrations and IFTA licenses.

For more information on the IRP and the requirements related to the IRP, contact your base jurisdiction motor vehicle department or IRP, Inc., the official repository for the IRP. More information

can be found on the IRP, Inc. website at [www.irponline.org](http://www.irponline.org). There is a training video on the website home page available in English, Spanish and French.

For more information on IFTA and its requirements, contact the appropriate agency in your base jurisdiction. For Maryland, that is the MVA. You will also find useful information about the Agreement at the official repository of IFTA at <http://www.iftach.org/index.php>.

### Individual Vehicle Mileage & Fuel Record (Example)

**Individual Vehicle Mileage And Fuel Record**

Carrier	ABC Carriers Inc		Account Number	99999999		Driver Name	John Doe Jr.		Unit Number	58		
Load Information	1/2/04 Pick Up Maplewood MO 1/3/04 Pick Up Springfield IL			Destinations:			1/2/04 Delivery Springfield IL 1/03/04 Delivery Dayton OH		Driver Comments			
Date	Town Origin-Jurisdiction Lines-Town Destination	State	Ending Odometer	Miles by Jurisdiction	Highways or Routes Traveled	Name of Fuel Stop and Location		Gallons Purchased				
1/2/2004	<b>Beginning State &amp; Odometer Reading</b>		MO	45,869	<b>All other odometer reading will be ending readings.</b>							
	Maplewood MO - IL Line	MO	45,878	9	64							
	MO Line - Springfield IL	IL	45,976	98	55-29	Ted's I-72 Fuel — Springfield IL		98				
1/3/2004	Springfield IL - IN Line	IL	46,101	125	29-97-72-57-74							
	IN Line - OH Line	IN	46,259	158	74-32-65-465-70							
	OH Line - Dayton OH	OH	46,297	38	70-49							
			<b>Total Trip Miles **</b>		428				<b>Total Fuel Purchases</b>			98
			<b>Odometer Miles, Total Trip Miles &amp; Total Jurisdictional Miles Must Agree</b>				<b>Total Jurisdictional Miles **</b>					
			Ending Odometer		46,297	OFFICE USE		Jurisdiction		Miles		
			Beginning Odometer		45,869			MO		9		
			Total Odometer Miles **		428			IL		223		
								IN		158		
								OH		38		
										OFFICE USE ONLY		

*Note: Beginning odometer reading on this trip must match ending reading from prior trip and ending reading from this trip must be the beginning reading on the next trip.*

Figure 1.4

# Section 2: Knowledge Test Background

## This Section Covers:

4. Vehicle Inspection
5. Basic Control of Your Vehicle
6. Shifting Gears
7. Looking Ahead
8. Communicating
9. Controlling Your Speed
10. Managing Space
11. Seeing Hazards
12. Distracted Driving
13. Aggressive Drivers/Road Rage
14. Night Driving & Driver Fatigue
15. Driving in Fog
16. Winter Driving
17. Hot Weather Driving
18. Railroad-highway Crossings
19. Mountain Driving
20. Driving Emergencies
21. Anti-Lock Braking Systems
22. Skid Control and Recovery
23. Accident Procedures
24. Fires
25. Alcohol, Other Drugs, and Driving
26. Hazardous Materials Rules

This section has information about safe driving all commercial drivers should know. Learning the information in this section will help you pass the general knowledge every CDL driver must take before getting their license.

This section has basic information on hazardous materials (HazMat) that all drivers should know. If you need a HazMat endorsement, you should study Section 9.

This section does **not** have specific information on the tests for air brakes, combination vehicles, doubles, or passenger vehicles. Section 11 will have more information about vehicle inspections. To prepare for the Vehicle Inspection Test, you must also know that information.

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## 2.1 – Vehicle Inspection

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### 2.1.1 – Why Inspect Your Vehicle?

- **Safety** – The most important reason to inspect your vehicle is to be safe for you and others on the road.
- **Money** – Finding a vehicle defect can save money and problems later.
- **Federal and state law**

Safety is the most important reason you should inspect your vehicle. Making sure your vehicle is in good working order makes sure you and other road users are safe.

Finding a vehicle defect during an inspection could save you problems later. A defect could cause your vehicle to break down on the road, which will cost time and money. Even worse, a defect could cause a crash, putting you and others on the road in danger.

Federal and state laws require drivers to inspect their vehicles. Federal and state inspectors also may inspect your vehicles. If they judge the vehicle to be unsafe, they will put it **out of service** until it is fixed. This means you will not be able to drive your vehicle and could be fined until the issue is fixed.

### 2.1.2 – Types of Vehicle Inspection

**Vehicle Inspection** – A vehicle inspection will help you find problems that could cause a crash or breakdown.

**Before a Trip** – You should always inspect your vehicle before starting a trip.

**During a Trip** – For safety you should do several things to make sure your vehicle continues to be safe:

- Watch gauges for signs of trouble.
- Use your senses to check for problems (look, listen, smell, feel).
- Check these critical items when you stop:
  - Tires, wheels, and rims.
  - Brakes.
  - Lights and reflectors.
  - Brake and electrical connections to trailer.
  - Trailer coupling devices.
  - Cargo securement devices.

**After-trip Inspection and Report** – You should do an after-trip inspection. This should be done on each vehicle you operate. It may include filling out a vehicle condition report listing any problems you find. The inspection report helps a motor carrier know when the vehicle needs repairs.

## 2.1.3 – What Should You Look For?

### TIRE PROBLEMS

- Too much or too little air pressure
- Bad wear
  - You need at least 4/32-inch tread depth in every major groove on front tires.
  - You need 2/32 inch on other tires.
  - No fabric should show through the tread or sidewall.
- Cuts or other damage
- Tread separation
- Dual tires that come in contact with each other or parts of the vehicle
- Mismatched sizes
- Radial and bias ply tires used together.
- Cut or cracked valve stems.
- The tires on the front wheels of a bus must not be re-grooved, recapped, or retreaded.

### WHEEL AND RIM PROBLEMS

- Damaged rims.
- Rust around wheel nuts may mean the nuts are loose--check tightness. After a tire has been changed, stop a short while later and re-check tightness of nuts.
- Missing clamps, spacers, studs, or lugs means danger.
- Mismatched, bent, or cracked lock rings are dangerous.
- Wheels or rims that have had welding repairs are not safe.

### BAD BRAKE DRUMS OR SHOES

- Cracked drums.
- No loose or missing bolts.
- Shoes or pads with oil, grease, or brake fluid on them.
- Shoes worn dangerously thin, missing, or broken.

## STEERING SYSTEM DEFECTS

- Missing nuts, bolts, cotter keys, or other parts.
- Bent, loose, or broken parts, such as steering column, steering gear box, or tie rods.
- If your vehicle is power steering equipped, check hoses, pumps, and fluid level; check for leaks.
- Steering wheel play of more than 10 degrees (approximately 2 inches movement at the rim of a 20-inch steering wheel) can make it hard to steer. See Figure 2.1

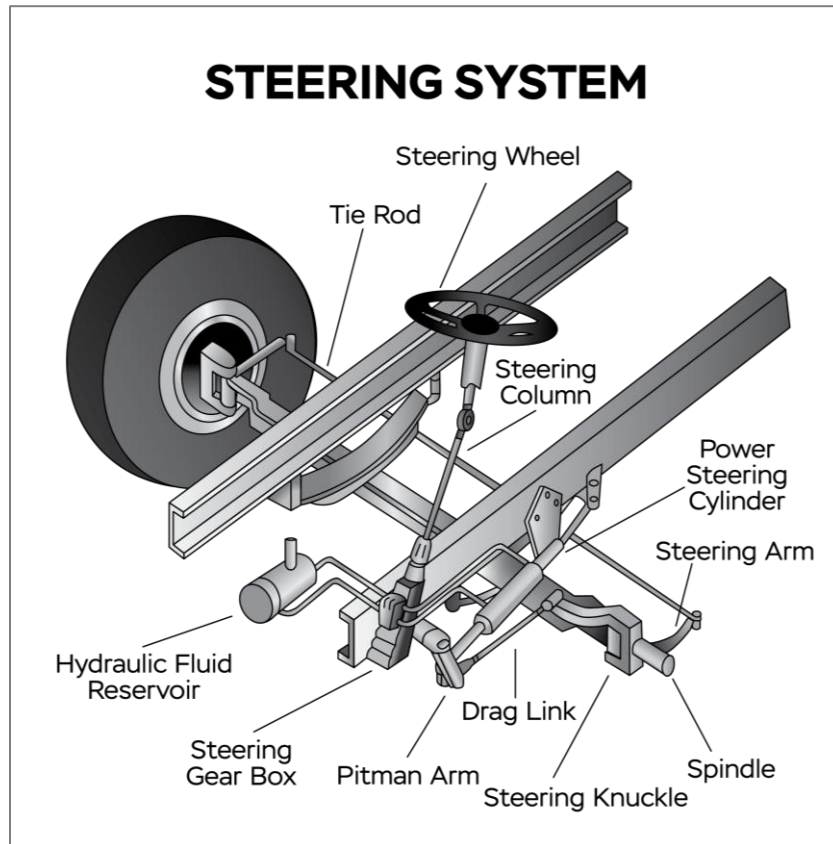
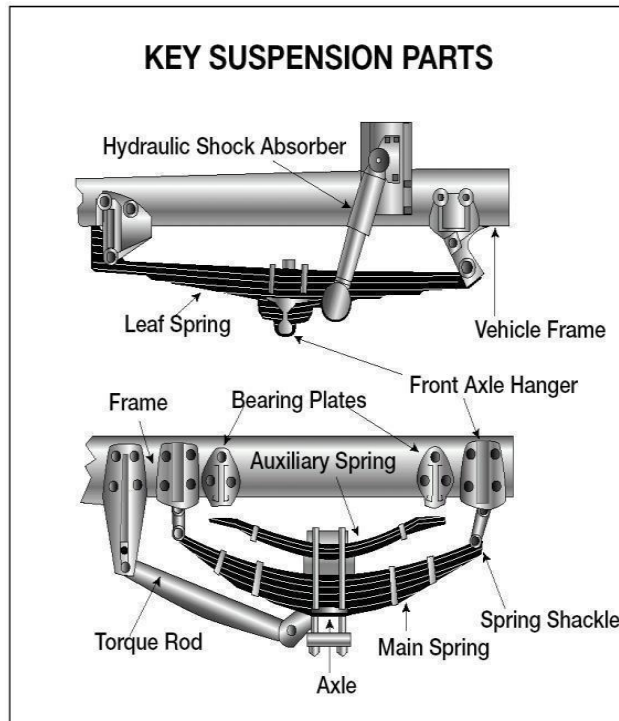


Figure 2.1

## SUSPENSION SYSTEM DEFECTS

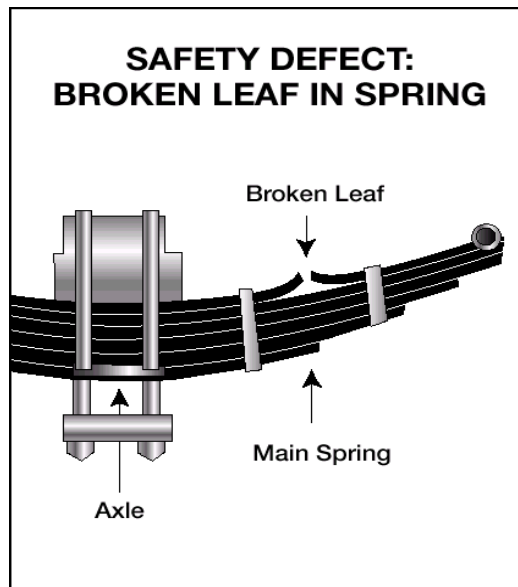
The suspension system holds up the vehicle and its load. It keeps the axles in place. This means broken suspension parts can be extremely dangerous. To check for problems with the suspension system, you should look for:

- Spring hangers that allow movement of the axle from the correct position. See Figure 2.2.



**Figure 2.2**

- Cracked or broken spring hangers.
  - Missing or broken leaves in any leaf spring. If more than  $\frac{1}{4}$  of the leaves in a spring are broken, the vehicle may be taken "out of service". Any defect could be dangerous. See Figure 2.3.



**Figure 2.3**

- Broken leaves in a multi-leaf spring or leaves that have shifted so they might hit a tire or other part.
- Leaking shock absorbers.
- Torque rod or arm, u-bolts, spring hangers, or other axle positioning parts that are cracked, damaged, or missing.
- Air suspension systems that are damaged or leaking. See Figure 2.4.

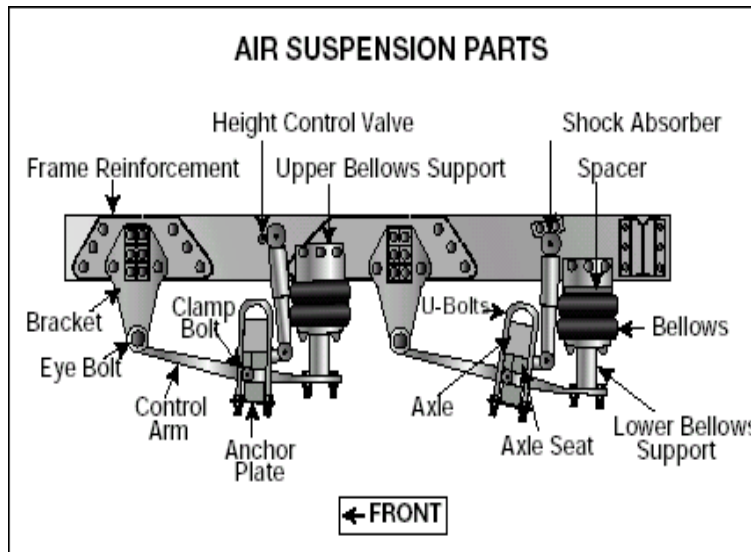


Figure 2.4

- Any loose, cracked, broken, or missing frame members.

## EXHAUST SYSTEM DEFECTS

A broken exhaust system can let poison fumes into the cab or sleeper berth. To check for problems with the exhaust system look for:

- Loose, broken, or missing exhaust pipes, mufflers, tailpipes, or vertical stacks.
- Loose, broken, or missing mounting brackets, clamps, bolts, or nuts.
- Exhaust system parts rubbing against fuel system parts, tires, or other moving parts of the vehicle.
- Exhaust system parts that are leaking.

## EMERGENCY EQUIPMENT

Vehicles must be equipped with emergency equipment. To make sure the emergency equipment is correct, look for:

- Fire extinguisher(s).
- Spare electrical fuses (unless equipped with circuit breakers).
- Warning devices for parked vehicles: three reflective triangles or at least 6 fuses or 3 liquid burning flares).

## CARGO (TRUCKS)

You must make sure the truck is not overloaded, and the cargo is balanced and secured before each trip. If the cargo contains hazardous materials, you must inspect for proper papers and placarding.

### 2.1.4 – CDL Vehicle Inspection Test

To get a CDL, you must pass a vehicle inspection test. You will be tested to see if you know if your vehicle is safe to drive. You will be asked to do a vehicle inspection of your vehicle. You must point to or touch and name each item you are inspecting and explain to the examiner what you would inspect for that part and why. The next section has 7 steps that will be helpful in learning how to do a vehicle inspection.

### 2.1.5 – The Seven-Step Inspection Method

#### METHOD OF INSPECTION

You should do a vehicle inspection the same way each time, so you will learn all the steps and be less likely to forget something. You need to check the condition of the different parts of your vehicle. This means checking to make sure the parts are working correctly and are not broken, out of place, or missing.

#### Approaching the Vehicle:

- Pay attention to the general condition.
- Look for damage or if the vehicle is leaning to one side.
- Look under the vehicle for fresh oil, coolant, grease, or fuel leaks.
- Check the area around the vehicle for hazards to vehicle movement (people, other vehicles, objects, low-hanging wires, limbs, etc.).

#### VEHICLE INSPECTION GUIDE

##### Step 1: Review Last Vehicle Inspection Report

You may have to write a vehicle inspection report each day. The motor carrier must repair any items in the report that affect safety and certify in the report that repairs were made or unnecessary.

If the report said there **were defects**, you **will** need to sign the report.

If **no defects** were found, you **will not** need to sign the report.

If you find anything unsafe during the Vehicle Inspection, get it fixed. Federal and state laws forbid operating an unsafe vehicle.

## Step 2: Check Engine Compartment

Check that the parking brakes are on or wheels are chocked.

You may have to raise the hood, tilt the cab (be sure to secure loose things first, so they don't fall and break something), or open the engine's compartment door.

Check the following:

- Engine oil level.
- Coolant level in radiator; condition of hoses.
- Power steering fluid level; hose condition (if so equipped).
- Windshield washer fluid level.
- Battery fluid level, connections and tie downs (battery may be located elsewhere)
- Automatic transmission fluid level (may require engine to be running).
- Check each belt for tightness and excessive wear (alternator, water pump, air compressor)
  - **NOTE:** Learn how much "give" the belts should have when correctly adjusted.
- Leaks in the engine compartment (fuel, coolant, oil, power steering fluid, hydraulic fluid, battery fluid).
- Cracked, worn electrical wiring insulation.

When you're done checking the engine compartment, lower and secure the hood, cab, or engine compartment door.

## Step 3: Start the Engine and Inspect Inside the Cab

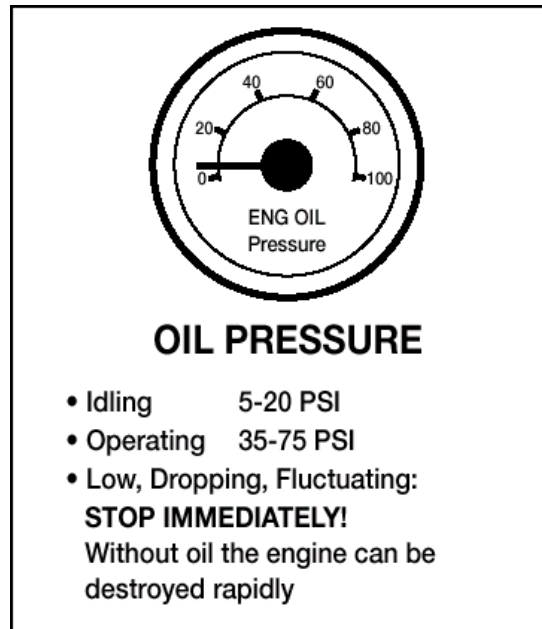
- Make sure the parking brake is on.
- Put the gearshift in neutral (or "park" if automatic).
- Start the engine and listen for unusual noises.

If the vehicle has one equipped, check the Anti-lock Braking System (ABS) indicator lights. A light on the dash should come on and then turn off. If it stays on, the ABS is not working properly. For trailers only, if the yellow light on the left rear of the trailer stays on, the ABS is not working properly. When you inspect the inside of the cab, you need to look at the gauges, check the condition of the controls, check your mirrors and windshield, and check your emergency equipment.

### Step 3a) Look at the Gauges

- **Oil pressure** – It should come up to normal within seconds after the engine is started. See Figure 2.5

- **Air pressure** – Pressure should build from 50 to 90 psi within 3 minutes. Build air pressure to the governor cut-out (usually around 120 – 140 psi.) **Know your vehicle's requirements.**
- **Ammeter or voltmeter** – Should be in normal range(s).
- **Coolant temperature** – Should begin a gradual rise to normal operating range.
- **Engine oil temperature** – Should begin a gradual rise to normal operating range.
- **Warning lights and buzzers** – Oil, coolant, charging circuit warning, and antilock brake system lights should go out right away.



**Figure 2.5**

### **Step 3b) Check the Condition of the Controls.**

Check all the following for looseness, sticking, damage, or improper setting:

- Steering wheel.
- Clutch.
- Accelerator ("gas pedal").
- Brake controls.
- Foot brake.
- Trailer brake (if your vehicle has one).
- Parking brake.
- Retarder controls (if your vehicle has them).
- Transmission controls.

- Interaxle differential lock (if your vehicle has one).
- Horn(s).
- Windshield wiper/washer.
- Lights. Headlights. Dimmer switch. Turn signal.
- Four-way flashers.
- Light switches for:
  - Parking lamps,
  - clearance lamps,
  - identification lamps,

### **Step 3c) Check Mirrors and Windshield.**

Inspect all mirrors and the windshield for cracks, dirt, illegal stickers, or other causes to make seeing more difficult. Clean and adjust the mirrors and windows if that is needed.

### **Step 3d) Check Emergency Equipment**

Check for the following safety equipment items:

- Spare electrical fuses (unless the vehicle has circuit breakers).
- Three red reflective triangles or three liquid burning flares.
- Properly charged and rated fire extinguisher.

### **Step 3e) Check the Safety Belt.**

Check that the safety belt is securely mounted, is adjustable, latches properly, and is not ripped or frayed.

### **Step 4: Turn Off the Engine and Check the Vehicle's Lights**

Make sure the parking brake is set, turn off the engine, and take the key with you. Turn on headlights (low beams) and four-way emergency flashers and get out of the vehicle.

### **Step 5: Do Walk-around Inspection General Inspection of the Lights**

Go to the front of the vehicle and check that low beams are on and both four-way flashers are working.

- Push the dimmer switch and check that the high beams work.
- Turn off the headlights and the four-way emergency flashers.
- Turn on parking, clearance, side-marker, and identification lights.
- Turn on the right turn signal and start a walk-around inspection.

## General Inspection of the Entire Vehicle:

- Walk around and inspect everything. Review all lights, reflectors, and glass as you go along. Clean the lights, reflectors, and glass as needed.

### On the Left Front Side:

- Driver's door glass should be clean.
- Door latches and locks should all work properly.
- Check the condition of the left front wheel and rim:
  - look that it isn't missing, bent, has broken studs, clamps, lugs, or has any signs of misalignment.
- Check the condition of the tires:
  - they should be properly inflated,
  - the valve stem and cap are in good condition,
  - there are no serious cuts,
  - bulges, or
  - tread wear.
- Review the condition of the lug nuts.
  - Use a wrench to test rust-streaked lug nuts since this could be a sign of looseness.
- Check the hub oil level is OK and there are no leaks.
- Check the left front suspension.
- Check the condition of spring, spring hangers, shackles, u-bolts.
- Check the shock absorber condition.
- Check the left front brake.
- Check the condition of the brake drum or disc.
- Check the condition of the hoses.

### Front:

- Check the condition of the front axle.
- Check the condition of the steering system.
- Check that there are no loose, worn, bent, damaged or missing parts.
- Check the steering mechanism to test for looseness.
- Check the condition of the windshield for damage and clean if dirty.
- Check windshield wiper arms for proper spring tension.
- Check wiper blades for damage, "stiff" rubber, and make sure they are secure.
- Check the lights and reflectors.

- Check that parking, clearance, and identification lights are clean, operating, and proper color (amber at front).
- Check that reflectors are clean and have a proper color (amber at front).
- Check that the right front turn signal light is clean, operating, and proper color (amber or white on signals facing forward).

On the **Right Front Side:**

- On the right front you will check all the items as done on the left front.

On the Right Side:

- Primary and secondary safety cab locks engaged (if cab-over-engine design).
- Check the Right fuel tanks are securely mounted and are not damaged or leaking.
- Check that the Fuel crossover line is secure.
- Check that the Tank(s) have enough fuel and cap(s) are on and secure.

**Check the Condition of All Visible Parts:**

- Check that the rear of the engine is not leaking.
- Check that the transmission is not leaking.
- Check that the exhaust system is secure, not leaking, not touching wires, fuel, or air-lines.
- Check that the frame and cross members have no bends or cracks.
- Check the air-lines and electrical wiring are secured against snagging, rubbing, wearing.
- Check the spare tire carrier or rack is not damaged (if your vehicle has one).
- Check the spare tire or wheel is securely mounted in the rack.
- Check the spare tire and wheel are the right size and have enough air.
- Check all cargo is properly blocked, braced, balanced, tied, or chained, and is the right weight limit for that vehicle to keep it from moving while the vehicle is in motion.
- If a header board is required, check that it is adequate and secure.
- Check the side boards, stakes strong enough, free of damage, properly set in place (if so equipped).
- If canvas or tarp is needed, check it is properly secured to prevent tearing, billowing, or blocking of mirrors.
- Check curbside cargo compartment doors are in good condition, securely closed, latched or locked and all required security seals in place.
- If your vehicle is oversize, check that all required signs (flags, lamps, and reflectors) are safely and properly mounted and you have all required permits.

**Right Rear:**

- Check the condition of wheels and rims--no missing, bent, or broken spacers, studs, clamps, or lugs.
- Check the condition of tires--properly inflated, valve stems and caps OK, no serious cuts, bulges, tread wear, tires not rubbing each other, and nothing stuck between them.
- Check the tires are of the same type. (not mixed radial and bias types).
- Check the tires evenly matched (same sizes). Wheel bearing/seals not leaking.
- Check the suspension.
- Check the condition of spring(s), spring hangers, shackles, and u-bolts.
- Check the sale secure.
- Check the powered axle(s) not leaking lube (gear oil).
- Check the condition of torque rod arms and bushings.
- Check the condition of the shock absorber(s).
- If a retractable axle is equipped, check the condition of the lift mechanism. If it is air powered, check for leaks.
- Check the condition of air ride components.
- Check the brake adjustment.
- Check the condition of brake drum(s) or discs.
- Check the condition of hoses--look for any wear due to rubbing.
- Check the lights and reflectors.
- Check the side-marker lights are clean, operating, and proper color (red at rear, others amber).
- Check the side-marker reflectors clean and proper color (red at rear, others amber).

#### **Rear:**

- Check the lights and reflectors.
- Rear clearance and identification lights should be:
  - clean,
  - operating,
  - and proper color (red at rear).
- Reflectors should be:
  - clean
  - and proper color (red at rear).
- Tail lights should be:
  - clean,
  - operating,
  - and proper color (red at rear).

- Right rear turn signal should be:
  - operating
  - and the proper color (red, yellow, or amber at rear).
- License plate(s) should be:
  - present,
  - clean,
  - and secured.
- Splash guards should be:
  - Present
  - Not damaged,
  - Properly fastened,
  - Not dragging on ground or rubbing tires.
- Cargo should be secure.
- Cargo should be properly blocked, braced, tied, chained, etc.
- Tailboards should be up and properly secured.
- End gates should be free of damage, properly secured in stake sockets.
- Canvas or tarp (if needed) properly secured to prevent tearing, billowing, or blocking of either the rearview mirrors or rear lights.
- If your vehicle is over-length or over-width, make sure all signs and other lights/flags are safely and properly mounted and all required permits are in your possession.
- Rear doors should be securely closed, latched/locked.

### **Left Side:**

Check all items as done on right side, plus:

- Any battery (if not mounted in the engine compartment).
- Any battery box securely mounted to vehicle. Box has a secure cover.
- All batteries are secured against movement.
- Batteries are not broken or leaking.
- Fluid in batteries is at proper level (except maintenance-free type).
- Cell caps are present and securely tightened (except maintenance-free type).
- Vents in cell caps are free of foreign material (except maintenance-free type).

### **Step 6: Check Signal Lights**

Get in your vehicle and turn off all lights.

- Turn on stop lights (apply trailer hand brake or have a helper put on the brake pedal).

- Turn on left turn signal lights.
- Get out and check lights:
  - **Left front turn signal light** should be:
    - clean
    - operating
    - and proper color (amber or white on signals facing the front).
  - **Left rear turn signal light** should be:
    - clean,
    - operating,
    - and proper color (red, yellow, or amber).
  - **Both** stop lights should be:
    - clean,
    - operating,
    - and proper color (red, yellow, or amber).

Get back in your vehicle.

- Turn off lights not needed for driving.
- Check for all required papers, trip manifests, permits, etc.
- Secure all loose items in the cab (they might interfere with operation of the controls or hit you in a crash).
- Start the engine.

## **Step 7: Start the Engine and Check the Brake System**

Test for hydraulic leaks.

- If the vehicle has hydraulic brakes, pump the brake pedal three times. Then apply firm pressure to the pedal and hold for five seconds. The pedal should not move. If it does, there may be a leak or other problem. Get it fixed before driving.
- If the vehicle has air brakes, do the checks described in Sections 5 and 6 of this manual.

## **BRAKE SYSTEM**

Test Parking Brake(s):

- Fasten your safety belt.
- Set the parking brake (power unit only)
- Release the trailer parking brake (if applicable)
- Place the vehicle into low gear.

- Gently pull forward against the parking brake to make sure the parking brake holds.
- Repeat the same steps for the trailer with trailer parking brake set and power unit parking brakes released (if applicable).
- If it doesn't hold the vehicle, it is faulty; do not drive.

Test the Service Brake Stopping Action:

- Start driving and get up to about five miles per hour.
- Push down the brake pedal firmly.
- If the vehicle begins "pulling" to one side or the other this can mean brake trouble.
- Any unusual brake pedal "feel" or if there is a delay in the stopping action, this can mean trouble.

## 2.1.6 – Inspection During a Trip

### CHECK YOUR VEHICLE OPERATION REGULARLY

You should check all the following parts of your vehicle on each trip:

- **All** of your instruments.
- Air pressure gauge (if you have air brakes).
- Temperature gauges.
- Pressure gauges.
- Ammeter/voltmeter.
- Mirrors.
- Tires.
- Cargo and cargo covers.
- Lights, etc.

If you see, hear, smell, or feel anything that might mean trouble, check it out.

### SAFETY INSPECTION

Drivers of trucks and truck tractors when transporting cargo must inspect the securement of the cargo:

- Within the first 50 miles of a trip; and
- Every 150 miles or every three hours (whichever comes first).

## 2.1.7 – After-trip Inspection and Report

You may have to make a written report each day on the condition of the vehicle(s) you drove. You will need to report anything that could be a safety problem, or that could possibly cause a mechanical breakdown. This report is then given to the motor carrier or owner or operator of the vehicle.

The vehicle inspection report tells the motor carrier about problems that may need fixing. The motor carrier will tell you what issues need to be fixed with your vehicle. 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.

## Subsection 2.1 Test Your Knowledge

1. What is the most important reason for doing a vehicle 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? For other tires?
7. Name some things you should check on the front of your vehicle during the walk around inspection.
8. What should wheel bearing seals be checked for?
9. How many red reflective triangles should you carry?
10. How do you test hydraulic brakes for leaks?
11. Why put the ignition key in your pocket during the vehicle inspection?

These questions may be on your test. If you can't answer them all, re-read subsection 2.1.

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## 2.2 – Learning Basic Control of Your Vehicle

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To drive a vehicle safely, you must be able to control its speed and direction. Safe operation of a commercial vehicle requires skill in:

- Accelerating.
- Steering.
- Stopping.
- Backing up.

Always fasten your seatbelt when you are on the road. Always apply the parking brake when you leave your vehicle.

## 2.2.1 – Accelerating Safely

When you first start your vehicle, you will need to make sure it doesn't roll back when it is put into gear or when you release the parking brake. If the vehicle rolls back, you may hit someone behind you.

If you have a manual transmission vehicle, push the clutch down part of the way before you take your right foot off the brake. Put on the parking brake anytime you need to keep from rolling back. Release the parking brake only when you have applied enough engine power to keep from rolling back.

On a tractor-trailer equipped with a trailer brake hand valve, the hand valve can be applied 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.

When you are driving in rain or snow, or other times when your tires don't have good traction, speed up very gradually. If you use too much power, the drive wheels may spin. You could lose control. If the drive wheels begin to spin, take your foot off the accelerator.

## 2.2.2 – Steering Safely and Properly

You should always hold the steering wheel firmly with both hands. Your hands should be on opposite sides of the wheel. If you hit a curb or a pothole, the wheel could pull away from your hands unless you have a firm hold onto the steering wheel.

## 2.2.3 – Stopping Safely and Quickly

Anytime you need to stop, push the brake pedal down gradually. How hard you need to push the brake pedal to stop will depend on how fast you are driving and how quickly you need to stop.

If you are not driving at a high speed, you may not need to push the brake pedal as hard.

If you need to stop quickly, you may need to push the brake pedal down very hard.

Control the pressure so the vehicle comes to a smooth, safe stop. If you have a manual transmission, push the clutch in when the engine is close to idle.

## 2.2.4 – Backing Up Safely

Backing up is always dangerous because you cannot see everything behind your vehicle. Avoid backing up whenever you can. When you park, try to park so you will be able to pull forward when you leave. When you have to back up, here are a few simple safety rules:

- **Start in the Proper Position** – Put the vehicle in the best position to allow you to back safely. This position will depend on the type of backing to be done.
- **Check Your Path Before You Drive** – Before you start moving, take a look at where your vehicle will go. Get out and walk around the vehicle. Make sure there's enough space on all sides and above, both in the path and near where your vehicle will go.
- **Use Mirrors on Both Sides** – Check the outside mirrors on both sides frequently. Get out of the vehicle and check your path if you are unsure.
- **Back Up Slowly** – Always back as slowly as you can. Use the lowest reverse gear. This makes it easier to fix any steering errors and helps you stop quickly if you need to.
- **Back Toward the Driver's Side** – You can see better when you back up toward the driver's side. Backing toward the right side is very dangerous because it is harder to see. If you back and turn toward the driver's side, you can watch the rear of your vehicle by looking out the side window. Even if you need to go around the block to get in the right position, it's safer and worth the extra time.
- **Use a Helper** – Use a helper when you can. There are blind spots you can't see. That's why a helper is important. The helper should stand near the back of your vehicle where you can see them. Before you begin backing, discuss and agree on a set of hand signals that you both understand. Agree on a signal for "stop."
- **Start in the Proper Position** – Put the vehicle in the best position to allow you to back safely. This position will depend on the type of backing to be done.
- **Use Mirrors on Both Sides** – Check the outside mirrors on both sides frequently. Get out of the vehicle and check your path if you are unsure.

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## 2.3 – Shifting Gears Correctly

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Shifting gears correctly is important. You will have less control if you can't get your vehicle into the right gear while driving.

### 2.3.1 – Manual Transmissions and Shifting Gears

#### **BASIC PROCEDURES FOR SHIFTING UP**

Upshifting or shifting up means moving to a higher gear. Most heavy vehicles with unsynchronized manual transmissions require double clutching to change gears. However, double clutching may not be required if your vehicle is equipped with a synchronized manual transmission. This is the basic method for double clutching:

1. Let off the accelerator, push in the clutch and shift to neutral at the same time.
2. Release clutch while still not pressing the accelerator.

3. Let engine and gears slow down to the rpm required for the next gear. (Learning how to do this takes practice.)
4. Push in the clutch and shift to the higher gear at the same time. Release clutch and press accelerator at the same time.

Shifting gears using double clutching requires practice. If you stay in neutral too long, you may have difficulty putting the vehicle into the next gear. If this happens, don't try to force it. Return to neutral, release clutch, increase engine speed to match road speed, and try again.

## KNOWING WHEN TO SHIFT UP

There are two ways of knowing when to shift:

1. **Use Your Engine Speed (rpm)** – Read the driver's manual for your vehicle and learn the operating rpm range. Watch your tachometer and 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.
2. **Use Road Speed (mph)** – Learn what speeds each gear is good for. Then, by using the speedometer, you'll know when to shift up.

With either method, you may learn to use engine sounds to know when to shift.

## BASIC PROCEDURES FOR SHIFTING DOWN

Downshifting means moving to a lower gear.

1. Let off the accelerator, push in the clutch, and shift to neutral at the same time.
2. Release the clutch.
3. Press the accelerator, increase engine and gear speed to the rpm required in the lower gear.
4. Push in the clutch and shift to lower gear at the same time.
5. Release clutch and press 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.

## SPECIAL CONDITIONS WHERE YOU SHOULD DOWNSHIFT

### Before Starting Down a Hill:

- Slow down and shift down to a speed that you can control without using the brakes hard. Brakes can overheat and lose their braking power when overused.
- Downshift before starting down the hill. Make sure you are in a low enough gear, usually lower than the gear required to climb the same hill.

## Before Entering a Curve:

Slow down to a safe speed and downshift to the right gear before entering the curve. This lets you use some power through the curve to help the vehicle be more stable while turning. It also lets you speed up as soon as you are out of the curve.

## 2.3.2 – Multi-speed Rear Axles and Auxiliary Transmissions

Some trucks have special parts that give them extra gears. These include multi-speed rear axles and extra transmissions. You usually use a knob or switch to control them on the main gearshift lever. There are many ways of shifting gears. Make sure you learn the right way to shift gears in the vehicle you will be driving.

## 2.3.3 – Automatic Transmissions

Some vehicles have automatic transmissions. If you are driving a vehicle with an automatic transmission you may want to use low range to give you extra power and control if you are driving slowly. This is used for tough driving conditions like going down steep hills, slippery roads, or moving a heavy load at low speeds. When you're in low range, your truck's gears are set to give more torque (or pulling power), even though your speed is lower. This helps protect your brakes and engine from working too hard. It is very important to use this braking technique when going down grades.

Low range can help your truck from rolling too fast downhill, start smoothly on hills or with heavy loads, and gives you more control in tricky situations.

## 2.3.4 – Using Retarders

Some vehicles have retarders. They help slow your vehicle and can reduce the need for using your brakes. Retarders reduce wear on the brakes and give you another way to slow down. There are four basic types of retarders:

- exhaust,
- engine,
- hydraulic, and
- electric.

All retarders can be turned on or off by the driver. On some vehicles the retarding power can be adjusted. When turned on, retarders apply their braking power to the drive wheels whenever you let up on the accelerator pedal all the way.

Because these devices can be noisy, be sure you know where you are allowed to use retarders.

**CAUTION: Retarders should only be used when you are sure your wheels have good traction.** When your drive wheels have poor traction, the retarder may cause them to skid. You should turn the retarder off whenever the road is wet, icy, or snow covered.

## Subsections 2.2 and 2.3 Test Your Knowledge

1. Why should you back up toward the driver's side?
2. If you are stopped on a hill, how can you start moving without rolling back?
3. When backing up, why is it important to use a helper?
4. What's the most important hand signal that you and the helper should agree on?
5. What are the two special conditions where you should downshift a manual transmission vehicle?
6. When should you downshift automatic transmissions?
7. Retarders keep you from skidding when the road is slippery. True or False?
8. What are the two ways to know when to shift?

These questions may be on the test. If you can't answer them all, re-read subsections 2.2 and 2.3.

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## 2.4 – Looking Ahead and Managing Space

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To be a safe driver you need to know what's going on all around your vehicle. Not looking or scanning ahead far enough is a major cause of crashes.

### **IMPORTANCE OF LOOKING FAR ENOUGH AHEAD**

Stopping or changing lanes can take a lot of distance so knowing what the traffic is doing on all sides of you is very important. You need to look far ahead on any road to make sure you have room to make these moves safely.

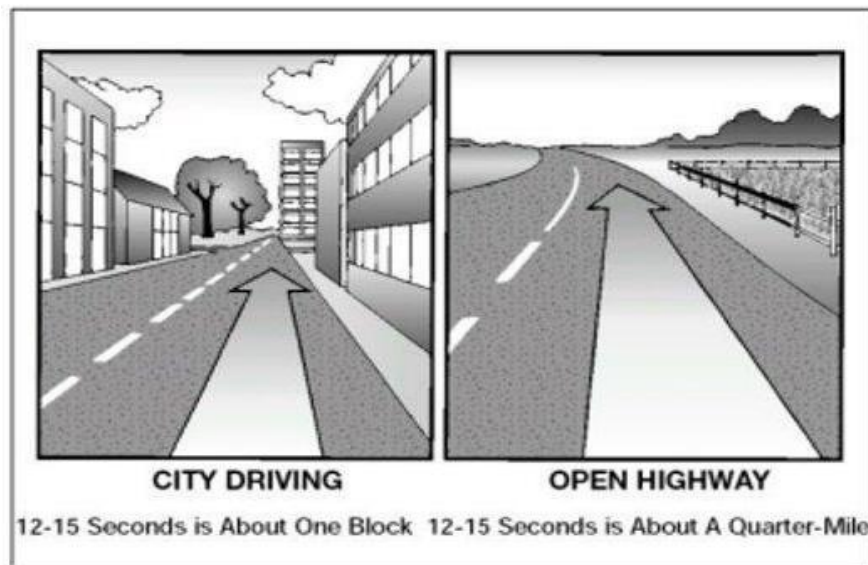
### **HOW FAR AHEAD SHOULD YOU LOOK?**

To drive safely, you should always look ahead at where you'll be in about 12 to 15 seconds. This helps you spot problems early and gives you time to slow down or change lanes smoothly.

- If you are driving in the city, that's about one block ahead.

- On the highway, it's about a quarter mile ahead.

Good drivers don't just stare far ahead all the time. They are keeping their eyes moving, looking, near, far and checking their mirrors. Scanning like this helps you stay aware of everything around your vehicle so you are always ready if you need to make quick decisions.



**Figure 2.6**

## **LOOK FOR TRAFFIC**

Good drivers will always be looking for other vehicles on the road. Look for vehicles coming onto the highway, into your lane, or those getting ready to turn. Watch for brake lights from slowing vehicles. By seeing these things far enough ahead, you can change your speed or change lanes to avoid a problem. If a traffic light has been green for a long time it will probably change before you get there. Start slowing down and be ready to stop.

## **SEEING TO THE SIDES AND REAR**

It's important to always know what's going on behind and to the sides of your vehicle. Check your mirrors regularly. Check more often in special situations which are explained more below.

### **Adjusting Your Mirrors**

**You should check your mirror adjustment before starting any trip.** To be accurate, you must check the mirror adjustment when the trailer(s) are straight. You should check and adjust each mirror to show some part of the vehicle. This will help you understand where other vehicles are by giving you a clear starting point to compare what you see in your mirrors.

### **Regular Mirror Checks**

You need to check your mirrors often to be aware of traffic and to check your vehicle.

## Using Mirrors to Monitor Traffic

Check your mirrors for vehicles on either side and behind you. In an emergency, you may need to know whether you can make a quick lane change. Use your mirrors to spot vehicles who may be trying to pass you. There are "blind spots" that your mirrors cannot show you. A blind spot is an area around your vehicle that you can't see by just using your mirrors. Check your mirrors regularly to know where other vehicles are around you, and to see if they move into your blind spots.

## Using Mirrors to Check Your Vehicle

Use the mirrors to keep an eye on your tires. It's one way to spot a tire fire. If you're carrying open cargo, you can use the mirrors to check that also. Look for loose straps, ropes, or chains. Watch for a flapping or ballooning tarp.

## Using Mirrors in Special Situations

Special situations include:

- lane changes,
- turns,
- merges, and
- tight maneuvers.

These special situations require more than regular mirror checks.

## Using Mirrors for Lane Changes

You need to check your mirrors to make sure no one is alongside you or about to pass you. You should always check your mirrors in these situations:

- Before you change lanes to make sure there is enough room.
- After you have signaled, to check that no one has moved into your blind spot.
- Right after you start the lane change, to double-check that your path is clear.
- After you complete the lane change.

## Using Your Mirrors When Making Turns

While turning, check your mirrors to make sure the rear of your vehicle will not hit anything.

## Using Your Mirrors When Merging

When merging, use your mirrors to make sure the gap in traffic is large enough for your vehicle to enter safely.

## Using Your Mirrors When Making Tight Maneuvers

Any time you are driving in close quarters, check your mirrors often. Make sure you have enough clearance.

## How to Use Mirrors

Use mirrors correctly by checking them quickly and understanding what you see.

When you check your mirrors while driving on the road, check quickly. Look back and forth between the mirrors and the road ahead. Don't focus on the mirrors for too long. Otherwise, you will continue to travel without knowing what is happening ahead.

Many large vehicles have curved mirrors that show a wider area than flat mirrors. These mirrors are sometimes called convex, fisheye, spot, and bug-eye mirrors. Everything appears smaller in a convex mirror than it would if you were looking at it directly.

Things also seem farther away than they really are. It's important to realize this and get used to it. It is important that you get used to how things look in the mirrors of your vehicle. This might be different for every vehicle you drive.

Figure 2.7 shows the field of vision using a convex mirror.

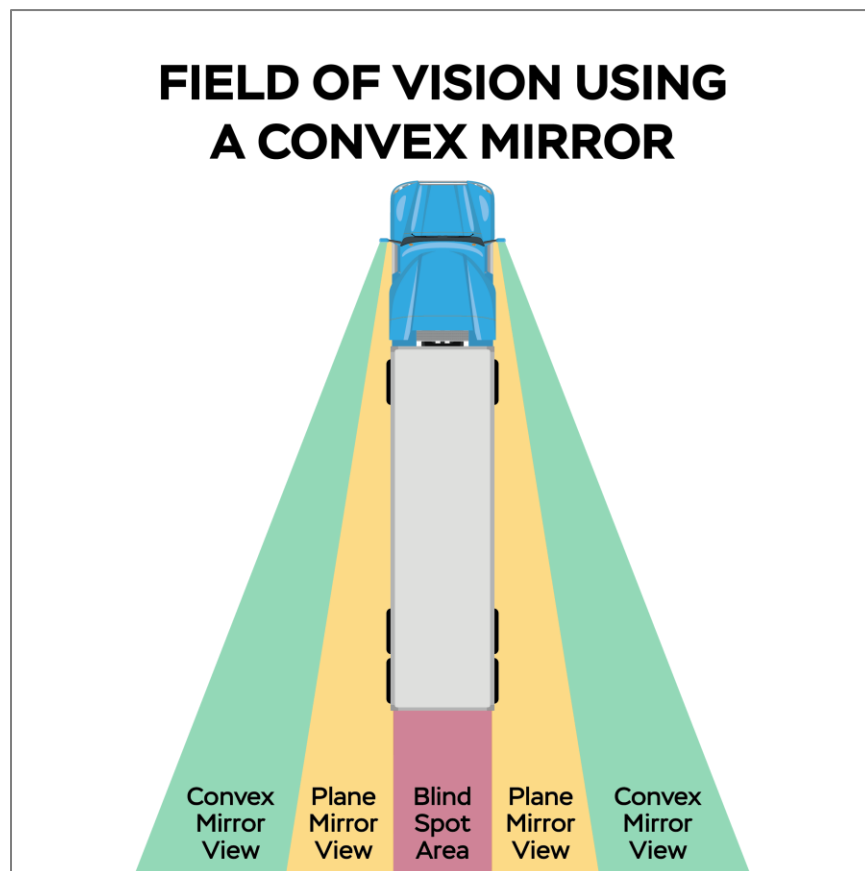


Figure 2.7

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## 2.5 – Communicating Clearly With Other Drivers

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### 2.5.1 – Tell Other Drivers What You Plan to Do

Other drivers can't know what you are going to do until you tell them.

Signaling what you plan to do is important for safety. Here are some general rules for signaling during specific situations.

#### **URNS**

There are three good rules for using turn signals:

- **Signal early** – Signal well before you turn. It is the best way to keep others from trying to pass you.
- **Signal continuously** – You need both hands on the wheel to turn safely. Don't cancel the signal until you have completed the turn.
- **Cancel your signal** – Don't forget to turn off your turn signal after you've turned. Even if your vehicle has self-canceling signals, you may need to manually turn off the signal depending on how sharp the turn was or if there is a defect in the sensor.

#### **LANE CHANGES**

Put your turn signal on before changing lanes. Change lanes slowly and smoothly. That way a driver you didn't see may have a chance to honk their horn, or avoid your vehicle.

#### **SLOWING DOWN**

Warn drivers behind you when you see you'll need to slow down. A few light taps on the brake pedal to flash the brake lights should warn following drivers. Use the four-way emergency flashers for times when you are driving very slowly or are stopped. Don't stop suddenly. Warn other drivers in any of the following situations:

#### **TROUBLE AHEAD**

The size of your vehicle may make it hard for drivers behind you to see hazards ahead. If you see a hazard that will require slowing down, warn the drivers behind by flashing your brake lights.

#### **TIGHT TURNS**

Most car drivers don't know how slowly you have to go to make a tight turn in a large vehicle. Give drivers behind you warning by braking early and slowing gradually.

## **STOPPING ON THE ROAD**

Truck and bus drivers sometimes stop in the roadway to unload cargo or passengers, or to stop at a railroad crossing. Warn following drivers by flashing your brake lights.

## **DRIVING SLOWLY**

Drivers often do not realize how fast they are catching up to a slow vehicle until they are very close. If you must drive slowly, alert following drivers by turning on your emergency flashers if it is legal. Laws regarding the use of flashers differ from one state to another. Check the laws of the states where you drive.

## **DON'T DIRECT TRAFFIC**

Some drivers try to help others by signaling when it is safe to pass. You should not do this. You could cause a crash. You could be blamed, and it could cost you.

## **2.5.2 – Communicating Your Presence**

Other drivers may not notice your vehicle even when it's in plain sight. To help prevent accidents, let them know you're there.

### **WHEN PASSING**

Whenever you are about to pass a vehicle, pedestrian, or bicyclist, assume they don't 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 carefully enough to avoid a crash even if they don't see or hear you.

### **WHEN IT'S HARD TO SEE**

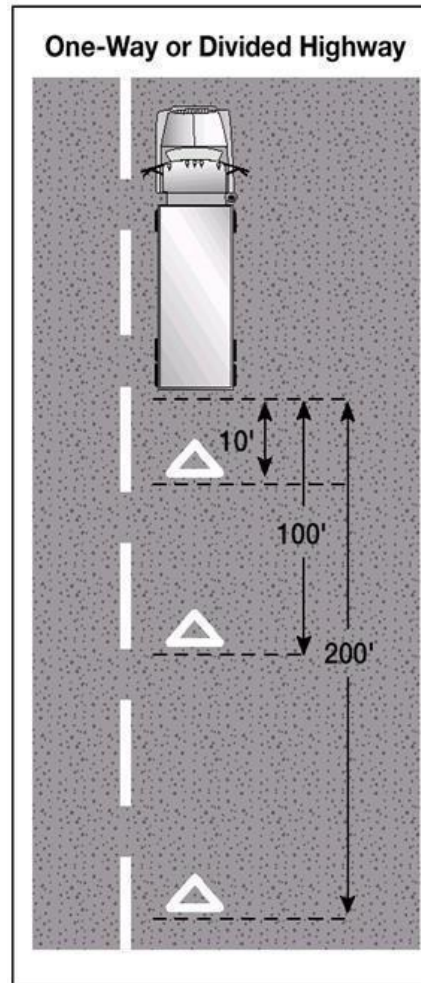
When it is dark or nearly dark, in rain, or snow, you should make yourself easier to see. If you are having trouble seeing other vehicles, other drivers will have trouble seeing you. Turn on your lights. Use the headlights, not just the identification or clearance lights. Use the low beams; high beams can bother people in the daytime as well as at night.

### **WHEN PARKED AT THE SIDE OF THE ROAD**

When you pull off the road and stop, be sure to turn on the four-way emergency flashers. This is important at night. Don't trust the taillights to give warning. Drivers have crashed into the rear of a parked vehicle because they thought it was moving normally.

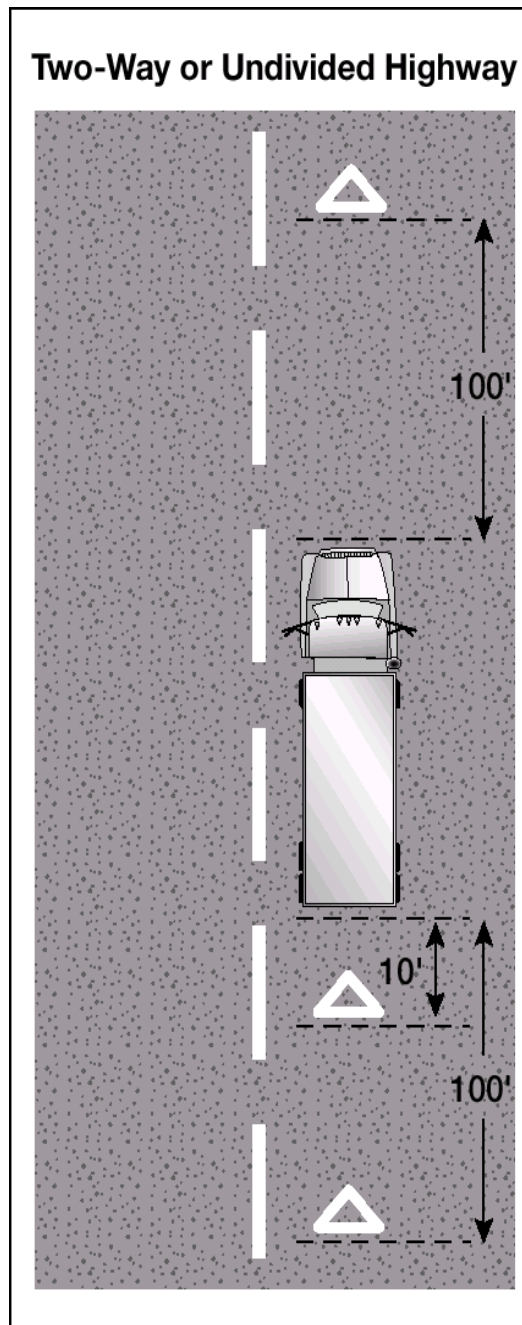
If you must stop on a road or the shoulder of any road, you must put out your emergency warning devices within ten minutes. Place your warning devices at the following locations:

1. If you must stop on or by a one-way or divided highway, place warning devices 10 feet, 100 feet, and 200 feet toward the approaching traffic. See Figure 2.8.



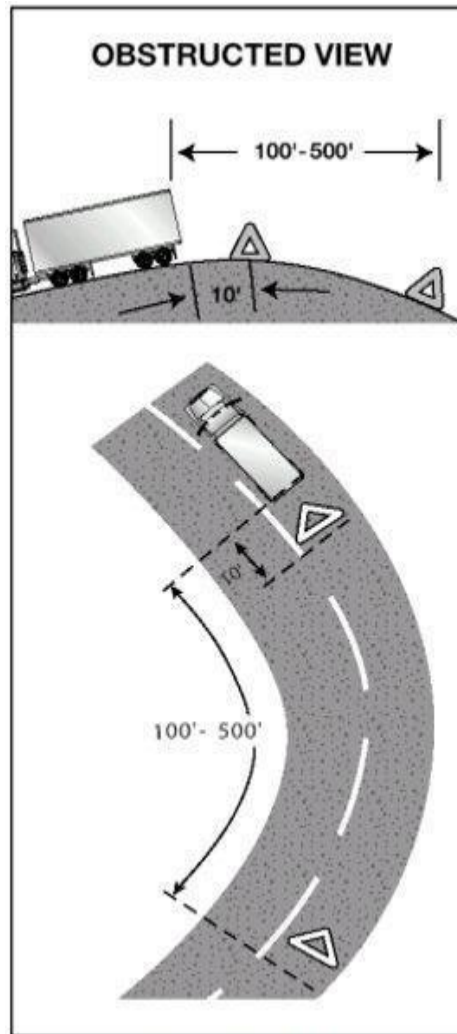
**Figure 2.8**

2. If you stop 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 to mark the location of the vehicle and 100 feet behind and ahead of the vehicle, on the shoulder or in the lane you stopped in. See Figure 2.9.



**Figure 2.9**

3. Back beyond any hill, curve, or other obstruction that prevents other drivers from seeing the vehicle within 500 feet. If line of sight view is obstructed due to a hill or curve, move the rear-most triangle to a point back down the road so warning is provided. See Figure 2.10.



**Figure 2.10**

When putting out the triangles, hold them between yourself and the oncoming traffic for your own safety. This will make it easier for other drivers to see you.

### **USE YOUR HORN WHEN NEEDED**

Your horn can let others know you're there. It can help to avoid a crash. Use your horn when needed. However, it can startle others and could be dangerous when used unnecessarily.

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## **2.6 – Controlling Speed**

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Driving too fast is a major cause of fatal crashes. You must adjust your speed depending on driving conditions. These include traction, curves, visibility, traffic, and hills.

## 2.6.1 – Stopping Distance

To help you know how much distance you will need to safely stop your vehicle, use the following formula:

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

### PERCEPTION DISTANCE

Perception Distance is the distance your vehicle travels, in ideal conditions; from the time your eyes see a hazard until your brain recognizes it.

Your perception is your ability to see, hear, or recognize something using your senses. Keep in mind there are mental and physical conditions which can affect your perception of distance. It can be affected greatly depending on visibility and the hazard itself. The average perception time for an alert driver is  $1\frac{3}{4}$  seconds. At 55 mph this accounts for 142 feet traveled.

### REACTION DISTANCE

Reaction Distance is the distance you will continue to travel, in ideal conditions; before you physically hit the brakes, in response to a hazard seen ahead.

The average driver has a reaction time of  $\frac{3}{4}$  second to 1 second. At 55 mph this accounts for 61 feet traveled

### BRAKING DISTANCE

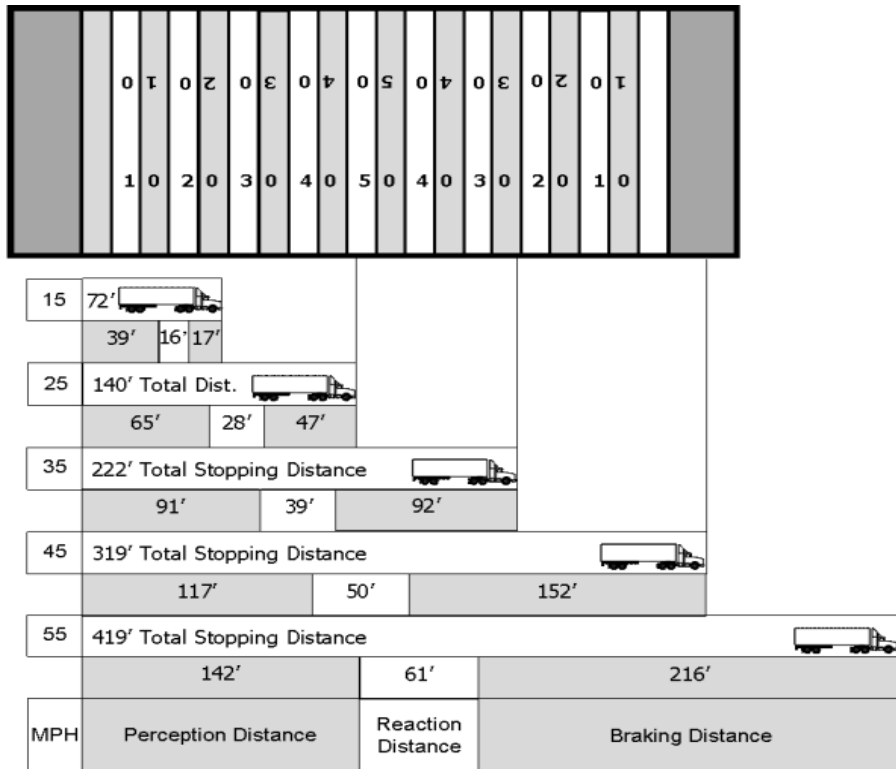
Braking Distance is the distance your vehicle will travel, in ideal conditions, while you are braking.

At 55 mph on dry pavement with good brakes, it can take about 216 feet.

### TOTAL STOPPING DISTANCE

Total Stopping Distance is the total minimum distance your vehicle has traveled, in ideal conditions; with everything considered, including perception distance, reaction distance and braking distance, until you can bring your vehicle to a complete stop.

At 55 mph, your vehicle will travel a minimum of 419 feet. See Figure 2.11.



**Figure 2.11**

## THE EFFECT OF SPEED ON STOPPING DISTANCE

The faster you drive, the greater the impact or striking power of your vehicle.

When you double your speed from 20 to 40 mph the impact is 4 times greater. The braking distance is also 4 times longer.

Triple the speed from 20 to 60 mph and the impact and braking distance is 9 times greater.

Increase the speed to 80 mph and the impact and braking distance are 16 times greater than at 20 mph.

High speeds greatly increase the severity of crashes and stopping distances. By slowing down, you can reduce braking distance.

## THE EFFECT OF VEHICLE WEIGHT ON STOPPING DISTANCE

The heavier the vehicle, the more work the brakes must do to stop it, and the more heat they absorb. But heavy vehicles have brakes, tires, springs, and shock absorbers which are designed to work best when the vehicle is fully loaded. Empty trucks need more stopping distance because an empty vehicle has less traction.

## 2.6.2 – Matching Speed to the Road Surface

You can't steer or brake a vehicle unless you have traction. Traction is friction between the tires and the road. There are some road conditions that reduce traction and call for lower speeds.

### **SLIPPERY SURFACES**

It will take longer to stop, and it will be harder to turn without skidding, when the road is slippery. Wet roads can double the stopping distance. You must drive slower to be able to stop in the same distance as on a dry road. Reduce speed by about one-third (e.g., slow from 55 to about 35 mph) on a wet road. On packed snow, reduce speed by a half, or more. If the surface is icy, reduce speed to a crawl and stop driving as soon as you can safely do so.

### **IDENTIFYING SLIPPERY SURFACES**

Sometimes it's hard to know if the road is slippery. Here are some signs of slippery roads:

#### **SHADED AREAS**

Shady parts of the road will remain icy and slippery long after open areas have melted.

#### **BRIDGES**

When the temperature drops, bridges will freeze before the road will. Be especially careful when the temperature is close to 32 degrees Fahrenheit.

#### **MELTING ICE**

Slight melting will make ice wet. Wet ice is much more slippery than ice that is not wet.

#### **BLACK ICE**

Black ice is a thin layer that is clear enough that you can see the road underneath it. It makes the road look wet. Any time the temperature is below freezing and the road looks wet, watch out 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's ice on these, the road surface is probably starting to ice up.

## JUST AFTER RAIN BEGINS

Right after it starts to rain, the water mixes with oil left on the road by vehicles. This makes the road very slippery. If the rain continues, it will wash the oil away.

## HYDROPLANING

In some weather, water or slush collects on the road. When your vehicle drives over the collected water, your vehicle can hydroplane. When a vehicle is hydroplaning, the tires lose their contact with the road and have little or no traction. You may not be able to steer or brake.

You can regain control by releasing the accelerator and pushing in the clutch. This will slow your vehicle and let the wheels turn freely. If the vehicle is hydroplaning, do not use the brakes to slow down. If the drive wheels start to skid, push in the clutch to let them turn freely.

It does not take a lot of water to cause hydroplaning. Hydroplaning can occur at speeds as low as 30 mph if there is a lot of water. Hydroplaning is more likely if tire pressure is low, or the tread is worn. The grooves in a tire carry away the water. If the grooves aren't deep, they don't work well.

Road surfaces where water can collect can create conditions that cause a vehicle to hydroplane. Watch for clear reflections, tire splashes, and raindrops on the road. These are signs of standing water.

## 2.6.3 – Speed and Curves

You need to adjust your speed for curves in the road. Two things can happen if you take a curve too fast.

First, the tires can lose their traction and continue straight ahead, causing you to skid off the road.

Second, the tires may keep their traction and cause vehicle rollover.

Tests have shown that trucks with a high center of gravity can rollover 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. Slow down as needed. Don't ever exceed the posted speed limit for the curve. Be in a gear that will let you accelerate slightly in the curve. This will help you keep control.

## 2.6.4 – Speed and Distance Ahead

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

## 2.6.5 – Speed and Traffic Flow

When you're 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. In many states, speed limits are lower for trucks and buses than for cars. It can vary as much as 15 mph. Use extra caution when you change lanes or pass on these roadways. Drive at the speed of the traffic if you can, without going at an illegal or unsafe speed. Keep a safe following distance.

The main reason drivers exceed speed limits is to save time. But anyone trying to drive faster than the speed of traffic will not be able to save much time. The risks involved are not worth it. If you go faster than the speed of other traffic, you'll have to keep passing other vehicles. This increases the chance of a crash, and it is more tiring. Fatigue increases the chance of a crash. Going with the flow of traffic is safer and easier.

## 2.6.7 – Speed on Downgrades

Your vehicle's speed will increase on downgrades because of gravity. The most important thing you can do is to select and maintain a speed that is not too fast for the:

- Total weight of the vehicle and cargo.
- Length of the grade.
- Steepness of the grade.
- Road conditions.
- Weather.

If a speed limit is posted, or there is a sign showing "Maximum Safe Speed," never exceed the speed shown. Also, look for and heed warning signs showing the length and steepness of the grade.

You must use the braking effect of the engine as the main way of controlling your speed on downgrades. The braking effect of the engine is greatest when it is near the governed rpms and the transmission is in the lower gears. Save your brakes so you will be able to slow or stop as required by road and traffic conditions.

Shift your transmission to a low gear before starting down the grade and use the proper braking techniques. For more information on safely going down steep downgrades, please read subsection 2.16 Mountain Driving.

## 2.6.8 – Roadway Work Zones

Speeding traffic is the number one cause of injury and death in roadway work zones. Always follow the posted speed limits when approaching and driving through a work zone. Watch your speedometer, and don't allow your speed to creep up as you drive through long sections of road construction. Decrease your speed for adverse weather or road conditions. Decrease your speed even further when a worker is close to the roadway.

In Maryland, you must move over when approaching any vehicles while they are stopped, standing, or parked on a road with its lights flashing. If it is not safe or possible to move over, you must slow down to a safe speed. Consider the weather, road conditions, traffic, and pedestrians when deciding a safe speed.

More information on Maryland's "Move Over Laws" can be found at [ZeroDeathsMD.gov](http://ZeroDeathsMD.gov)

## Subsections 2.4, 2.5, and 2.6 Test Your Knowledge

4. How far ahead does the manual say you should look?
5. What are two main things to look for ahead?
6. What's your most important way to see the sides and rear of your vehicle?
7. What does "communicating" mean in safe driving?
8. Where should you place reflectors when stopped on a divided highway?
9. What three things add up to total stopping distance?
10. If you go twice as fast, will your stopping distance increase by two or four times?
11. Empty trucks have the best braking. True or False?
12. What is hydroplaning?
13. What is "black ice"?

These questions may be on the test. If you can't answer them all, re-read subsections 2.4, 2.5, and 2.6.

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## 2.7 – Managing Space

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To be a safe driver, you need space all around your vehicle. When things go wrong, space gives you time to think and to act.

To have space available when something goes wrong, you need to manage space. While this is true for all drivers, it is very important for large vehicles. They take up more space, and they require more space for stopping and turning.

### 2.7.1 – Space Ahead

Of all the space around your vehicle, it is the area ahead of the vehicle – the space you're driving into – that is most important.

## THE NEED FOR SPACE AHEAD

You need space ahead in case you must suddenly stop. According to crash reports, the vehicle that trucks and buses often run into is the one in front of them. The most frequent cause is following too closely. Remember, if the vehicle ahead of you is smaller than yours, it can probably stop faster than you can. You may crash if you are following too closely.

## HOW MUCH SPACE?

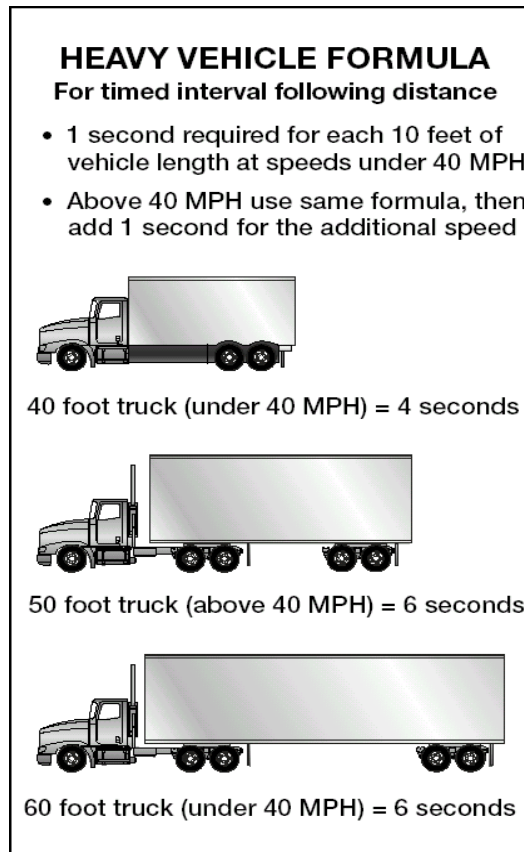
How much space should you keep in front of you? One good rule says you need at least one second for each 10 feet of vehicle length at speeds below 40 mph. At greater speeds, you must add 1 second for safety.

## FOR EXAMPLE:

If you are driving a 40-foot vehicle, you should leave 4 seconds between you and the vehicle ahead. In a 60-foot rig, you'll need 6 seconds. Over 40 mph, you'd need 5 seconds for a 40-foot vehicle and 7 seconds for a 60-foot vehicle. See Figure 2.12.

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 like this: "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 ten feet of length.

If you are driving a 40-foot truck and only counted up to 2 seconds, you're too close. Drop back a little and count again until you have 4 seconds of following distance (or 5 seconds, if you're going over 40 mph). After a little practice, you will know how far back you should be. Remember to add 1 second for speeds above 40 mph. Also remember that when the road is slippery, you need much more space to stop.



**Figure 2.12**

## 2.7.2 – Space Behind

You can't stop others from following you too closely. But there are things you can do to make it safer.

### STAY TO THE RIGHT

Heavy vehicles are often tailgated when they can't keep up with the speed of traffic. This often happens when you're going uphill. If a heavy load is slowing you down, stay in the right lane if you can. Going uphill, you should not pass another slow vehicle unless you can get around quickly and safely.

### DEALING WITH TAILGATERS SAFELY

In a large vehicle, it's often hard to see whether a vehicle is close behind you. You may be tailgated:

- When you are traveling slowly. 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 find yourself being tailgated, here are some things you can do to reduce the chances of a crash:

- **Avoid quick changes** – If you have to slow down or turn, signal early, and reduce speed very gradually.
- **Increase your following distance** – Keeping room in front of you will help you to avoid having to make sudden speed or direction changes. It also makes it easier for the tailgater to get around you.
- **Don't speed up** – It's safer to be tailgated at a low speed than a high speed.
- **Avoid tricks** – Don't turn on your tail lights or flash your brake lights. Follow the suggestions above.

### 2.7.3 – Space to the Sides

Commercial vehicles are often wide and take up most of the lane. Safe drivers will manage what little space they have. You can do this by keeping your vehicle centered in your lane and avoid driving alongside others.

#### STAYING CENTERED IN A LANE

You need to keep your vehicle centered in the lane to keep safe clearance on either side. If your vehicle is wide, you have little room to spare.

#### TRAVELING NEXT TO OTHERS

There are two dangers in traveling alongside other vehicles:

- 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 aren't near other traffic. When traffic is heavy, it may be hard to find an open spot. If you must travel near other vehicles, try to 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

Strong winds make it difficult to stay in your lane. The problem is usually worse for lighter vehicles. This problem can be especially bad when coming out of tunnels. Don't drive alongside other vehicles if you can avoid it.

### 2.7.4 – Space Overhead

Hitting overhead objects is a danger. Make sure you always have overhead clearance.

Don't assume that the heights posted at bridges and overpasses are correct. Re-paving 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 higher than a loaded one. Just because you were able to fit under a bridge when you were loaded does not mean that you can do it when you are empty.

If you doubt you have safe space to pass under an object, go slowly. If you aren't sure you can make it, take another route. Warnings are often posted on low bridges or underpasses, but sometimes they are not.

Some roads can cause a vehicle to tilt. There can be a problem clearing objects along the edge of the road, such as signs, trees, or bridge supports. Where this is a problem, drive a little 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's easy to miss seeing them while you are backing. (Also check for other hazards at the same time.)

## 2.7.5 – Space Below

Many drivers forget about the space under their vehicles. That space can be very small when a vehicle is heavily loaded. This is often a problem on dirt roads and in unpaved yards. Don't take a chance on getting hung up. Drainage channels across roads can cause the ends of some vehicles to drag. Cross such depressions carefully.

Railroad tracks can also cause problems, particularly when pulling trailers with a low underneath clearance. Don't take a chance on getting hung up halfway across.

## 2.7.6 – Space for Turns

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. 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. A driver behind you 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. See Figure 2.13.

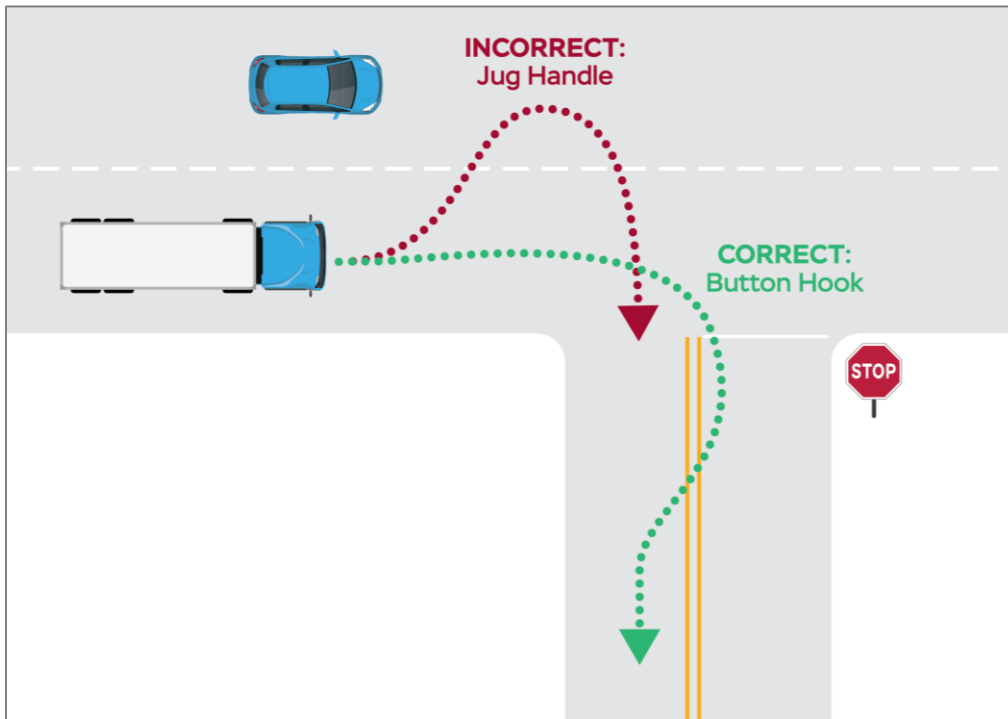
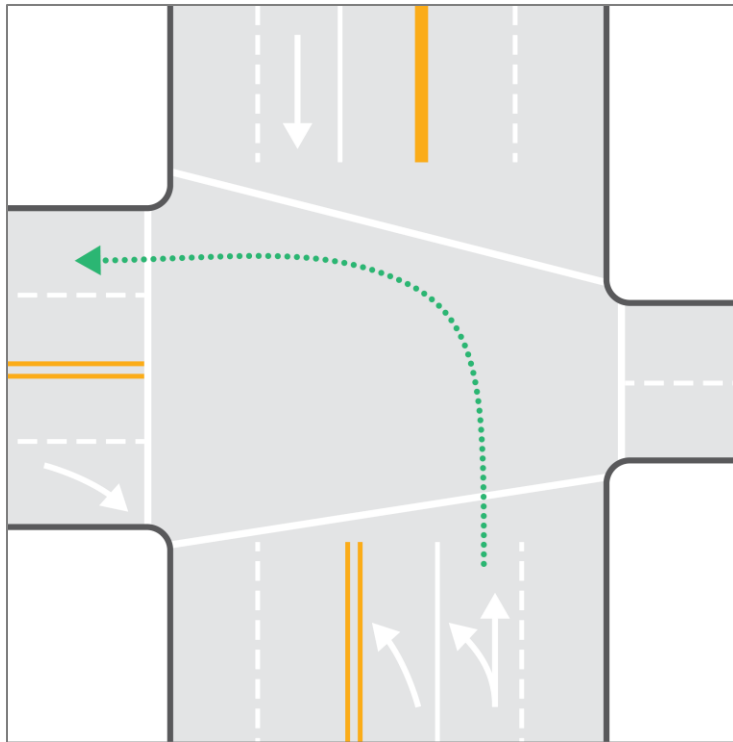


Figure 2.13

## 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 turn lane. 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. See Figure 2.14.



**Figure 2.14**

### 2.7.7 – Space Needed to Cross or Enter Traffic

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

- Because of slow acceleration and the space large vehicles require, you may need a much 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.

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## 2.8 – Seeing Hazards

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### 2.8.1 – The Importance of Seeing Hazards

#### **WHAT IS A HAZARD?**

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 toward the freeway exit, but their brake lights come on and the car begins braking hard. This could mean the driver is uncertain about taking the off ramp. The car might suddenly return to the highway. This car is a hazard.

If the driver of the car cuts in front of you, it is no longer just a hazard; it is an emergency.

#### **SEEING HAZARDS LETS YOU BE PREPARED**

You will have more time to act if you see hazards before they become emergencies. In the example above, you might make a lane change 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. A driver who did not see the hazard until the slow car pulled back on the highway in front of him would have to do something very suddenly. Sudden braking or a quick lane change is much more likely to lead to a crash.

#### **LEARNING TO SEE HAZARDS**

There are often clues that will help you see hazards. The more you drive, the better you can learn to see hazards. This section will talk about hazards you should be aware of.

### 2.8.2 – Hazardous Roads

#### **MOVE-OVER LAWS**

Law enforcement officers, emergency medical services, fire department personnel and people working on the road are being hit by vehicles while working at the roadside at a frightening amount. To lessen the problem, move-over laws have been enacted. These require drivers to slow and change lanes when approaching a roadside incident or emergency vehicle. You will see posted signs on roadways in states that have move-over laws.

When nearing an authorized emergency vehicle stopped on the roadside or a work zone, you should proceed with caution by slowing and yielding the right-of-way. You can do this by making a lane change into one that is not next to the authorized emergency vehicle or work zone. If it is not

safe to make a lane change, slow down and proceed with caution while maintaining a safe speed for traffic conditions.

Slow down and be very careful if you see any of the following road hazards:

- **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 unsafely. Workers and construction vehicles may get in the way.
  - Drive slowly and carefully near work zones. Use your four-way flashers or brake lights to warn drivers behind you.
- **Drop Off** – Sometimes the pavement drops off sharply near the edge of the road. Driving too near the edge can tilt your vehicle toward the side of the road. This can cause the top of your vehicle to hit roadside objects (signs, tree limbs). Also, it can be hard to steer as you cross the drop off, going off the road, or coming back on.
- **Foreign Objects** – Things that have fallen on the road can be hazards. They can be a danger to your tires and wheel rims and cause major damage to your vehicle. Some objects which seem harmless can actually be very dangerous. For example, cardboard boxes may be empty, but they may also have some solid or heavy material capable of causing damage. The same is true of paper and cloth sacks. It is important to remain alert for objects of all sorts, so you can see them early enough to avoid them without making sudden and unsafe moves.
- **Off Ramps/On Ramps** – Freeway and turnpike exits can be very dangerous for commercial vehicles. Off ramps and on ramps often have speed limit signs posted. Remember, these speeds may be safe for automobiles, but may not be safe for larger vehicles or heavily loaded vehicles. Exits that go downhill and turn at the same time are dangerous because the downgrade makes it difficult to reduce speed. Braking and turning at the same time can be a dangerous practice. Make sure you are going slowly enough before you get on the curved part of an off ramp or on ramp.

### 2.8.3 – Drivers Who Are Hazards

To protect yourself and others, you must know when other drivers may do something hazardous. Some clues to this type of hazard are discussed below.

#### **BLOCKED VISION**

People who can't see others are a very dangerous hazard. Be alert for drivers whose vision is blocked. Vans with the rear window blocked are examples. Rental trucks should be watched carefully. Their drivers are often not used to the limited vision they have to the sides and rear of the truck. In winter, vehicles with frosted, ice-covered, or snow-covered windows are hazards.

Vehicles may be partly hidden by blind intersections or alleys. If you only can see the rear or front end of a vehicle but not the driver, then the driver can't see you. Be alert because they may back out or enter into your lane. Always be prepared to stop.

## **DELIVERY TRUCKS**

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 and may suddenly step out of their vehicle or drive their vehicle into the traffic lane.

## **PARKED VEHICLES**

It is not always easy to tell from a distance when someone might be about to get out of a parked vehicle. The parked vehicle may suddenly start up and drive into your way. Watch for movement inside the vehicle or movement of the vehicle itself that shows people are inside. Watch for brake lights or backup lights, exhaust, and other clues that a driver is about to move.

## **STOPPED BUS**

Passengers may cross in front of or behind the bus, and they often can't see you.

## **PEDESTRIANS AND BICYCLISTS**

Walkers, joggers, and bicyclists may be on the road with their back to the traffic, so they can't see you. Sometimes they wear headphones, so they can't hear you either. This can be dangerous. On rainy days, pedestrians may not see you because of hats or umbrellas. They may be hurrying to get out of the rain and may not pay attention to the traffic.

## **DISTRACTIONS**

People who are distracted are hazards. Watch for where they are looking. If they are looking elsewhere, they can't see you. But be alert even when they are looking at you. They may believe that they have the right of way.

## **CHILDREN**

Children tend to act quickly without checking traffic. Children playing with one another may not look for traffic and are a serious hazard.

## **TALKERS**

Drivers or pedestrians talking to one another may not be paying close attention to the traffic.

## **WORKERS**

People working on or near the roadway are a hazard. The work creates a distraction for other drivers and the workers themselves may not see you.

## **ICE CREAM TRUCKS**

Someone selling ice cream is a hazard. Children may be nearby and may not see you.

## **DISABLED VEHICLES**

Drivers changing a tire or fixing an engine often do not pay attention to the danger that roadway traffic is to them. They are often careless. Jacked up wheels or raised hoods are hazards.

## **CRASHES**

People involved in a crash may not look for traffic. Passing drivers tend to look at the crash. People often run across the road without looking. Vehicles may slow or stop suddenly.

## **SHOPPERS**

People in and around shopping areas are often not watching traffic because they are looking for stores or looking into store windows.

## **CONFUSED DRIVERS**

Confused drivers often change direction suddenly or stop without warning. Confusion is common near freeway or turnpike interchanges and major intersections. Tourists unfamiliar with the area can be very hazardous. Signs of tourists include car-top luggage and out-of-state license plates. Unexpected actions like stopping in the middle of a block, changing lanes for no apparent reason, backup lights suddenly turning on, are signs of confusion. You may notice hesitation, including driving very slowly, using brakes often, or stopping in the middle of an intersection. You may also see drivers who are looking at street signs, maps, and house numbers. These drivers may not be paying attention to you.

## **SLOW DRIVERS.**

Drivers who do not maintain normal speed are hazards. Seeing slow moving vehicles early can prevent a crash. Some vehicles are naturally slow and a hazard. These are vehicles like mopeds, farm machinery, construction machinery, and tractors. Some of these will have the "slow moving vehicle" symbol to warn you. This is a red triangle with an orange center. Watch for it.

## **DRIVERS SIGNALING A TURN**

Drivers signaling a turn may slow more than expected or even stop. If they are making a tight turn into an alley or driveway, they may go very slowly. 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 IN A HURRY**

Other drivers may feel your vehicle is keeping them from getting where they want to go on time. These drivers may pass you without a safe gap in the oncoming traffic, cutting too close in front of you. Drivers entering the road may pull in front of you in order to avoid being stuck behind you, causing you to brake. Be aware of this and watch for drivers who are in a hurry.

## **IMPAIRED DRIVERS OR DISTRACTED**

Drivers who are sleepy, have had too much to drink, are on drugs, distracted, or who are ill are hazards. Some warnings to these drivers are:

- Swerving across the road or drifting from one side to another.
- Leaving the road (dropping right wheels onto the shoulder, or bumping across a curb in a turn).
- Stopping at the wrong time (stopping at a green light, or waiting for too long at a stop).
- Driving with an open window in cold weather.
- Speeding up or slowing down suddenly, driving too fast or too slow.

Be alert for drunk drivers and sleepy drivers late at night.

## **DRIVER BODY MOVEMENT AS A WARNING**

Drivers look in the direction they are going to turn. You may sometimes get a clue from a driver's head and body movements that a driver may be going to make a turn, even though the turn signals aren't on. Drivers making over-the-shoulder checks may be going to change lanes. These clues are most easily seen in motorcyclists and bicyclists. Watch other road users and try to tell whether they might do something hazardous.

## **CONFLICTS**

You are in conflict when you have to change speed or direction to avoid hitting someone. Conflicts can happen:

- at intersections where vehicles meet,
- at merges such as highway on ramps
- and where there are needed lane changes such as the end of a lane, forcing a move to another lane of traffic.

Other situations include slow moving or stalled traffic in a traffic lane, and crash scenes. Watch for other drivers who are in conflict because they are a hazard to you. When they react to this conflict, they may do something that will put them in conflict with you.

## 2.8.4 – Always Have a Plan

You should always be looking for hazards. Continue to learn to see hazards on the road. Don't forget why you are looking for hazards. It is because they may turn into emergencies.

You look for the hazards to have time to plan a way out of any emergency. When you see a hazard, think about the emergencies that could develop and figure out what you would do.

Always be prepared to act based on your plans. In this way, you will be a prepared, defensive driver who will improve your own safety as well as the safety of all road users.

## Subsections 2.7 and 2.8 Test Your Knowledge

1. How do you find out how many seconds of following distance space 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?
5. What is a hazard?
6. Why make emergency plans when you see a hazard?

These questions may be on the test. If you can't answer them all, re-read subsections 2.7 and 2.8

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## 2.9 – Distracted Driving

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A driver distraction is anything that takes your attention away from driving. Whenever you are driving a vehicle and your full attention is not on the driving task, you are putting yourself, your passengers, other vehicles, and pedestrians in danger. Distracted driving can cause collisions, resulting in injury, death or property damage.

Activities **inside** of the vehicle that can distract your attention include:

- Talking to passengers,
- Adjusting the radio or climate controls,
- Eating, drinking or smoking,
- Reading,

- Picking up something that fell,
- Talking on a cell phone or vehicle radio,
- Reading or sending text messages,
- Using any type of electronic devices (such as navigation systems, computers, etc.),
- Daydreaming or being occupied with other mental distractions,
- and many others.

Possible distractions that could happen **outside** a moving vehicle:

- Outside traffic, vehicles or pedestrians,
- Outside events such as police pulling someone over or a crash scene,
- Sunlight/sunset,
- Objects in roadway,
- Road construction,
- Reading billboards or other road advertisements,
- and many others.

## 2.9.1 – The Distracted Driving Crash Problem

Studies have shown that 8% of large-truck crashes happened when Commercial Motor Vehicle (CMV) drivers were externally distracted and 2% of large truck crashes happened when the driver was internally distracted.

Almost 5,500 people are killed each year on U.S. roadways, and an estimated 448,000 people are injured in motor vehicle crashes involving distracted driving (NHTSA Traffic Safety Facts: Distracted Driving).

Research shows that talking on a cell phone, even if it's hands-free, drains the brain of 39% of the energy it would normally use for safe driving. Drivers who use a hand-held device are more likely to get into a crash serious enough to cause injury. (NHTSA distracted driving website, [www.distracted.gov](http://www.distracted.gov)).

## 2.9.2 – Effects of Distracted Driving

Effects of distracted driving include:

- **Slowed Perception** – which may cause you to be delayed in perceiving or completely fail to perceive an important traffic event.
- **Delayed Decision Making** – which can cause you to be delayed in taking the proper action.
- **Improper Action** – which can cause you to make mistakes in steering, accelerating, or braking.

## 2.9.3 – Types of Distractions

There are many causes of distraction which can all increase risk of accident and injury.

- **Physical distraction** – one that causes you to take your hands off the wheel or eyes off the road, such as reaching for an object.
- **Mental distraction** – activities that take your mind away from the road, such as talking to a passenger or thinking about something that happened during the day.
- **Both physical and mental distraction** – even greater chance a crash could happen, such as talking on a cell phone; or sending or reading text messages.

## 2.9.4 – Cell/Mobile Phones

### FROM DRIVER HANDBOOK: CELL PHONES

It is illegal to use a hand-held cell phone, including texting, while driving. This means you cannot use your phone while holding it. You can use your phone for calls while driving if you are not holding it (hands-free). If you do this, you should use it as little as possible and do the following to stay safe:

- Use your cell phone only in emergencies; if possible, have a passenger make the call.
- If you must make a call, pull safely off the road, and stop before making the call.
- Let your voicemail answer incoming calls.
- Keep your telephone conversations short.

If you are under 18 years old, you may not use a cell phone while driving, even hands-free. The only exception is that you may use it to make a 911 call. Federal law limits how drivers of commercial motor vehicles (CMVs) can use mobile phones while driving. These rules are in [Title 49 CFR Parts 383, 384, 390, 391, and 392](#) of the Federal Motor Carrier Safety Regulations (FMCSRs), and in the Hazardous Materials Regulations (HMR).

### WHAT THE RULES SAY

- You cannot use a hand-held mobile phone while driving a CMV.
- You cannot dial by pressing more than one button.
- You cannot reach for a phone in a way that makes you move out of your seatbelt or seated position.
- Motor carriers cannot let or require their drivers to use hand-held phones while driving.
- If you choose to use a phone while driving a CMV, you may only use a hands-free device that:
  - Can be operated by pressing a single button, and
  - Is mounted within easy reach while you are seated and wearing a seat belt.

## PENALTIES

If you're convicted of using a hand-held phone while driving a CMV:

- You may lose your Commercial Driver's License (CDL):
  - 60-day disqualification for a second offense within 3 years
  - 120-day disqualification for a third or later offense within 3 years
- You may be fined up to \$2,750.
- Your employer may be fined up to \$11,000 if they allow or require you to use a hand-held phone while driving.

## EMERGENCY EXCEPTION

You may use a hand-held phone only in an emergency, such as to contact police, firefighters, or other emergency services.

## SAFETY RISKS

Research shows that CMV drivers are 6 times more likely to be in a crash, near-crash, or drift out of their lane when dialing a phone. Drivers take their eyes off the road for an average of 3.8 seconds while dialing. At 55 mph, that's like driving the length of a football field without looking at the road.

## STAY FOCUSED

Your first responsibility as a CMV driver is to drive safely. Stay alert and keep your eyes and mind on the road.

Even hands-free phones can be distracting. Talking on any phone takes your attention away from driving.

## 2.9.5 – Texting

Federal law bans texting while driving a CMV in interstate commerce. These rules are part of [Title 49 CFR Parts 383, 384, 390, 391, and 392](#) of the Federal Motor Carrier Safety Regulations (FMCSRs).

## WHAT THE RULES SAY

- CMV drivers are not allowed to text while driving.
- Motor carriers are not allowed to let or require drivers to text while driving.
- Texting includes typing or reading messages on a phone, tablet, or other electronic device.
- You may only text in an emergency, such as to contact police, firefighters, or emergency medical services.

## PENALTIES

If you're convicted of texting while driving a CMV:

- You can lose your Commercial Driver's License (CDL):
  - 60-day disqualification for a second offense within 3 years
  - 120-day disqualification for three or more offenses within 3 years
- You can be fined up to \$2,750.
- Your employer can be fined up to \$11,000 for allowing or requiring you to text while driving.

## WHY TEXTING IS DANGEROUS

Texting is one of the most dangerous distractions because it:

- Takes your eyes off the road
- Takes your hands off the wheel
- Takes your mind off driving

In fact, research shows:

- You are 23 times more likely to be in a crash or near-crash if you text while driving a CMV.
- On average, texting takes your eyes off the road for 4.6 seconds.
- At 55 mph, that's like driving 371 feet — a full football field — without looking.

Stay safe. Never text while driving. Your first job as a CMV driver is to keep your focus on the road and drive safely.

## 2.9.6 – Don't Drive Distracted

### From Driver Handbook: Distracted Driving

Concentration is very important and necessary for safe driving. You should be constantly aware of the road and the other vehicles around you. Keep alert and you may be able to avoid a crash. Constantly check where other vehicles are in front, behind, and next to you.

“Distracted driving” is when you take your eyes, hands or especially your mind, away from driving. Distracted driving causes more crashes that are reported to the police than anything else. Any distraction can cause you to miss seeing and hearing things that could help you avoid a crash. Many activities contribute to distracted driving. Some examples include:

- Eating and drinking.
- Adjusting the radio or other sources of music.
- Adjusting or programming a GPS.

- Dealing with children and pets.
- Loose objects moving in the vehicle.
- Talking and texting on a cell phone.
- Smoking.
- Putting on makeup.
- Shaving.
- Reading.
- Interacting with others in the vehicle.

## 2.9.7 – Watch Out for Distracted Drivers

You need to be able to recognize other drivers who are engaged in any form of driving distraction. Not recognizing other distracted drivers can prevent you from perceiving or reacting correctly in time to prevent a crash. Watch for:

- Vehicles drifting over the lane divider lines or within their own lane.
- Vehicles traveling at inconsistent speeds.
- Drivers who are preoccupied with maps, food, smoking, cell phones, or other objects.
- Drivers who appear to be involved in conversations with their passengers.

Give a distracted driver plenty of room and maintain your safe following distance.

Be very careful when passing a driver who seems to be distracted. The other driver may not be aware of your presence, and they may drift in front of you.

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## 2.10 – Aggressive Drivers/Road Rage

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### 2.10.1 – What Is It?

Examples of aggressive driving include:

- Speeding,
- Tailgating,
- Ignoring traffic signals and devices,
- Making unsafe lane changes,
- Not yielding the right-of-way, and

- Unsafe or illegal passing.

Crowded roads, unexpected delays, rushing, road construction, and stress can cause people to drive aggressively. You must respect and cooperate with all other people using the road. You must follow all rules to keep everyone safe and avoid crashes. Some tips to reduce the possibility of becoming involved in an aggressive driving incident are:

- Allow extra time to travel.
- Be patient.
- Be courteous.
- Focus on your driving behavior.
- Always signal your intentions. (Let other drivers know what you plan to do by using turn signals, etc.)
- Obey all traffic laws, signs, signals, and pavement markings.
- Yield the right-of-way.
- Avoid competing with other drivers.

## 2.10.2 – Don't Be an Aggressive Driver

How you feel before you even start your vehicle has a lot to do with how stress will affect you while driving. Here are some tips to keep calm and prevent aggression while driving:

- Reduce your stress before and while you drive.
- Give the drive your full attention. Don't allow yourself to become distracted by talking on your cell phone, eating, etc.
- Be realistic about your travel time. Expect delays because of traffic, construction, or bad weather and make allowances.
- If you're going to be later than you expected, deal with it. Take a deep breath and accept the delay.
- Give other drivers the benefit of the doubt. Try to imagine why they are driving that way. Whatever their reason, it has nothing to do with you.
- Slow down and keep your following distance reasonable.
- Don't drive slowly in the left lane of traffic.
- Avoid gestures. Keep your hands on the wheel. Avoid making any gestures that might anger another driver, even seemingly harmless expressions of irritation like shaking your head.
- Be a cautious and courteous driver. If another driver seems eager to get in front of you, say, "Be my guest." This response will soon become a habit, and you won't be as offended by other drivers' actions.

## 2.10.3 – What You Should Do When Confronted by an Aggressive Driver

- First and foremost, make every attempt to get out of their way.
- Do not challenge them by speeding up or attempting to hold-your-own in your travel lane.
- Avoid eye contact.
- Ignore gestures and refuse to react to them.
- Report aggressive drivers to the appropriate authorities by providing a vehicle description, license number, location and, if possible, direction of travel.
- If you have a cell phone, and can do it safely, call the police.
- If an aggressive driver is involved in a crash farther down the road, stop a safe distance from the crash scene, wait for the police to arrive, and report the driving behavior that you witnessed.

## Subsections 2.9 and 2.10 Test Your Knowledge

1. What are some tips to follow so you won't become a distracted driver?
2. How do you use in-vehicle communications equipment cautiously?
3. How do you recognize a distracted driver?
4. What should you do when confronted with an aggressive driver?
5. What are some things you can do to reduce your stress before and while you drive?

These questions may be on the test. If you can't answer them all, re-read subsections 2.9 and 2.10.

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## 2.11 – Driving at Night

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### 2.11.1 – It is More Dangerous

You are at greater risk when you drive at night. Drivers cannot see hazards or risks as quickly as in daylight; so, they have less time to respond and are less able to avoid a crash.

The problems of night driving involve the driver, the roadway, and the vehicle.

## 2.11.2 – Driver Factors

**Vision:** Good vision is critical for safe driving. Your control of the brake, accelerator, and steering wheel is based on what you see. If you cannot see clearly, you will have trouble identifying traffic and roadway conditions, spotting potential trouble or quickly responding to problems.

Because seeing well is so important to safe driving, you should have your eyes checked regularly by an eye specialist. You may never know you have poor vision unless your eyes are tested. If you need to wear glasses or contact lenses for driving, remember to:

- Always wear them when driving, even for short distances. If your driver license says corrective lenses are required, it is illegal to move a vehicle without using corrective lenses.
- Keep an extra set of corrective lenses in your vehicle. If your normal corrective lenses are broken or lost, you can use the spare lenses to drive safely.
- Avoid using dark or tinted corrective lenses at night, even if you think they help with glare. Tinted lenses reduce the light that you need to see clearly under night driving conditions.

**Glare:** Drivers can be blinded for a short time by bright light. 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.

**Fatigue and Lack of Alertness:** Fatigue is physical or mental tiredness that can be caused by physical or mental strain, repetitive tasks, illness or lack of sleep. Just like alcohol and drugs, it impairs your vision and judgment.

Fatigue causes errors related to speed and distance, increases your risk of being in a crash, causes you to not see and react to hazards as quickly; and impacts your ability to make critical decisions. When you are fatigued, you could fall asleep behind the wheel and crash, injuring or killing yourself or others.

[National Sleep Foundation's 2022 Report:](#) Drowsy driving is a significant public health concern in the United States. Rigorous estimates suggest drowsy driving related motor vehicle crashes account for roughly 20% of all motor vehicle crashes. In fact, data from the AAA Foundation indicates that sleepiness is implicated in 21% of all motor vehicle crashes resulting in a death and 13% of motor vehicle crashes resulting in hospitalizations—totaling over 300,000 police-reported crashes, over 100,000 injuries, and over 6,000 deaths in the United States each year. The National Sleep Foundation believes these figures are likely underestimates of the true scope of the problem.

### AT-RISK GROUPS

Crashes tend to happen at times when people are most likely to be tired for example, during the night and in the mid-afternoon. Most people are less alert at night, especially after midnight. This is even more likely if you have been driving for a long time. People who drive at night are much more likely to have fall-asleep crashes.

Research has shown young males, shift workers, commercial drivers, long-haul drivers, people with untreated sleep disorders, and people with short-term or chronic sleep deprivation are at higher risk for having a fall-asleep crash.

At least 15% of all heavy truck crashes involve fatigue. A congressionally mandated study of 80 long-haul truck drivers in the United States and Canada found that drivers averaged less than 5 hours of sleep per day. (Federal Motor Carrier Safety Administration, 1996) It is no surprise then that the National Transportation Safety Board (NTSB) reported that drowsy driving was probably the cause of more than half of crashes leading to a truck driver's death. (NTSB, 1990) For each truck driver fatality, another three to four people are killed. (NHTSA, 1994)

## **WARNING SIGNS OF FATIGUE**

According to the National Sleep Foundation's Sleep in America poll, 60% of Americans have driven while feeling sleepy and 36% admit to having fallen asleep at the wheel in the past year. However, many people cannot tell if or when they are about to fall asleep. Here are some signs that should tell you to stop and rest:

- Difficulty focusing, frequent blinking or heavy eyelids
- Yawning repeatedly or rubbing eyes
- Daydreaming; or wandering/disconnected thoughts
- Trouble remembering the last few miles driven; missing exits or traffic signs
- Trouble keeping your head up
- Drifting from your lane, following too closely or hitting a shoulder rumble strip
- Feeling restless and irritable

When you are tired trying to "push on" is far more dangerous than most drivers think. It is a major cause of fatal crashes. If you notice any signs of fatigue, stop driving and go to sleep for the night or take a 15–20 minute nap.

## **ARE YOU AT RISK?**

Before you drive, consider whether you are:

- Sleep-deprived or fatigued
  - 6 hours of sleep or less triples your risk
- Experiencing sleep loss (insomnia), poor quality sleep, or not getting enough sleep each night
- Driving long distances without proper rest breaks
- Driving through the night, mid-afternoon or when you would normally be asleep.
  - Many heavy motor vehicle crashes occur between midnight and 6 a.m.
- Taking medications that make you sleepy
  - Antidepressants, cold tablets, antihistamines – check the warnings on the medicine labels
- Working more than 60 hours a week
  - Increases your risk by 40%

- Working more than one job, and your main job involves shift work
- Driving alone or on a long, rural, dark or boring road
- Flying or changing time zones

### **PREVENTING DROWSINESS BEFORE A TRIP:**

- Get enough sleep. Adults need 8 to 9 hours to maintain alertness.
- Prepare your route carefully to identify total distance, stopping points, and other logistic considerations.
- Schedule trips for the hours you are normally awake, not the middle of the night.
- Drive with a passenger.
- Avoid medications that cause drowsiness.
- Consult your primary care provider if you suffer from daytime sleepiness, have difficulty sleeping at night or take frequent naps.
- Incorporate exercise into your daily life to give you more energy.

### **MAINTAINING ALERTNESS WHILE DRIVING:**

- Protect yourself from glare and eye strain with sunglasses.
- Keep cool by opening the window or using the air conditioner.
- Avoid heavy foods higher in calories. They take longer to digest which makes you tired.
- Be aware of down time during the day – down time is when you are not actively driving.
- Have another CDL holder ride with you, and take turns driving.
- Take periodic breaks – about every 100 miles or 2 hours during long trips.
- Stop driving and get some rest or take a nap.
- Caffeine can increase awareness for a few hours, but do not drink too much. It will eventually wear off. Do not rely on caffeine to prevent fatigue.
- Avoid drugs. While they may keep you awake for a while, they won't make you alert.
- If you are drowsy, the only safe cure is to get off the road and get some sleep. If you don't, you risk your life and the lives of others.

## **2.11.3 – Roadway Factors**

### **POOR LIGHTING**

In the daytime there is usually enough light to see well. This is not true at night. Some areas may have bright street lights, but many areas will have poor lighting. On most roads you will probably have to depend entirely on your headlights.

Less light means you will not be able to see hazards as well as in daytime. Others on the road who do not have lights are hard to see. There are many crashes at night involving pedestrians, joggers, bicyclists, 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.

Drive slower when lighting is poor or confusing and make sure you can stop in the distance you can see ahead.

## **DRUNK DRIVERS**

Drunk drivers and drivers under the influence of drugs are a hazard to themselves and to you. Be especially alert around the closing times for bars and taverns. Watch for drivers who have trouble staying in their lane or maintaining speed, who stop without reason, or show other signs of being under the influence of alcohol or drugs.

## **2.11.4 – Vehicle Factors**

### **HEADLIGHTS**

At night your headlights will usually be the main source of light for you to see by and for others to see you. You can't see nearly as much with your headlights as you see in the daytime. With low beams you can see ahead about 250 feet and with high beams about 350-500 feet. You must adjust your speed to keep your stopping distance within your sight distance. This means going slowly 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 cuts down your ability to see and makes it harder for others to see you. Make sure your lights are clean and working. Headlights can be out of adjustment. If they don't point in the right direction, they won't give you a good view and they can blind other drivers. Have a qualified person make sure they are adjusted properly. One example of a qualified person might be a vehicle repair technician.

### **OTHER LIGHTS**

For you to be seen easily, the following must be clean and working properly:

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

## **TURN SIGNALS AND BRAKE 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.

## **WINDSHIELD AND MIRRORS**

It is more important at night than in the daytime to have a clean windshield and clean mirrors. Bright lights at night can cause dirt on your windshield or mirrors to create a glare of its own, blocking your view. Most people have experienced driving toward the sun just as it has risen or is about to set, and found that they can barely see through a windshield that seemed to look okay in the middle of the day. Clean your windshield on the inside and outside for safe driving at night.

## **2.11.5 – Night Driving Procedures**

### **VEHICLE PROCEDURES**

Make sure you are rested and alert. If you are drowsy, sleep before you drive! Even a nap can save your life or the lives of others. If you wear eyeglasses, make sure they are clean and unscratched. Don't wear sunglasses at night. Do a complete vehicle inspection. Check all lights and reflectors, cleaning all those you can reach.

### **AVOID BLINDING OTHERS**

Be aware that glare from your headlights can cause problems for drivers coming toward you. They can also bother drivers going in the same direction you are, when your lights shine in their rearview mirrors.

### **AVOID GLARE FROM ONCOMING VEHICLES**

Do not look directly at lights of oncoming vehicles. Look slightly to the right at a right lane or edge marking, if available. If other drivers do not put their low beams on, do not respond by putting your own high beams on. This increases glare for oncoming drivers and increases the chance of a crash.

### **USE HIGH BEAMS WHEN YOU CAN**

Some drivers make the mistake of always using low beams. This seriously cuts down on their ability to see ahead. Use high beams when it is safe and legal to do so. Use them when you are not within 500 feet of an approaching vehicle. Also, don't let the inside of your cab get too bright. This makes it harder to see outside. Keep the interior light off and adjust your instrument lights as low as you can to still be able to read the gauges.

## IF YOU GET SLEEPY, STOP AT THE NEAREST SAFE PLACE

People often don't realize how close they are to falling asleep even when their eyelids are falling shut. If you can safely do so, look at yourself in a mirror. If you look sleepy, or you just feel sleepy, stop driving! You are in a very dangerous condition. The only safe cure is to stop at the nearest safe place and sleep.

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## 2.12 – Driving in Fog

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Fog can happen at any time. Fog on highways can be extremely dangerous. Fog is often unexpected, and you can lose visibility rapidly. You should watch for foggy conditions and be ready to reduce your speed. Do not assume that the fog will thin out after you enter it.

The best advice is not to drive in fog. It is better that you pull off the road into a rest area or truck stop until you can see better and the fog is gone. If you must drive, be sure to consider the following:

- Obey all fog-related warning signs.
- Slow down before you enter fog.
- Use low-beam headlights and fog lights for best visibility even in daytime and be alert for other drivers who may have forgotten to turn on their lights.
- Turn on your 4-way flashers. This will give vehicles approaching you from behind a quicker opportunity to notice your vehicle.
- Watch for vehicles on the side of the roadway. Seeing taillights or headlights in front of you may not correctly show where the road is ahead of you. The vehicle may not be on the road at all.
- Use roadside highway reflectors as guides to determine how the road may curve ahead of you.
- Listen for traffic you cannot see.
- Avoid passing other vehicles.
- Don't stop along the side of the road, unless absolutely necessary.

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## 2.13 – Driving in Winter

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### 2.13.1 – Vehicle Checks

Make sure your vehicle is ready before driving in winter weather. You should make a regular vehicle inspection, paying extra attention to the following items.

## **COOLANT LEVEL AND ANTIFREEZE AMOUNT**

Make sure the cooling system is full and there is enough antifreeze in the system to protect against freezing. You can check this with a special coolant tester.

## **DEFROSTING AND HEATING EQUIPMENT**

Make sure the defrosters work. They are needed for safe driving. Make sure the heater is working, and that you know how to operate it. If you use other heaters like mirror heaters, battery box heaters or fuel tank heaters, check their operation as well.

## **WIPERS AND WASHERS**

Make sure the windshield wiper blades are in good condition. Make sure the wiper blades press against the window hard enough to wipe the windshield clean, otherwise they may not sweep off snow properly. Make sure the windshield washer works and there is washing fluid in the washer reservoir.

Use windshield washer appropriate for the temperature. If you cannot see well enough while driving (for example, if your wipers fail), stop safely and fix the problem.

## **TIRES**

Make sure you have enough tread on your tires. The drive tires must provide traction to push the vehicle over wet pavement and through snow. The steering tires must have traction to steer the vehicle. Enough tread is especially important in winter conditions. You must have at least 4/32-inch tread depth in every major groove on front tires and at least 2/32 inch on other tires. More would be better. Use a gauge to determine if you have enough tread for safe driving.



**Figure 2.14A**

### **TIRE CHAINS**

You may find yourself in conditions where you can't drive without chains, even to get to a place of safety. Carry the right number of chains and extra cross-links. Make sure they will fit your drive tires. Check the chains for broken hooks, worn or broken cross-links, and bent or broken side chains. Learn how to put the chains on before you need to do it in snow and ice.

### **LIGHTS AND REFLECTORS**

Make sure the lights and reflectors are clean. Lights and reflectors are especially important during bad weather. Check from time to time during bad weather to make sure they are clean and working properly.

### **WINDOWS AND MIRRORS**

Remove any ice, snow, etc., from the windshield, windows, and mirrors before starting. Use a windshield scraper, snow brush, and windshield defroster as necessary.

### **HAND HOLDS, STEPS, AND DECK PLATES**

Remove all ice and snow from hand holds, steps, and deck plates. This will reduce the danger of slipping.

## **RADIATOR SHUTTERS AND WINTERFRONT**

Remove ice from the radiator shutters. Make sure the winterfront is not closed too tightly. If the shutters freeze shut or the winterfront is closed too tight, the engine may overheat and stop.

## **EXHAUST SYSTEM**

Exhaust system leaks are especially dangerous when cab ventilation may be poor (windows rolled up, etc.). Loose connections could permit poisonous carbon monoxide to leak into your vehicle. Carbon monoxide gas will cause you to be sleepy. In large enough amounts it can kill you. Check the exhaust system for loose parts and for sounds and signs of leaks.

## **2.13.2 – Driving**

### **START GENTLY AND SLOWLY**

When first starting, get the feel of the road. Don't hurry.

### **CHECK FOR ICE**

Check for ice on the road, especially bridges and overpasses. A lack of spray from other vehicles indicates ice has formed on the road. Also, check your mirrors and wiper blades for ice. If they have ice, the road most likely will be icy as well.

### **SLIPPERY SURFACES**

Drive slowly and smoothly on slippery roads. If it is very slippery, you shouldn't drive at all. Stop at the first safe place.

### **ADJUST TURNING AND BRAKING IN POOR WEATHER CONDITIONS**

Make turns as gently as possible. Don't brake any harder than needed. Don't use the engine brake or speed retarder as they can cause the driving wheels to skid on slippery surfaces.

### **ADJUST SPEED IN POOR WEATHER CONDITIONS**

Don't pass slower vehicles unless necessary. Go slowly and watch far enough ahead to keep a steady speed. Avoid having to slow down and speed up. Take curves at slower speeds and don't brake while in curves. Be aware that as the temperature rises to the point where ice begins to melt, the road becomes even more slippery. Slow down more.

## ADJUST SPACE IN POOR WEATHER CONDITIONS

Don't drive alongside other vehicles. Keep a longer following distance. When you see a traffic jam ahead, slow down or stop to wait for it to clear. Try hard to anticipate stops early and slow down gradually. Watch for snowplows, as well as salt and sand trucks, and give them plenty of room.

## WET BRAKES

When driving in heavy rain or deep standing water, your brakes will get wet. Water in the brakes can cause the brakes to be weak, to apply unevenly, or to grab. This can cause lack of braking power, wheel lockups, pulling to one side or the other, and jackknife if you pull a trailer.

Avoid driving through deep puddles or flowing water if possible. If you can't avoid them, you should:

- Slow down and place transmission in a low gear.
- Gently put on the brakes. This presses linings against brake drums or discs and keeps mud, silt, sand, and water from getting in.
- Increase 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 heat them up and dry them out.
- Make a test stop when safe to do so. Check behind to make sure no one is following, then apply the brakes to be sure they work well. If not, dry them out further as described above.

**CAUTION:** Do not apply too much brake pressure and accelerator at the same time, or you can overheat brake drums and linings.

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## 2.14 – Driving in Very Hot Weather

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### 2.14.1 – Vehicle Checks

Do a normal vehicle inspection, but pay special attention to the following items:

#### TIRES

Check the tire mounting and air pressure. Inspect the tires every two hours or every 100 miles when driving in very hot weather. Air pressure increases with temperature. Do not let air out or the pressure will be too low when the tires cool off. If a tire is too hot to touch, remain stopped until the tire cools off. Otherwise the tire may blow out or catch fire.

## ENGINE OIL

The engine oil helps keep the engine cool, as well as 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.

## ENGINE COOLANT

Before starting out, make sure the engine cooling system has enough water and antifreeze according to the engine manufacturer's directions. Antifreeze helps the engine under hot conditions as well as cold conditions.

When driving, check the water temperature or coolant temperature gauge from time to time. Make sure that it remains in the normal range. If the gauge goes above the highest safe temperature, there may be something wrong that could lead to engine failure and possibly fire. Stop driving as soon as safely possible and try to find out what is wrong.

Some vehicles have sight glasses, see-through coolant overflow containers, or coolant recovery containers. These permit you to 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.

Never 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. If you can touch the radiator cap with your bare hand, it is probably cool enough to open.

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

- Shut engine off.
- Wait until the engine has cooled.
- Protect your hands (use gloves or a thick cloth).
- Turn the radiator cap slowly to the first stop, which releases the pressure seal.
- Step back while pressure is released from the cooling system.
- When all pressure has been released, press down on the cap and turn it further to remove it.
- Visually check the level of coolant and add more coolant if necessary.
- Replace cap and turn all the way to the closed position.

## 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 or fan properly. This will result in overheating. Also, check belts for cracking or other signs of wear.

## HOSES

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

### 2.14.2 – Driving

#### WATCH FOR BLEEDING TAR

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

#### GO SLOWLY ENOUGH TO PREVENT OVERHEATING

High speeds create more heat for tires and the engine. In desert conditions the heat may build up to the point where it is dangerous. The heat will increase chances of tire failure or even fire, and engine failure.

## Subsections 2.11, 2.12, 2.13, and 2.14 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 effects 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 if the engine isn't overheated. True or False?

These questions may be on the test. If you can't answer all of them, re-read subsections 2.11, 2.12, 2.13, and 2.14.

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## 2.15 – Railroad-highway Crossings

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Railroad-highway crossings are a special kind of intersection where the roadway crosses train tracks. These crossings are always dangerous. You must approach every railroad-highway crossing as if a train is coming. It is extremely difficult to judge the distance of the train from the crossing as well as the speed of an approaching train.

## 2.15.1 – Types of Crossings

There are 2 types of railroad crossings you may come across:

- **Passive Crossings** – This type of crossing does not have any type of traffic control device. The decision to stop or continue driving is entirely up to you. Passive crossings require you to recognize the crossing, search for any train using the tracks and decide if there is enough clear space to cross safely. If you see a train and aren't sure how far away it is, you should not cross until it is safe to do so.
- **Active Crossings** – This type of crossing has traffic control devices to alert drivers when it is not safe to cross the tracks. These devices could include flashing red lights. They may have gates, signals, and bells, but not always.

## 2.15.2 – Warning Signs and Devices

### ADVANCE WARNING SIGNS

The round, black-on- yellow warning sign is placed ahead of a public railroad-highway crossing. The advance warning sign tells you to slow down, look and listen for the train, and be prepared to stop at the tracks if a train is coming. All passenger and hazmat carrying vehicles are required to stop. See Figure 2.15.



Figure 2.15

### PAVEMENT MARKINGS

Pavement markings mean the same as the advance warning sign. They consist of an “X” with the letters “RR” and a no-passing marking on two-lane roads. See Figure 2.16.



Figure 2.16

There is also a no passing zone sign on two-lane roads. There may be a white stop line painted on the pavement before the railroad tracks. The front of the vehicle must remain behind this line while stopped at the crossing.

### CROSS-BUCK SIGNS

This sign marks the grade crossing. It requires you to yield the right-of-way to the train. If there is no white stop line painted on the pavement, vehicles that are required to stop must stop no closer than 15 feet or more than 50 feet from the nearest rail of the nearest track. When the road crosses over more than one track, a sign below the cross-buck indicates the number of tracks. See Figure 2.17.

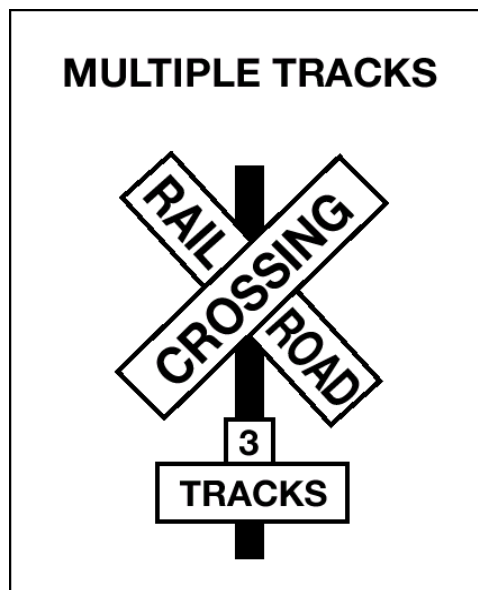


Figure 2.17

## FLASHING RED LIGHT SIGNALS

At many highway-rail grade crossings, the cross-buck sign has flashing red lights and bells. When the lights begin to flash, stop! A train is approaching. You are required to yield the right-of-way to the train. If there is more than one track, make sure all tracks are clear before crossing. See Figure 2.18.

## GATES

Many railroad-highway crossings have gates with flashing red lights and bells. Stop when the lights begin to flash and before the gate lowers across the road lane. Stay stopped until the gates go up and the lights have stopped flashing. Proceed when it is safe. See Figure 2.18.

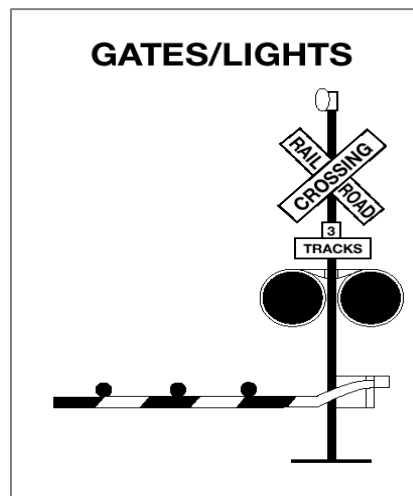


Figure 2.18

## 2.15.3 – Driving Procedures

### NEVER RACE A TRAIN TO A CROSSING

Never attempt to race a train to a crossing. It is extremely difficult to judge the speed of an approaching train.

### REDUCE SPEED

**You must reduce your speed according to your ability to see** approaching trains in any direction and must keep your speed to a point which will allow you to stop short of the tracks if you need to stop.

## DON'T EXPECT TO HEAR A TRAIN

**Trains might not always sound their horn when they approach some crossings depending on local laws.** Public crossings where trains do not sound horns should be marked by signs. Noise inside your vehicle may also prevent you from hearing the train horn until the train is dangerously close to the crossing.

## DON'T RELY ON SIGNALS

You should not rely only on the presence of warning signals, gates, or flagmen to warn of the approach of trains. Be especially alert at crossings that do not have gates or flashing red light signals.

## DOUBLE TRACKS REQUIRE A DOUBLE CHECK

**Some railroad crossings may have two separate tracks to cross.** Remember that a train on one track may hide a train on the other track. Look both ways before crossing. After one train has cleared a crossing, be sure no other trains are near before starting across the tracks.

## RAIL YARD AREAS AND GRADE CROSSINGS IN CITIES AND TOWNS

Rail Yard areas and grade crossings in cities and towns are just as dangerous as rural grade crossings. Approach them with as much caution.

### 2.15.4 – Stopping Safely at Railroad: Highway Crossings

A full stop is required at grade crossings whenever:

- The nature of the cargo makes a stop mandatory under state or federal regulations.
- Such a stop is otherwise required by law.

When stopping be sure to:

- Check for traffic behind you while stopping gradually. Use a pullout lane, if available.
- Turn on your four-way emergency flashers.

### 2.15.5 – Crossing the Tracks

Railroad crossings with steep approaches can cause your unit to get stuck on the tracks.

Never let traffic conditions trap you in a position where you have to stop on the tracks. Be sure you can get all the way across the tracks before you start across. It takes a typical tractor-trailer unit at least 14 seconds to clear a single track and more than 15 seconds to clear a double track.

Do not shift gears while crossing railroad tracks.

## 2.15.6 – Special Situations

**Be Aware!** These trailers can get stuck on raised crossings:

- Low slung units (lowboy, car carrier, moving van, possum-belly, livestock trailer).
- Single-axle tractor pulling a long trailer with its landing gear set to accommodate a tandem-axle tractor.

If for any reason you get stuck on the tracks, get out of the vehicle and away from the tracks. Check signposts or signal housing at the crossing for emergency notification information. Call 911 or another emergency number. Give the location of the crossing using all identifiable landmarks, especially the DOT number, if posted.

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## 2.16 – Mountain Driving

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In mountain driving, gravity plays a major role. On any upgrade, gravity slows you down. The steeper the grade, the longer the grade, and the heavier your load--the more you will have to use lower gears to climb hills or mountains.

In coming down long, steep downgrades, gravity increases the speed of your vehicle. You must select a safe speed, then use a low gear, and proper braking techniques. You should plan ahead and get information about any long, steep grades along your planned route of travel. Talking to other drivers who are familiar with the grades before your trip can be helpful in finding out what speeds are safe.

You must go slow enough so your brakes can hold you back without getting too hot. If the brakes become too hot, they may start to "fade." This means you have to apply them harder to get the same stopping power. If you continue to use the brakes hard, they can keep fading until you cannot slow down or stop at all.

### 2.16.1 – Select a "Safe" Speed

It is important to select a speed that is not too fast for the:

- Total weight of the vehicle and cargo
- Length of the grade
- Steepness of the grade
- Road conditions
- Weather

If a speed limit is posted, or there is a "Maximum Safe Speed" sign, never go faster than the speed shown. Look for and follow warning signs marking the length and steepness of the grade.

You must use the braking effect of the engine as the main way of controlling your speed. The braking effect of the engine is greatest when it is near the governed RPMs and the transmission is in the lower gears. Save your brakes so you will be able to slow or stop as required by road and traffic conditions.

## 2.16.2 – Select the Right Gear Before Starting Down the Grade

Going “down the grade” means going down a long hill. To do this safely, you need to follow to make sure you are in the right gear before you start going down the grade.

**To do this**, shift the transmission to a low gear before starting down the grade. Do not try to downshift after your vehicle has sped up. You will not be able to shift into a lower gear. You may not even be able to get back 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 also lead to loss of all engine braking effect.

With some older trucks, a rule for choosing gears is to use the same gear going down a hill that you would need to climb the hill. However, some newer trucks have low friction parts and streamlined shapes for fuel economy. They may also have more powerful engines. This means they can go up hills in higher gears and have less friction and air drag to hold them back going down hills. For that reason, drivers of more modern trucks may have to use lower gears going down a hill than would be required to go up the hill. You should know what is right for your vehicle.

## 2.16.3 – Brake Fading or Failure

Brakes work by pressing brake shoes or pads against the brake drum or discs to slow the vehicle. Braking creates heat and brakes are designed to take a lot of heat. However, brakes can fade or fail from too much heat caused by using them too often and not relying on the engine braking effect. Brake fade is also affected by adjustment. To safely control a vehicle, every brake must be adjusted properly to do its share of the work. The other brakes can then 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. Therefore, brake adjustment must be checked frequently.

## 2.16.4 – Proper Braking Technique

**Remember:** The use of brakes on a long 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 are the proper braking techniques:

- 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.

Escape ramps have been built on many steep mountain downgrades. Escape ramps are made to stop runaway vehicles safely without injuring drivers and passengers. Escape ramps use a long bed of loose, soft material to slow a runaway vehicle, sometimes in combination with an upgrade.

Know escape ramp locations on your route. Signs show drivers where ramps are located. Escape ramps save lives, equipment and cargo.

## Subsections 2.15 and 2.16 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 proper gear before starting down a hill?
3. Describe the proper braking technique when going down a long, steep downgrade.
4. What type of vehicles can get stuck on a railroad-highway crossing?
5. How long does it take for a typical tractor-trailer unit to clear a double track?

These questions may be on the test. If you can't answer them all, re-read subsections 2.15 and 2.16.

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## 2.17 – Driving Emergencies

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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. But if an emergency does happen, your chances of avoiding a crash depend upon how well you act. Actions you can take are discussed below.

### 2.17.1 – Steering to Avoid a Crash

Stopping is not always the safest thing to do in an emergency. When you don't 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 flip over.

## KEEP BOTH HANDS ON THE STEERING WHEEL

To turn quickly, you must have a firm grip on the steering wheel with both hands. The best way to have both hands on the wheel, if there is an emergency, is to keep them there all the time.

## HOW TO TURN QUICKLY AND SAFELY

A quick turn can be made safely, if it's done the right way. Here are some points that safe drivers use:

- Do not apply the brake while you are turning. It's 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 way. The more sharply you turn, the greater the chances of a skid or rollover.
- Be prepared to "counter-steer" or turn the wheel back in the other direction, once you've passed whatever was in your path. Unless you are prepared to counter-steer, you won't be able to do it quickly enough. You should think of emergency steering and counter-steering as two parts of one driving action.

## WHERE TO STEER

If an oncoming driver has drifted into your lane, a move to your right is best. If that driver realizes what has happened, the natural response will be to return to his or her own lane.

If something is blocking your path, the best direction to steer will depend on the situation.

If you have been using your mirrors, you'll 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. You will know if you have been using your mirrors.

If you are blocked on both sides, a move to the right may be best. At least you won't force anyone into an opposing traffic lane and a possible head-on collision.

## LEAVING THE ROAD

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. Here are some guidelines, if you do leave the road:

- **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 a loose surface.
- **Keep One Set of Wheels on the Pavement, if Possible** – This helps you keep control of your vehicle.
- **Stay on the Shoulder** – If the shoulder is clear, stay on it until your vehicle has come to a stop. Signal and check your mirrors before pulling back onto the road.

- **Returning to the Road** – If you are forced to return to the road before you can stop, use the following procedure:
  - Hold the wheel tightly and turn sharply enough to get back on the road safely. Don't 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, counter-steer immediately. The two turns should be made as a single "steer-counter-steer" move.

## 2.17.2 – How to Stop Quickly and Safely

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 needed. 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

With this method, you apply your brakes all the way and 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.

### DON'T SLAM ON THE BRAKES

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

## 2.17.3 – Brake Failure

**Brake failure means your brakes stop working.** Brakes kept in good condition rarely fail. Most hydraulic brake failures happen because of loss of hydraulic pressure or brake fade on long hills. For information about air brakes, read Section 5.

## LOSS OF HYDRAULIC PRESSURE

When the system won't build up pressure, the brake pedal will feel spongy or go to the floor. Here are some things you can do.

- **Downshift** – Putting the vehicle into a lower gear will help to slow the vehicle.
- **Pump the Brakes** – Sometimes pumping the brake pedal will generate enough hydraulic pressure to stop the vehicle.
- **Use the Parking Brake** – The parking or emergency brake is separate from the hydraulic brake system. Therefore, it can be used to slow the vehicle. However, be sure to press the release button or pull the release lever at the same time you use the emergency brake so you can adjust the brake pressure and keep the wheels from locking up.
- **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 low gear, apply the parking brake, and, if necessary, roll back into some obstacle that will stop the vehicle.

## BRAKE FAILURE ON DOWNGRADES

Going slow enough and braking properly will almost always prevent brake failure on long downgrades. However, once the brakes have failed you are going to have to look for something else outside your vehicle to stop it.

## USE AN ESCAPE RAMP

Your best option is an escape ramp. If there is one, there'll be signs telling you about it. Use it. Ramps are usually located a few miles from the top of the downgrade. Every year, hundreds of drivers avoid injury to themselves or damage to their vehicles by using escape ramps. 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.

Any driver who loses brakes going downhill should use an escape ramp if it's available. If you don't use it, your chances of having a serious crash are much greater.

If no escape ramp is available, take the least hazardous escape route you can, 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 don't work. The longer you wait, the faster the vehicle will go, and the harder it will be to stop.

## 2.17.4 – Tire Failure

### RECOGNIZE TIRE FAILURE

Quickly knowing you have a tire failure will let you have more time to react. Having just a few extra seconds to remember what it is you're supposed to do can help you. The major signs of tire failure are:

- **Sound** – The loud "bang" of a blowout is an easily recognized sign. Because it can take a few seconds for your vehicle to react, you might think it was some other vehicle. But any time you hear a tire blow, you'd be safest to assume it is yours.
- **Vibration** – If the vehicle thumps or vibrates heavily, it may be a sign that one of the tires has gone flat. With a rear tire, that may be the only sign you get.
- **Feel** – If the steering feels "heavy," it is probably a sign that one of the front tires has failed. Sometimes, failure of a rear tire will cause the vehicle to slide back and forth or "fishtail." However, dual rear tires usually prevent this.

## RESPOND TO TIRE FAILURE

When a tire fails, your vehicle is in danger. You must immediately:

- **Hold the Steering Wheel Firmly** – If a front tire fails, it can twist the steering wheel out of your hand. The only way to prevent this is to always keep a firm grip on the steering wheel with both hands.
- **Stay off the Brake** – It's natural to want to brake in an emergency. However, braking when a tire has failed could cause loss of control. Unless you're about to run into something, stay off the brake until the vehicle has slowed down. Then brake very gently, pull off the road, and stop.
- **Check the Tires** – After you've come to a stop, 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 looking at it.

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## 2.18 – Antilock Braking Systems (ABS)

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ABS is a computerized system that keeps your wheels from locking up during hard brake applications.

ABS is an addition to your normal brakes. It does not decrease or increase your normal braking capability. ABS only activates when wheels are about to lock up.

ABS does not necessarily shorten your stopping distance, but it does help you keep the vehicle under control during hard braking.

### 2.18.1 – How Antilock Braking Systems Work

Sensors detect potential wheel lock up. An electronic control unit (ECU) will then decrease brake pressure to avoid wheel lockup.

Brake pressure is adjusted to provide the maximum braking without danger of lockup.

ABS works far faster than the driver can respond to potential wheel lockup. At all other times the brake system will operate normally.

## 2.18.2 – Vehicles Required to Have Antilock Braking Systems

The Department of Transportation requires that ABS be on:

- Truck tractors with air brakes built on or after March 1, 1997.
- Other air brake vehicles (trucks, buses, trailers, and converter dollies) that were built on or after March 1, 1998.
- Hydraulically braked trucks and buses with a gross vehicle weight rating of 10,000 lbs. or more built on or after March 1, 1999.

Many commercial vehicles built before these dates have been voluntarily equipped with ABS.

## 2.18.3 – How to Know if Your Vehicle is Equipped with ABS

- **Tractors, trucks, and buses** – Will have yellow ABS malfunction lamps on the instrument panel.
- **Trailers** – Will have yellow ABS malfunction lamps on the left side, either on the front or rear corner.
- **Dollies** – Manufactured on or after March 1, 1998, are required to have a lamp on the left side.

As a system check on newer vehicles, the malfunction lamp comes on at start-up for a bulb check and then goes out quickly. On older systems, the lamp could stay on until you are driving over five mph.

If the lamp stays on after the bulb check, or goes on once you are underway, you may have lost ABS control.

In the case of towed units manufactured before it was required by the Department of Transportation, it may be difficult to tell if the unit is equipped with ABS. Look under the vehicle for the Electronic Control Unit (ECU) and wheel speed sensor wires coming from the back of the brakes.

## 2.18.4 – How ABS Helps You

When you brake hard on slippery surfaces in a vehicle without ABS, your wheels may lock up. When your steering wheels lock up, you lose steering control. When your other wheels lock up, you may skid, jackknife, or even spin the vehicle.

ABS helps you avoid wheel lock up and maintain control. You may or may not be able to stop faster with ABS, but you should be able to steer around an obstacle while braking, and avoid skids caused by over braking.

## 2.18.5 – If ABS is Only on the Tractor or is Only on the Trailer

Having ABS on only the tractor, only the trailer, or even on only one axle, still gives you more control over the vehicle during braking. Brake normally.

When only the tractor has ABS, you should be able to maintain steering control, and there is less chance of jackknifing. But keep your eye on the trailer and let up on the brakes (if you can safely do so) if it begins to swing out.

When only the trailer has ABS, the trailer is less likely to swing out, but if you lose steering control or start a tractor jackknife, let up on the brakes (if you can safely do so) until you regain control.

## 2.18.6 – Braking with ABS

When you drive a vehicle with ABS, you should brake as you always have. In other words:

- Use only the braking force necessary to stop safely and stay in control.
- Brake the same way, regardless of whether you have ABS on the bus, tractor, trailer, or both.
- As you slow down, monitor your tractor and trailer and back off the brakes (if it is safe to do so) to stay in control.

There is only one exception to this procedure. If you drive a straight truck or combination with working ABS on all axles, you can fully apply the brakes in an emergency stop.

## 2.18.7 – Braking if ABS is Not Working

Without ABS you still have normal brake functions. Drive and brake as you always have.

Vehicles with ABS have yellow malfunction lamps to tell you if something isn't working.

As a system check on newer vehicles, the malfunction lamp comes on at start-up for a bulb check and then goes out quickly. On older systems, the lamp could stay on until you are driving over five mph.

If the lamp stays on after the bulb check, or goes on once you are underway, you may have lost ABS control on one or more wheels.

Remember, if your ABS malfunctions, you still have regular brakes. Drive normally but get the system serviced soon.

## 2.18.8 – Safety Reminders

**ABS will not allow you to drive faster, follow more closely, or drive less carefully.**

**ABS will not prevent power or turning skids.** ABS should prevent brake-induced skids or jackknifes, but not those caused by spinning the drive wheels or going too fast in a turn.

**ABS will not necessarily reduce stopping distance.** ABS will help maintain vehicle control but not always reduce stopping distance.

**ABS will not increase or decrease ultimate stopping power.** ABS is an “add-on” to your normal brakes, not a replacement for them.

**ABS will not change the way you normally brake.** Under normal brake conditions, your vehicle will stop as it always stopped. ABS only starts to work when a wheel would normally have locked up because of over braking.

**ABS will not compensate for bad brakes or for not taking care of the brakes and having regular maintenance.**

**REMEMBER:** The best vehicle safety feature is still a safe driver.

**REMEMBER:** Drive so you never need to use your ABS.

**REMEMBER:** If you need it, ABS could help to prevent serious crashes.

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## 2.19 – Skid Control and Recovery

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A skid happens whenever the tires lose their grip on the road. This is caused in one of four ways:

- **Over-braking** – Braking too hard and locking up the wheels. Skids also can occur when using the speed retarder when the road is slippery.
- **Over-steering** – Turning the wheels more sharply than the vehicle can turn.
- **Over-acceleration** – Applying too much power, such as pressing the accelerator too hard, causing them to spin.
- **Driving Too Fast** – Most serious skids result from driving too fast for road conditions. Drivers who adjust their driving to conditions don't over- accelerate and don't have to over-brake or over-steer from too much speed.

### 2.19.1 – Drive-Wheel Skids

By far the most common skid is one in which 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 easily stop them. If it is very slippery, push the clutch in. Otherwise, the engine can keep the wheels from rolling freely and regaining traction.

Rear wheel braking skids occur when the rear drive wheels lock. Because locked wheels have less traction than rolling wheels, the rear wheels usually slide sideways to "catch up" with the front wheels. In a bus or straight truck, the vehicle will slide sideways in a "spin out." With vehicles towing trailers, a

drive-wheel skid can let the trailer push the towing vehicle sideways, causing a sudden jackknife. See Figure 2.19.

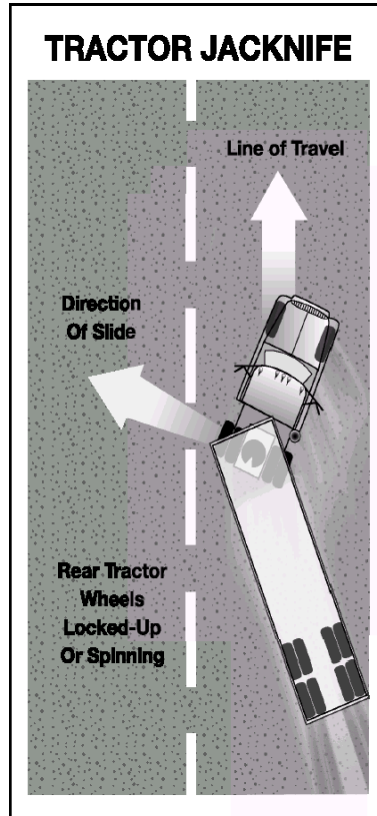


Figure 2.19

### 2.19.2 – Correcting a Drive-wheel Braking Skid

Do the following to correct a drive-wheel braking skid.

- **Stop Braking** – This will let the rear wheels roll again and keep the rear wheels from sliding.
- **Counter-steer** – As a vehicle turns back on course, it usually keeps on turning. Unless you turn the steering wheel the other way quickly, you may find yourself skidding in the opposite direction.

Learning to stay off the brake, turn the steering wheel quickly, push in the clutch, and counter-steer in a skid takes a lot of practice. The best place to get this practice is on a large driving range or "skid pad."

### 2.19.3 – Front-wheel Skids

Driving too fast for conditions causes most front-wheel skids. Other causes include lack of tread on the front tires and cargo loaded so not enough weight is on the front axle. In a front-wheel skid, the

front end tends to go in a straight line regardless of how much you turn the steering wheel. On a very slippery surface, you may not be able to steer around 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 or braking so hard. Slow down as quickly as possible without skidding.

## Subsections 2.17, 2.18, and 2.19 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?
5. How do you know if your vehicle has antilock brakes?
6. What is the proper braking technique when driving a vehicle with antilock brakes?
7. How do antilock brakes help you?

These questions may be on the test. If you can't answer them all, re-read subsections 2.17, 2.18, and 2.19.

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## 2.20 – Crash Procedures

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When you're in a crash and not seriously hurt, you need to act to prevent further damage or injury. The basic steps to be taken at any crash are to:

- Protect the area.
- Notify authorities.
- Care for the injured.

### 2.20.1 – Protect the Area

The first thing to do at a crash scene is to keep another crash from happening in the same spot. To protect the crash area:

- If your vehicle is involved in the crash, try to get it to the side of the road. This will help prevent another crash and allow traffic to move.
- If you're stopping to help, park away from the crash. The area immediately around the crash will be needed for emergency vehicles.

- Put on your flashers.
- Set out reflective triangles to warn other traffic. Make sure other drivers can see them in time to avoid the crash scene.

## 2.20.2 – Notify Authorities

Call for assistance before you get out of your vehicle. Try to determine where you are so you can give the exact location.

## 2.20.3 – Care for the Injured

If a qualified person is at the accident and helping the injured, stay out of the way unless asked to assist. Otherwise, do the best you can to help any injured parties. Here are some simple steps to follow in giving assistance:

- Don't move a severely injured person unless the danger of fire or passing traffic makes it necessary.
- Stop heavy bleeding by applying direct pressure to the wound.
- Keep the injured person warm.

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## 2.21 – Fires

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Truck fires can cause damage and injury. Learn the causes of fires and how to prevent them. Know what to do to put out fires.

### 2.21.1 – Causes of Fire

The following are some causes of vehicle fires:

**After crashes.** Spilled fuel, improper use of flares.

**Tires.** Under-inflated tires and duals that touch.

**Electrical System.** Short circuits due to damaged insulation, loose connections.

**Fuel.** Driver smoking, improper fueling, loose fuel connections.

**Cargo.** Flammable cargo, improperly sealed or loaded cargo, poor ventilation.

## 2.21.2 – Fire Prevention

Pay attention to the following:

**Vehicle Inspection.** Make a complete inspection of the electrical, fuel, and exhaust systems, tires, and cargo. Be sure to check that the fire extinguisher is charged.

**During Trip Inspection.** Check the tires, wheels, and truck body for signs of heat whenever you stop during a trip.

**Follow Safe Procedures.** Follow correct safety procedures for fueling the vehicle, using brakes, handling flares, and other activities that can cause a fire.

**Monitoring.** Check the instruments and gauges often for signs of overheating and use the mirrors to look for signs of smoke from tires or the vehicle.

**Caution.** Use normal caution in handling anything flammable.

## 2.21.3 – Fire Fighting

Knowing how to fight fires is important. Drivers who didn't know what to do have made fires worse. Know how the fire extinguisher works. Read the instructions printed on the extinguisher before you need it. Here are some procedures to follow in case of fire.

### PULL OFF THE ROAD

The first step is to get the vehicle off the road and stop. In doing so:

- **Park in an open area**, away from buildings, trees, brush, other vehicles, or anything that might catch fire. Don't pull into a gas station / service station.
- **Notify emergency services** of your problem and your location.
- **Keep the Fire from Spreading.** Before trying to put out the fire, make sure that it doesn't spread any further.

**With an engine fire**, turn off the engine as soon as you can. Don't open the hood if you can avoid it.

**For a cargo fire in a van or box trailer**, keep the doors shut, especially if your cargo contains hazardous materials. Opening the van doors will supply the fire with oxygen and can cause it to burn very fast.

### EXTINGUISH THE FIRE

Here are some rules to follow in putting out a fire:

- When using the extinguisher, stay as far away from the fire as possible.
- Position yourself upwind. Let the wind carry the extinguisher to the fire.

- Aim at the source or base of the fire, not up in the flames.
- Shoot foam through louvers, radiator, or from the vehicle's underside.

## USE THE RIGHT FIRE EXTINGUISHER

Figures 2.20 and 2.21 detail the type of fire extinguisher to use by class of fire.

The **B:C** type fire extinguisher is designed to work on electrical fires and burning liquids.

The **A:B:C** type is designed to work on burning wood, paper, and cloth as well.

Water can be used on wood, paper, or cloth, but don't use water on an electrical fire (can cause shock) or a gasoline fire (it will spread the flames).

A burning tire must be cooled. Lots of water may be required.

If you're not sure what to use, especially on a hazardous materials fire, wait for firefighters.

Continue until what was burning has cooled. Just because you don't see smoke or flames, doesn't mean the fire can't start again.

**Figure 2.20: Class/Type of Fires**

Class	Type
<b>A</b>	<b>Wood, Paper, Ordinary Combustibles</b> Extinguish by cooling and quenching using water or dry chemicals
<b>B</b>	<b>Gasoline, Oil, Grease, Other Greasy Liquids</b> Extinguish by smothering, cooling, or heat shielding using carbon dioxide or dry chemicals
<b>C</b>	<b>Electrical Equipment Fires</b> Extinguish with non-conducting agents such as carbon dioxide or dry chemicals. <b>DO NOT USE WATER.</b>
<b>D</b>	<b>Fires in Combustible Metals</b> Extinguish by using specialized extinguishing powders

## Figure 2.21: Class of Fire/Type of Extinguisher

Class of Fire	Fire Extinguisher Type
B or C	Regular Dry Chemical
A, B, C, or D	Multi-Purpose Dry Chemical
D	Purple K Dry Chemical
B or C	KCL Dry Chemical
D	Dry Powder Special Compound
B or C	Carbon Dioxide (Dry)
B or C	Halogenated Agent (Gas)
A	Water
A	Water With Anti-Freeze
A or B	Water, Loaded Steam Style
B, on some A	Foam

### Subsections 2.20 and 2.21 Test Your Knowledge

1. What are some things to do at a crash scene to prevent another crash?
2. Name two causes of tire fires.
3. What kinds of fires are a B:C extinguisher not good for?
4. When using your extinguisher, should you get as close as possible to the fire?
5. Name some causes of vehicle fires.

These questions may be on the test. If you can't answer them all, re-read subsections 2.20 and 2.21.

## 2.22 – Alcohol, Other Drugs, and Driving

### 2.22.1 – Alcohol, Drugs and Driving

Driving drunk or on drugs is a very serious threat to everyone’s safety. Alcohol and drugs impair your ability to drive. This means they make it very difficult or impossible for you to drive safely.

Blood alcohol concentration (BAC) is a measurement of the amount of alcohol in your blood. Maryland considers drivers to be driving under the influence of alcohol when their blood alcohol concentration is .08 or higher. Even though Maryland’s limit for drunk driving is .08, any amount of alcohol can affect your ability to safely drive a vehicle. Your judgment and physical coordination may be impaired at a much lower BAC and could result in criminal charges. For example, your vision, ability to perform simple movements, and reaction time may be affected with just one drink and can increase the risk of a crash.

It is very difficult to know your own BAC or how alcohol affects your ability to drive. You cannot simply tell by the number of drinks you had because many things can affect how your body digests alcohol. This includes your weight, body fat, how long ago you ate, and how much you ate. How tired you are, your mood, and medications can also make a difference in how alcohol affects your ability to drive.

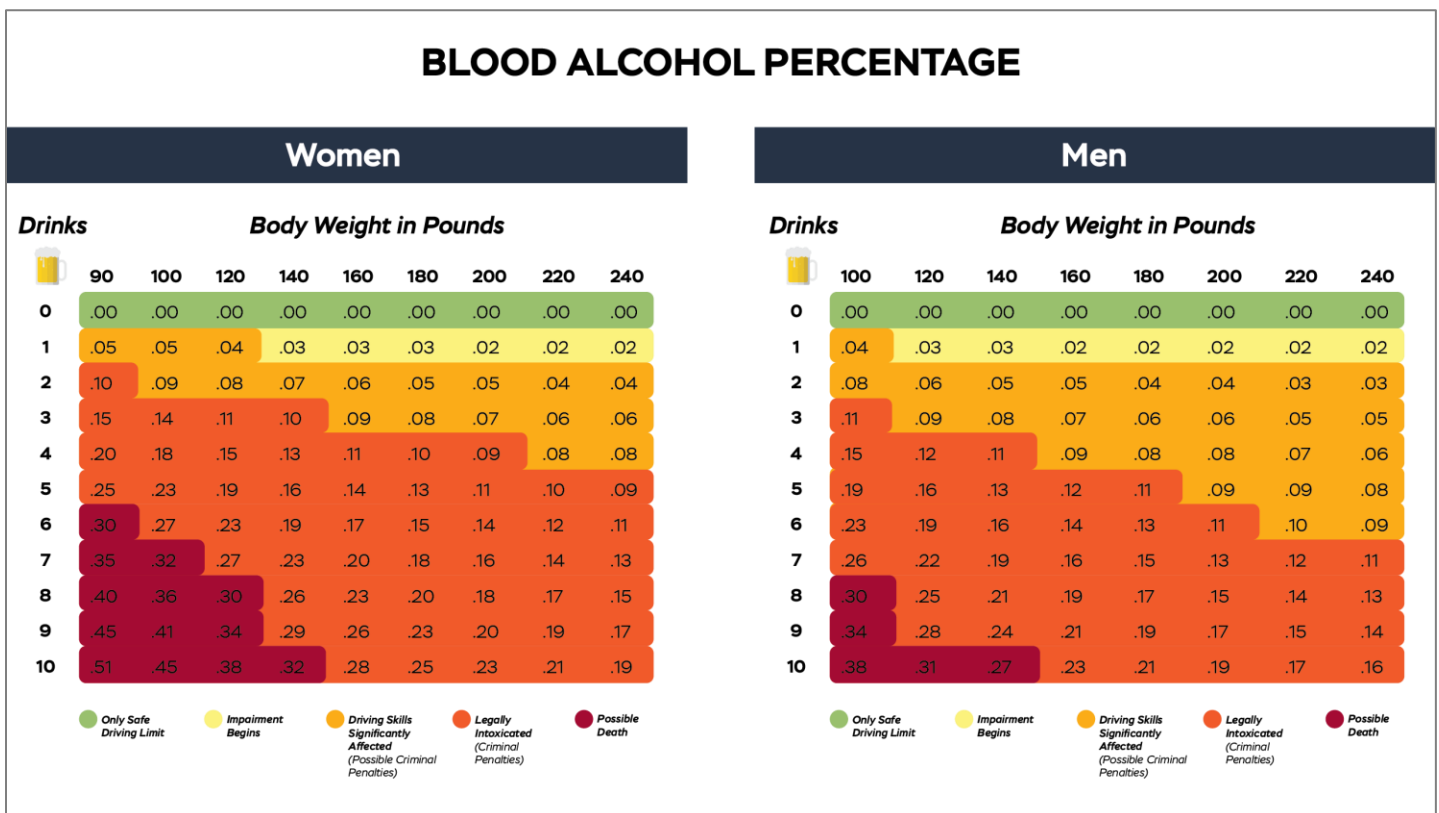


Figure 2.22

Effects Of Increasing Blood Alcohol Content		
<p>Blood Alcohol Content is the amount of alcohol in your blood recorded in milligrams of alcohol per 100 milliliters of blood. Your BAC depends on the amount of blood (which increases with weight) and the amount of alcohol you consume over time (how fast you drink). The faster you drink, the higher your BAC, as the liver can only handle about one drink per hour—the rest builds up in your blood.</p>		
BAC	Effects on Body	Effects on Driving Condition
.02	Mellow feeling, slight body warmth.	Less inhibited.
.05	Noticeable relaxation.	Less alert, less self-focused, coordination impairment begins.
.08	Definite impairment in coordination & judgment	Drunk driving limit, impaired coordination & judgment.
.10*	Noisy, possible embarrassing behavior, mood swings.	Reduction in reaction time.
.15	Impaired balance & movement, clearly drunk.	Unable to drive.
.30	Many lose consciousness.	
.40	Most lose consciousness, some die.	
.50	Breathing stops, many die.	
<p>BAC of .10 means that 1/10 of 1 % (or 1/1000) of your total blood content is alcohol.</p>		

**Figure 2.23**

## **UNDER 21 – ALCOHOL NOT ALLOWED**

If you are not yet 21 years old, it is against the law for you to drink alcohol. If law enforcement stops you and you have been drinking, your license will be suspended or revoked. If that happens, you will not be allowed to drive. Also, you could be charged with violating the alcohol restriction on your license.

## **OPEN ALCOHOL CONTAINER**

It is against the law to drive with an open container of alcohol in the passenger area of the vehicle. An open container is any open can, bottle, other type of container, or package. A six-pack of alcohol with open, empty, or missing bottles/cans can be considered an open container.

The passenger area of a vehicle includes:

- The driver and passenger seats.
- Any place the driver or passengers can easily reach from where they are sitting.

## 2.22.2 – Controlled Dangerous Substances (CDS): Illegal and Prescription Drugs

Illegal drugs, some prescription medications, and chemical inhalants can severely impair your ability to drive safely. They can affect your alertness, concentration, coordination, and reaction time. All drugs can make it hard to judge distances and react to signals and sounds on the road. Your license can be suspended or revoked for driving while on controlled dangerous substances. It is important to pay close attention to label warnings on prescription and over-the-counter drugs. Look for warnings that tell you not to drive or use heavy machinery when taking the medication. If you drive after taking a medication that tells you not to and it impairs your ability to drive safely, you could be charged with a crime.

## 2.22.3 – Illness

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

## 2.22.4 – FMCSA's Drug and Alcohol Clearinghouse

The Clearinghouse has information about holders of commercial driver's licenses (CDLs) and commercial learner's permits (CLPs) who are covered by FMCSA's Drug and Alcohol Testing Program.

### **CLEARINGHOUSE STATUS AND CDL DOWNGRADES**

As of November 18, 2024, having a "prohibited" Clearinghouse status will result in losing or being denied a commercial driver's license (CDL) or commercial learner's permit (CLP). [Read more about how a driver's Clearinghouse status affects CDL eligibility.](#)

Drivers in a "prohibited" Clearinghouse status must complete the return-to-duty (RTD) process to become eligible for a CDL or CLP. [Learn about the steps a driver takes to get back to being "not prohibited".](#)

Learn more: [Read the second Clearinghouse final rule.](#)

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## 2.23 – Hazardous Materials Rules for All Commercial Drivers

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All drivers should know something about hazardous materials. You must be able to recognize hazardous cargo, and you must know whether you can haul it without having a hazardous materials endorsement on your CDL.

### 2.23.1 – What Are Hazardous Materials?

Hazardous materials are products that pose a risk to health, safety, and property during transportation. See Figure 2.24.

**Figure 2.24: Hazard Class Definitions**

Class	Class Name	Example
1	Explosives	Ammunition, Dynamite, Fireworks
2	Gases	Propane, Oxygen, Helium
3	Flammable	Gasoline, 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 Fluid
9	Miscellaneous Hazardous Materials	Formaldehyde, Asbestos
None	ORM-D (Other Regulated Material- Domestic)	Hair Spray or Charcoal
None	Combustible Liquids	Fuel Oils, Lighter Fluid

### 2.23.2 – What Are the Rules

You must follow many rules about transporting hazardous materials. The intent of the rules is to:

- Contain the product.
- Communicate the risk.
- Keep drivers and equipment safe.

**To 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 pack safely. Similar rules tell drivers how to load, transport, and unload bulk tanks. These are containment rules.

**To Communicate the Risk.** The shipper uses a shipping paper and diamond shaped hazard labels to warn dockworkers and drivers of the risk.

After an accident or hazardous material spill or leak, you may be injured and unable to communicate the hazards of the materials you are transporting. Firefighters and police can prevent or reduce the amount of damage or injury at the scene if they know what hazardous materials are being transported. Your life, and the lives of others, may depend on quickly finding the hazardous materials shipping papers.

You must keep hazardous shipping papers:

- In a pouch on the driver's door, or
- In clear view within reach while driving, or
- On the driver's seat when out of the vehicle.

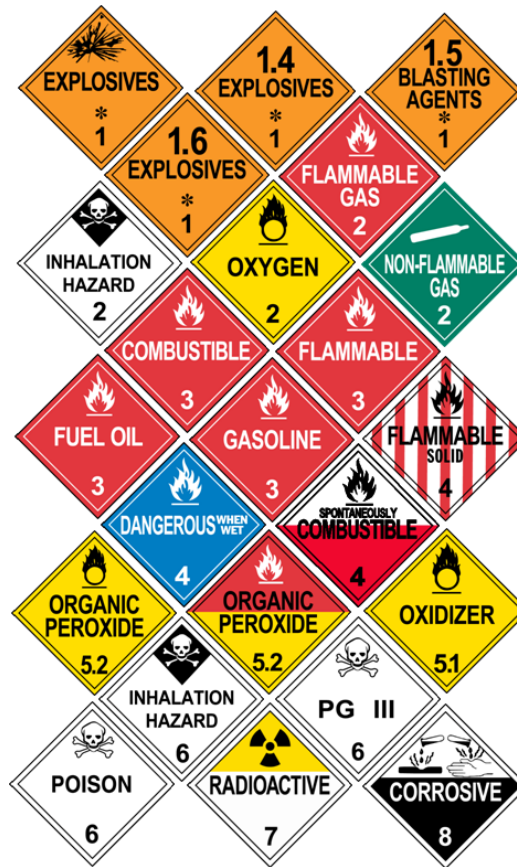
### 2.23.3 – Lists of Regulated Products

**Placards** are used to warn others of hazardous materials. Placards are signs put on the outside of a vehicle that identify the hazard class of the cargo. A placarded vehicle must have at least four identical placards. They are put on the front, rear, and both sides of the vehicle.

Placards must be readable from all four directions. They must be at least 9.84 inches square, turned upright on a point, in a diamond shape. Cargo tanks and other bulk packaging display the identification number of their contents on placards or orange panels. See Figure 2.25 for examples of hazardous material placards.

**Identification Numbers** are a four-digit code used by first responders to identify hazardous materials. An identification number may be used to identify more than one chemical on shipping papers. The identification number will be preceded by the letters “NA” or “UN”. The US DOT Emergency Response Guidebook (ERG) lists the chemicals and the identification numbers assigned to them.

Not all vehicles carrying hazardous materials need to have placards. The rules about placards are given in Section 9 of this manual. You can drive a vehicle that carries hazardous materials if it does not require placards. If it requires placards, you cannot drive it unless your commercial driver's license has the hazardous materials endorsement.



**Figure 2.25**

The rules require all drivers of placarded vehicles to learn how to safely load and transport hazardous products. You must have a commercial driver's license with the hazardous materials endorsement. To get the endorsement, you must pass a written test on material found in Section 9 of this manual.

A tank endorsement is needed for any commercial vehicle designed to transport any liquid or gaseous materials in:

- A single tank with an individual rated capacity of more than 119 gallons or
- Multiple tanks with a total capacity of 1,000 gallons or more

The tanks can be either permanently or temporarily attached to the vehicle or chassis. The liquid or gas does not have to be a hazardous material.

Drivers who need the hazardous materials endorsement must learn the placard rules. If you do not know if your vehicle needs placards, ask your employer. It is a crime to drive a vehicle needing placards without having the hazardous materials endorsement. When stopped by law enforcement, you will be cited, and you will not be allowed to drive your truck. A failure to placard when needed may risk your life and others if you have a crash. Emergency help will not know of your hazardous cargo.

Drivers of hazardous materials must also know which products they can load together, and which they cannot. These rules are also in Section 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 and consult the regulations.

## Subsections 2.22 and 2.23 Test Your Knowledge

1. Common medicines for colds can make you sleepy. True or False?
2. Coffee and a little fresh air will help a drinker sober up. True or False?
3. What is a hazardous materials placard?
4. Why are placards used?

These questions may be on the test. If you can't answer them all, re-read subsections 2.22 and 2.23.

# Section 3: Transporting Cargo Safely

## This Section Covers:

- Inspecting Cargo
- Cargo Weight and Balance
- Securing Cargo
- Cargo Needing Special Attention

This section tells you about hauling cargo safely. You must understand basic cargo safety rules to get a CDL.

Loose or unsecured cargo can be a danger to yourself and others if it falls off a vehicle.

Loose cargo that falls off a vehicle can cause traffic problems and others could be hurt or killed.

Loose cargo could hurt or kill you during a quick stop or crash.

Overloading your vehicle with too much cargo could damage it.

If all of your cargo is loaded on one side of the vehicle, it could make it harder to steer the vehicle.

Even if you don't load and secure the cargo yourself, you are responsible for:

- Inspecting your cargo.
- Recognizing overloads and poorly balanced weight.
- Knowing your cargo is properly secured and does not block your view ahead or to the sides.
- Knowing your cargo does not restrict your access to emergency equipment.

If you plan to drive a truck that carries hazardous materials that require a placard, you will also need to have a hazardous materials endorsement. Section 9 of this manual has the information you need to pass the hazardous materials test.

---

## 3.1 – Inspecting Cargo

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When you check your vehicle, make sure the truck is not carrying too much weight and the cargo is balanced and tied down safely.

### 3.1.1 – After Starting Your Trip.

Check the cargo and how it's tied down again within the first 50 miles of your trip. Fix anything that needs to be adjusted.

### 3.1.2 – Check Again as Needed.

It is important to check your cargo often and make sure it is safely tied down. You may need to check your cargo more often during a trip, but you should always inspect again:

- After you have driven for 3 hours or 150 miles.
- Any time you stop to take a break.
- Rules about how much your commercial vehicle can weigh, how to secure and cover your cargo, and where you can drive large vehicles are different in each area. Make sure you know the rules for the places you'll be driving.

---

## 3.2 – Weight and Balance

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You must know how much weight your vehicle can hold. The manufacturer of each vehicle will say how much it can carry, including the cargo, driver, passengers, and any accessories. You must know what your vehicle can carry safely.

### 3.2.1 – Definitions You Should Know

**Axle Weight.** The weight one axle or a group of axles on a vehicle can carry.

**Coupling Device Capacity.** The maximum weight a coupling device (like a hitch or connector) can safely pull or carry, set by the manufacturer

**Gross Vehicle Weight Rating (GVWR).** The maximum total weight a vehicle can carry, set by the manufacturer.

**Gross Combination Weight Rating (GCWR).** The highest total weight the manufacturer says the power unit (like the truck) and the trailer(s) can weigh together. It's either the number on the Federal Motor Vehicle Safety Standard (FMVSS) certification label or the combined gross vehicle weight ratings (GVWRs) **or the gross vehicle weights (GVWs)** of the truck and trailer(s)

**NOTE:** Gross vehicle weight is only used by **roadside enforcement** to figure out whether the driver/vehicle is subject to CDL regulations. It is not used to figure out if a vehicle is representative for the purposes of Skills testing.

**Suspension Systems.** Suspension systems have a manufacturer's maximum limit for weight capacity, known as the weight capacity rating.

**Tire Load.** The maximum weight a tire can safely carry at a specified pressure. This rating is marked on the side of each tire.

### 3.2.2 – Legal Weight Limits

You must keep weights within legal limits. States have maximums for Gross Vehicle Weight Rating (GVWRs), Gross Combined Weight Rating (GCWRs), and axle weights.

The largest axle weight allowed on each axle is usually set by a “**bridge formula.**” This bridge formula lowers the weight allowed for axles that are closer together. This is to help protect bridges and roads from too much weight. You’ll often see these signs near bridges showing weight limits. Bridge weight restriction signs are generally placed near the bridge.

Overloading can have bad effects on a vehicle. It makes it harder to steer, stop, and control. On hills, it causes problems both ways. The truck goes too slow uphill and too fast downhill. It also takes longer to stop, and if the brakes work too hard for too long, they can overheat or even fail.

During bad weather or in mountains, it may not be safe to carry a full load. Always think about the weather and the road before driving.



LEGAL WEIGHT LIMITS	
BRIDGE WEIGHT LIMIT	
AXLES	
2-3	22 T
4-5	25 T
6+	27 T
AXLES	
3+	38 T

Figure 3

### 3.2.3 – Don't be Top-heavy

Where the weight sits in your vehicle affects how safely you can drive. If cargo is piled up too high or too heavy on the top, your vehicle’s center of gravity rises, and you are more likely to tip over.

This is most dangerous on curves, sharp turns, or if you have to swerve to avoid a hazard. If your cargo is loaded with a high center of gravity, you have a greater chance of rollover when taking sharp turns. To stay safe, you should load the heaviest parts of your cargo on the bottom, and the lighter parts are on top, keeping the weight as low as possible.

### 3.2.4 – Balance the Weight

Having the wrong weight balance can make your vehicle hard to control. Too much weight on the front axle can make it hard to steer. It can damage the steering axle and tires.

If there is too little weight on the front axle because the weight has moved to the back, steering can become unsafe. Also, if the driving axles don't have enough weight, your tires may slip more easily, especially in bad weather. This can make it hard to keep moving.

On flatbed vehicles, not having weight balance can make it more likely the load will shift to the side or fall off. See Figure 3.1.

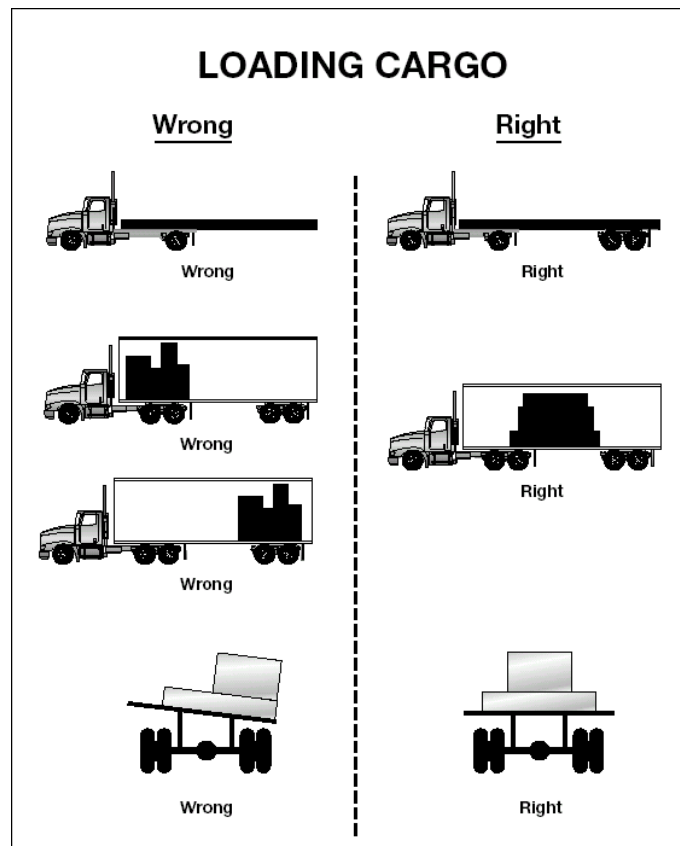


Figure 3.1

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## 3.3 – Securing Cargo

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### 3.3.1 – Blocking and Bracing

**Blocking** is a way to keep your cargo from sliding. It may be used in the front, back, and sides of your cargo to keep it from moving. Blocking is shaped to fit snugly against cargo. It is attached to the cargo floor to stop cargo from moving.

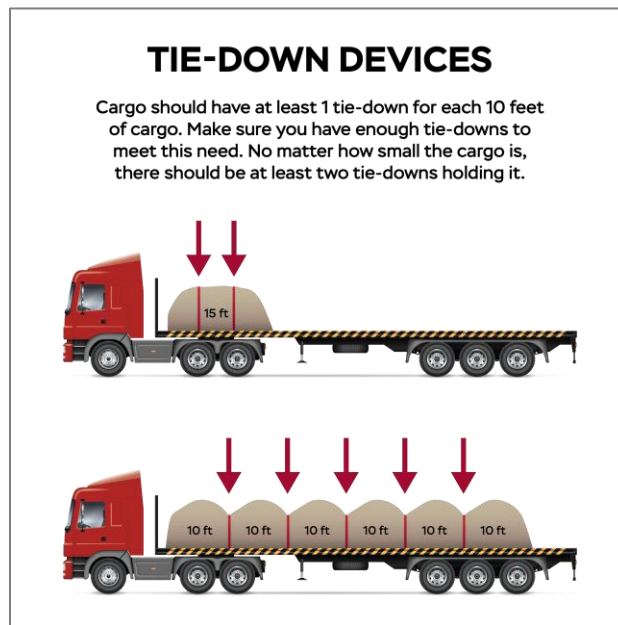
**Bracing** also keeps cargo from moving. It goes from the top of the cargo to the floor or walls of the cargo area.

### 3.3.2 – Cargo Tie-down

On flatbed trailers or trailers without sides, cargo must be secured to keep it from shifting or falling off. In closed vans, tie-downs can also be important to prevent cargo from moving or shifting because this could make your vehicle harder to control. Federal rules say that the total strength of the securement system (the system you use to secure your cargo) must be at least half the weight of the cargo.

**For example**, if your load weighs 20,000 pounds, the securement system must hold at least 10,000 pounds.

You must use the right tie-down equipment, including ropes, straps, chains, and tension devices like winches, ratchets, and clinching components. Tie-downs like hooks, bolts, rails, and rings must be attached to the vehicle correctly. See Figure 3.2.



**Figure 3.2**

Cargo should have at least one tie-down for each ten feet of cargo. Make sure you have enough tie-downs to meet this need. No matter how small the cargo is, it should have at least two tie-downs.

There are special requirements for securing various heavy metal pieces. Find out what they are if you must carry these types of loads.

### 3.3.3 – Header Boards

Front-end header boards, sometimes called headache racks, protect you from your cargo in case of a crash or emergency stop. Make sure the front-end structure is in good condition. The front-end structure should block the forward movement of any cargo you carry.

### 3.3.4 – Covering Cargo

There are two basic reasons for covering cargo: protecting people from spilled cargo and protecting cargo from weather.

**Spill** protection is a safety requirement in many states. Be familiar with the laws in the states and local jurisdictions you drive in.

You should look at your cargo covers in the mirrors from time to time while driving. A flapping cover can tear loose, uncover the cargo, and possibly block your view or someone else's. If your cover is loose, you should stop and secure it.

### 3.3.5 – Sealed and Containerized Loads

Containers are used when freight is carried part of the way by train or ship. Trucks can deliver at the beginning or end of the trip. Some containers have their own tiedown devices or locks that attach directly to a special frame. Some containers have to be loaded onto flatbed trailers. They must be properly secured just like any other cargo.

You can't inspect sealed loads, but you should still make sure you don't go over the total weight or axle weight limits.

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## 3.4 – Cargo Needing Special Attention

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### 3.4.1 – Dry Bulk

Dry bulk tanks need special care because they have a high center of gravity, and the load can shift. Be extremely cautious when going around curves and making sharp turns. Drive slowly.

## 3.4.2 – Hanging Meat

Hanging meat like suspended beef, pork, or lamb, can be a very unstable load with a high center of gravity. Extra caution is needed on sharp curves such as off ramps and on ramps. Drive slowly.

## 3.4.3 – Livestock

Livestock can move around in a trailer, which can make your vehicle hard to control. When the trailer isn't full, use false bulkheads – removal walls or barriers - to keep livestock grouped together. This helps stop them from moving too much and shifting weight. Even when animals are grouped, be careful on curves, because livestock can lean shift the weight, which makes vehicle rollover more likely.

## 3.4.4 – Oversized Loads

If your load is too long, too wide, or too high, you need special permits to drive. You're usually only allowed to drive with an overweight load during certain times. You may need to use special equipment such as "wide load" signs, flashing lights, or flags. You may need to travel with a police escort or pilot vehicles displaying warning signs and flashing lights. These special loads require extra careful driving.

Make sure you know the laws in the states and local jurisdictions where you'll be driving.

## Section 3 Test Your Knowledge

1. What four things related to cargo are drivers responsible for?
2. How often do you need to stop while on the road to check your cargo?
3. How is Gross Combination Weight Rating different from Gross Combination Weight?
4. Name two situations where legal maximum weights may not be safe.
5. What can happen if you don't have enough weight on the front axle?
6. What is the minimum number of tie-downs needed for any flatbed load?
7. What is the minimum number of tie-downs needed for a 20-foot load?
8. Name the two basic reasons for covering cargo on an open bed.
9. What do you need to check before transporting a sealed load?

These questions may be on your test. If you can't answer them all, re-read Section 3.

# Section 4: Transporting Passengers Safely

## This Section Covers

1. Vehicle Inspection
2. Loading
3. On the Road
4. After-trip Vehicle Inspection
5. Prohibited Practices
6. Use of Brake-door Interlocks

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

Bus drivers must have the letter P on their commercial driver's license. The letter P stands for the Passenger endorsement on their commercial driver license.

School Bus Driver is a separate endorsement. See Section 10 for more information.

To get the P 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 needed for the class of vehicle you drive.

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## 4.1 – Vehicle Inspection

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Before driving your bus, you must be sure it is safe. You must review the inspection report made by the last driver. You should only sign the last driver's report whether the defects reported have been certified as repaired or not needing to be repaired. If the defects have been certified as repaired, this means they have already been fixed, and your vehicle is safe to drive. If the defects have been certified as not needing to be repaired, this means there may be some damage or wear on a part of your vehicle, but it is still safe to drive.

---

### 4.1.1 – Vehicle Systems

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Make sure these things are in good working order before driving:

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

Make sure your bus has a fire extinguisher and emergency reflectors (3 reflective triangles or at least 6 fuses 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, or others 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 the sign has 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 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.

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## 4.2– Loading and Trip Start

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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 carrying hazardous materials. Most hazardous materials cannot be carried on a bus. They are a risk to health, safety, and property during transportation. Do not transport any hazardous material unless you are sure the rules allow it.

The Federal Hazardous Materials Table shows which materials are hazardous. 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.

## Figure 4.1: Hazard Class Definitions

Class	Class Name	Example
1	Explosives	Ammunition, Dynamite, Fireworks
2	Gases	Propane, Oxygen, Helium
3	Flammable	Gasoline, 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 Hazardous Materials	Formaldehyde, Asbestos
None	ORM-D (Other Regulated Material- Domestic)	Hair Spray or Charcoal
None	Combustible Liquids	Fuel Oils, Lighter Fluid

### 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 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 their 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.

If you drive a charter bus, you should not let riders on the bus until departure time. This will help prevent theft or vandalism of the bus.

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## 4.3 – On the Road

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### 4.3.1 – Passenger Supervision

Many charter and intercity carriers have rules about passenger comfort and safety. Tell passengers any rules about smoking, vaping, drinking, or using electronic devices at the start of the trip. Explaining the rules at the start will help to avoid trouble later.

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 their 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. You should warn riders to watch their steps 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 in a well-lit area where there are other people. Many carriers have guidelines for handling disruptive riders.

## 4.3.3 – Common Crashes

Bus crashes often happen at intersections. Use caution at every intersection, even if it has a signal or stop sign that 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.

## 4.3.4 – Speed on Curves

**Driving too fast through a curve can cause crashes that destroy buses and kill people. Curves become even more dangerous when rain or snow has made the road slippery.**

Every banked curve has a safe "design speed." The design speed is the speed of vehicles the road was made to handle. In clear weather, the posted speed is safe for cars, but it may be too high for many buses. With good traction, the bus may rollover; 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 Railroad Crossings.** Stop your bus between 15 and 50 feet before railroad crossings.

Listen and look in both directions for trains. You should open your front door if it makes it easier 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 law enforcement officer 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

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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 you drive. The report must specify each bus and list any defect that would affect safety or result in a breakdown. If there are no defects, make sure to say so in the report.

Riders can 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.

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## 4.5 – Prohibited Practices

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Avoid fueling your bus with riders on board unless 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

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Mass transit vehicles 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.

### Section 4 Test Your Knowledge

1. Name some things to check in the interior of a bus during a Vehicle Inspection.
2. What are some hazardous materials you **can** transport by bus?
3. What are some hazardous materials you **can't** transport by bus?
4. What is a standee line?
5. Does it matter where you make a disruptive passenger get off the bus?
6. How far from a railroad crossing should you stop?
7. When must you stop before crossing a drawbridge?
8. Describe from memory the “prohibited practices” listed in the manual.
9. The rear door of a transit bus needs to be open to put on the parking brake. True or False?

These questions may be on your test. If you can't answer them all, re-read Section 4.

# Section 5: Air Brakes

## This Section Covers

1. Air Brake System Parts
2. Dual Air Brake Systems
3. Inspecting Air Brakes
4. Using 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. The airbrake test is a special test on the pre-trip inspection.

## WHAT ARE AIR BRAKES

Air brakes use compressed air to apply pressure to the brake shoes or pads to slow the vehicle down. Air brakes are a good way of stopping large and heavy vehicles safely, but the brakes must be well kept 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 case of a brake system failure.

---

## 5.1 – The Parts of an Air Brake System

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

### 5.1.1 – Air Compressor

The air compressor pumps air into the air storage tanks or 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.

### 5.1.2 – 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, the governor stops the compressor from pumping air. The cut-out level is usually around 125 pounds per square-inch or "psi".

When the tank pressure falls to the "cut-in" level, the governor allows the compressor to start pumping again. The cut-in level is usually around 100 psi.

### 5.1.3 – Air Storage Tanks

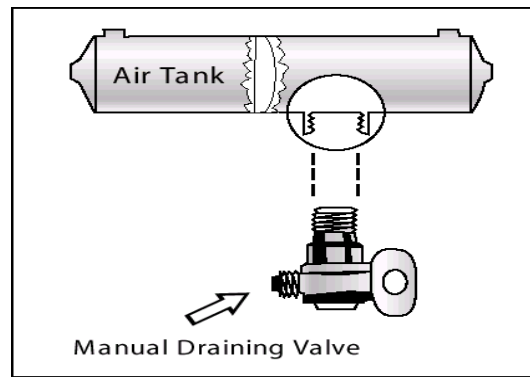
Air storage tanks are used to hold compressed air. The number and size of air tanks varies among vehicles. The tanks will hold enough air to allow the brakes to be used several times, even if the compressor stops working.

### 5.1.4 – 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 at the end of each day of driving. Each air tank is equipped with a drain valve in the bottom. There are two types:

- **Manual:** Operated by using your hands to turn or by pulling a cable. You must drain the tanks yourself at the end of each day of driving. See Figure 5.1.
- **Automatic:** The water and oil are automatically drained. These tanks may be equipped for manual draining as well.
  - Automatic air tanks are available with electric heating devices. These help prevent freezing of the automatic drain in cold weather.



**Figure 5.1**

### 5.1.5 – Alcohol Evaporator

Some air brake systems have an alcohol evaporator to put alcohol into the air system. This helps 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 it up as needed. In cold weather, you should check every day. Daily air tank drainage is still needed to get rid of water and oil unless the system has automatic drain valves.

### 5.1.6 – 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 it fixed by a mechanic.

### 5.1.7 – The Brake Pedal

Pressing down on the brake pedal is what triggers the air brakes. Pressing 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 when you don't need to can let air out faster than the compressor can replace it. If the pressure gets too low, the brakes won't work.

## 5.1.8 – Foundation Brakes

Foundation brakes are used at each wheel. The most common type is the s-cam drum brake. The parts of the brake are discussed below.

### BRAKE DRUMS, SHOES, AND LININGS

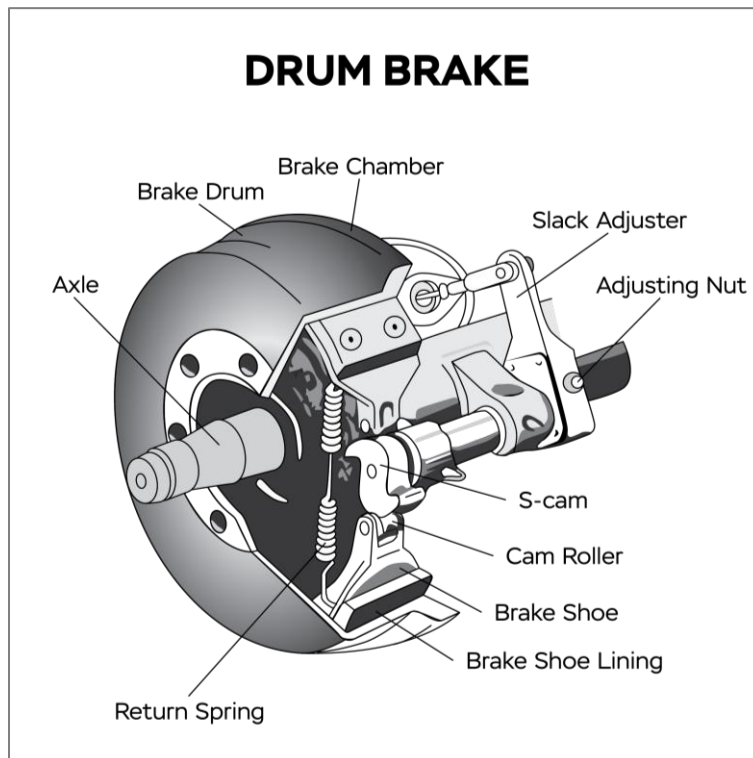
There are brake drums on each end of the vehicle's axles. The wheels are bolted to the drums. The braking mechanism is inside the drum.

The brake works by pushing the brake shoes and linings against the inside of the drum. This causes friction, which creates heat and slows the vehicle. The heat a drum can take without being damaged depends on how hard and how long the brakes are used. Too much heat can make the brakes stop working.

### S-CAM BRAKES

When you push the brake pedal, air is let into each brake chamber. Air pressure pushes the rod out, moving the slack adjuster, thus twisting the brake camshaft. This turns the s-cam (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. See Figure 5.2.



**Figure 5.2**

## WEDGE BRAKES

In this type of 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, like a large c-clamp.

Wedge brakes and disc brakes are less common than s-cam brakes.

### 5.1.9 – Supply Pressure Gauges

All vehicles with air brakes 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. There are also pressure gauges with two needles, one for each half of the system. Dual systems will be discussed later. These gauges tell you how much pressure there is in the air tanks.

### 5.1.10 – Application Pressure Gauge

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

### 5.1.11 – Low Air Pressure Warning

A low air pressure warning signal is needed on vehicles with air brakes. A warning signal you can see must come on before the air pressure in the tanks falls below 55 psi. On older vehicles, the signal must come on before one half the compressor governor cutout pressure. The warning is usually a red light. A buzzer you can hear 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 55 psi.

- An **automatic wig wag** will rise out of your view when the pressure in the system goes above 55 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 55 psi.

On large buses, the low-pressure warning devices usually signal at 80-85 psi.

## 5.1.12 – Stop Light Switch

**You need working brake lights** to warn drivers behind you when you put your brakes on. The air brake system turns on an electric switch with air pressure. The switch turns on the brake lights when you put on the air brakes.

## 5.1.13 – Front Brake Limiting Valve

This section applies only to some vehicles built before 1975. Some of these vehicles 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 reduce the stopping power of the vehicle.

Front wheel braking is good under all conditions. Tests have shown the front wheels are not likely to skid when braking, 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 (55 psi or more application pressure). The driver cannot control these valves.

## 5.1.14 – Spring Brakes

All trucks, truck tractors, and buses must be equipped with emergency brakes and parking brakes. The brakes must be held on by mechanical force because air pressure can eventually leak away. Spring brakes are usually used to provide this mechanical force.

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.

## 5.1.15 – 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, you can use a control handle on the dashboard 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. You should plan carefully when moving. Otherwise, you may be stopped in a dangerous location when the separate air supply runs out. See Figure 5.3.

# TRACTOR PROTECTION VALVE & EMERGENCY TRAILER BRAKE OPERATION

## Tractor Protection Valve:

- Provides air supply
- Closes automatically if air supply drops when driving

The parking brakes, when applied, close the tractor protection valve and set the spring brakes at the same time.

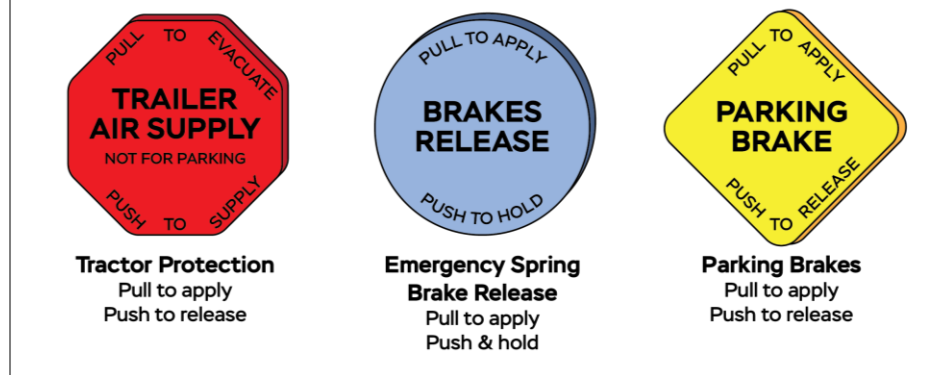


Figure 5.3

## ANTILOCK BRAKING SYSTEMS (ABS)

ABS is a computerized system that keeps your wheels from locking up during hard brake applications. Truck tractors with air brakes built on or after March 1, 1997, must be equipped with antilock brakes. Other vehicles with air brakes such as trucks, buses, trailers, and converter dollies built on or after March 1, 1998, must be equipped with antilock brakes. Many commercial vehicles built before these dates have been voluntarily equipped with ABS. Check the certification label for the date of manufacture to find out if your vehicle is equipped with ABS.

Vehicles with ABS have yellow malfunction lamps to tell you if something isn't working.

Tractors, trucks, and buses will have yellow ABS malfunction lamps on the instrument panel.

Trailers will have yellow ABS malfunction lamps on the left side of the trailer, either on the front or rear corner.

Dollies must have a lamp on the left side.

On newer vehicles, the malfunction lamp comes on at start-up for a bulb check and then goes out quickly. On older systems, the lamp could stay on until you are driving over five mph.

If the lamp stays on after the bulb check, or goes on once you are underway, you may have lost ABS control at one or more wheels.

It may be hard to tell if an older towed unit is equipped with ABS, especially if it was made before towed units needed to have ABS. Look under the vehicle for the electronic control unit (ECU) and wheel speed sensor wires coming from the back of the brakes.

ABS is an addition to your normal brakes. It does not decrease or increase your normal braking capability. ABS only activates when wheels are about to lock up.

ABS does not necessarily shorten your stopping distance, but it does help you keep the vehicle under control during hard braking.

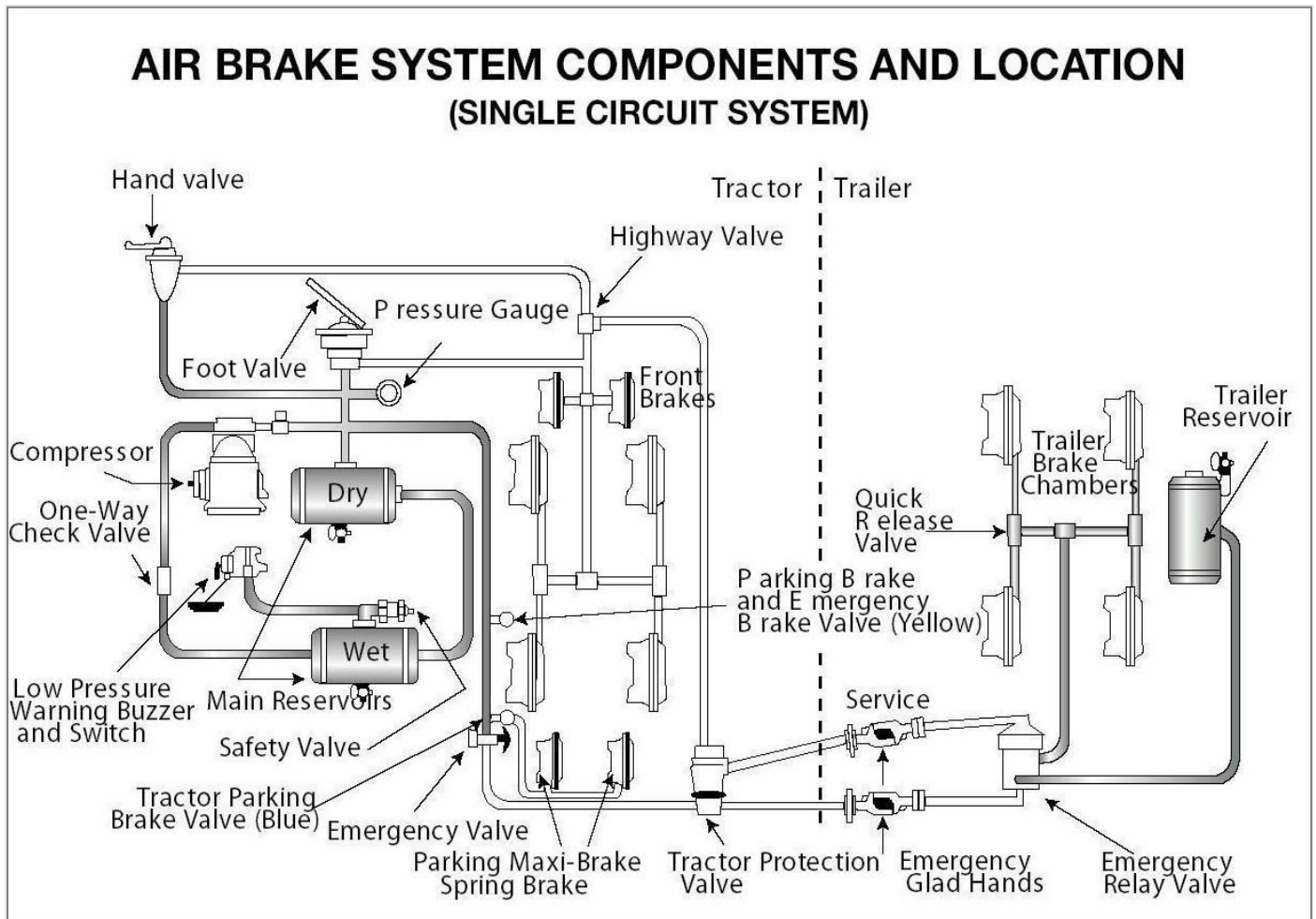


Figure 5.4

## Subsection 5.1 Test Your Knowledge

1. Why must air tanks be drained?
2. What is a supply pressure gauge used for?
3. All vehicles with air brakes must have a low air pressure warning signal. True or False?
4. What are spring brakes?
5. Front wheel brakes are good under all conditions. True or False?
6. How do you know if your vehicle is equipped with antilock brakes?

These questions may be on your test. If you can't answer them all, re-read subsection 5.1.

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## 5.2 – Dual Air Brake

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Most 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 works the regular brakes on the rear axle or axles. This is called the primary system. The other system works the regular brakes on the front axle and possibly one rear axle. This is called the secondary system. Both systems supply air to the trailer. See Figure 5.4.

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 55 psi.

The warning light and buzzer should come on before the air pressure drops below 55 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 working fully. This means it will take you longer to stop. Bring the vehicle to a safe stop and have the air brakes system fixed.

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## 5.3 – Inspecting Air Brake Systems

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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. These things are discussed below, added where they fit into the seven-step method.

### Vehicle Inspection Guide for Vehicles with Air Brakes

#### STEP 1: REVIEW LAST VEHICLE INSPECTION REPORT

You may have to write a vehicle inspection report each day. The motor carrier must repair any items in the report that affect safety and certify in the report that repairs were made or unnecessary.

If the report said there **were defects**, you **will** need to sign the report.

If **no defects** were found, you **will not** need to sign the report.

If you find anything unsafe during the Vehicle Inspection, get it fixed. Federal and state laws forbid operating an unsafe vehicle.

#### STEP 2: CHECK ENGINE COMPARTMENT

Check that the parking brakes are on or wheels are chocked.

You may have to raise the hood, tilt the cab (be sure to secure loose things first, so they don't fall and break something), or open the engine's compartment door.

Check the following:

- Engine oil level.
- Coolant level in radiator; condition of hoses.
- Power steering fluid level; hose condition (if so equipped).
- Windshield washer fluid level.
- Battery fluid level, connections and tie downs (battery may be located elsewhere)
- Automatic transmission fluid level (may require engine to be running).
- Check each belt for tightness and excessive wear (alternator, water pump, air compressor)
  - **NOTE:** Learn how much "give" the belts should have when correctly adjusted.
- Leaks in the engine compartment (fuel, coolant, oil, power steering fluid, hydraulic fluid, battery fluid).
- Cracked, worn electrical wiring insulation.

- **Air Compressor Drive Belt:** If the air compressor is belt-driven, check the condition and tightness of the belt. It should be in good condition.

When you're done checking the engine compartment, lower and secure the hood, cab, or engine compartment door.

### **STEP 3: START THE ENGINE AND INSPECT INSIDE THE CAB**

Make sure the parking brake is on.

Put the gearshift in neutral (or "park" if automatic).

Start the engine and listen for unusual noises.

If the vehicle has one equipped, check the Anti-lock Braking System (ABS) indicator lights. A light on the dash should come on and then turn off. If it stays on, the ABS is not working properly. For trailers only, if the yellow light on the left rear of the trailer stays on, the ABS is not working properly. When you inspect the inside of the cab, you need to look at the gauges, check the condition of the controls, check your mirrors and windshield, and check your emergency equipment.

#### **Step 3a: Look at the Gauges**

- **Oil pressure** – It should come up to normal within seconds after the engine is started. See Figure 2.5.
- **Air pressure** – Pressure should build from 50 to 90 psi within 3 minutes. Build air pressure to the governor cut-out (usually around 120 – 140 psi.) **Know your vehicle's requirements.**
- **Ammeter or voltmeter** – Should be in normal range(s).
- **Coolant temperature** – Should begin a gradual rise to normal operating range.
- **Engine oil temperature** – Should begin a gradual rise to normal operating range.
- **Warning lights and buzzers** – Oil, coolant, charging circuit warning, and antilock brake system lights should go out right away.

#### **Step 3b: Check the Condition of the Controls.**

Check all the following for looseness, sticking, damage, or improper setting:

- Steering wheel.
- Clutch.
- Accelerator ("gas pedal").
- Brake controls.
- Foot brake.
- Trailer brake (if your vehicle has one).
- Parking brake.
- Retarder controls (if your vehicle has them).

- Transmission controls.
- Interaxle differential lock (if your vehicle has one).
- Horn(s).
- Windshield wiper/washer.
- Lights. Headlights. Dimmer switch. Turn signal.
- Four-way flashers.
- Light switches for:
  - Parking lamps
  - Clearance lamps
  - Identification lamps

### **Step 3c: Check Mirrors and Windshield.**

Inspect all mirrors and the windshield for cracks, dirt, illegal stickers, or other causes to make seeing more difficult. Clean and adjust the mirrors and windows if that is needed.

### **Step 3d: Check Emergency Equipment**

Check for the following safety equipment items:

- Spare electrical fuses (unless the vehicle has circuit breakers).
- Three red reflective triangles or three liquid burning flares.
- Properly charged and rated fire extinguisher.

### **Step 3e) Check the Safety Belt.**

Check that the safety belt is securely mounted, is adjustable, latches properly, and is not ripped or frayed.

## **STEP 4: TURN OFF THE ENGINE AND CHECK THE VEHICLE'S LIGHTS**

Make sure the parking brake is set, turn off the engine, and take the key with you. Turn on headlights (low beams) and four-way emergency flashers and get out of the vehicle.

## **STEP 5: DO WALK-AROUND INSPECTION GENERAL INSPECTION OF THE LIGHTS**

Go to the front of the vehicle and check that low beams are on and both four-way flashers are working.

- Push the dimmer switch and check that the high beams work.
- Turn off the headlights and the four-way emergency flashers.
- Turn on parking, clearance, side-marker, and identification lights.

- Turn on the right turn signal and start a walk-around inspection.

### Check Slack Adjusters on S-cam Brakes

- Park on level ground and chock the wheels to prevent the vehicle from moving.
- Release the parking brakes so you can move the slack adjusters.
- Use gloves and pull hard on each slack adjuster that you can reach.

If a slack adjuster moves more than about one inch where the push rod attaches to it, you should have it inspected for proper adjustment. 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. Even though automatic slack adjusters adjust themselves during full brake applications, they must be checked.

Automatic adjusters should not have to be manually adjusted except when performing maintenance on the brakes and during installation of the slack adjusters. In a vehicle equipped with automatic adjusters, when the pushrod stroke exceeds the legal brake adjustment limit, it is a sign of a problem in the adjuster or the related foundation brake components. It could also mean the adjuster was improperly installed.

When brakes equipped with automatic adjusters are out of adjustment, you should take your vehicle to a repair facility as soon as possible to have the problem corrected. Just manually bringing the pushrod strike back into legal limits of an automatic adjuster does not address the problem with the automatic adjuster. If you do this too often, you risk causing premature wear of the adjuster itself. The manual adjustment of automatic slack adjusters is dangerous because it may give you a false sense of security about whether your braking system is working.

The manual adjustment of an automatic adjuster should only be used as a temporary measure to correct the adjustment in an emergency. It's likely the brake will be back out of adjustment since this usually does not fix the underlying problem.

**NOTE:** Automatic slack adjusters are made by different manufacturers and do not all work the same. You should consult the specific manufacturer's Service Manual before troubleshooting a brake adjustment problem.

### 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.

### General Inspection of the entire vehicle

Walk around and inspect everything. Review all lights, reflectors, and glass as you go along. Clean the lights, reflectors, and glass as needed.

## On the **Left Front Side**:

- Driver's door glass should be clean.
- Door latches and locks should all work properly.
- Check the condition of the left front wheel and rim:
- look that it isn't missing, bent, has broken studs, clamps, lugs, or has any signs of misalignment.
- Check the condition of the tires:
  - they should be properly inflated,
  - the valve stem and cap are in good condition,
  - there are no serious cuts,
  - bulges, or
  - tread wear.
- Review the condition of the lug nuts.
  - Use a wrench to test rust-streaked lug nuts since this could be a sign of looseness.
- Check the hub oil level is OK and there are no leaks.
- Check the left front suspension.
- Check the condition of spring, spring hangers, shackles, u-bolts.
- Check the shock absorber condition.
- Check the left front brake.
- Check the condition of the brake drum or disc.
- Check the condition of the hoses.

## **Front**

- Check the condition of the front axle.
- Check the condition of the steering system.
- Check that there are no loose, worn, bent, damaged or missing parts.
- Check the steering mechanism to test for looseness.
- Check the condition of the windshield for damage and clean if dirty.
- Check windshield wiper arms for proper spring tension.
- Check wiper blades for damage, "stiff" rubber, and make sure they are secure.
- Check the lights and reflectors.
- Check that parking, clearance, and identification lights are clean, operating, and proper color (amber at front).
- Check that reflectors are clean and have a proper color (amber at front).

- Check that the right front turn signal light is clean, operating, and proper color (amber or white on signals facing forward).

### On the **Right Front Side**

- On the right front you will check all the items as done on the left front.

### On the Right Side

- Primary and secondary safety cab locks engaged (if cab-over-engine design).
- Check the Right fuel tanks are securely mounted and are not damaged or leaking.
- Check that the Fuel crossover line is secure.
- Check that the Tank(s) have enough fuel and cap(s) are on and secure.

### **Check the Condition of all visible parts.**

- Check that the rear of the engine is not leaking.
- Check that the transmission is not leaking.
- Check that the exhaust system is secure, not leaking, not touching wires, fuel, or air-lines.
- Check that the frame and cross members have no bends or cracks.
- Check the air-lines and electrical wiring are secured against snagging, rubbing, wearing.
- Check the spare tire carrier or rack is not damaged (if your vehicle has one).
- Check the spare tire or wheel is securely mounted in the rack.
- Check the spare tire and wheel are the right size and have enough air.
- Check all cargo is properly blocked, braced, balanced, tied, or chained, and is the right weight limit for that vehicle to keep it from moving while the vehicle is in motion.
- If a header board is required, check that it is adequate and secure .
- Check the side boards, stakes strong enough, free of damage, properly set in place (if so equipped).
- If canvas or tarp is needed, check it is properly secured to prevent tearing, billowing, or blocking of mirrors.
- Check curbside cargo compartment doors are in good condition, securely closed, latched or locked and all required security seals in place.
- If your vehicle is oversize, check that all required signs (flags, lamps, and reflectors) are safely and properly mounted and you have all required permits.

### **Right Rear**

- Check the condition of wheels and rims--no missing, bent, or broken spacers, studs, clamps, or lugs.
- Check the condition of tires--properly inflated, valve stems and caps OK, no serious cuts, bulges, tread wear, tires not rubbing each other, and nothing stuck between them.

- Check the tires are of the same type. (not mixed radial and bias types).
- Check the tires evenly matched (same sizes). Wheel bearing/seals not leaking.
- Check the suspension.
- Check the condition of spring(s), spring hangers, shackles, and u-bolts.
- Check the sale secure.
- Check the powered axle(s) not leaking lube (gear oil).
- Check the condition of torque rod arms and bushings.
- Check the condition of the shock absorber(s).
- If a retractable axle is equipped, check the condition of the lift mechanism. If it is air powered, check for leaks.
- Check the condition of air ride components.
- Check the brake adjustment.
- Check the condition of brake drum(s) or discs.
- Check the condition of hoses--look for any wear due to rubbing.
- Check the lights and reflectors.
- Check the side-marker lights are clean, operating, and proper color (red at rear, others amber).
- Check the side-marker reflectors clean and proper color (red at rear, others amber).

## **Rear**

- Check the lights and reflectors.
- Rear clearance and identification lights should be:
  - clean,
  - operating,
  - and proper color (red at rear).
- Reflectors should be:
  - clean
  - and proper color (red at rear).
- Tail lights should be:
  - clean,
  - operating,
  - and proper color (red at rear).
- Right rear turn signal should be:
  - operating
  - and the proper color (red, yellow, or amber at rear).
- License plate(s) should be:

- present,
- clean,
- and secured.
- Splash guards should be:
  - Present
  - Not damaged,
  - Properly fastened,
  - Not dragging on ground or rubbing tires.
- Cargo should be secure.
- Cargo should be properly blocked, braced, tied, chained, etc.
- Tailboards should be up and properly secured.
- End gates should be free of damage, properly secured in stake sockets.
- Canvas or tarp (if needed) properly secured to prevent tearing, billowing, or blocking of either the rearview mirrors or rear lights.
- If your vehicle is over-length or over-width, make sure all signs and other lights/flags are safely and properly mounted and all required permits are in your possession.
- Rear doors should be securely closed, latched/locked.

## Left Side

Check all items as done on right side, plus:

- Any battery (if not mounted in the engine compartment).
- Any battery box securely mounted to vehicle. Box has a secure cover.
- All batteries are secured against movement.
- Batteries are not broken or leaking.
- Fluid in batteries is at proper level (except maintenance-free type).
- Cell caps are present and securely tightened (except maintenance-free type).
- Vents in cell caps are free of foreign material (except maintenance-free type).

## STEP 6: CHECK SIGNAL LIGHTS

Get in your vehicle and turn off all lights.

- Turn on stop lights (apply trailer hand brake or have a helper put on the brake pedal).
- Turn on left turn signal lights.
- Get out and check lights:
  - Left front turn signal light should be:

- clean
- operating
- and proper color (amber or white on signals facing the front).
- Left rear turn signal light should be:
  - clean,
  - operating,
  - and proper color (red, yellow, or amber).
- Both stop lights should be:
  - clean,
  - operating,
  - and proper color (red, yellow, or amber).

Get back in your vehicle.

- Turn off lights not needed for driving.
- Check for all required papers, trip manifests, permits, etc.
- Secure all loose items in the cab (they might interfere with operation of the controls or hit you in a crash).
- Start the engine.

## **STEP 7: FINAL AIR BREAK CHECK**

### **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 for the exact values.

- 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 Air Leakage Rate.**

With a fully-charged air system (usually around 125 psi), turn off the engine, release the parking brake (push in); 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.

With the air pressure built up to governor cutoff (120 – 140 psi), shut off the engine, chock your wheels (if necessary), release the parking brake (all vehicles), and the tractor protection valve (combination vehicle); and fully apply the foot brake. Hold the foot brake for one minute.

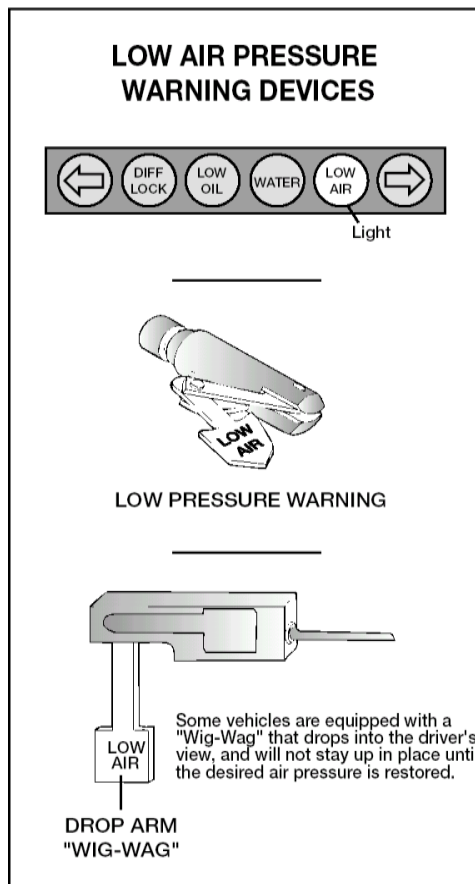
Check the air gauge to see if the air pressure drops more than three pounds in one minute (single vehicle) or four pounds in one minute (combination vehicle). If the air pressure falls more than three psi in one minute for single vehicles (more than four psi for combination vehicles), the air loss rate is too much.

Check for air leaks and fix them before driving the vehicle. Otherwise, you could lose your brakes while driving.

## **Test Low Pressure Warning Signal.**

1. Shut the engine off when you have enough air pressure so that the low pressure warning signal is not on.
2. 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 55 psi in the air tank (or tank with the lowest air pressure, in dual air systems). See Figure 5.5.

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.



**Figure 5.5**

### **Check That Spring Brakes Come on Automatically.**

Continue stepping on and off the brake pedal (called fanning) to reduce tank pressure.

- The tractor protection valve and parking brake valve should close (pop out) on a tractor-trailer combination vehicle, and the parking brake valve should close (pop out) on other combination and single vehicle types when the air pressure falls to the manufacturer's specification (20 – 45 psi).
- This will cause the spring brakes to come on.

### **Check Rate of Air Pressure Buildup.**

When the engine is on, 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 build-up from 50 to 90 psi within 3 minutes with the engine at an idle speed of 600-900 rpms.

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 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.
- Take note of 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.

## **Subsections 5.2 and 5.3 Test Your Knowledge**

1. What is a dual air brake system?
2. What are the 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 your test. If you can't answer them all, re-read subsections 5.2 and 5.3.

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## 5.4 – Using Air Brakes

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### 5.4.1 – 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 your vehicle stops, select a starting gear.

### 5.4.2 – Braking with Antilock Brakes

When you brake hard on slippery surfaces in a vehicle without ABS, your wheels may lock up. When your steering wheels lock up, you lose steering control. When your other wheels lock up, you may skid, jackknife, or even spin the vehicle.

ABS helps you avoid wheel lock up. The computer senses impending lockup, reduces the braking pressure to a safe level, and helps you maintain control. You may or may not be able to stop faster with ABS, but you should be able to steer around an obstacle while braking, and avoid skids caused by over braking.

Only having ABS on the tractor, the trailer, or even one axle, still gives you more control over the vehicle during braking. Brake normally.

When only the tractor has ABS, you should be able to maintain steering control, and there is less chance of jackknifing than without ABS on the tractor. But, keep your eye on the trailer and let up on the brakes (if you can safely do so) if it begins to swing out.

When only the trailer has ABS, the trailer is less likely to swing out, but if you lose steering control or start a tractor jackknife, let up on the brakes (if you can safely do so) until you gain control.

When you drive a tractor-trailer combination with ABS, you should brake as you always have. In other words:

- Use only the braking force necessary to stop safely and stay in control.
- Brake the same way, regardless of whether you have ABS on the tractor, the trailer, or both.
- As you slow down, monitor your tractor and trailer and back off the brakes (if it is safe to do so) to stay in control.

There is only one exception to this procedure, if you always drive a straight truck or combination with working ABS on all axles, in an emergency stop, you can fully apply the brakes.

Without ABS, you still have normal brake functions. Drive and brake as you always have.

Remember, if your ABS malfunctions, you still have regular brakes. Drive normally but get the system serviced soon.

### 5.4.3 – 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

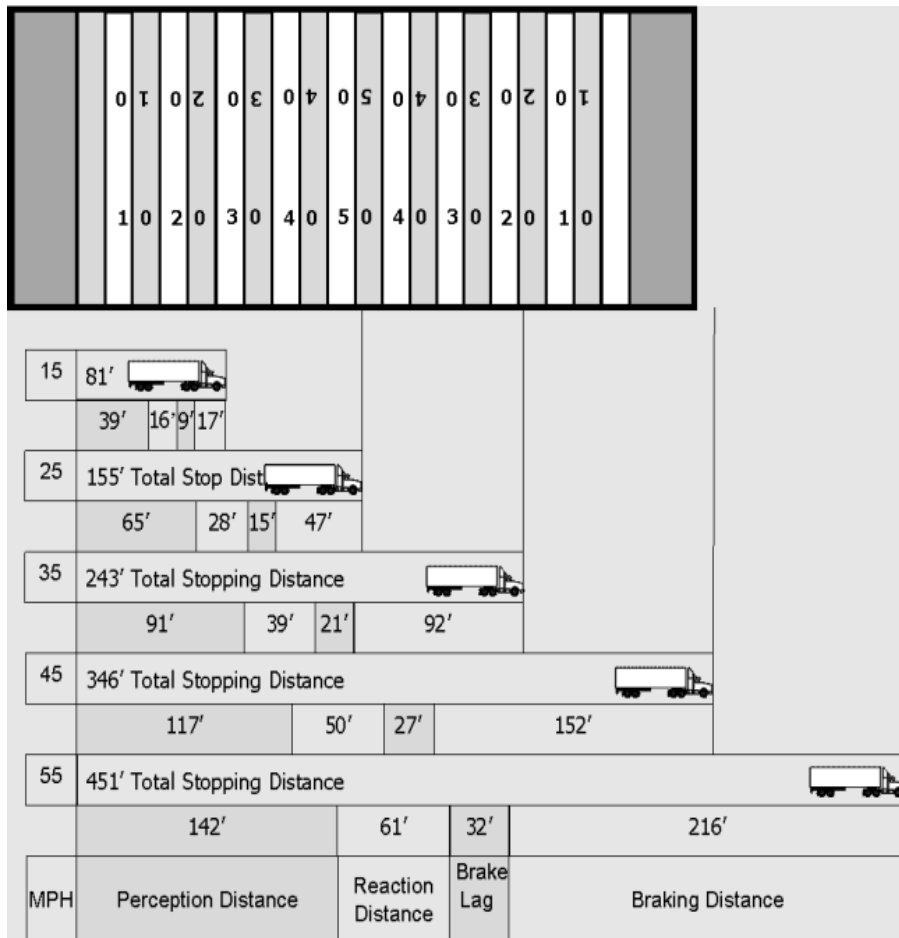
Apply your brakes all the way. Release brakes when wheels lock up. As soon as the wheels start rolling, apply the brakes fully again. It can take up to one second for the wheels to start rolling after you release the brakes. If you re-apply the brakes before the wheels start rolling, the vehicle won't straighten out.

### 5.4.4 – Stopping Distance

Stopping distance was described in Section 2 under "Speed and Stopping Distance." With air brakes there is an added delay called brake lag. Brake lag is 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 one half second or more for the air to flow through the lines to the brakes. The total stopping distance for vehicles with air brake systems is made up of four factors.

**Perception Distance + Reaction Distance + Brake Lag Distance + 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 450 feet. See Figure 5.6.



**Figure 5.6**

### 5.4.5 – 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 too much heat caused by using them too often and not relying on the engine braking effect.

If you overuse the service brakes, you can cause overheating which leads to brake fade. Brake fade happens when excessive heat causes chemical changes in the brake lining, reducing the friction and 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 reduced. Continued overuse may increase brake fade until the vehicle cannot be slowed down or stopped.

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 enough braking available to control the vehicle. Brakes can get out of adjustment quickly, especially when they are hot. You should check brake adjustment often.

## 5.4.6 – Proper Braking Technique Downhill

The use of brakes on a long or steep downgrade is only to help 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 slowed to approximately five mph below your "safe" speed, release the brakes. (This 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.

## 5.4.7 – 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.

## 5.4.8 – Parking Brakes

Any time you park you should 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. 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 some other shape including a lever that swings from side to side or up and down.

**Don't** use the parking brakes:

1. if the brakes are very hot (from just having come down a steep grade), or
2. 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 (Figure 5.7) on a level surface 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.**



**Figure 5.7**

## Subsection 5.4 Test Your Knowledge

1. Why should you be in the proper 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 to help the braking effect of the engine. True or False?
4. If you are only away from your vehicle for a short time, you do not need to use the parking brake. True or False?
5. How often should you drain air tanks?
6. How should you brake when you drive a tractor-trailer combination with ABS?
7. You still have normal brake functions if your ABS is not working. True or False?

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

# Section 6: Combination Vehicles

## This Section Covers

1. Driving Combination Vehicles Safely
2. Combination Vehicle Air Brakes
3. Antilock Brake Systems
4. Coupling and Uncoupling
5. Inspecting Combinations

This section tells you about combination vehicles like tractor-trailers, doubles, triples, and straight trucks with trailers. This information is only to give you the minimum knowledge needed for driving common combination vehicles. You should also study Section 7 if you need to pass the test for doubles and triples.

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## 6.1 – Driving Combination Vehicles Safely

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Combination vehicles are usually heavier, longer, and need more driving skill than single commercial vehicles. This means you need more knowledge and skill to drive combination vehicles than it takes to drive single vehicles. In this section, we talk about some important safety factors that apply specifically to combination vehicles.

### 6.1.1 – Rollover Risks

More than half of truck drivers who die in crashes are killed in rollovers. When a truck's cargo is piled up high, the truck's center of gravity moves higher up from the ground. This makes the truck less stable and easier to tip over. A fully loaded truck is 10 times more likely to rollover in a crash than an empty one.

The following two things will help you prevent rollovers:

- keep the cargo as close to the ground as possible,
- drive slowly around turns.

Keeping cargo low is even more important in combination vehicles than in straight trucks. Also, keep the load centered on your rig. If the load is to one side so it makes a trailer lean, a rollover is more likely. Make sure your cargo is centered and spread out as much as possible. Cargo distribution is covered in Section 3 of this manual.

Rollovers happen when you turn too fast. Drive slowly around corners, on-ramps, and off-ramps.

Avoid quick lane changes, especially when your truck is fully loaded.

## 6.1.2 – Steer Gently

Trucks with trailers can tip over from a "crack-the-whip" effect. "Crack-the-whip" effect can happen when you change lanes quickly. The trailer swings out, then swings back, like the end of a whip. That sharp movement can cause trailer rollover. In many crashes, only the trailer tips over.

The "crack-the-whip" effect happens because of something called "rearward amplification". This means that when you make a quick lane change, the trailer swings more than the front of the truck. Figure 6.1 shows eight types of truck and trailer combination vehicles. The chart ranks them from the least likely to roller over (at the top) to the most likely (at the bottom).

A rearward amplification of 2.0 means the trailer is twice as likely to rollover as the front part of the truck. Triples (3 trailers) have a rating of 3.5. That means the last trailer is 3.5 times more likely to tip over than the tractor.

To avoid rollovers:

- Steer gently and smoothly
- Don't jerk the wheel - sudden moves can tip your trailer
- Leave enough space behind other vehicles:
  - Stay back at least 1 second for every 10 feet of your vehicle's length
- Add 1 more second if you're going over 40mph
- Look far ahead on the road to avoid surprises or quick lane changes
- At night, drive slow enough so you can see and react to obstacles in time.
- Always slow down before turns.

## 6.1.3 – Brake Early

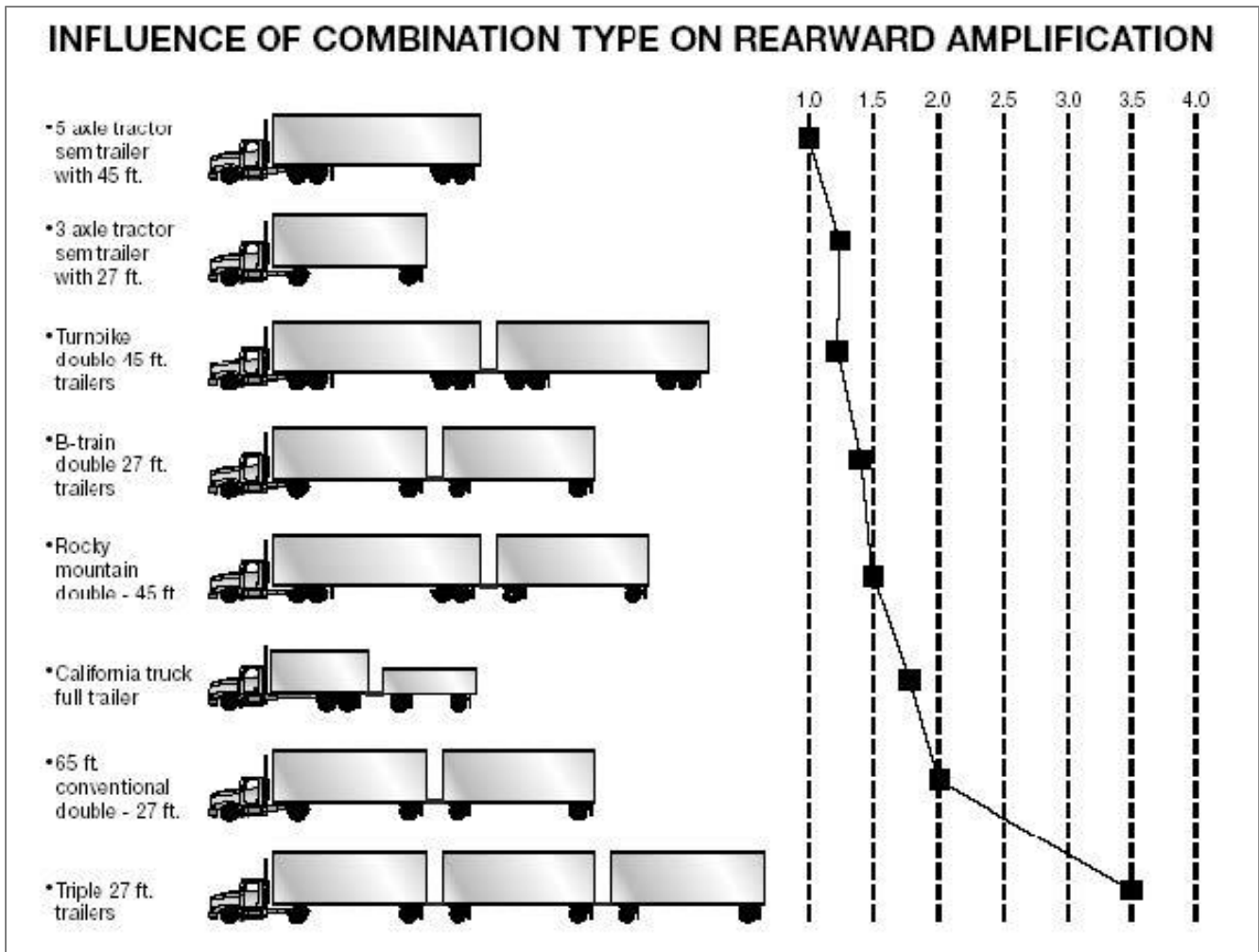
Control your speed whether your truck is loaded or empty. Big trucks take longer to stop when they are empty. That's because empty trucks have stiff suspension springs and strong brakes, which can reduce traction. This makes it very easy to lock up the wheels and lose control.

If this happens:

- Your trailer can swing out and hit other vehicles.
- Your tractor can jackknife very quickly.

Be extra careful when driving a "bobtail" (a tractor without a semi trailer). Tests show that bobtails are hard to stop smoothly. They often take longer to stop than a fully loaded tractor-semitrailer.

In any combination rig, allow lots of following distance and look far ahead, so you can brake early. This helps you avoid sudden emergencies and hazards.



**Figure 6.1**

### 6.1.4 – Railroad-highway Crossings

Railroad-highway crossings can also cause problems, especially if your trailer has low ground clearance.

These trailers can get stuck on raised crossings:

- Low slung units (lowboy, car carrier, moving van, possum-belly, livestock trailer).
- Single-axle tractor pulling a long trailer with its landing gear set to accommodate a tandem-axle tractor.

If your vehicle gets stuck on the tracks, get out right away and move away from the tracks.

Look for a sign or signal box at the crossing. It will have emergency contact information.

Call 911 or the number listed. Tell them exactly where you are. Mention any landmarks.

## 6.1.5 – Prevent Trailer Skids

If the trailer's wheels lock up, the trailer can swing out to the side. This happens more often when the trailer is empty or lightly loaded. It's called a "trailer jackknife." See Figure 6.2 for an image that shows a trailer jackknife.

### HOW TO STOP A TRAILER SKID:

1. **Recognize the skid.** The first and most important step is to watch your mirrors. If you brake hard, check your mirrors right away to make sure the trailer is staying behind you. If the trailer swings out of your lane, it can jackknife and that is very hard to stop.
2. **Take your foot off the brake.** Let go of the brakes so the trailer can get its grip, or traction, back. Do not use the trailer hand brake (if you have one) to try to straighten out the rig. This can make the skid worse because the trailer brakes likely caused the skid in the first place. Once the trailer wheels grip the road again, the trailer will straighten out and follow the tractor.

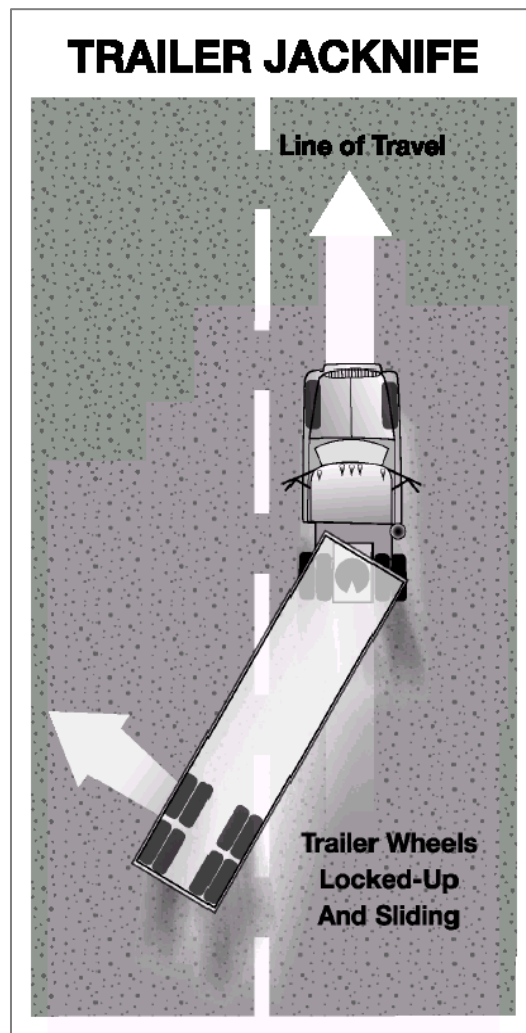


Figure 6.2

## 6.1.6 – Turning Wide and Off-Tracking

When a vehicle goes around a corner, the rear wheels follow a different path than the front wheels. This is called off-tracking or "cheating." Figure 6.3 shows how off-tracking causes the path followed by a tractor to be wider than the rig itself.

Longer vehicles will off-track more often. The rear wheels of the truck will off-track some, and the rear wheels of the trailer will off-track even more. If there is more than one trailer, the rear wheels of the last trailer 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 anything else. However, keep the rear of your vehicle close to the curb. This will stop other drivers from passing you on the right.

If you cannot complete your turn without entering another traffic lane, turn wide as you complete the turn. This is better than swinging wide to the left before starting the turn because it will keep other drivers from passing you on the right. See Figure 6.4.

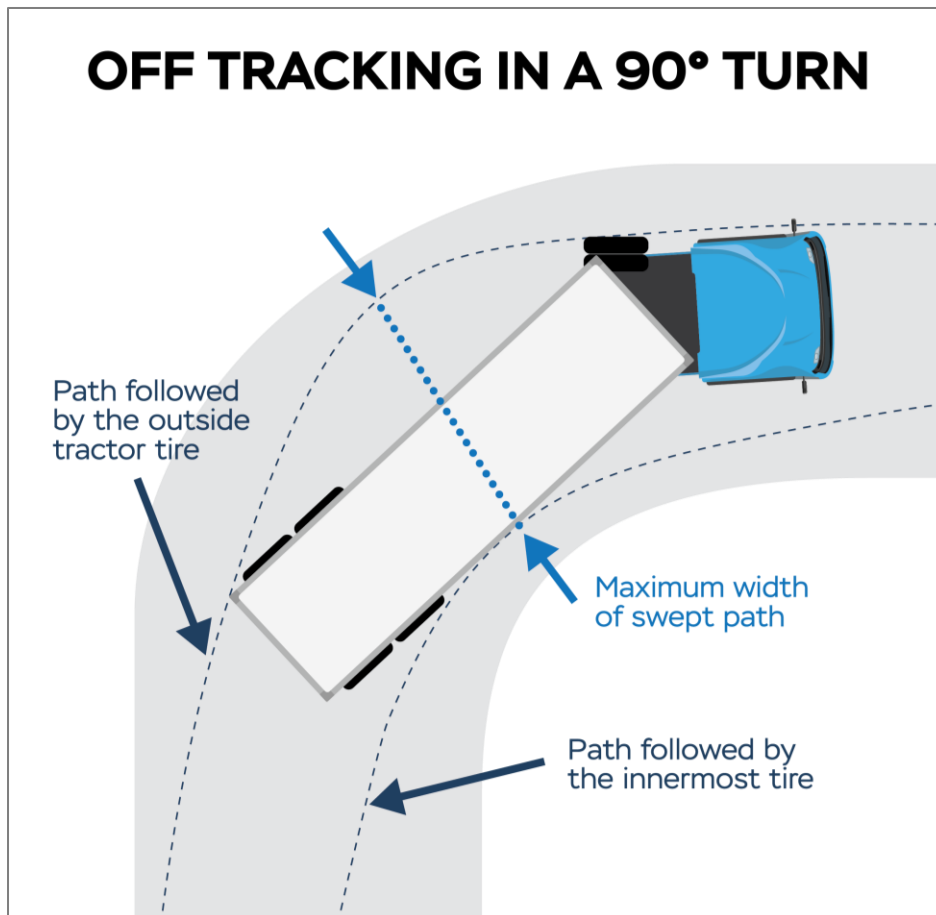


Figure 6.3

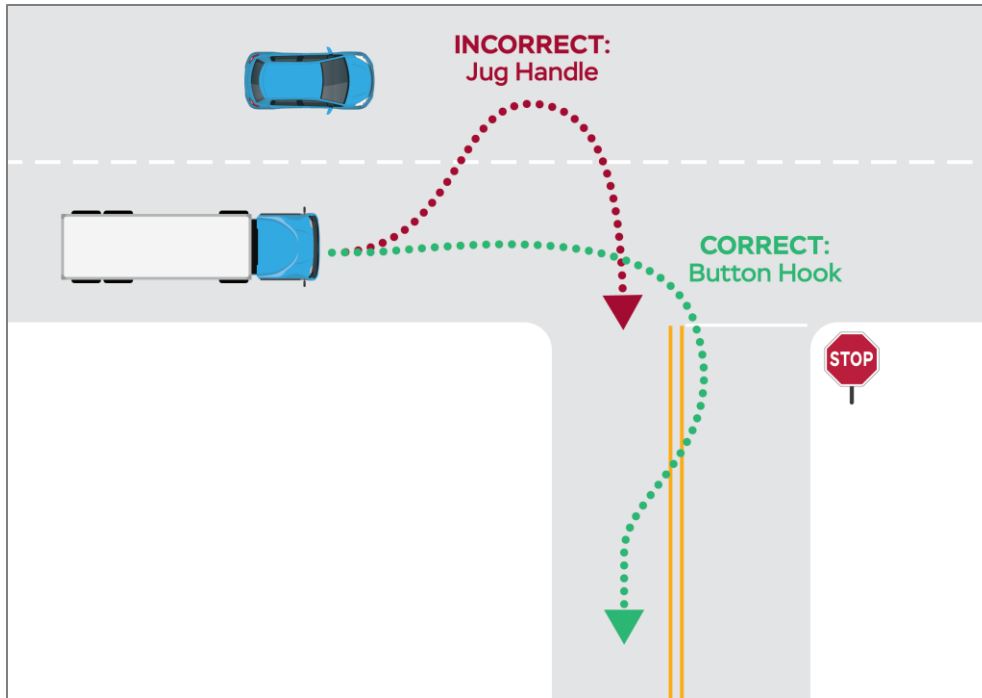
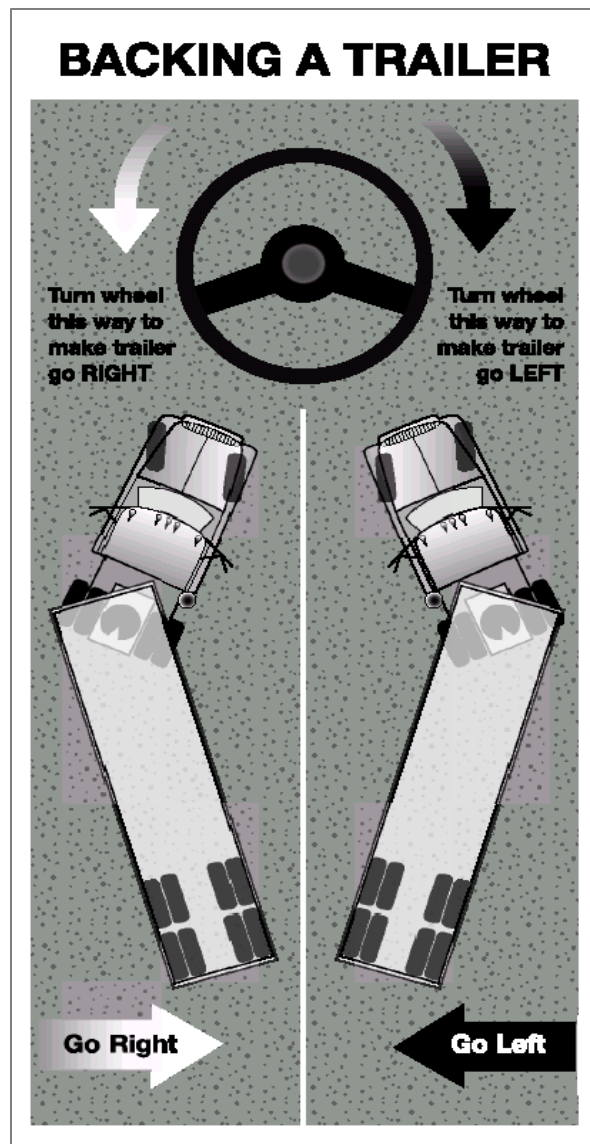


Figure 6.4

### 6.1.7 – Backing with a Trailer.

**Backing with a Trailer.** When backing a car, straight truck, or bus, you turn the top of the steering wheel in the direction you want to go. When backing a trailer, you turn the steering wheel in the opposite direction. Once the trailer starts to turn, you must turn the wheel the other way to follow the trailer.

Whenever you back up 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. See Figure 6.5.



**Figure 6.5**

**Look at Your Path.** Look at your line of travel before you begin. Get out and walk around the vehicle. Check your clearance to the sides and overhead, in and near the path of your vehicle.

**Use Mirrors on Both Sides.** Check the outside mirrors on both sides frequently. Get out of the vehicle and re-inspect your path if you are unsure.

**Back Slowly.** This will let you make corrections before you get too far off course.

**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.

**Pull Forward.** When backing a trailer, make pull-ups to reposition your vehicle as needed.

## Subsection 6.1 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. When you back a trailer, you should position your vehicle so you can back in a curved path to the driver's side. True or False?
6. What type of trailers can get stuck on railroad-highway crossings?

These questions may be on your test. If you can't answer them all, re-read subsection 6.1.

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## 6.2 – Combination Vehicle Air Brakes

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You should study Section 5: Air Brakes before reading this. In combination vehicles the braking system has parts to control the trailer brakes, in addition to the parts described in Section 5. These parts are described below.

### 6.2.1 – Trailer Hand Valve

The trailer hand valve (also called the trolley valve or Johnson bar) works the trailer brakes. The trailer hand valve should be used only to test the trailer brakes. Do not use it in driving because of the danger of making the trailer skid. The foot brake sends air to every brake on the vehicle, including the trailer(s). There is much less danger of causing a skid or jackknife when using just the foot brake.

Never use the hand valve for parking because all the air might leak out unlocking the brakes (in trailers that don't 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.

### 6.2.2 – Tractor Protection Valve

The tractor protection valve keeps air in the tractor or truck brake system should the trailer break away or develop a bad leak. The tractor protection valve is controlled by the "trailer air supply" control valve in the cab. The control valve allows you to open and shut the tractor protection valve.

The tractor protection valve will close automatically if air pressure is low (in the range of 20 to 45 psi). When the tractor protection valve closes it stops any air from going out of the tractor. It also lets the air out of the trailer emergency line. This causes the trailer emergency brakes to come on, with possible loss of control. For more information about emergency brakes, read Section 6.2.8.

## 6.2.3 – Trailer Air Supply Control

The trailer air supply control on newer vehicles is a red eight-sided knob, which you use to control the tractor protection valve. You push it in to supply the trailer with air and pull it out to shut the air off and put on the trailer emergency brakes. The valve will pop out (thus closing the tractor protection valve) when the air pressure drops into the range of 20 to 45 psi.

Tractor protection valve controls or "emergency" valves on older vehicles may not work automatically. There may be a lever rather than a knob. The "normal" position is used for pulling a trailer. The "emergency" position is used to shut the air off and put on the trailer emergency brakes.

## 6.2.4 – Trailer Air-lines

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, etc.)

### **SERVICE AIR-LINE**

The service line (also called the control line or signal line) carries air, which is controlled by the foot brake or the trailer hand brake. 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. These valves allow the trailer brakes to be applied more quickly than would otherwise be possible.

### **EMERGENCY AIR-LINE**

The emergency line (also called the supply line) has two purposes:

1. It supplies air to the trailer air tanks.
2. It controls the emergency brakes on combination vehicles.

Loss of air pressure in the emergency line causes the trailer emergency brakes to come on. The pressure loss could have many different causes like:

- a trailer breaking loose and tearing apart the emergency air hose
- a leak in a hose,
- cracked metal tubing,
- or some other part breaking or getting loose, letting the air out.

When the emergency line loses pressure, it also causes the tractor protection valve to close (the air supply knob will pop out).

Emergency lines are often coded with the color red (red hose, red couplers, or other parts) to keep from getting them mixed up with the blue service line.

## 6.2.5 – Hose Couplers (Glad Hands)

Glad hands are coupling devices used to 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 a connection is made. When connecting the glad hands, press the two seals together with the couplers at a 90 degree angle to each other. Turn the glad hand attached to the hose to join and lock the couplers.

When coupling, make sure to couple the proper glad hands together. To help avoid mistakes, the lines are sometimes different colors. Blue is used for the service lines and red for the emergency (supply) lines. Sometimes, metal tags are attached to the lines with the words "service" and "emergency" stamped on them. See Figure 6.6

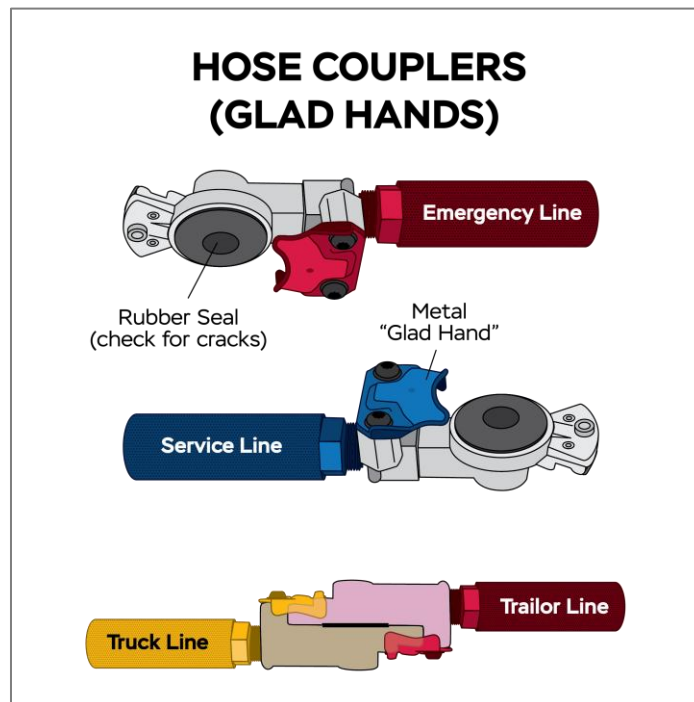


Figure 6.6

If you do cross the air-lines, supply air will be sent to the service line instead of going to charge the trailer air tanks. Air will not be available to release the trailer spring brakes (parking brakes). If the spring brakes don't 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 there will be no emergency brakes, and the trailer wheels will turn freely. If you crossed the air-lines, you could drive away but you wouldn't have trailer brakes. This would be very dangerous. Always test the trailer brakes before driving with the hand valve or by pulling the air supply (tractor protection valve) control. Pull gently against them in a low gear to make sure the brakes work.

Some vehicles have "dead end" or dummy couplers to which the hoses may be attached when they are not in use. This will prevent water and dirt from getting into 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, the glad hands can sometimes be locked together (depending on the couplings). It is very important to keep the air supply clean.

## 6.2.6 – Trailer Air Tanks

Each trailer and converter dolly has one or more air tanks. They are filled by the emergency (supply) line from the tractor. They provide the air pressure used to operate trailer brakes. Air pressure is sent from the air tanks to the brakes by relay valves.

The pressure in the service line tells how much pressure the relay valves should send to the trailer brakes. The pressure in the service line is controlled by the brake pedal (and the trailer hand brake).

It is important that you don't let water and oil build up in the air tanks. If you do, the brakes may not work correctly. Each tank has a drain valve on it and you should drain each tank every day. If your tanks have automatic drains, they will keep most moisture out. But you should still open the drains to make sure.

## 6.2.7 – Shut-off Valves

Shut-off valves (also called cut-out cocks) are used in the service and supply air-lines at the back of trailers used to tow other trailers. These valves let you close the air-lines off when another trailer is not being towed. You must check that all shut-off valves are in the open position except the ones at the back of the last trailer, which must be closed.

## 6.2.8 – Trailer Service, Parking, and Emergency Brakes

Newer trailers have spring brakes just like trucks and truck tractors. However, converter dollies and trailers built before 1975 do not have 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.

For trailers without spring brakes, the emergency brakes come on whenever air pressure in the emergency line is lost. The emergency brakes come on whenever the air supply knob is pulled out or the trailer is disconnected. A major leak in the emergency line will cause the tractor protection valve to close and the trailer emergency brakes to come on. But the brakes will hold only as long as there is air pressure in the trailer air tank. Eventually, the air will leak away and then there will be no brakes. These trailers don't have a parking brake, so it is very important you use wheel chocks when you park trailers without spring brakes.

You may not notice a major leak in the service line until you try to put the brakes on. Then, the air loss from the leak will lower the air tank pressure quickly. If it goes low enough, the trailer emergency brakes will come on.

## Subsection 6.2 Test Your Knowledge

1. Why should you not use the trailer hand valve while driving?
2. Describe what the trailer air supply control does.
3. Describe what the service line is 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 shut-off valves?

These questions may be on your test. If you can't answer them all, re-read subsection 6.

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## 6.3 – Antilock Brake Systems

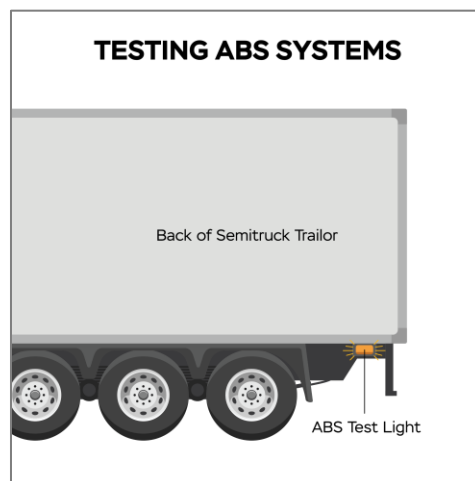
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### 6.3.1 – Trailers Required to Have ABS

All trailers and converter dollies built on or after March 1, 1998, are required to have ABS. However, many trailers and converter dollies built before this date have been voluntarily equipped with ABS.

Trailers will have yellow ABS malfunction lamps on the left side, either on the front or rear corner. See Figure 6.7. Dollies manufactured on or after March 1, 1998, are required to have a lamp on the left side.

In the case of vehicles manufactured before the required date, it may be difficult to tell if the unit is equipped with ABS. Look under the vehicle for the ECU and wheel speed sensor wires coming from the back of the brakes.



**Figure 6.7**

## 6.3.2 – Braking with ABS

ABS is an addition to your normal brakes. It does not decrease or increase your normal braking capability. ABS only activates when wheels are about to lock up.

ABS does not always shorten your stopping distance, but it does help you keep the vehicle under control during hard braking.

ABS helps you avoid wheel lock up. The computer senses impending lockup, reduces the braking pressure to a safe level, and you maintain control.

Having ABS on only the trailer, or even on only one axle, still gives you more control over the vehicle during braking.

When only the trailer has ABS, the trailer is less likely to swing out, but if you lose steering control or start a tractor jackknife, let up on the brakes (if you can safely do so) until you gain control.

When you drive a tractor-trailer combination with ABS, you should brake as you always have. In other words:

Use only the braking force necessary to stop safely and stay in control.

Brake the same way, regardless of whether you have ABS on the tractor, the trailer, or both.

As you slow down, watch your tractor and trailer and back off the brakes (if it is safe to do so) to stay in control.

**Remember**, if your ABS malfunctions, you still have regular brakes. Drive normally but get the system serviced soon.

ABS won't allow you to drive faster, follow more closely, or drive less carefully.

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## 6.4 – Coupling and Uncoupling

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Knowing how to couple and uncouple correctly is basic to safe operation of combination vehicles. Wrong coupling and uncoupling can be very dangerous. General coupling and uncoupling steps are listed below. There are differences between different rigs, so learn the details of coupling and uncoupling the truck(s) you will operate.

## 6.4.1 – How to Couple or Uncouple Tractor-Semitrailers

### STEP 1: INSPECT FIFTH WHEEL

- Check for damaged/missing parts.
- Check to see that mounting to the tractor is secure, no cracks in the frame, etc.
- Be sure that the fifth wheel plate is greased as required. If you don't, it could cause steering problems because of friction between the tractor and trailer.
- Check if fifth wheel is in proper position for coupling:
- Be sure the wheel is tilted down toward the rear of the tractor
- Check that the jaws open.
- Check the safety unlocking handle is in the automatic lock position.
- If you have a sliding fifth wheel, make sure it is locked.
- Make sure the trailer kingpin is not bent or broken.

### STEP 2: INSPECT AREA AND CHOCK WHEELS

- Make sure the area around the vehicle is clear.
- Be sure trailer wheels are chocked or spring brakes are on.
- Check that cargo (if any) is secured against movement due to the tractor being coupled to the trailer.

### STEP 3: POSITION TRACTOR

- Put the tractor directly in front of the trailer. (Never back under the trailer at an angle because you might push the trailer sideways and break the landing gear.)
- Check position, using outside mirrors, by looking down both sides of the trailer.

### STEP 4: BACK SLOWLY

- Back until the fifth wheel just touches the trailer. Don't hit the trailer.

### STEP 5: SECURE TRACTOR

- Put on the parking brake.
- Put the transmission in neutral.

### STEP 6: CHECK TRAILER HEIGHT

- The trailer should be low enough that it is raised slightly by the tractor when the tractor is backed under it. Raise or lower the trailer as needed. (If the trailer is too low, the tractor may strike and damage the trailer nose; if the trailer is too high, it may not couple correctly.)

- Check that the kingpin and fifth wheel are aligned.

### **STEP 7: CONNECT AIR-LINES TO TRAILER**

- Check glad hand seals and connect tractor emergency air-line to trailer emergency glad hand.
- Check glad hand seals and connect tractor service air-line to trailer service glad hand.
- Make sure air-lines are safely supported where they won't be crushed or caught while the tractor is backing under the trailer.

### **STEP 8: SUPPLY AIR TO TRAILER**

- From the cab, push in "air supply" knob or move tractor protection valve control from the "emergency" to the "normal" position to supply air to the trailer brake system.
- Wait until the air pressure is normal. Check brake system for crossed air-lines.
- Shut the engine off so you can hear the brakes.
- Apply and release trailer brakes and listen for the sound of trailer brakes being applied and released. You should hear the brakes move when applied and hear air escape when the brakes are released.
- Check the air brake system pressure gauge for signs of major air loss.
- When you are sure trailer brakes are working, start the engine.
- Make sure air pressure is up to normal.

### **STEP 9: LOCK TRAILER BRAKES**

- Pull out the "air supply" knob or move the tractor protection valve control from "normal" to "emergency."

### **STEP 10: BACK UNDER 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 CONNECTION FOR SECURITY**

- Raise trailer landing gear slightly off 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 VEHICLE**

- Put the transmission in neutral. Put parking brakes on.

- Shut off the engine and take the key with you so someone else won't move the truck while you are under it.

### **STEP 13: INSPECT COUPLING**

- Use a flashlight, if necessary.
- Make sure there is no space between the upper and lower fifth wheel. If there is space, something is wrong (kingpin may be on top of the closed fifth wheel jaws, and the trailer would come loose very easily).
- Go under the trailer and look into the back of the fifth wheel. Make sure the fifth wheel jaws have closed around the shank of the kingpin.
- Check that the locking lever is in the "lock" position.
- Check that the safety latch is in position over the locking lever. On some fifth wheels the catch must be put in place by hand.
- If the coupling isn't right, don't drive the coupled unit; get it fixed.

### **STEP 14: CONNECT THE ELECTRICAL CORD AND CHECK AIR-LINES**

- Plug the electrical cord into the trailer and fasten the safety catch.
- Check both air-lines and electrical lines for signs of damage.
- Make sure air and electrical lines will not hit any moving parts of vehicle.

### **STEP 15: RAISE FRONT TRAILER SUPPORTS (LANDING GEAR)**

- Use low gear range (if so equipped) to begin raising the landing gear. Once free of weight, switch to the high gear range.
- Raise the landing gear all the way up. (Never drive with landing gear only part way up as it may catch on railroad tracks or other things.)
- After raising the landing gear, secure the crank handle safely.
- When full weight of trailer is resting on tractor:
- Check for enough clearance between the rear of the tractor frame and landing gear. When the tractor turns sharply, it must not hit the landing gear.
- Check that there is enough clearance between the top of the tractor tires and the nose of the trailer.

### **STEP 16: REMOVE TRAILER WHEEL CHOCKS**

- Remove and store wheel chocks in a safe place.

## **6.4.2 – Uncoupling Tractor-Semitrailers**

The following steps will help you to uncouple safely.

## **STEP 1: POSITION RIG**

- Make sure the surface of the parking area can support the weight of the trailer.
- Have the tractor lined up with the trailer. Pulling out at an angle can damage landing gear.

## **STEP 2: EASE PRESSURE ON LOCKING JAWS**

- Shut off trailer air supply to lock trailer brakes.
- Ease pressure on fifth wheel locking jaws by backing up gently. (This will help you release the fifth wheel locking lever.)
- Put parking brakes on while the tractor is pushing against the kingpin. (This will hold the rig with pressure off the locking jaws.)

## **STEP 3: CHOCK TRAILER WHEELS**

- Chock the trailer wheels if the trailer doesn't have spring brakes or if you're not sure. (The air could leak out of the trailer air tank, releasing its emergency brakes. Without chocks, the trailer could move.)

## **STEP 4: LOWER THE LANDING GEAR**

- If the trailer is empty, lower the landing gear until it makes firm contact with the ground.
- If the trailer is loaded, after the landing gear makes firm contact with the ground, turn 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 will:
  - Make it easier to unlatch the fifth wheel.
  - Make it easier to couple the next time.

## **STEP 5: DISCONNECT AIR-LINES AND ELECTRICAL CABLE**

- Disconnect air-lines from the trailer. Connect air-line glad hands to dummy couplers at the back of the cab or couple them together.
- Hang electrical cable with plug down to prevent moisture from entering it.
- Make sure lines are supported so they won't be damaged while driving the tractor.

## **STEP 6: UNLOCK FIFTH WHEEL**

- Raise the release handle lock.
- Pull the release handle to the "open" position.
- Keep legs and feet clear of the rear tractor wheels to avoid serious injury in case the vehicle moves.

### **STEP 7: PULL TRACTOR PARTIALLY CLEAR OF TRAILER**

- Pull the tractor forward until the fifth wheel comes out from under the trailer.
- Stop with the tractor frame under the trailer (prevents the trailer from falling to ground if landing gear should collapse or sink).

### **STEP 8: SECURE TRACTOR**

- Apply the parking brake.
- Place transmission in neutral.

### **STEP 9: INSPECT TRAILER SUPPORTS**

- Make sure the ground is supporting the trailer. Make sure the landing gear is not damaged.

### **STEP 10: PULL TRACTOR CLEAR OF TRAILER**

- Release parking brakes.
- Check the area and drive the tractor forward until it clears.

## Subsections 6.3 and 6.4 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?
5. How do you know if your trailer is equipped with antilock brakes?

These questions may be on your test. If you can't answer them all, re-read subsections 6.3 and 6.4.

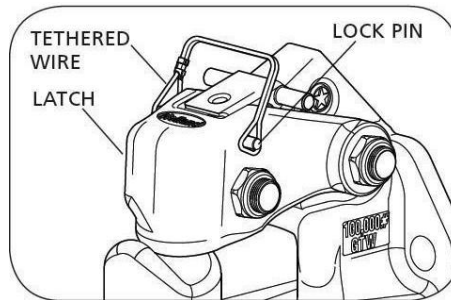
### **6.4.3 – Coupling a Pintle Hook**

#### **STEP 1: INSPECT PINTLE HOOK**

- Before operating, check for worn, damaged, or missing parts, and make sure the mount is secure. If the pintle hook is not secured to the mounting surface, the pintle hook could separate from the vehicle which, if not avoided, could result in death or serious injury.

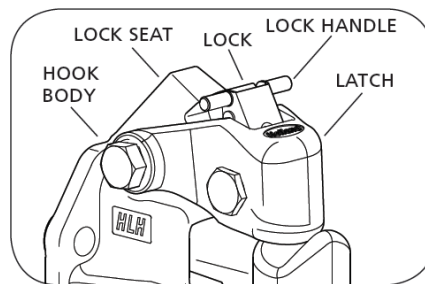
## STEP 2: UNLOCK LOCK PIN AND OPEN LATCH

- Unlock and remove the tethered lock pin, if applicable (Figure 6.8).

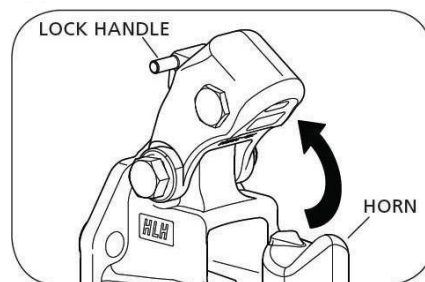


**Figure 6.8**

- Lift the lock handle away from the vehicle until the lock clears the lock seat on the hook body.
- Open the latch by rotating the latch assembly up toward the vehicle until the latch is in its most upright position, then release the lock handle. (Figures 6.9 and 6.10)



**Figure 6.9**



**Figure 6.10**

## STEP 3: LOWER DRAWBAR INTO PLACE

- Position the drawbar eye over the horn of the pintle hook and lower it into place.

#### STEP 4: LOCK PINTLE HOOK

- Push the latch closed. When locked correctly, the lock handle will rotate and move up until it is flush with the top of the latch (Figure 6.11).

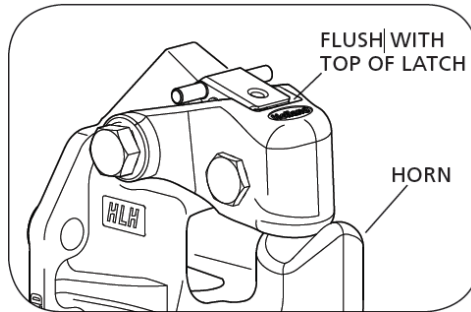


Figure 6.11

- Insert the tethered lock pin through the latch and lock holes, and close the tethered wire lock pin. (Figure 6.8).
- Not locking the latch correctly can cause the trailer to separate from the vehicle. A trailer separation could cause death or serious injury if the trailer were to hit someone.

### 6.4.4 – Uncoupling a Pintle Hook

#### STEP 1: PARK ON LEVEL SURFACE

- Park the trailer on a firm level surface and block trailer tires.

#### STEP 2: DISCONNECT ELECTRICAL CONNECTOR, BREAKAWAY BRAKE SWITCH AND SAFETY CHAINS

- Disconnect electrical connector.
- Disconnect breakaway brake switch lanyard. Disconnect safety chains from tow vehicle.

#### STEP 3: UNLOCK THE COUPLER

- Unlock the coupler and open it.

#### STEP 4: CHECK GROUND SURFACE FOR CORRECT SUPPORT

- Before extending the jack, make sure the ground surface below the jack pad will support the tongue load.

### STEP 5: ROTATE JACK HANDLE

- Rotate jack handle to extend the jack and transfer the weight of the trailer tongue to the jack.

### STEP 6: RAISE TRAILER COUPLER

- Raise the trailer coupler above the tow vehicle hitch.

### STEP 7: DRIVE FORWARD

- Drive the tow vehicle forward.

## 6.4.5 – Coupling a Drawbar

USE FIGURE 6.12 TO FOLLOW THE STEPS 1-4:

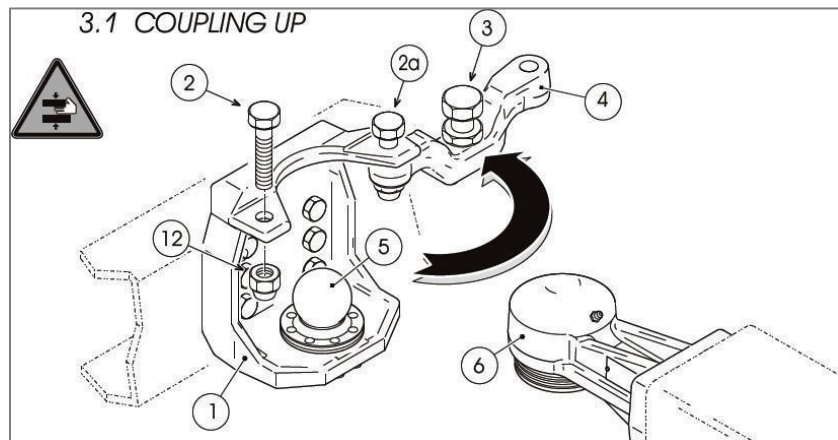


Figure 6.12

#### Step 1: Remove Safety Lock screw and Rotate Safety Cover Bar

- Remove **safety lock screw (2 in Figure 6.12)**, recover and keep its **self-locking nut (12 in Figure 6.12)** aside then also loosen **safety lock screw (2a in Figure 6.12)** and turn out the **adjustment screw (3 in Figure 6.12)** by at least five turns.
- Rotate the **safety cover bar (4 in Figure 6.12)** outwards so that it is completely open.

#### Step 2: Reverse Truck

- Reverse truck very slowly until the **ball cup drawbar eye (6 in Figure 6.12)** is in position exactly above the **drawbar coupling ball (5 in Figure 6.12)**.

#### Step 3: Lower the Drawbeam

- Lower the drawbeam until the **ball cup drawbar eye (6 in Figure 6.12)** lies completely covering the **drawbar coupling ball (5 in Figure 6.12)**.

#### Step 4: Rotate the Safety Cover Bar

- Rotate the **safety cover bar (4 in Figure 6.12)** back inwards and fit in **safety lock screw (2 in Figure 6.12)** together with its **self-locking nut (12 in Figure 6.12)**.
- Tighten in both the **lock screws (2,2a in Figure 6.12)** together with their **self-locking nuts (12, 12a in Figure 6.12)** at a 350 to 400 Nm torque wrench setting.

#### USE FIGURE 6.13 TO FOLLOW STEP 5:

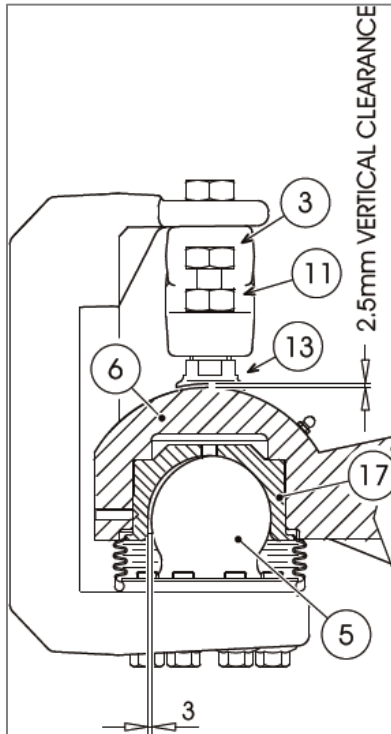


Figure 6.13

#### Step 5: Adjust the Adjustment Screw

- Adjust the **adjustment screw (3 in Figure 6.13)** until there is a 0.3 - 0.5 mm vertical clearance between the **guard disk (13 in Figure 6.13)** and the **ball cup (6 in Figure 6.13)**. Lock setting with **counter nut (11 in Figure 6.13)**.

USE FIGURE 6.14 TO FOLLOW STEPS 6-7:

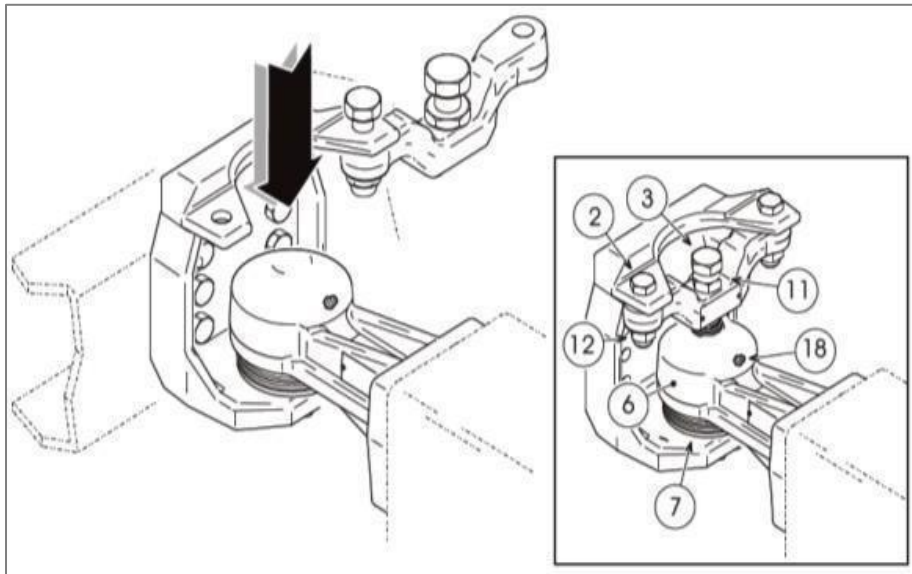


Figure 6.14

The **safety cover bar (4 in Figure 6.12)** must perfectly lodge into its seating appropriately or you are not allowed to drive the combination vehicle.

#### Step 6: Protect Coupling Ball and Anchor Edge onto Ball

- Protect the part that is still visible of the **coupling ball (5 in Figure 6.14)** with the **rubber dust proof bellows protection cover (7 in Figure 6.14)**. Accurately anchor the edge directly onto the ball itself.

#### Step 7: Lubricate the Drawbar Eye

- Lubricate the inside of the **drawbar eye ball cup (6 in Figure 6.14)** directly through the **grease nipple (18 in Figure 6.14)**.

### 6.4.6 – Uncoupling a Drawbar

#### STEP 1: TURN TRAILER BRAKE ON

- Make sure that the trailer brake is on.

#### STEP 2: REMOVE COVER AND LOOSEN SCREWS

- Remove the **rubber dust proof bellows protection cover (7 in Figure 6.13)**.
- Loosen the **adjustment screw (3 in Figure 6.13)** and the **counter nut (11 in Figure 6.13)**.
- Loosen **safety lock screw (2a in Figure 6.12)** and remove **safety lock screw (2 in Figure 6.12)** together with its **self-locking nut (12 in Figure 6.12)**.

### **STEP 3: ROTATE SAFETY COVER BAR AND LIFT TRAILER DRAWBEAM**

- Rotate the **safety cover bar (4 in Figure 6.12)** outwards so that it is completely open.
- Lift the trailer drawbeam until the **drawbar coupling ball (5 in Figure 6.12)** is fully visible. Move forward with the trailer very slowly.
- Rotate the **safety cover bar (4 in Figure 6.12)** inwards until it lodges back in its housing.

### **STEP 4: LOCK SAFETY SCREW AND TIGHTEN SELF- LOCKING NUT**

- Fit in **safety lock screw (2 in Figure 6.12)** and tighten in **self-locking nut (12 in Figure 6.12)**.

## **6.4.7 – Coupling a Gooseneck Hitch**

If you are hooking up a Gooseneck or a fifth wheel hitch, the procedure is a little different from a receiver and ball, but it is not more difficult.

### **STEP 1: OPEN THE LATCH AND LUBRICATE THE GOOSENECK BALL**

- Open the clamp latch on the Gooseneck coupler. Make sure that the Gooseneck ball is properly lubricated.

### **STEP 2: POSITION COUPLER AND LATCH THE CLAMP**

- Position the trailer's coupler directly over the ball and lower the Gooseneck trailer into position and latch the clamp.

### **STEP 3: ATTACH SAFETY CHAINS**

- Attach your safety chains. Remember that all gooseneck trailers are required by law to have safety chains.

### **STEP 4: CONNECT TRAILER LIGHT WIRING**

- Connect your trailer light wiring to your vehicle's connector.
- Check all your lights, including your brake lights.

### **STEP 5: LOWER AND STOW THE TRAILER JACKS**

- Completely lower and stow the trailer jacks, allowing the weight to settle onto the tow vehicle.

## **6.4.8 – Uncoupling a Gooseneck Hitch**

### **STEP 1: REMOVE SAFETY PIN AND CLIP**

- Simply remove the safety pin and clip.

## STEP 2: ROTATE HANDLE AND RAISE TRAILER OFF BALL

- Rotate handle to the position shown in Figure 6.15 and raise trailer off ball. Coupler will return to load position automatically.

## STEP 3: INSTALL SAFETY PIN AND CLIP

- Install safety pin and clip. See Figure 6.15.

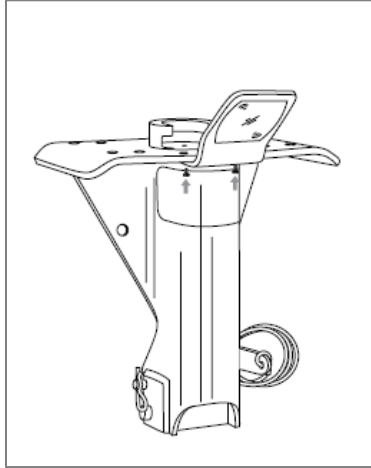


Figure 6.15

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## 6.5 – Inspecting a Combination Vehicle

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Use the **seven-step inspection procedure described in Section 2** to inspect your combination vehicle. There are more things to inspect on a combination vehicle than on a single vehicle. For example, tires, wheels, lights, reflectors, etc. However, there are also new things to check. These are discussed below.

### 6.5.1 – Additional Things to Check during a Walk-around Inspection

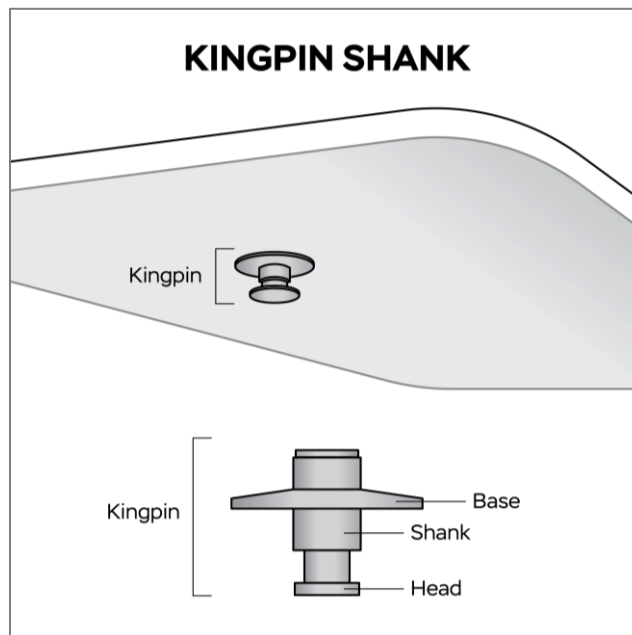
Do these checks in addition to those already listed in Section 2.

#### COUPLING SYSTEM AREAS

Check the fifth wheel (lower part):

- Securely mounted to frame.
- No missing or damaged parts.

- Has enough grease.
- No visible space between upper and lower fifth wheel.
- Locking jaws are around the shank and not the head of kingpin. See Figure 6.16.
- Release arm is properly seated and safety latch/lock engaged.



**Figure 6.16**

- Check the fifth wheel (upper part).
- Glide plate is securely mounted to the trailer frame. Kingpin is not damaged.
- Air and electric lines to the trailer.
- Electrical cord is firmly plugged in and secured.
- Air-lines are properly connected to glad hands with no air leaks.
- Air-lines are properly secured with enough slack for turns.
- All lines are free from damage.
- Check Sliding fifth wheel if there is one.
- Slide is not damaged or parts missing.
- Slide is properly greased.
- All locking pins are present and locked in place.
- If air powered check there are no air leaks.
- Check that the fifth wheel is not so far forward that the tractor frame will hit the landing gear or the cab hit the trailer, during turns.

## LANDING GEAR

- Fully raised.
- Parts are not missing, bent or otherwise damaged.
- Crank handle in place and secured.
- If power operated, no air or hydraulic leaks.

## 6.5.2 – Combination Vehicle Brake Check

Do these checks in addition to those listed in Section 5.3: Inspecting Air Brake Systems.

The following section explains how to check air brakes on combination vehicles. Check the brakes on a double or triple trailer as you would any combination vehicle.

### CHECK THAT AIR FLOWS TO ALL TRAILERS

- Use the tractor parking brake or chock the wheels to hold the vehicle.
- Wait for air pressure to reach normal, then push in the red "trailer air supply" knob. This will supply air to the emergency (supply) lines.
- Use the trailer handbrake to provide air to the service line.
- Go to the rear of the rig.
- Open the emergency line shut-off valve at the rear of the last trailer. You should hear air escaping, showing the entire system is charged.
- Close the emergency line valve.
- With the trailer handbrake or service brake pedal on, open the service line valve to check that service pressure goes through all the trailers and then close the valve. If you do NOT hear air escaping from both lines, check that the shut-off valves on the trailer and dolly are in the OPEN position. You MUST have air all the way to the back for all the brakes to work.

### TEST TRACTOR PROTECTION VALVE

- Charge the trailer air brake system by building up normal air pressure and pushing the "air supply" knob in.
- Shut the engine off.
- 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 "normal" to "emergency" position) when the air pressure falls into the pressure range specified by the manufacturer. Usually within the range of 20 to 45 psi.

If the tractor protection valve doesn't work properly, 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 TRAILER EMERGENCY BRAKES

- Charge the trailer air brake system and check that the trailer rolls freely.
- Then stop and pull out the trailer air supply control (also called tractor protection valve control or trailer emergency valve) or place it in the "emergency" position.
- Pull gently on the trailer with the tractor to check that the trailer emergency brakes are on.

## TEST TRAILER SERVICE BRAKES

- Check for normal air pressure,
- Release the parking brakes,
- Move the vehicle forward slowly and apply trailer brakes with the hand control (trolley valve), if so equipped.
  - You should feel the brakes come on. This tells you the trailer brakes are connected and working. The trailer brakes should be tested with the hand valve, but controlled in normal operation with the foot pedal, which applies air to the service brakes at all wheels.

## Subsection 6.5 Test Your Knowledge

1. Which shut-off valves should be open and which closed?
2. How can you test that 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 your test. If you can't answer all of them, re-read subsection 6.5.

# Section 7: Doubles and Triples

## This Section Covers

1. Pulling Double/Triple Trailers
2. Coupling and Uncoupling
3. Inspecting Doubles and Triples
4. Checking Air Brakes

This section tells you about driving safely with double and triple trailers. It tells you about how important it is to be very careful when driving with more than one trailer, how to couple and uncouple correctly, and about inspecting doubles and triples carefully. If you want to get your CDL with a Double/Triple endorsement, you should also study Sections 2, 5, and 6.

**NOTE:** Triples are not allowed under Maryland Law, but you can still get the endorsement T with a knowledge test.

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## 7.1 – Pulling Double/Triple Trailers

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You need to take special care when pulling two and three trailers. The extra trailers make your vehicle less stable and more likely to rollover. Pay special attention to the situations covered in the next sections.

### 7.1.1 – Prevent Your Trailer from Rolling Over

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 trailer combination vehicle may be too fast for a set of doubles or triples.

### 7.1.2 – Beware of the Crack-the-Whip Effect

Doubles and triples are more likely to turn over than other combination vehicles because of the "crack-the-whip" effect. You must steer gently when pulling trailers. The last trailer in a combination is the trailer most likely to turn over. If you don't understand the crack-the-whip effect, study subsection 6.1.2 of this manual.

### 7.1.3 – Inspect Completely

There are more critical parts to check when you have two or three trailers. You need to check them all. Follow the steps described later in this section.

### 7.1.4 – Look Far Ahead

Doubles and triples must be driven very smoothly to avoid rollover or jackknife. Look further ahead than you would while driving a single vehicle so you can slow down and change lanes safely.

### 7.1.5 – Manage Space

Doubles and triples take up more space than other commercial vehicles. They are longer and need more space because they can't be turned or stopped suddenly. You should allow more following distance. Make sure you have large enough gaps before entering or crossing traffic. Be certain you are clear at the sides before changing lanes.

### 7.1.6 – Bad Conditions

Be more careful in bad conditions. In bad weather, slippery conditions, and mountain driving, you must be especially careful if you drive doubles and triples. You will have more length and more dead axles to pull with your drive axles than other drivers. There is more chance for skids and loss of traction.

### 7.1.7 – Parking the Vehicle

When parking a vehicle pulling more than one trailer, you need to choose a spot you can pull straight through. Trying to back up out of a parking spot will take a lot of time and be very difficult. You need to be aware of how parking lots are arranged to avoid a long and difficult escape.

### 7.1.8 – Antilock Braking Systems on Converter Dollies

Converter dollies built on or after March 1, 1998, must have antilock brakes. These dollies will have a yellow lamp on the left side of the dolly.

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## 7.2 – Coupling and Uncoupling

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Knowing how to couple and uncouple correctly is basic to safe operation of doubles and triples. Wrong coupling and uncoupling can be very dangerous. Coupling and uncoupling steps for doubles and triples are listed below.

### 7.2.1 – Coupling Twin Trailers

#### SECURE SECOND (REAR) TRAILER

If the second trailer doesn't 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.

For the safest handling on the road, the more heavily loaded semi-trailer should be in first position behind the tractor. The lighter trailer should be in the rear.

A converter gear on a dolly is a coupling device of one or two axles and a fifth wheel by which a semi-trailer can be coupled to the rear of a tractor-trailer combination forming a double bottom rig. See Figure 7.1.

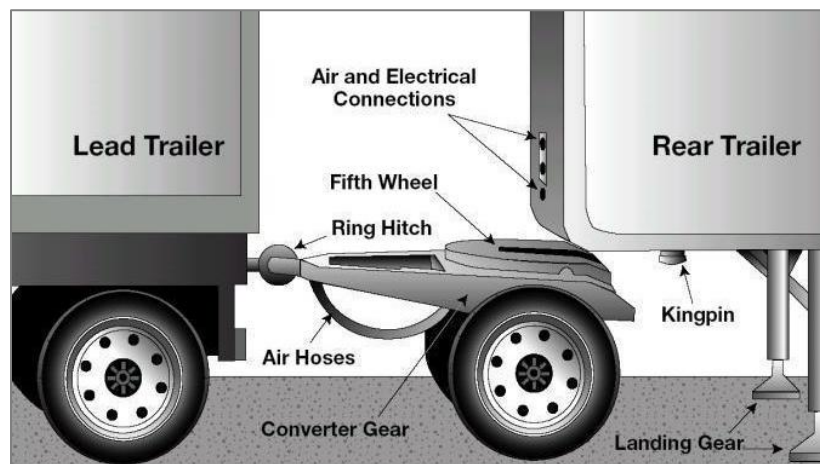


Figure 7.1

#### POSITION CONVERTER DOLLY IN FRONT OF SECOND (REAR) TRAILER

Release dolly brakes by opening the air tank valve. Or, if the dolly has spring brakes, use the dolly parking brake control.

If you have enough distance, wheel the dolly into position by hand so it is in line with the kingpin.

Or you can use the tractor and first semitrailer to pick up the converter dolly. Follow these steps:

1. Position the combination as close as possible to the converter dolly.
2. Move the dolly to the rear of the first semitrailer and couple it to the trailer.
3. Lock pintle hook.
4. Secure dolly support in raised position.
5. Pull the dolly into position as close as possible to the nose of the second semitrailer.
6. Lower dolly support.
7. Unhook dolly from the first trailer.
8. Wheel dolly into position in front of the second trailer in line with the kingpin.

### **CONNECT CONVERTER DOLLY TO FRONT TRAILER**

1. Back the first semi-trailer into position in front of the dolly tongue.
2. Hook the dolly to the front trailer. Lock the pintle hook.
3. Secure converter gear support in raised position.

### **CONNECT CONVERTER DOLLY TO REAR TRAILER**

1. Make sure trailer brakes are locked or wheels are chocked.
2. Make sure trailer height is correct.
  - It must be slightly lower than the center of the fifth wheel, so the trailer is raised slightly when the dolly is pushed under.
3. Back converter dolly under rear trailer.
4. Raise landing gear slightly off ground to prevent damage if the trailer moves.
5. Test coupling by pulling against the pin of the second semitrailer.
6. Make a visual check of coupling.
  - There should not be space between the upper and lower fifth wheel.
  - The locking jaws should be closed on the kingpin.
7. Connect safety chains, air hoses, and light cords.
8. Close converter dolly air tank valve, and service and emergency shut-off valves at rear of second trailer.
9. Open shut-off valves at rear of first trailer and on dolly if it is present.
10. Raise landing gear completely.
11. Charge trailer brakes by pushing the "air supply" knob in and check for air at the rear of the second trailer by opening the emergency line shut-off. If air pressure isn't there, something is wrong and the brakes won't work.

## 7.2.2 – Uncoupling Twin Trailers

### UNCOUPLE REAR TRAILER

1. Park your rig in a straight line on firm level ground. Apply parking brakes so the rig won't move.
2. Chock wheels of the second trailer if it doesn't have spring brakes.
3. Lower the landing gear of the second semi-trailer enough to remove some weight from the dolly.
4. Close air shut-offs at rear of first semi-trailer and on dolly if it is equipped with one.
5. Disconnect all dolly air and electric lines and secure them.
6. Release dolly brakes.
7. Release converter dolly fifth wheel latch.
8. Slowly pull the tractor, first semi trailer, and dolly forward to pull the dolly out from under the rear semi trailer.

### UNCOUPLE CONVERTER DOLLY

1. Lower dolly landing gear. Disconnect safety chains.
2. Apply converter gear spring brakes or chock wheels.
3. Release pintle hook on first semi-trailer. Slowly pull clear of the dolly.
  - **Never** unlock the pintle hook with the dolly still under the rear trailer. The dolly tow bar may fly up, possibly causing injury, and making it very difficult to re-couple.

## 7.2.3 – Coupling and Uncoupling Triple Trailers

### COUPLE TRACTOR/FIRST SEMI TRAILER TO SECOND/THIRD TRAILERS

1. Couple tractor to first trailer. Use the method already described for coupling tractor-semi trailers.
2. Move converter dolly into position and couple first trailer to second trailer using the method for coupling doubles. Triples rig is now complete.

### UNCOUPLE TRIPLE-TRAILER RIG

1. Uncouple third trailer by pulling the dolly out, then unhitching the dolly using the method for uncoupling doubles.
2. Uncouple remainder of rig as you would any double-bottom rig using the method already described.

## 7.2.4 – Coupling and Uncoupling Other Combinations

The methods described so far apply to the more common tractor-trailer combinations. However, there are other ways of coupling and uncoupling the many types of truck-trailer and tractor-trailer combinations that are in use. There are too many to cover in this manual. You will need to learn the correct way to couple and uncouple the vehicle(s) you will drive according to their manufacturer and owner specifications.

---

## 7.3 – Inspecting Doubles and Triples

---

Use the seven-step inspection procedure described in Section 2 to inspect your combination vehicle.

There are more things to inspect on a combination vehicle than on a single vehicle. Many of these items are simply more of what you would find on a single vehicle. For example, tires, wheels, lights, and reflectors. There are also some new things to check. These are discussed below.

### 7.3.1 – Additional Checks

Do these checks in addition to those already listed in Section 2.1.5, Step 5: Do a Walk-around Inspection.

#### **COUPLING SYSTEM AREAS**

- Check fifth wheel (lower): make sure
  - It is securely mounted to frame;
  - There are no missing or damaged parts; and
  - There is enough grease.
- Check the fifth wheel (upper).
- Check the glide plate is securely mounted to the trailer frame.
- Check the kingpin is not damaged.
- Check there is no visible space between the upper and lower fifth wheel.
- Check the locking jaws are around the shank, not the head of the kingpin.
- Check the release arm is properly seated and the safety latch/lock engaged.
- Check the air and electric lines to the trailer.
- Check the electrical cord is firmly plugged in and secured.
- Check the air-lines are:
  - properly connected to glad hands,

- have no air leaks, and
- are properly secured with enough slack for turns.
- Check that all lines are free from damage.
- Check the sliding fifth wheel: that
  - The slide is not damaged;
  - The slide is not missing parts; and
  - It is properly greased.
- Check that all locking pins are present and locked in place.
- If air powered, check there are no air leaks.
- Check the fifth wheel is not so far forward that the tractor frame will hit landing gear, or the cab will hit the trailer, during turns.

## **LANDING GEAR**

- Check it is fully raised.
- Check that no parts are missing.
- Check that it is not bent or damaged.
- Check the crank handle is in place and secured.
- If power operated, check there are no air or hydraulic leaks.

## **DOUBLE AND TRIPLE TRAILERS**

- Check the shut-off valves at the rear of trailers, in service and emergency lines.
- Check the rear of front trailers: OPEN.
- Check the rear of the last trailer: CLOSED.
- Check the converter dolly air tank drain valve: CLOSED.
- Be sure air-lines are supported and glad hands are properly connected.
- If the spare tire is carried on converter gear (dolly), make sure it's secured.
- Be sure the pintle-eye of the dolly is in place in the pintle hook of trailer(s).
- Make sure the pintle hook is latched.
- Check that safety chains are secured to trailer(s).
- Be sure light cords are firmly in sockets on trailers.

### **7.3.2 – Additional Things to Check during a Walk-around Inspection**

Remember that the checks in this section are in addition to Subsection 5.3, Inspecting Air Brake Systems.

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## 7.4 – Doubles/Triples Air Brake Check

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Check the brakes on a double or triple trailer as you would any combination vehicle. Subsection 6.5.2 explains how to check air brakes on combination vehicles. You must also make the following checks on your double or triple trailers

### 7.4.1 – Additional Air Brake Checks

#### **CHECK THAT AIR FLOWS TO ALL TRAILERS (DOUBLE AND TRIPLE TRAILERS).**

- Use the tractor parking brake or chock the wheels to hold the vehicle.
- Wait for air pressure to reach normal, then push in the red "trailer air supply" knob. This will supply air to the emergency (supply) lines.
- Use the trailer handbrake to provide air to the service line.
- Go to the rear of the rig.
- Open the emergency line shut-off 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 handbrake or the service brake pedal is on), and then close the valve.
  - If you do NOT hear air escaping from both lines, check that the shut-off valves on the trailer(s) and dolly(ies) are in the OPEN position. You MUST have air all the way to the back for all the brakes to work.

#### **TEST TRACTOR PROTECTION VALVE.**

- Charge the trailer air brake system by building up normal air pressure and pushing the "air supply" knob in.
- Shut the engine off.
- 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 "normal" to "emergency" position) when the air pressure falls into the pressure range specified by the manufacturer. Usually within the range of 20 to 45 psi.

If the tractor protection valve doesn't work properly, 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 TRAILER EMERGENCY BRAKES.**

- Charge the trailer air brake system and check that the trailer rolls freely.

- Then stop and pull out the trailer air supply control (also called tractor protection valve control or trailer emergency valve) or place it in the "emergency" position.
- Pull gently on the trailer with the tractor to check that the trailer emergency brakes are on.

### TEST TRAILER SERVICE BRAKES.

- Check for normal air pressure,
- Release the parking brakes,
- Move the vehicle forward slowly and apply trailer brakes with the hand control (trolley valve), if so equipped.
  - You should feel the brakes come on. This tells you the trailer brakes are connected and working. The trailer brakes should be tested with the hand valve, but controlled in normal operation with the foot pedal, which applies air to the service brakes at all wheels.

## Section 7 Test Your Knowledge

1. What is a converter dolly?
2. Do converter 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 trailer height is correct before coupling?
5. What do you check when making a visual check of 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? The pintle hook?
8. Should the shut-off valves on the rear of the last trailer be open or closed?
9. Should the shut-off valves on the first trailer in a set of doubles be open or closed?
10. Should the shut-off valves on the middle trailer of a set of triples be open or closed?
11. How can you test that air flows to all trailers?
12. How do you know if your converter dolly is equipped with antilock brakes?

These questions may be on your test. If you can't answer them all, re-read Section 7.

# Section 8: Tank Vehicles

## This Section Covers

1. Inspecting Tank Vehicles
2. Driving Tank Vehicles
3. Safe Driving Rules

This section has information to help you pass the CDL knowledge test for driving a tank vehicle. You should also study Sections 2, 5, 6, and 9.

A tank endorsement is required for certain vehicles that transport liquids or gases. The liquid or gas does not have to be a hazardous material.

You need a tank endorsement on your CDL if:

Vehicle needs a Class A or B CDL and you want to haul a liquid or liquid gas in a tank or tanks having an individual rated capacity of more than 119 gallons and an aggregate rated capacity of 1000 gallons or more that is either permanently or temporarily attached to the vehicle or the chassis.

Your vehicle is Class C and used to transport hazardous materials in liquid or gas form in the above described rated tanks.

Before loading, unloading, or driving a tanker, inspect the vehicle. This makes sure that the vehicle is safe to carry the liquid or gas and is safe to drive.

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## 8.1 – Inspecting Tank Vehicles

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Tank vehicles have special items you need to check. Tank vehicles come in many types and sizes. You need to check the vehicle's operator manual to make sure you know how to inspect your tank vehicle.

### 8.1.1 – Leaks

On all tank vehicles, the most important thing to check for is leaks. Check under and around the vehicle for signs of any leaking. Don't carry liquids or gases in a leaking tank. To do so is a crime. You will be cited and prevented from driving further. You may also be liable for the clean-up of any spill.

You should inspect the following:

- Check the tank's body or shell for dents or leaks.
- Check the intake, discharge, and cut-off valves. Make sure the valves are in the correct position before loading, unloading, or moving the vehicle.
- Check pipes, connections, and hoses for leaks, especially around joints.
- Check manhole covers and vents. Make sure the covers have gaskets and they close correctly.
- Keep the vents clear so they work correctly.

## 8.2.2 – Check Special Purpose Equipment

If your vehicle has any of the following equipment, make sure it works:

- Vapor recovery kits.
- Grounding and bonding cables. Emergency shut-off systems.
- Built in fire extinguisher.

Never drive a tank vehicle with open valves or manhole covers.

## 8.3.3 – Special Equipment

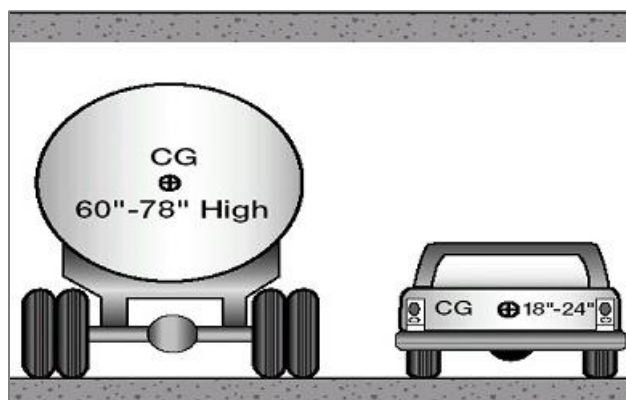
Check the emergency equipment needed for your vehicle. Find out what working equipment you must carry and make sure you have it.

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## 8.2 – Driving Tank Vehicles

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Hauling liquids in tanks requires special skills because of the high center of gravity and liquid movement. See Figure 8.1.



**Figure 8.1**

## 8.2.1 – High Center of Gravity

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. Liquid tankers are especially easy to rollover. Tests have shown that tankers can turn over at the speed limits posted for curves. Be sure to take highway curves and on ramp/off ramp curves at speeds well below the posted limit.

## 8.2.2 – Danger of Surge

Liquid surge happens when the liquid in a tank moves around suddenly to one side of the tank. This movement can have bad effects on your vehicle's handling. For example, when coming to a stop, 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 like ice, the wave can shove the truck out into an intersection. You must be very familiar with the way your vehicle handles when driving a liquid tanker.

## 8.2.3 – Bulkheads

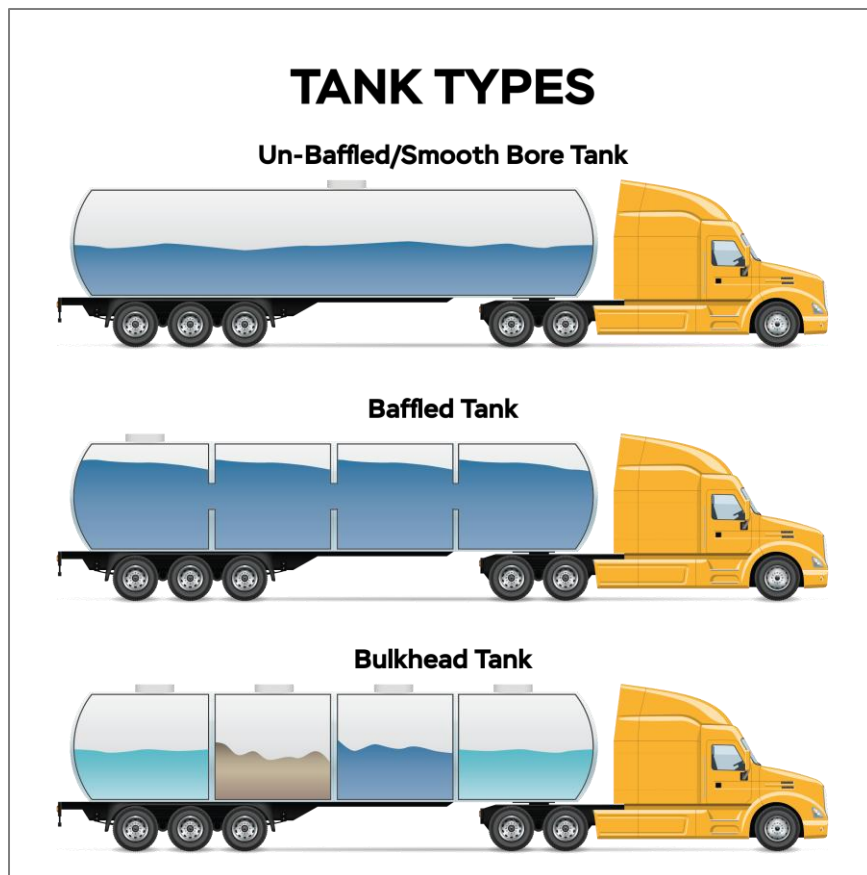
Some liquid tanks are divided into several smaller tanks by bulkheads. When loading and unloading the smaller tanks, the driver must pay attention to weight distribution. Don't put too much weight on the front or rear of the vehicle.

## 8.2.4 – Baffled Tanks

Baffled liquid tanks have bulkheads in them with holes that let the liquid flow through. The baffles help to control the forward and backward liquid surge. Side-to-side surge can still occur. This can cause rollover.

## 8.2.5 – Un-baffled Tanks

Un-baffled liquid tankers (sometimes called "smooth bore" tanks) have nothing inside to slow down the flow of the liquid. This makes the forward-and-back surge very strong. Un-baffled tanks usually transport food products like milk, for example. Sanitation regulations don't allow the use of baffles because of how difficult it is to clean the inside of the tank. Be extremely slow and careful when driving smooth bore tanks, especially when starting and stopping.



**Figure 8.2**

### 8.2.6 – Outage

Never load a cargo tank totally full. Liquids expand as they warm and you must leave room for the expanding liquid. 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.

### 8.2.7 – How Much to Load?

A full tank of dense liquid (such as some acids) may exceed legal weight limits. For that reason, you may often only partially fill tanks with heavy liquids. The amount of liquid to load into a tank depends on:

- The amount the liquid will expand in transit.
- The weight of the liquid.
- Legal weight limits.

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## 8.3 – Safe Driving Rules

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To drive tank vehicles safely, you must remember to follow all the safe driving rules. A few of these rules are:

- **Drive Smoothly** – Because of the high center of gravity and the surge of the liquid, you must start, slow down, and stop very smoothly. You must also make smooth turns and lane changes.
- **Controlling Surge**
  - Keep a steady pressure on the brakes. Do not release too soon when coming to a stop.
  - Brake far in advance of a stop and increase your following distance.
  - If you must make a quick stop to avoid a crash, use controlled or stab braking. If you do not remember how to stop using these methods, review subsection 2.17.2. Also, remember that if you steer quickly while braking, you may cause vehicle rollover.
- **Curves** – Slow down before curves, then accelerate slightly through the curve. The posted speed for a curve may be too fast for a tank vehicle.
- **Stopping Distance** – Keep in mind how much space you need to stop your vehicle. Remember that wet roads double the normal stopping distance. Empty tank vehicles may take longer to stop than full ones.
- **Skids** – Don't oversteer, over accelerate, or over brake. If you do, your vehicle may skid. On tank trailers, if your drive wheels or trailer wheels begin to skid, your vehicle may jackknife. When any vehicle starts to skid, you must restore traction to the wheels.

## Section 8 Test Your Knowledge

1. How are bulkheads different from baffles?
2. Should a tank vehicle take curves, on ramps, or off ramps at the posted speed limits?
3. How 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. How can you help control surge?
7. What two reasons make special care necessary when driving tank vehicles?

These questions may be on the test. If you can't answer them all, re-read Section 8.

# Section 9: Hazardous Materials

## This Section Covers

1. The Reason for the Regulations
2. How to Load, Unload and Mark a Bulk Tank
3. Driver Responsibilities
4. Driving and Parking Rules
5. Communications Rules
6. Emergencies
7. Loading and Unloading

**Hazardous materials** (often called HAZMAT) are products that can harm people, the environment, or property during transportation. You might see the term HAZMAT on road signs or safety instructions. Sometimes it is shortened to HM in government rules. Hazardous materials include:

- explosives
- various types of gas
- solids
- flammable and combustible liquid
- hazardous substances
- hazardous waste
- marine pollutants

There is a lot of dangerous risk involved in transporting and storing hazardous materials. All levels of government regulate how hazardous materials can be handled and transported.

The **Hazardous Materials Regulations (HMR)** are found in [Title 49 of the Code of Federal Regulations \(CFR\), Parts 171 through 180](#). These regulations are commonly cited as 49 CFR 171-180 and are issued by the Pipeline and Hazardous Materials Safety Administration (PHMSA), which is part of the U.S. Department of Transportation (DOT)

The Hazardous Materials Table in the regulations has a list of these items. However, this list does not include all hazardous materials. A material is considered hazardous based on its characteristics and the shipper's decision on if it meets a definition of a hazardous material in the regulations.

The regulations require vehicles transporting certain types or amounts of hazardous materials to display diamond-shaped, square on point, warning signs called **placards**.

This section will help you understand what you need to do when you're transporting hazardous materials. However, hazmat rules and government regulations can change often, so this information

may not always be completely up to date and can change often. An up-to-date copy of the complete regulations is essential for you to have. Included in these regulations is a complete glossary of terms.

You must have a CDL with a hazardous materials endorsement before you drive any vehicle to transport hazardous material as defined in [Title 49 CFR 383.5 of the Federal Motor Carrier Safety Regulations](#). You must pass a written test about the regulations and requirements to get this endorsement.

Everything you need to know to pass the written test is in this section. There is a lot more information about working with hazardous materials you will need to know as a CDL driver.

The regulations require training and testing for all drivers involved in transporting hazardous materials. Your employer or a designated representative is required to provide this training and testing. Hazardous materials employers are required to keep a record of training for each employee as long as that employee is working with hazardous materials, and for 90 days after. The regulations require people working with hazardous materials be trained and tested at least once every three years.

All drivers must be trained in the security risks of hazardous materials transportation. This training must include how to recognize and respond to possible security threats.

The regulations also require drivers have special training before:

- Transporting certain flammable gas materials
- Transporting controlled quantities of radioactive materials on the highway
- Transporting cargo tanks and portable tanks

Each driver's employer or designated representative must provide such training.

Some locations require permits to transport certain explosives or bulk hazardous wastes. States and counties also may require drivers to follow special hazardous materials routes. The federal government may require permits or exemptions for special hazardous materials cargo such as rocket fuel. Find out about permits, exemptions, and special routes for the places you drive.

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## 9.1 – The Intent of the Regulations

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### 9.1.1 – Contain the Material

Transporting hazardous materials can be risky. The regulations are intended to protect you, those around you, and the environment. They tell shippers how to package the materials safely and drivers how to load, transport, and unload the material. These are called **containment rules**.

## 9.1.2 – Communicate the Risk

To communicate the risk, shippers must warn drivers and others about the material's hazards. Shippers must put hazard warning labels on packages, provide proper shipping papers, emergency response information, and placards. These steps communicate the hazard to the shipper, the carrier, and the driver.

## 9.1.3 – Assure Safe Drivers and Equipment

To get a hazardous materials endorsement on your CDL, you must pass a written test about transporting hazardous materials. To pass the test, you must know how to:

- Identify what are hazardous materials.
- Safely load shipments.
- Properly placard your vehicle
- Safely transport shipments.

Learn the rules and follow them. Following the rules reduces the risk of injury from hazardous materials. Taking shortcuts by breaking rules is unsafe. Failure to follow the rules can result in fines and jail.

Inspect your vehicle before and during each trip. Law enforcement officers may stop and inspect your vehicle. When they stop you, they may check:

- Your shipping papers,
- Vehicle placards,
- The hazardous materials endorsement on your driver license,
- and your knowledge of hazardous materials.

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## 9.2 – Hazardous Materials Transportation: Who Does What

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There are three roles involved in transporting hazardous materials: the shipper, the carrier, and the driver. Each role has specific things they must do to make sure hazardous materials are transported safely.

### 9.2.1 – The Shipper

Sends products from one place to another by truck, rail, vessel, or airplane.

Uses the hazardous materials regulations to figure out the product's:

- Identification number
- Proper shipping name.
- Hazard class.
- Packing group.
- Correct packaging.
- Correct label and markings.
- Correct placards.

Must package, mark, and label the materials; prepare shipping papers; provide emergency response information; and supply placards.

Certify on the shipping paper that the shipment has been prepared according to the rules (unless you are pulling cargo tanks supplied by you or your employer).

## 9.2.2 – The Carrier

Takes the shipment from the shipper to its destination.

Before transportation, checks that the shipper correctly described, marked, labeled, and otherwise prepared the shipment for transportation.

Refuses improper shipments.

## 9.2.3 – The Driver

Makes sure the shipper has identified, marked, and labeled the hazardous materials properly.

Refuses leaking packages and shipments.

Places placards on the vehicle when loading, if required.

Safely transports the shipment without delay.

Follows all special rules about transporting hazardous materials.

Keeps hazardous materials shipping papers and emergency response information in the right place.

Reports accidents and incidents involving hazardous materials to the right government agency, when the accident/incident occurs while the driver is in physical control of the shipment.

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## 9.3 – Communication Rules

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### 9.3.1 – Definitions

Some words and phrases have special meanings when talking about hazardous materials. Some of these may differ from meanings you are used to. The words and phrases in this section may be on your test. The meanings of other important words are in the glossary at the end of Section 9.

A material's hazard class reflects the risks associated with it. There are nine different hazard classes. The types of materials included in these nine classes are in Figure 9.1.

## Figure 9.1: Hazardous Materials Class Chart

Class	Division	Name of Class or Division	Examples
1	1.1	Mass Explosion	Dynamite, Flares, Display Fireworks, Ammunition, Blasting Agents, Explosive Devices
1	1.2	Projection Hazard	Dynamite, Flares, Display Fireworks, Ammunition, Blasting Agents, Explosive Devices
1	1.3	Fire Hazard	Dynamite, Flares, Display Fireworks, Ammunition, Blasting Agents, Explosive Devices
1	1.4	Minor Explosion	Dynamite, Flares, Display Fireworks, Ammunition, Blasting Agents, Explosive Devices
1	1.5	Very Insensitive	Dynamite, Flares, Display Fireworks, Ammunition, Blasting Agents, Explosive Devices
1	1.6	Extremely Insensitive	Dynamite, Flares, Display Fireworks, Ammunition, Blasting Agents, Explosive Devices
2	2.1	Flammable Gases	Propane
2	2.2	Non-Flammable Gases	Helium
2	2.3	Poisonous/Toxic Gases	Fluorine, Compressed
3	—	Flammable Liquids	Gasoline
4	4.1	Flammable Solids	Ammonium Picrate, Wetted White Phosphorus Sodium
4	4.2	Spontaneously Combustible	Ammonium Picrate, Wetted White Phosphorus Sodium
4	4.3	Dangerous When Wet	Ammonium Picrate, Wetted White Phosphorus Sodium
5	5.1	Oxidizers	Ammonium Nitrate
5	5.2	Organic Peroxides	Methyl Ethyl Ketone Peroxide
6	6.1	Poison (Toxic Material)	Potassium Cyanide
6	6.2	Infectious Substances	Anthrax Virus
7	—	Radioactive	Uranium
8	—	Corrosive	Battery Fluid
9	—	Miscellaneous Hazardous Materials	Polychlorinated Biphenyls (PCB)
None	—	ORM-D (Other Regulated Material-Domestic)	Food Flavorings, Medicines
None	—	Combustible Liquids	Fuel Oil

A **shipping paper** describes the hazardous materials being transported. Shipping orders, bills of lading, and manifests are all types of shipping papers. Figure 9.6 shows an example shipping paper.

After a crash or hazardous materials spill or leak, you may be injured and unable to communicate the hazards of the materials you are transporting. Firefighters and police can best do their jobs to help at the scene if they know what hazardous materials are being carried. Your life, and the lives of others, may depend on quickly finding the hazardous materials shipping papers.

For that reason, the rules require:

- Shippers to describe hazardous materials correctly and include an emergency response telephone number on shipping papers.
- Carriers and drivers to quickly identify hazardous materials shipping papers, or keep them on top of other shipping papers and keep the required emergency response information with the shipping papers.
- Drivers to keep hazardous materials shipping papers:
  - In a pouch on the driver's door, or
  - In clear view within immediate reach while the seat belt is fastened while driving, or
  - On the driver's seat when out of the vehicle.

### 9.3.2 – Package Labels

Shippers put diamond-shaped hazard warning labels on most hazardous materials packages. These labels inform others of the hazard. If the diamond label won't fit on the package, shippers may put the label on a tag securely attached to the package. For example, compressed gas cylinders that will not hold a label will have tags or decals. Labels look like the examples in Figure 9.2.



**Figure 9.2: Examples of HAZMAT Labels**

### 9.3.3 – Lists of Regulated Products

**Placards.** Placards are used to warn others of hazardous materials. Placards are signs put on the outside of a vehicle and on bulk packages, which identify the hazard class of the cargo. See Figure 9.3.

A placarded vehicle must have at least four identical placards. They are put on the front, rear, and both sides of the vehicle.

Placards must be placed where they can be seen on all four sides of your vehicle. They are at least 250 mm or 9.84 inches square with the square-on-point, in a diamond shape. Cargo tanks and other bulk packaging show the identification number of their contents on:

- Placards or
- Orange panels or
- White square-on-point displays



**Figure 9.3: Examples of HAZMAT Placards**

**Identification numbers** are a four-digit code used by first responders to identify hazardous materials. An identification number may be used to identify more than one chemical. The letters “NA” or “UN” will precede the identification number. The United States Department of Transportation’s Emergency Response Guidebook (ERG) lists the chemicals and the identification numbers assigned to them.

There are three main lists used by shippers, carriers, and drivers when trying to identify hazardous materials. Before transporting a material, look for its name on three lists. Some materials are on all lists, others on only one. Always check the following lists:

- Section 172.101, the Hazardous Materials Table.
- Appendix A to Section 172.101, the List of Hazardous Substances and Reportable Quantities.
- Appendix B to Section 172.101, the List of Marine Pollutants.

**The Hazardous Materials Table.** Figure 9.4 shows part of the Hazardous Materials Table.

**Column 1: Symbols** tells which shipping mode(s) the entry affects and other information concerning the shipping description. The next five columns show each material's shipping name, hazard class or division, identification number, packaging group, and required labels.

Six different symbols may appear in Column 1 of the table.

- **(+)** – Shows the proper shipping name, hazard class, and packing group to use, even if the material doesn't meet the hazard class definition.
- **(A)** – Means the hazardous material described in Column 2 is subject to the HMR only when offered or intended for transport by air unless it is a hazardous substance or hazardous waste.
- **(W)** – Means the hazardous material described in Column 2 is subject to the HMR only when offered or intended for transportation by water unless it is a hazardous substance, hazardous waste, or marine pollutant.
- **(D)** – Means the proper shipping name is appropriate for describing materials for domestic transportation but may not be proper for international transportation.
- **(I)** – Identifies a proper shipping name that is used to describe materials in international transportation. A different shipping name may be used when only domestic transportation is involved.
- **(G)** – Means this hazardous material described in Column 2 is a generic shipping name. A generic shipping name must be accompanied by a technical name on the shipping paper. A technical name is a specific chemical that makes the product hazardous

**Column 2: Hazardous materials descriptions and proper shipping names** lists the proper shipping names and descriptions of regulated materials. Entries are in alphabetical order so you can quickly find the right entry. The table shows proper shipping names in regular type. The shipping paper must show proper shipping names. Names shown in italics are not proper shipping names.

## 49 CFR 172.101 Sample of Hazardous Materials Table

Symbols	Hazardous Materials Descriptions & Proper Shipping Names	Hazard Class or Division	Identification Numbers	PG	Label Codes	Special Provisions (170.102)	Packaging (173.***)		
							Exceptions	Non-Bulk	Bulk
A	Acetaldehyde Ammonia	9	UN1841	III	9	IB8, IP3, IP7, T1, TP33	155	204	240

**Figure 9.4**

## Appendix A to [49 CFR 172.101](#)

### List of Hazardous Substances and Reportable Quantities

Hazardous Substances	Reportable Quantity (RQ) Pounds (Kilograms)
Phenyl mercaptan	100 (45.4)
Phenylmercury acetate	100 (45.4)
Phenylthiourea	100 (45.4)
Phorate	10 (4.54)
Phosgene	10 (4.54)
Phosphine	100 (45.4)
Phosphoric acid	5,000 (2270)
Phosphoric acid, diethyl 4-nitrophenyl ester	100 (45.4)
Phosphoric acid, lead (2+) Salt (2:3) salt	10 (.454)

**Figure 9.5**

**Column 3: Hazard class or Division** shows a material's hazard class or division, or the entry "Forbidden." Never transport a "Forbidden" material. Placard hazardous materials shipments based on the quantity and hazard class. You can decide which placards to use if you know these three things:

- The material's hazard class.
- Amount being shipped.
- Amount of all hazardous materials of all classes on your vehicle.

**Column 4: Identification Numbers** lists the identification number for each proper shipping name. Identification numbers are preceded by the letters "UN", "NA" or "ID". The letters "UN" mean "United Nations" are for proper shipping names used for both international transportation as well as domestic transportation. The letters "NA" are associated with proper shipping names that are only used within the United States and to and from Canada. The letters "ID" are associated with proper shipping names recognized by the International Civil Aviation Organization (IACO) Technical instructions for transportation by air. The identification number must appear on both the shipping paper as part of the shipping description and on the package. It also must appear on cargo tanks and other bulk packaging. Police and firefighters use this number to quickly identify the hazardous materials.

**Column 5: PG** shows the packing group (in Roman numeral) assigned to a material.

**Column 6: Label Codes** shows the hazard warning label(s) shippers must put on packages of hazardous materials. Some products require use of more than one label due to multiple hazards being present.

**Column 7: Special Provisions** lists the additional (special) provisions that apply to this material. When there is an entry in this column, you must refer to the federal regulations for specific information. The numbers 1- 6 in this column mean the hazardous material is a poison inhalation hazard (PIH). PIH materials have special requirements for shipping papers, marking, and placards.

**Column 8: Packaging** is a three-part column showing the section numbers covering the packaging requirements for each hazardous material.

**NOTE:** Columns 9 and 10 do not apply to transportation by highway.

## Appendix A to [49 CFR 172.101](#) – 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 Figure 9.5.

Column 2 of the list shows each product's **reportable quantity (RQ)**. When these materials are being transported in a reportable quantity or more 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 spills of these materials if a reportable quantity of the material has been spilled.

If the words INHALATION HAZARD appear on the shipping paper or package, the rules require display of the POISON INHALATION HAZARD or POISON GAS placards, as appropriate. These placards must be used in addition to other placards, which may be required by the product's hazard class. Always display the hazard class placard and the POISON INHALATION HAZARD placard.

## Appendix B to [49 CFR 172.101](#) – List of Marine Pollutants

Appendix B is a listing of chemicals that are toxic to marine life. For highway transportation, this list is only used for chemicals in a container with a capacity of 119 gallons or more without a placard or label as specified by the HMR.

Any bulk packages of a Marine Pollutant must display the Marine Pollutant marking, a white triangle with a fish and an "X" through the fish. This marking is not a placard but must also be displayed on the outside of the vehicle. In addition, a notation must be made on the shipping papers near the description of the material: "Marine Pollutant".

## 9.3.4 – The Shipping Paper

The shipping paper shown in Figure 9.6 describes a shipment. A shipping paper for hazardous materials must include:

- 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 shipping description for each hazardous material.
- A shipper's certification, signed by the shipper, saying they prepared the shipment according to the regulations.

## Shipping Paper Example

<b>To:</b>	ABC Corporation 88 Valley Street Anywhere, VA 11111	<b>From:</b>	DEF Corporation 55 Mountain Street Nowhere, CO 22222	<b>Page 1 of 1</b>
<b>Quantity</b>	<b>HM</b>	<b>Description</b>		<b>Weight</b>
1 Cylinder	RQ  ("RQ" means that this is a reportable quantity.)	UN1076, Phosgene, 2.3, Poison, Inhalation Hazard, Zone A  (UN1076 is the identification number from column 4 of the Hazardous materials Table, Phosgene is the proper shipping name from Column 2 of the Hazardous Materials Table, 2.3 is the Hazard Class from Column 3 of the Hazardous Materials Table.)		25 lbs.
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.				
Shipper:	DEF Corporation	Carrier:	Safety First	
Per:	Joe Smith	Per:	Jane Smith	
Date:	10/15/2003			
SPECIAL INSTRUCTIONS: 24-hour Emergency Contact, John Smith, 1- 800-555-5555				

**Figure 9.6**

### 9.3.5 – The Item Description

If a shipping paper describes both hazardous and non-hazardous cargo, the hazardous materials must be:

- Entered first.
- Highlighted in a contrasting color, OR
- Identified by an "X" placed before the shipping description (describing what the item is) in a column captioned "HM".

**NOTE:** The letters "RQ" may be used instead of "X" if a reportable quantity needs to be identified.

The basic description of hazardous materials includes:

- The identification number,
- Proper shipping name,
- Hazard class or division,
- And the packing group, if any, in that order. The packing group is displayed in Roman numerals and may be preceded by "PG".

Identification number, shipping name, and hazard class must not be abbreviated unless specifically authorized in the hazardous materials regulations. The description must also show:

- The total quantity and unit of measure.
- The number and type of packages (example: "6 Drums").
- The letters RQ, if a reportable quantity.
- If the letters RQ appear, the name of the hazardous substance (if not included in the shipping name).
- For all materials with the letter "G" (Generic) in Column 1, the technical name of the hazardous material.

Shipping papers must list an emergency response telephone number unless otherwise noted. The emergency response telephone number is the responsibility of the shipper. It can be used by emergency responders to obtain information about any hazardous materials involved in a spill or fire. The telephone number must be:

- The number of the person offering the hazardous material for transportation (if the shipper/officer is the emergency response information (ERI) provider); or
- The number of an agency or organization capable of, and accepting responsibility for, providing the detailed information required by paragraph (a)(2) of this section. The person who is registered with the ERI provider must be identified by name, or contract number or other unique identifier assigned by the ERI provider, on the shipping paper.

Shippers must provide emergency response information to the motor carrier for each hazardous material being shipped. The emergency response information must be able to be used away from the motor vehicle. This means it can't be kept attached to the vehicle or depend on the vehicle to be used. The emergency response information must explain how to safely handle incidents involving the material. At a minimum, it must include the following information:

- The basic description and technical name; Immediate hazards to health;
- Risks of fire or explosion;
- Immediate precautions to be taken in the event of an accident or incident;

- Immediate methods for handling fires;
- Initial methods for handling spills or leaks in the absence of fires; and
- Preliminary first aid measures

This information can be on the shipping paper or some other document that includes the basic description and technical name of the hazardous material. Or, it may be in a guidance book such as the **Emergency Response Guidebook (ERG)**. Motor carriers may assist shippers by keeping an ERG on each vehicle carrying hazardous materials. The driver must provide the emergency response information to any federal, state, or local authority responding to a hazardous materials incident or investigating one.

Total quantity and number & type of packages must appear before or after the basic description. The packaging type and the unit of measurement may be abbreviated.

#### **FOR EXAMPLE:**

10 ctns. UN1263, Paint, 3, PG II, 500 lbs.

The shipper of hazardous wastes must put the word WASTE before the proper shipping name of the material on the shipping paper (hazardous waste manifest).

#### **FOR EXAMPLE:**

UN1090, Waste Acetone, 3, PG II.

A non-hazardous material may not be described by using a hazard class or an identification number.

Shippers must keep a copy of shipping papers (or an electronic image) for 2 years after the initial carrier accepts the material. Shippers must keep a copy of papers for hazardous waste for 3 years.

If you are only the carrier and not the original shipper of the cargo, you must keep a copy of the shipping paper for 1 year upon receipt of the cargo.

**NOTE:** To view complete regulatory requirements for the transportation of hazardous materials one should refer to the Code of Federal Regulations, Title 49, Parts 171-185.

### **9.3.6 – Shipper's Certification**

When the shipper packages hazardous materials, they certify the package has been prepared according to the rules. The signed shipper's certification appears on the original shipping paper.

The only exceptions are:

- When a shipper is a private carrier transporting their own product and
- When the package is provided by the carrier (for example, a cargo tank).

Unless a package is clearly unsafe or does not comply with the HMR, you may accept the shipper's certification concerning proper packaging. Some carriers have additional rules about transporting hazardous materials. Follow your employer's rules when accepting shipments.

### 9.3.7 – Package Markings and Labels

Shippers print required markings directly on the package, an attached label, or tag. An important package marking is the name of the hazardous material. It is the same name as the one on the shipping paper. The requirements for marking vary by package size and material being transported. When required, the shipper will put the following on the package:

- The name and address of the shipper or consignee.
- The hazardous material's shipping name and identification number.
- All required labels

It is a good idea to compare the shipping paper to the markings and labels. Always make sure the shipper shows the correct basic description on the shipping paper, and verifies the right labels are shown on the packages. If you are not familiar with the material, ask the shipper to contact your office.

If rules require it, the shipper will put one of the following on the package:

- RQ,
- Marine Pollutant,
- Biohazard,
- Hot,
- Inhalation-Hazard

Packages with liquid containers inside will also have package orientation markings with the arrows pointing in the correct upright direction. The labels used always reflect the hazard class of the product. If a package needs more than one label, the labels must be close together and near the proper shipping name.

### 9.3.8 – Recognizing Hazardous Materials

Learn to recognize shipments of hazardous materials. To find out if the shipment includes hazardous materials, look at the shipping paper. Does it have:

- An entry with a proper shipping name, hazard class, and identification number?
- A highlighted entry, or one with an X or RQ in the hazardous materials column?

Other clues suggesting hazardous materials:

- What business is the shipper in?

- Examples: 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 on the premises?
- What type of package is being shipped? Cylinders and drums are often used for hazardous materials shipments.
- Is a hazard class label, proper shipping name, or identification number on the package?
- Are there any handling precautions?

### 9.3.9 – Hazardous Waste Manifest

When transporting hazardous waste, you must sign and carry a **Uniform Hazardous Waste Manifest**. The name and EPA registration number of the shippers, carriers, and destination must appear on the manifest. Shippers must prepare, date, and sign by hand the manifest.

Treat the manifest as a shipping paper when transporting the waste. Only give the waste shipment to another registered carrier or disposal/treatment facility. Each carrier transporting the shipment must sign the manifest. After you deliver 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.

### 9.3.10 – Placarding

Attach the appropriate placards to the vehicle before you drive it. You are only allowed to move an improperly placarded vehicle during an emergency, in order to protect life or property.

Placards must appear on both sides and both ends of the vehicle. Each placard must be:

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

No other signs or placards are allowed on the vehicle.

The front placard may be on the front of the tractor or the front of the trailer.

To decide which placards to use, you need to know:

- The hazard class of the materials.
- The amount of hazardous materials shipped.
- The total weight of all classes of hazardous materials in your vehicle.

## 9.3.11 – Placard Tables

There are two placard tables, Table 1 and Table 2. Table 1 materials must be placarded whenever any amount is transported. See Figure 9.7.

Except for bulk packaging, the hazard classes in Table 2 need placards only if the total amount transported is 1,001 pounds or more including the package. Add the amounts from all shipping papers for all the Table 2 products you have on board. See Figure 9.8.

### Figure 9.7: Placard Table 1 Any Amount

IF YOUR VEHICLE CONTAINS ANY AMOUNT OF...	PLACARD AS...
1.1 Mass Explosives	Explosives 1.1
1.2 Project Hazards	Explosives 1.2
1.3 Mass Fire Hazards	Explosives 1.3
2.3 Poisonous/Toxic Gases	Poison Gas
4.3 Dangerous When Wet	Dangerous When Wet
5.2 (Organic Peroxide, Type B, liquid or solid, Temperature controlled)	Organic Peroxide
6.1 (Inhalation hazard zone A & B only)	Poison/toxic inhalation
7 (Radioactive Yellow III label only)	Radioactive

You may use DANGEROUS placards instead of separate placards for each Table 2 hazard class when:

- You have 1,001 pounds or more of two or more Table 2 hazard classes, requiring different placards, **and**
- You have not loaded 2,205 pounds or more of any Table 2 hazard class material at any one place. You must use the specific placard for this material.

The dangerous placard is an **option**, not a requirement. You can always placard for the materials.

If the words INHALATION HAZARD are on the shipping paper or package, you must display POISON GAS or POISON INHALATION placards in addition to any other placards needed by the product's hazard class. The 1,000 pound exception does not apply to these materials.

Materials with a secondary hazard of dangerous when wet must display the DANGEROUS WHEN WET placard in addition to any other placards needed by the product's hazard class. The 1,000-pound exception to placarding does not apply to these materials.

**Figure 9.8: Placard Table 2 1,001 Pounds Or More**

Category of Material (Hazard class or division number and additional description, as appropriate)	Placard Name
1.4 Minor Explosion	Explosives 1.4
1.5 Very Insensitive	Explosives 1.5
1.6 Extremely Insensitive	Explosives 1.6
2.1 Flammable Gases	Flammable Gas
2.2 Non- Flammable Gases	Non-Flammable Gas.
3 Flammable Liquids	Flammable
Combustible Liquid	Combustible*
4.1 Flammable Solids	Flammable Solid
4.2 Spontaneously Combustible	Spontaneously Combustible
5.1 Oxidizers	Oxidizer
5.2 (other than organic peroxide, Type B, liquid or solid, Temperature Controlled)	Organic Peroxide
6.1 (other than inhalation hazard zone A or B)	Poison
6.2 Infectious Substances	(None)
8 Corrosives	Corrosive
9 Miscellaneous Hazardous Materials	Class 9**
ORM-D	(None)

\*FLAMMABLE may be used in place of a COMBUSTIBLE on a cargo tank or portable tank.  
 \*\*Class 9 Placard is not required for domestic transportation.

Placards used to identify the primary or subsidiary hazard class of a material must have the hazard class or division number displayed in the lower corner of the placard. Permanently affixed subsidiary hazard placards without the hazard class number may be used if they stay within color specifications.

Placards may be displayed for hazardous materials even if not needed so long as the placard identifies the hazard of the material being transported.

**Bulk packaging** is a single container with a capacity than 119 gallons. A bulk package, and a vehicle transporting a bulk package, must be placarded, even if it only has the residue of a hazardous material. Certain bulk packages only must be placarded on the two opposite sides or may display labels. All other bulk packages must be placarded on all four sides.

## Subsections 9.1, 9.2, and 9.3 Test Your Knowledge

1. Shippers package to \_\_\_\_\_ the material.
2. Drivers placard their vehicle to \_\_\_\_\_ the risk.
3. What three things do you need to know to decide which placards (if any) you need?
4. A hazardous materials identification number must appear on the \_\_\_\_\_ and on the \_\_\_\_\_. The identification number must also appear on cargo tanks and other bulk packaging.
5. Where do you need to keep shipping papers describing hazardous materials?

These questions may be on your test. If you can't answer them all, re-read subsections 9.1, 9.2, and 9.3.

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## 9.4 – Loading and Unloading

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Do all you can to protect containers of hazardous materials. Don't use any tools, which might damage containers or other packaging during loading. Don't use hooks.

### 9.4.1 – General Loading Requirements

Before loading or unloading, set the parking brake. Make sure the vehicle will not move. Many products become more hazardous when exposed to heat. Load hazardous materials away from heat sources.

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. It is illegal to move a vehicle with leaking hazardous materials.

Containers of hazardous materials must be braced to prevent movement of the packages during transportation.

## **NO SMOKING.**

When loading or unloading hazardous materials, keep fire away. Don't let people smoke nearby. Never smoke around:

- Class 1 (Explosives)
- Class 2.1 (Flammable Gas )
- Class 3 (Flammable Liquids)
- Class 4 (Flammable Solids)
- Class 5 (Oxidizers)

## **SECURE AGAINST MOVEMENT**

Brace containers so they will not fall, slide, or bounce around during transportation. Be very careful when loading containers with valves or other fittings. All hazardous materials packages must be secured during transportation.

After loading, do not open any package during your trip. Never transfer hazardous materials from one package to another while in transit. You may empty a cargo tank, but do not empty any other package while it is on the vehicle.

## **CARGO HEATER RULES**

There are special cargo heater rules for loading:

- Class 1 (Explosives)
- Class 2.1 (Flammable Gas)
- Class 3 (Flammable Liquids)

The rules usually forbid use of cargo heaters, including automatic cargo heater/air conditioner units. Unless you have read all the related rules, don't load the above products in a cargo space that has a heater.

## **USE CLOSED CARGO SPACE.**

You can't have overhang or tailgate loads of:

- Class 1 (Explosives)
- Class 4 (Flammable Solids) Class 5 (Oxidizers)

You must load these hazardous materials into a closed cargo space unless all packages are:

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

## 9.4.2 – Precautions for Specific Hazards

### **CLASS 1 (EXPLOSIVES) MATERIALS**

Turn your engine off before loading or unloading any explosives. Then check the cargo space. You must:

- Disable cargo heaters. Disconnect heater power sources and drain heater fuel tanks.
- Make sure there are no sharp points that might damage cargo. Look for bolts, screws, nails, broken side panels, and broken floorboards.
- Use a floor lining with Division 1.1, 1.2, or 1.3. The floors must be tight and the liner must be either non-metallic material or non-ferrous metal. Non-ferrous metals are any metal that does not contain iron or iron alloys.

Use extra care to protect explosives. Never use hooks or other metal tools. Never drop, throw, or roll packages. Protect explosive packages from other cargo that might cause damage.

Do not transfer a Division 1.1, 1.2, or 1.3 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 others on the road.

Never transport damaged packages of explosives. Do not take a package that shows any dampness or oily stain.

Do not transport Division 1.1 or 1.2 in vehicle combinations if:

- 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) Hazard zone A or B or Division 6.1 (Poisonous) materials Hazard zone A.
- Hazardous materials in a portable tank, on a DOT Spec 106A or 110A tank.

### **CLASS 2 (COMPRESSED GASES) INCLUDING CRYOGENIC LIQUIDS**

If your vehicle doesn't have racks to hold cylinders, the cargo space floor must be flat. The cylinders must be:

- Held upright.
- In racks attached to the vehicle or in boxes that will keep them from turning over.

Cylinders may be loaded in a lying down (horizontal) position as long as the relief valve is positioned in the vapor space of the container.

## CLASS 4 (FLAMMABLE SOLIDS) AND CLASS 5 (OXIDIZERS) MATERIALS

- Class 4 materials are solids that react (including fire and explosion) to water, heat, and air or even react spontaneously.
- Class 4 and 5 materials must be completely enclosed in a vehicle or covered securely.
- Class 4 and 5 materials, which become unstable and dangerous when wet, must be kept dry while in transit and during loading and unloading.
- Materials that are subject to spontaneous combustion or heating must be in vehicles with sufficient ventilation.

**Division 2.3 (Poisonous Gas) or Division 6.1 (Poisonous) Materials.** Never transport these materials in containers with interconnections. Never load a package labeled POISON or POISON INHALATION HAZARD in the driver's cab or sleeper or with food material for human or animal consumption. There are special rules for loading and unloading Class 2 materials in cargo tanks. You must have special training to do this.

## CLASS 7 (RADIOACTIVE) MATERIALS

Some packages of Class 7 (Radioactive) materials have a number called the "transport index." The transport index tells the degree of control needed during transportation. 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 shipper labels these packages Radioactive II or Radioactive III and prints the package's transport index on the label. The total transport index of all packages in a single vehicle must not be more than 50.

Table A to this section ([49 CFR 177-842](#)) shows rules for each transport index. It shows how close you can load Class 7 (Radioactive) materials to people, animals, or film. For example, you can't leave a package with a transport index of 1.1 within two feet of people or cargo space walls.

## CLASS 8 (CORROSIVE) MATERIALS

- If loading by hand, load breakable containers of corrosive liquid one by one.
- Keep them right side up.
- Do not drop or roll the containers.
- Load them onto an even floor surface.
- Stack carboys only if the lower tiers can bear the weight of the upper tiers safely.
- Do not load nitric acid above any other product.
- Load charged storage batteries so their liquid won't spill.
- Keep them right side up.
- Make sure other cargo won't fall against or short circuit them.

**Never** load corrosive liquids next to or above:

- Division 1.4 (Explosives C).
- Division 4.1 (Flammable Solids). Division 4.3 (Dangerous When Wet). Class 5 (Oxidizers).
- Division 2.3, Zone B (Poisonous Gases).

**Never** load corrosive liquids with:

- Division 1.1 or 1.2
- Division 1.3
- Division 1.5 (Blasting Agents).
- Division 2.3, Zone A (Poisonous Gases).
- Division 4.2 (Spontaneously Combustible Materials).
- Division 6.1, PGI, Zone A (Poison Liquids).

**Figure 9.9: Do Not Load Table**

Do Not Load	In The Same Vehicle With
Division 6.1 or 2.3 (POISON or poison inhalation hazard labeled material)	Animal or human food unless the poison package is over packed in an approved way. Foodstuffs are 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, PGI, Zone A	Division 1.1, 1.2, 1.3 Explosives, Division 5.1 (Oxidizers), Class 3 (Flammable Liquids), Class 8 (Corrosive Liquids), Division 5.2 (Organic Peroxides), Division 1.1, 1.2, 1.3 Explosives, Division 1.5 (Blasting Agents), Division 2.1 (Flammable Gases), Class 4 (Flammable Solids).
Charged storage batteries	Division 1.1.
Class 1 (Detonating primers)	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. For Example: Cyanides, Inorganic, n.o.s. Silver Cyanide Sodium Cyanide.
Nitric acid (Class 8)	Other materials unless the nitric acid is not loaded above any other material.

## MIXED LOADS

The rules require some products to be loaded separately. You cannot load them together in the same cargo space. Figure 9.9 lists some examples. The regulations (the Segregation Table for Hazardous Materials) name other materials you must keep apart.

### Subsection 9.4 Test Your Knowledge

1. Around which hazard classes must you never smoke?
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 materials be stainless steel?
4. At the shipper's dock you're given a paper for 100 cartons of battery acid. You already have 100 pounds of dry Silver Cyanide on board. What precautions do you have to take?
5. Name a hazard class that uses transport indexes to determine the amount that can be loaded in a single vehicle.

These questions may be on your test. If you can't answer them all, re-read subsection 9.4.

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## 9.5 – Bulk Packaging Marking, Loading, and Unloading

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The glossary at the end of this section gives the meaning of the word bulk.

**Cargo tanks** are bulk packaging permanently attached to a vehicle. Cargo tanks stay on the vehicle when you load and unload them.

**Portable tanks** are bulk packaging, which are not permanently attached to a vehicle. The product is loaded or unloaded while the portable tanks are off the vehicle. Portable tanks are then put on a vehicle for transportation. There are many types of cargo tanks. The most common cargo tanks are MC306 for liquids and MC331 for gases.

### 9.5.1 – Markings

You must display the identification number of the hazardous materials in portable tanks, cargo tanks, and other bulk packaging like dump trucks. Identification numbers are in Column 4 of the Hazardous Materials Table.

The rules require black 100 mm (3.9 inch) numbers on orange panels on placards. If your cargo does not require a placard, you must use a white, diamond-shaped background. Specification cargo tanks must show re-test date markings.

Portable tanks must show the lessee or owner's name. They must also show the shipping name of the contents on two opposing sides.

If your portable tank can hold more than 1,000 gallons, the letters of the shipping name must be at least two inches tall. If your portable tank holds less than 1,000 gallons, the letters of the shipping name must be one-inch tall.

The identification number must appear on each side and each end of a portable tank or other bulk packaging that hold 1,000 gallons or more and on two opposing sides, if the portable tank holds less than 1,000 gallons.

The identification numbers must still be visible when the portable tank is on the motor vehicle. If they are not visible, you must display the identification number on all four sides of the motor vehicle.

Intermediate bulk containers (IBCs) are bulk packages, but are not required to have the owner's name or shipping name.

## 9.5.2 – Tank Loading

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

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

There are special attendance rules for cargo tanks transporting propane and anhydrous ammonia.

Close all manholes and valves before moving a tank of hazardous materials, no matter how small the amount in the tank or how short the distance. Manholes and valves must be closed to prevent leaks. It is illegal to move a cargo tank with open valves or covers unless it is empty according to [49 CFR 173.29](#).

## 9.5.3 – Flammable Liquids

Turn off your engine before loading or unloading any flammable liquids. Only run the engine if needed to operate a pump. Ground a cargo tank correctly before filling it through an open filling hole. Ground the tank before opening the filling hole, and maintain the ground until after closing the filling hole.

## 9.5.4 – Compressed Gas

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. If you use the engine, turn it off after product transfer, before you unhook the hose. Unhook all loading/unloading connections before coupling, uncoupling, or moving a cargo tank. Always chock trailers and semi-trailers to prevent motion when uncoupled from the power unit.

### Subsection 9.5 Test Your Knowledge

1. What are cargo tanks?
2. How is a portable tank different from a cargo tank?
3. Your engine runs a pump used during delivery of compressed gas. Should you turn off the engine before or after unhooking hoses after delivery?

These questions may be on your test. If you can't answer them all, re-read subsection 9.5.

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## 9.6 – Hazardous Materials: Driving and Parking Rules

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### 9.6.1 – Parking with Division 1.1, 1.2, or 1.3 Explosives

Never park with Division 1.1, 1.2, or 1.3 explosives within five feet of the traveled part of the road. Except for short periods of time needed for vehicle operation necessities (e.g., fueling), do not park within 300 feet of:

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

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

Don't 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 property.

- On the carrier's property.
- On the consignee's property.

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

## 9.6.2 – Parking a Placarded Vehicle Not Transporting Division 1.1, 1.2, or 1.3 Explosives

You may park a placarded vehicle (not laden with explosives) within five feet of the traveled part of the road only if your work requires it. Do so only briefly. Someone must always watch the vehicle when parked on a public roadway or shoulder. Do not uncouple a trailer and leave it with hazardous materials on a public street. Do not park within 300 feet of an open fire.

## 9.6.3 – Attending Parked Vehicles

The person attending a placarded vehicle must:

- Be in the vehicle, awake, and not in the sleeper berth, or within 100 feet of the vehicle and have it within clear view.
- Be aware of the hazards of the materials being transported.
- Know what to do in emergencies.
- Be able to move the vehicle, if needed.

## 9.6.4 – No Flares!

You might break down and have to use stopped 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.

Vehicle loaded with Division 1.1, 1.2, or 1.3 Explosives.

## 9.6.5 – Route Restrictions

Some states and counties require permits to transport hazardous materials or wastes. They may limit the routes you can use. Local rules about routes and permits change often. It is your job as driver to find out if you need permits or must use special routes. Make sure you have all the needed papers before starting.

If you work for a carrier, ask your dispatcher about route restrictions or permits.

If you are an independent trucker and are planning a new route, check with state agencies where you plan to travel.

Some localities prohibit transportation of hazardous materials through tunnels, over bridges, or other roadways. Always 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 explosives, you must have a written route plan and follow that plan. Carriers prepare the route plan in advance and give the driver a copy. You may plan the route yourself if you pick up 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 materials. After choosing the route, the carrier must tell the driver about the radioactive materials, and show the route plan.

## 9.6.6 – No Smoking

Do not smoke within 25 feet of a placarded cargo tank used for Class 3 (flammable liquids) or Division

2.1 (gases). Also, do not smoke or carry a lighted cigarette, cigar, or pipe within 25 feet of any vehicle, which contains:

- Class 1 (Explosives)
- Class 3 (Flammable Liquids) Class 4.1 (Flammable Solids)
- Class 4.2 (Spontaneously Combustible) Class 5 (Oxidizers)

## 9.6.7 – Refuel with Engine Off

Turn off your engine before fueling a motor vehicle containing hazardous materials. Someone must always be at the nozzle, controlling fuel flow.

## 9.6.8 – 10 B:C Fire Extinguisher

The power unit of placarded vehicles must have a fire extinguisher with a UL rating of 10 B:C or more.

## 9.6.9 – Check Tires

Make sure your tires are properly inflated.

You must examine each tire on a motor vehicle at the beginning of each trip and each time the vehicle is parked.

The only acceptable way to check tire pressure is to use a tire pressure gauge.

Do not drive with a tire that is leaking or flat except to the nearest safe place to fix it. Remove any overheated tire. Place it a safe distance from your vehicle. Don't drive until you correct the cause of the overheating. Remember to follow the rules about parking and attending placarded vehicles. They apply even when checking, repairing, or replacing tires.

## 9.6.10 – Where to Keep Shipping Papers and Emergency Response Information

Do not accept a hazardous materials shipment without a properly prepared shipping paper. A shipping paper for hazardous materials must always be easily recognized. Other people must be able to find it quickly after a crash.

Clearly distinguish hazardous materials shipping papers from others by tabbing them or keeping them on top of the stack of papers.

When you are behind the wheel, keep shipping papers within your reach (with your seat belt on), or in a pouch on the driver's door. They must be easily seen by someone entering the cab.

When not behind the wheel, leave shipping papers in the driver's door pouch or on the driver's seat.

Emergency response information must be kept in the same location as the shipping paper.

Papers for Division 1.1, 1.2 or, 1.3 Explosives.

A carrier must give each driver transporting Division 1.1, 1.2, or 1.3 explosives a copy of Federal Motor Carrier Safety Regulations (FMCSR), Part 397. The carrier must also give written instructions on what to do if delayed or in an accident. The written instructions must include:

- The names and telephone numbers of people to contact (including carrier agents or shippers).
- The nature of the explosives transported.
- The precautions to take in emergencies such as fires, accidents, or leaks.

Drivers must sign a receipt for these documents. You must be familiar with, and have in your possession while driving, the:

- Shipping papers.
- Written emergency instructions. Written route plan.
- A copy of FMCSR, Part 397.

## 9.6.11 – Equipment for Chlorine

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.

## 9.6.12 – Stop Before Railroad Crossings

Stop before a railroad crossing if your vehicle:

- Is placarded.
- Carries any amount of chlorine.
- Has cargo tanks, whether loaded or empty, used for hazardous materials.

You must stop 15 to 50 feet before the nearest rail. Proceed only when you are sure no train is coming and you can clear the tracks without stopping. Don't shift gears while crossing the tracks.

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# 9.7 – Hazardous Materials: Emergencies

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## 9.7.1 – Emergency Response Guidebook (ERG)

The Department of Transportation has a guidebook for firefighters, police, and industry workers on how to protect themselves and the public from hazardous materials. The guide is indexed by proper shipping name and hazardous materials identification number. Emergency personnel look for these things on the shipping paper. That is why it is vital that the proper shipping name, identification number, label, and placards are correct.

## 9.7.2 – Crashes/Incidents

As a professional driver, your job at the scene of a crash or an incident is to:

- Keep people away from the scene.
- Limit the spread of material, only if you can safely do so.
- Communicate the danger of the hazardous materials to emergency response personnel.
- Provide emergency responders with the shipping papers and emergency response information.
- Follow this checklist:
- Check to see that your driving partner is OK. Keep shipping papers with you.

- Keep people far away and upwind. Warn others of the danger.
- Call for help.
- Follow your employer's instructions.

## 9.7.3 – Fires & Leaks

### FIRES

You might have to control minor truck fires on the road. However, unless you have the training and equipment to do so safely, don't fight hazardous materials fires. Dealing with hazardous materials fires requires special training and protective gear.

When you notice a fire, call for help. You may use the fire extinguisher to keep minor truck fires from spreading to cargo before firefighters arrive. Feel trailer doors to see if they are hot before opening them. If it's hot, you may have a cargo fire and should not open the doors. Opening doors lets air in and may make the fire flare up. Without air, many fires only smolder until firemen arrive, doing less damage. If your cargo is already on fire, it is not safe to fight the fire. Keep the shipping papers with you to give to emergency personnel as soon as they arrive. Warn other people of the danger and keep them away.

### LEAKS

If you find a cargo leak, identify the hazardous materials leaking by using shipping papers, labels, or package location. Do not touch any leaking material. You can injure yourself by touching hazardous materials. Do not try to identify the material or find the source of a leak by smell. Toxic gases can destroy your sense of smell and can injure or kill you even if they don't smell. Never eat, drink, or smoke around a leak or spill.

If hazardous materials are 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, if doing so serves safety. Only move your vehicle if you can do so without danger to yourself or others.

Never continue driving with hazardous materials leaking from your vehicle to find a phone, truck stop, help, or similar reason. Remember, the carrier pays for the cleanup of contaminated parking lots, roadways, and drainage ditches. The costs are enormous, so don't leave a lengthy trail of contamination. If hazardous materials are spilling from your vehicle:

- Park it.
- Secure the area. Stay there.
- Call for help or send someone else for help.
- When sending someone for help, give that person: 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 proper shipping name, hazard class, and identification number of the hazardous materials, if you know them.

This is a lot for someone to remember. It is a good idea to write it all down for the person you send for help. The emergency response team must know these things to find you and to handle the emergency. They may have to travel a long way to get to you. This information will help them to bring the right equipment the first time, without having to go back for it.

Never move your vehicle if it will cause contamination or damage the vehicle. Keep upwind and away from roadside rests, truck stops, cafes, and businesses. Never try to repack leaking containers. Don't try to repair leaks unless you have the training and equipment to do so safely. Call your dispatcher or supervisor for instructions and, if needed, emergency personnel.

## 9.7.4 – Responses to Specific Hazards

### CLASS 1 (EXPLOSIVES)

- If your vehicle has a breakdown or accident while carrying explosives, warn others of the danger.
- Keep bystanders away.
- Do not allow smoking or open fire near the vehicle.
- If there is a fire, warn every one of the danger of explosion.
- Remove all explosives before separating vehicles involved in a collision.
- Place the explosives at least 200 feet from the vehicles and occupied buildings.
- Stay a safe distance away.

### CLASS 2 (COMPRESSED GASES)

- If compressed gas is leaking from your vehicle, warn others of the danger.
- Only permit those involved in removing the hazard or wreckage to get close.
- You must notify the shipper if compressed gas is involved in any 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.

### CLASS 3 (FLAMMABLE LIQUIDS)

- If you are transporting a flammable liquid and have an accident or your vehicle breaks down, prevent bystanders from gathering.
- Warn people of the danger.
- Keep them from smoking.
- Never transport a leaking cargo tank farther than needed to reach a safe place.

- Get off the roadway if you can do so safely.
- Don't transfer flammable liquid from one vehicle to another on a public roadway except in an emergency.

#### **CLASS 4 (FLAMMABLE SOLIDS) AND CLASS 5 (OXIDIZING MATERIALS)**

- If a flammable solid or oxidizing material 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 decreases the fire hazard.

#### **CLASS 6 (POISONOUS MATERIALS AND INFECTIOUS SUBSTANCES)**

- If you think a Division 2.3 (Poison Gases) or Division 6.1 (Poison Materials) might be flammable, take the added precautions needed for flammable liquids or gases.
- Do not allow smoking, open flame, or welding.
- Warn others of the hazards of fire, of inhaling vapors, or coming in contact with the poison.
- A vehicle involved in a leak of Division 2.3 (Poison Gases) or Division 6.1 (Poisons) must be checked for stray poison before being used again.
- If a Division 6.2 (Infectious Substances) package is damaged in handling or transportation, you should immediately contact your supervisor. Packages that look damaged or show signs of leakage should not be accepted.

#### **CLASS 7 (RADIOACTIVE MATERIALS)**

- If radioactive material is involved in a leak or broken package, tell your dispatcher or supervisor as soon as possible.
- If there is a spill, or if an internal container might be damaged, do not touch or inhale the material.
- Do not use the vehicle until it is cleaned and checked with a survey meter.

#### **CLASS 8 (CORROSIVE MATERIALS)**

- If corrosives spill or leak during transportation, be careful to avoid further damage or injury when handling the containers.
- Parts of the vehicle exposed to a corrosive liquid must be thoroughly washed with water.
- After unloading, wash out the interior as soon as possible before reloading.
- If continuing to transport a leaking tank would be unsafe, get off the road.
- If safe to do so, contain any liquid leaking from the vehicle.
- Keep bystanders away from the liquid and its fumes.
- Do everything possible to prevent injury to yourself and to others.

## 9.7.5 – Required Notification

The National Response Center helps coordinate emergency response to chemical hazards. It is a resource to the police and firefighters. It keeps a 24-hour toll-free line listed below. You or your employer must phone when any of the following occur as a direct result of a hazardous materials incident:

- A person is killed.
- An injured person requires hospitalization. Estimated property damage exceeds \$50,000.
- The general public is evacuated for more than one hour.
- One or more major transportation arteries or facilities are closed for one hour or more.
- Fire, breakage, spillage, or suspected radioactive contamination occurs.
- Fire, breakage, spillage or suspected contamination occur involving shipment of infectious substance(s) (bacteria or toxins).
- The release of a marine pollutant in a quantity more than 119 gallons for a liquid or 882 pounds for a solid; or a situation exists of such a nature (e.g., continuing danger to life exists at the scene of an incident) that, in the judgment of the carrier, should be reported.

### **NATIONAL RESPONSE CENTER (800) 424-8802**

When you call the National Response Center you should be ready to give:

- Your name.
- Name and address of the carrier you work for. Phone number where they can be reached.
- Date, time, and location of incident. The extent of injuries, if any.
- Classification, name, and quantity of hazardous materials involved, if the information is available.
- Type of incident and nature of hazardous materials involvement 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 name of the shipper and the quantity of the hazardous substance discharged.
- Be prepared to give your employer the required information as well. Carriers must make detailed written reports within 30 days of an incident.

### **CHEMTREC (800) 424-9300**

The Chemical Transportation Emergency Center (CHEMTREC) in Washington also has a 24-hour toll-free line. CHEMTREC was created to provide emergency personnel with technical information about the physical properties of hazardous materials. The National Response Center and CHEMTREC are in close communication. If you call either one, they will tell the other about the problem when appropriate.

Do not leave radioactive **yellow - II** or **yellow - III** labeled packages near people, animals, or film longer than shown in Figure 9.10.

**Figure 9.10: Radioactive Separation Table**

Total Transport Index	Minimum Distance in Feet to Nearest Undeveloped Film:	Minimum Distance in Feet to Nearest Undeveloped Film:	Minimum Distance in Feet to Nearest Undeveloped Film:	Minimum Distance in Feet to Nearest Undeveloped Film:	Minimum Distance in Feet to Nearest Undeveloped Film:	To People or Cargo Compartment Partitions
	0-2 Hrs.	2-4 Hrs.	4-8 Hrs.	8-12 Hrs.	Over 12 Hrs.	
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	—

**CLASSES OF HAZARDOUS MATERIALS**

Hazardous materials are categorized into nine major hazard classes and other categories for consumer commodities and combustible liquids. The classes of hazardous materials are listed in Figure 9.11.

## Figure 9.11: Hazard Class Definitions Table B

Class	Class Name	Example
1	Explosives	Ammunition, Dynamite, Fireworks
2	Gases	Propane, Oxygen, Helium
3	Flammable	Gasoline, 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 Fluid
9	Miscellaneous Hazardous Materials	Formaldehyde, Asbestos
None	ORM-D (Other Regulated Material-Domestic)	Hair Spray or Charcoal
None	Combustible Liquids	Fuel Oils, Lighter Fluid

### Subsections 9.6 and 9.7 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 traveled part of the roadway can you park with Division 1.2 or 1.3 materials?
4. How close can you park to a bridge, tunnel, or building with Division 1.2 or 1.3 materials?
5. What type of fire extinguisher do placarded vehicles need to carry?
6. You're hauling 100 pounds of Division 4.3 materials. Do you need to stop before a railroad-highway crossing?
7. At a rest area, you discover your hazardous materials shipments slowly leaking from the vehicle. There is no phone around. What should you do?
8. What is the Emergency Response Guide (ERG)?

These questions may be on your test. If you can't answer them all, re-read subsections 9.6 and 9.7.

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## 9.8 – Hazardous Materials Glossary

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This glossary has definitions of some terms used in this section. You can find a complete glossary of terms for hazardous materials in [the federal Hazardous Materials Rules \(49 CFR 171.8\)](#). You should keep an up-to-date copy of these rules for your reference.

You will not be tested on this glossary.

**Bulk packaging** – Packaging, other than a 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 more than 450 L (119 gallons) as a receptacle for a liquid;
- A maximum net mass more than 400 kg (882 pounds) or a maximum capacity more than 450 L (119 gallons) as a receptacle for a solid; or
- A water capacity more than 454 kg (1000 pounds) as a receptacle for a gas as defined in Sec. 173.115.

**Cargo tank** - A bulk packaging which:

- Is a tank intended primarily for the carriage of liquids or gases and includes appurtenances, reinforcements, fittings, and closures (for "tank", see [49 CFR 178.345-1\(c\)](#), [49 CFR 178.337-1](#), or [49 CFR 178.338-1](#), as applicable);
- 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 motor vehicle; and
- 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 in commerce by rail car, aircraft, motor vehicle or vessel.

**Consignee** – The business or person to whom a shipment is delivered.

**Division** – A subdivision of a hazard class.

**EPA** – U.S. Environmental Protection Agency.

**FMCSR** – The Federal Motor Carrier Safety Regulations.

**Freight container** – a reusable container having a volume of 64 cubic feet or more, designed and constructed to permit being lifted with its contents intact and intended primarily for containment of packages (in unit form) during transportation.

**Fuel tank** – A tank, other than a cargo tank, used to transport flammable or combustible liquid or compressed gas for the purpose of supplying fuel for propulsion of the transport vehicle to which it is attached, or for the operation of other equipment on the transport vehicle.

**Gross weight or gross mass** – The weight of the packaging plus the weight of its contents.

**Hazard class** – The category of hazard assigned to a hazardous material under the definitional criteria of Part 173 and the provisions of the Sec. 172.101 Table. A material may meet the defining criteria for more than one hazard class but is assigned to only one hazard class.

**Hazardous materials** – A substance or material which has been determined by the Secretary of Transportation to be capable of posing an unreasonable risk to health, safety, and property when transported in commerce, and which has been so designated. The term includes hazardous substances, hazardous wastes, marine pollutants, elevated temperature materials and materials designated as hazardous in the hazardous materials table of §172.101, and materials that meet the defining criteria for hazard classes and divisions in §173, subchapter c of this chapter.

**Hazardous substance** - A material, including its mixtures and solutions, that:

- Is listed in Appendix A to Sec. 172.101;
- Is in a quantity, in one package, which equals or exceeds the reportable quantity (RQ) listed in Appendix A to Sec. 172.101; and
- When in a mixture or solution -
  - For radionuclides, conforms to paragraph 7 of Appendix A to Sec. 172.101.
  - For other than radionuclides, is in a concentration by weight which equals or exceeds the concentration corresponding to the RQ of the material, as shown in Figure 9.12.

**Figure 9.12: Hazardous Substance Concentrations**

RQ Pounds (Kilograms)	Concentration by Weight: Percent	Concentration by Weight: PPM
5,000 (2,270)	10	100,000
1,000 (454)	2	20,000
100 (45.4)	.2	2,000
10 (4.54)	.02	200
1 (0.454)	.002	20

This definition does not apply to petroleum products that are lubricants or fuels (see [40 CFR 300.6](#)).

**Hazardous waste** – Any material that is subject to the Hazardous Waste Manifest Requirements of the U.S. Environmental Protection Agency specified in [40 CFR Part 262](#).

**Intermediate bulk container (IBC)** – A rigid or flexible portable packaging, other than a cylinder or portable tank, which is designed for mechanical handling. Standards for IBCs manufactured in the United States are set forth in subparts N and O Part 178.

**Limited quantity** – The maximum amount of a hazardous material for which there may be specific labeling or packaging exception.

**Marking** – The descriptive name, identification number, instructions, cautions, weight, specification, or UN marks or combinations thereof, required by this subchapter on outer packaging of hazardous materials.

**Mixture** – A material composed of more than one chemical compound or element.

**Name of contents** – The proper shipping name as specified in Sec. 172.101.

**Non-bulk packaging** – A packaging, which has:

- A maximum capacity of 450 L (119 gallons) as a receptacle for a liquid;
- A maximum net mass less than 400 kg (882 pounds) and a maximum capacity of 450 L (119 gallons) or less as a receptacle for a solid;
- A water capacity more than 454 kg (1,000 pounds) or less as a receptacle for a gas as defined in Sec. 173.115;
- A maximum net mass of 400 kg (882 pounds) or less for a bag or box conforming to the applicable requirements for specification packaging, including the maximum net mass limitations, provided in subpart L of Part 178.

**N.O.S.** – Not otherwise specified.

**Outage or ullage** – The amount by which a packaging falls short of being liquid full, usually expressed in percent by volume.

**Portable tank** – Bulk packaging (except a cylinder having a water capacity of 1,000 pounds or less) designed primarily to be loaded onto, or on, or temporarily attached to a transport vehicle or ship and equipped with skids, mountings, or accessories to facilitate handling of the tank by mechanical means. It does not include a 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 materials shown in Roman print (not italics) in Sec. 172.101.

**P.s.i. or psi** – Pounds per square inch.

**P.s.i.a. or psia** – Pounds per square inch absolute.

**Reportable quantity (RQ)** – The quantity specified in Column 2 of the Appendix to Sec. 172.101 for any material identified in Column 1 of the Appendix.

**PHMSA** – The Pipeline and Hazardous Materials Safety Administration, U.S. Department of Transportation, Washington, DC 20590.

**Shipper's certification** – A statement on a shipping paper, signed by the shipper, saying he/she prepared the shipment properly according to law. For example:

- "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 or the Department of Transportation."; or
- I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national government regulations."

**Shipping paper** – A shipping order, bill of lading, manifest, or other shipping document serving a similar purpose prepared following subpart C of Part 172.

**Technical name** – A recognized chemical name or microbiological name currently used in scientific and technical handbooks, journals, and texts.

**Transport vehicle** – A cargo-carrying vehicle such as an automobile, van, tractor, truck, semi-trailer, tank car, or rail car used for the transportation of cargo by any mode. Each cargo-carrying body (trailer, rail car, etc.) is a separate transport vehicle.

**UN standard packaging** – A specification packaging conforming to the standards in the UN recommendations.

**UN** – United Nations.

# Section 10: School Buses

## This Section Covers

1. Danger Zones and Use of Mirrors
2. Loading and Unloading
3. Emergency Exit and Evacuation
4. Railroad-highway Grade Crossings
5. Student Management
6. Antilock Braking Systems
7. Special Safety Considerations

Because state and local laws regulate so much of school transportation and school bus operations, many of the procedures in this section may be different in each state. You should be familiar with the laws and regulations in your state and local school district.

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## 10.1 – Danger Zones and Use of Mirrors

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### 10.1.1 – Danger Zones

The **danger zone** is the area on all sides of the bus where children are in the most danger of being hit by a vehicle, including their own bus.

The danger zones may extend as much as 30 feet from the front bumper with the first 10 feet being the most dangerous. This includes 10 feet from the left and right sides of the bus and 10 feet behind the rear bumper of the school bus.

The area to the left of the bus is dangerous because of passing cars. Figure 10.1 shows these danger zones.



**Figure 10.1**

### 10.1.2 – Correct Mirror Adjustment

Correct adjustment and use of all mirrors is vital to the safe operation of the school bus in order to observe the danger zone around the bus and look for students, traffic, and other objects in this area. You should always check each mirror before operating the school bus to have the largest viewing area. If needed, have the mirrors adjusted.

### 10.1.3 – Outside Left and Right Side Flat Mirrors

These mirrors are mounted at the left and right front corners of the bus at the side or front of the windshield.

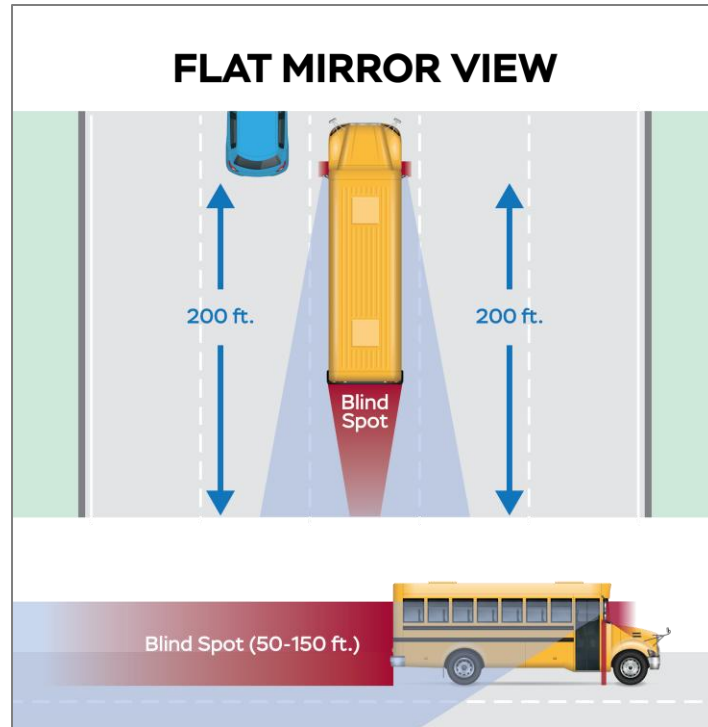
- They are used to monitor traffic, check clearances and students on the sides and to the rear of the bus.

- There is a blind spot immediately below and in front of each mirror and directly behind the rear bumper.
- The blind spot behind the bus extends 50 to 150 feet and could extend up to 400 feet depending on the length and width of the bus.

Ensure the mirrors are properly adjusted so you can see:

- 200 feet or 4 bus lengths behind the bus. Along the sides of the bus.
- The rear tires are touching the ground.

Figure 10.2 shows how both the outside left and right-side flat mirrors should be adjusted.



**Figure 10.2**

### 10.1.4 – Outside Left and Right Side Convex Mirrors

The convex mirrors are located below the outside flat mirrors. They are used to monitor the left and right sides at a wide angle. These mirrors give a view of people and objects that does not accurately reflect their size and distance from the bus. They provide a view of:

- traffic
- clearances
- and students at the side of the bus.

You should position these mirrors to see:

- The entire side of the bus up to the mirror mounts.
- Front of the rear tires touching the ground.
- At least one traffic lane on either side of the bus.

Figure 10.3 shows how both the outside left and right side convex mirrors should be adjusted.

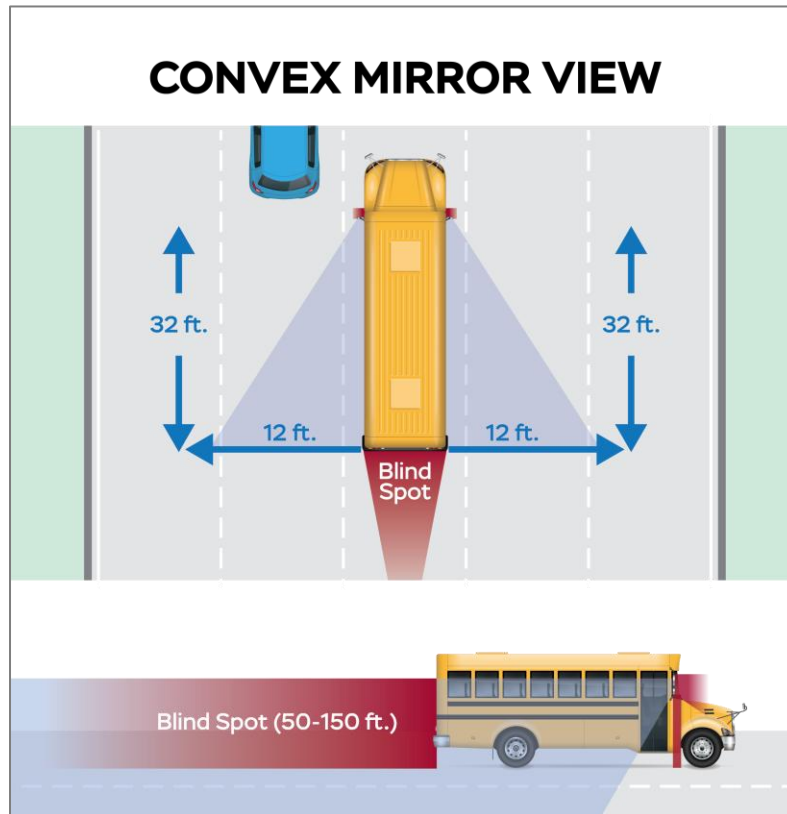


Figure 10.3

### 10.1.5 – Outside Left and Right Side Crossover Mirrors

These mirrors are mounted on both the left and right front corners of the bus. They are used to see:

- The front bumper “danger zone” area directly in front of the bus that is not visible by direct vision
- The “danger zone” area to the left side and the right side of the bus
  - Including the service door
  - Front wheel area.

The mirror presents a view of people and objects that does not accurately reflect their size and distance from the bus. The driver must ensure that these mirrors are properly adjusted.

Ensure that the mirrors are properly adjusted so you can see:

- The entire area in front of the bus from the front bumper at ground level to a point where direct vision is possible. Direct vision and mirror view vision should overlap.
- The right and left front tires touching the ground.
- The area from the front of the bus to the service door.

These mirrors, along with the convex and flat mirrors, should be viewed in an order that makes the most safety sense for the situation to ensure that a child or object is not in any of the danger zones.

Figure 10.4 illustrates how the left and right side crossover mirrors should be adjusted.



**Figure 10.4**

### 10.1.6 – Overhead Inside Rearview Mirror

This mirror is mounted directly above the windshield on the driver's side area of the bus. This mirror is used to monitor passenger activity inside the bus. It may provide limited visibility directly in back of the bus if the bus is equipped with a glass-bottomed rear emergency door.

There is a blind spot area directly behind the driver's seat as well as a large blind spot area that begins at the rear bumper and could extend up to 400 feet or more behind the bus. You must use the exterior side mirrors to monitor traffic that approaches and enters this area.

You should position the mirror to see:

- The top of the rear window in the top of the mirror.
- All of the students, including the heads of the students right behind you.

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## 10.2 – Loading and Unloading

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Each year, more students are killed while getting on or off a school bus than are killed as passengers inside of a school bus. It is critical to know what to do before, during, and after loading or unloading students. This section will give you specific procedures to follow to keep safe. Following these steps will help you avoid injuries and fatalities during and after loading and unloading students.

The information in this section is intended to provide a broad overview but is not a definitive set of actions. It is important that you learn and obey the state laws and regulations about loading and unloading operations in your state.

### 10.2.1 – Approaching the Stop

Each school district makes official routes and official school bus stops. All stops should be approved by the school district before making the stop. You should never change the location of a bus stop without written approval from the school district.

You must use extreme caution when approaching a school bus stop. You are in a very demanding situation when entering these areas. It is critical that you understand and follow all state and local laws and regulations about approaching a school bus stop. This involves the proper use of mirrors, alternating flashing lights, and when equipped, the moveable stop signal arm and crossing control arm.

When **approaching the stop**, you should:

- Approach cautiously at a slow speed.
- Look for pedestrians, traffic, or other objects before, during, and after coming to a stop.
- Continuously check all mirrors.
- If the school bus has them equipped, activate alternating flashing amber warning lights at least 200 feet or approximately 5-10 seconds before the school bus stop or following state law.
- Turn on the right turn signal indicator about 100-300 feet or approximately 3-5 seconds before pulling over.
- Continuously check mirrors to watch the danger zones for students, traffic, and other objects.

- Move as far as possible to the right on the traveled portion of the roadway.

When **stopping** you should:

- Bring the school bus to a full stop with the front bumper at least 10 feet away from students at the designated stop. This forces the students to walk to the bus so you have a better view of their movements.
- Place transmission in Park, or if there is no Park shift point, in Neutral and set the parking brake at each stop.
- Activate alternating red lights when traffic is a safe distance from the school bus and ensure the stop arm is extended.
- Make a final check to see that all traffic has stopped before completely opening the door and signaling students to approach.

## 10.2.2 – Loading Procedures

Perform a safe stop as described in subsection 10.2.1.

Students should wait in a designated location for the school bus, facing the bus as it approaches.

Students should board the bus only when signaled by the driver.

Monitor all mirrors continuously.

Count the number of students at the bus stop and be sure they all board the bus. It is helpful to know the names of students at each stop. If there is a student missing, ask the other students where the student is.

Have the students board the school bus slowly, in single file, and use the handrail. The dome light should be on while loading in the dark.

Wait until students are seated and facing forward before moving the bus.

Check all mirrors. Make certain no one is running to catch the bus.

If you cannot account for a student outside, secure the bus, take the key, and check around and underneath the bus.

When all students are accounted for, prepare to leave by:

- Closing the door. Engaging the transmission.
- Releasing the parking brake.
- Turning off alternating flashing red lights. Turning on the left turn signal.
- Checking all mirrors again.
- Allowing congested traffic to disperse.
- When it is safe, move the bus to enter traffic flow and continue the route.

The loading procedure is essentially the same wherever you load students, but there are slight differences. When students are loading at the school campus, you should:

- Turn off the ignition switch.
- Remove the key if you are leaving the driver's compartment.

Position yourself to supervise loading as required or recommended by your state or local regulations.

### 10.2.3 – Unloading Procedures on the Route

Perform a safe stop at designated unloading areas as described in subsection 10.2.1.

Have the students remain seated until told to exit. Check all mirrors.

Count the number of students while unloading to confirm the location of all students before pulling away from the stop.

Tell students to exit the bus and walk at least 10 feet away from the side of the bus to a position where the driver can plainly see all students.

Check all mirrors again. Make sure no students are around or returning to the bus.

If you cannot account for a student outside the bus, secure the bus, and check around and underneath the bus.

When all students are accounted for, prepare to leave by:

- Closing the door. Engaging transmission. Releasing parking brake.
- Turning off alternating flashing red lights. Turning on left turn signal.
- Checking all mirrors again.
- Allowing congested traffic to disperse.
- When it is safe, move the bus, enter the traffic flow and continue the route.

**NOTE:** If you have missed a student's unloading stop, do not back up. Be sure to follow local procedures.

### ADDITIONAL PROCEDURES FOR STUDENTS THAT MUST CROSS THE ROADWAY

You should understand what students should do when exiting a school bus and crossing the street in front of the bus. In addition, the school bus driver should understand that students might not always do what they are supposed to do.

If a student or students must cross the roadway, they should follow these procedures:

- Walk approximately 10 feet away from the side of the school bus to a position where you can see them.
- Walk to a location at least 10 feet in front of the right corner of the bumper, keeping away from the front of the school bus.
- Stop at the right edge of the roadway.
- You should be able to see the student's feet.

When students reach the edge of the roadway, they should:

- Stop and look in all directions, making sure the roadway is clear and is safe.
- Check to see if the red flashing lights on the bus are still flashing.
- Wait for your signal before crossing the roadway.

Upon your signal, the students should:

- Cross far enough in front of the school bus to be in your view.
- Stop at the left edge of the school bus, stop, and look again for your signal to continue to cross the roadway.
- Look for traffic in both directions, making sure the roadway is clear.
- Proceed across the roadway, continuing to look in all directions.

**NOTE:** The school bus driver should enforce any state or local regulations or recommendations concerning student actions outside the school bus.

## 10.2.4 – Unloading Procedures at School

State and local laws about unloading students at schools, particularly in the school parking lot or a location off the traveled roadway, are often different from unloading along the school bus route. It is important that you understand and follow state and local laws and regulations. The following procedures are meant to be general guidelines.

**When unloading at the school you should:**

- Perform a safe stop at designated unloading areas as described in subsection 10.2.1.
- Secure the bus by:
  - Turning off the ignition switch.
  - Removing key if leaving driver's compartment. Have the students remain seated until told to exit.
- Position yourself to supervise unloading as required or recommended by your state or local regulations.

- Have students exit in orderly fashion.
- Observe students as they step from the bus to see they all move promptly away from the unloading area.
- Walk through the bus and check for hiding/sleeping students and items left by students.
- Check all mirrors. Make certain no students are returning to the bus.
- If you cannot account for a student outside the bus and the bus is secure, check around and underneath the bus.

**When all students are accounted for, prepare to leave by:**

- Closing the door. Fastening safety belt. Starting engine.
- Engaging the transmission. Releasing the parking brake.
- Turning off alternating flashing red lights. Turning on the left turn signal.
- Checking all mirrors again.
- Allowing congested traffic to disperse.
- When it is safe, pull away from the unloading area.

## 10.2.5 – Special Dangers of Loading and Unloading

### **DROPPED OR FORGOTTEN OBJECTS**

Always focus on students as they approach the bus and watch for any who disappear from sight.

Students may drop an object near the bus during loading and unloading. Stopping or returning to pick up the object may cause the student to disappear from the driver’s sight at a very dangerous moment.

Students should be told to leave any dropped object and move to a point of safety out of the danger zones before trying to get the driver’s attention to retrieve the object.

### **HANDRAIL HANG-UPS**

Students have been injured or killed when clothing, accessories, or even parts of their body get caught in the handrail or door as they exited the bus. You should closely observe all students exiting the bus to confirm that they are in a safe location prior to moving the bus

## 10.2.6 – Post-trip Inspection

When your route or school activity trip is finished, you should conduct a post-trip inspection of the bus.

You should walk through the bus and around the bus looking for the following:

- Articles left on the bus. Sleeping students.
- Open windows and doors.
- Mechanical/operational problems with the bus,
  - Give special attention to items that are unique to school buses like mirror systems, flashing warning lamps, and stop signal arms.
- Damage or vandalism.

Any problems or special situations should be reported immediately to your supervisor or school authorities.

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## 10.3 – Emergency Exit and Evacuation

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An emergency can happen to anyone, anytime, anywhere. It could be a crash, a stalled school bus on a railroad-highway crossing or in a high-speed intersection, an electrical fire in the engine compartment, a medical emergency to a student on the school bus, etc. Emergencies may cause you to evacuate the bus to keep everyone safe. Knowing what to do before, during, and after an emergency evacuation can mean the difference between life and death.

### 10.3.1 – Planning for Emergencies

#### **DECIDE WHEN YOU NEED TO EVACUATE THE BUS**

The most important consideration for deciding to evacuate the bus is to recognize the hazard. If you have enough time, you should contact your dispatcher to explain the situation before deciding to evacuate the school bus.

Keeping students on the bus during an emergency is the best way to ensure their safety. However, if keeping students on the bus would put them in unnecessary risk of injury, you should evacuate the bus. Remember, the decision to evacuate the bus must be made quickly

**When deciding if you should evacuate, ask yourself the following questions:**

- Is there a fire or danger of fire?
- Is there a smell of raw or leaking fuel?
- Is there a chance the bus could be hit by other vehicles?
- Is the bus in the path of a sighted tornado or rising waters?
- Are there downed power lines?
- Would removing students expose them to speeding traffic, severe weather, or a dangerous environment such as downed power lines?

- Would moving students complicate injuries such as neck and back injuries and fractures?
- Is there a hazardous spill involved? Sometimes, it may be safer to remain on the bus and not come in contact with the material.

## **MANDATORY EVACUATIONS**

You must evacuate the bus when:

- The bus is on fire or there is a threat of a fire.
- The bus is stalled on or adjacent to a railroad-highway crossing.
- The position of the bus may change and increase the danger.
- There is an imminent danger of collision.
- There is a hazardous materials spill.

### **10.3.2 – Evacuation Procedures**

#### **BE PREPARED AND PLAN AHEAD**

You must explain the emergency evacuation procedures to all students. This includes knowing how to operate the various emergency exits and the importance of listening to and following all instructions given by you.

If you have older students who are responsible, you can assign them to be assistants at each emergency exit. Teach them how to help the other students off the bus. Assign another student assistant to lead the students to a safe place after evacuation.

#### **Some tips to help find a safe place:**

- A safe place will be at least 100 feet off the road in the direction of oncoming traffic. This will keep the students from being hit by debris if another vehicle collides with the bus.
- Lead students upwind of the bus if fire is present.
- Lead students as far away from railroad tracks as possible and in the direction of any oncoming train.
- Lead students upwind of the bus at least 300 feet if there is a risk from spilled hazardous materials.
- If the bus is in the direct path of a sighted tornado and evacuation is ordered:
  - Escort students to a nearby ditch or culvert if shelter in a building is not readily available,
  - Direct them to lie face down, hands covering their head.
  - They should be far enough away so the bus cannot topple on them.
- Avoid areas that are subject to flash floods.

## GENERAL PROCEDURES

Decide if evacuation is in the best interest of safety.

### Decide the best type of evacuation:

- Front, rear or side door evacuation, or some combination of doors.
- Roof or window evacuation.
- Secure the bus by:
  - Placing transmission in Park, or if there is no shift point, in Neutral.
  - Setting parking brakes. Shutting off the engine. Removing ignition key.
  - Activating hazard-warning lights.
- If time allows, notify dispatch office of evacuation location, conditions, and type of assistance needed.
- Dangle radio microphone or telephone out of driver's window for later use, if operable.
- If no radio, or radio is inoperable, dispatch a passing motorist or area resident to call for help. As a last resort, dispatch two older, responsible students to go for help.
- Order the evacuation.
- Evacuate students from the bus.

Do not move a student you believe may have suffered a neck or spinal injury unless his or her life is in immediate danger.

### Special procedures must be used to move neck spinal injury victims to prevent further injury.

- Direct a student assistant to lead students to the nearest safe place.
- Walk through the bus to ensure no students remain on the bus.
- Retrieve emergency equipment.
- Join waiting students.
- Account for all students and check for their safety.
- Protect the scene. Set out emergency warning devices as necessary and appropriate.
- Prepare information for emergency responders.

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## 10.4 – Railroad-highway Crossings

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### 10.4.1 – Types of Crossings

#### **PASSIVE CROSSINGS**

Passive crossings have yellow circular advance warning signs, pavement markings and cross-bucks to assist you in recognizing a crossing. This type of crossing does not have any type of traffic control device. You must stop at these crossings and follow proper procedures. However, the decision to proceed is entirely yours. Passive crossings require you to:

- Recognize the crossing.
- Search for any train using the tracks
- Decide if there is sufficient clear space to cross safely.

#### **ACTIVE CROSSINGS**

This type of crossing has a traffic control device installed at the crossing to regulate traffic at the crossing. These active devices include flashing red lights, with or without bells and flashing red lights with bells and gates.

### 10.4.2 – Warning Signs and Devices

#### **ADVANCE WARNING SIGNS**

The round, black-on- yellow warning sign is placed ahead of a public railroad-highway crossing. The advance warning sign tells you to slow down, look and listen for the train, and be prepared to stop at the tracks if a train is coming. See Figure 10.5.



**Figure 10.5**

## PAVEMENT MARKINGS

Pavement markings mean the same as the advance warning sign. They look like an “X” with the letters “RR” and a no-passing marking on two-lane roads.

There is also a no passing zone sign on two-lane roads. There may be a white stop line painted on the pavement before the railroad tracks. The front of the school bus must remain behind this line while stopped at the crossing. See Figure 10.6.

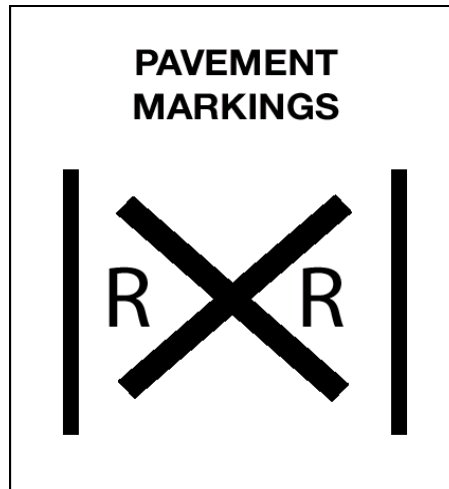


Figure 10.6

## CROSS-BUCK SIGNS

This sign marks the crossing. It requires you to yield the right-of-way to the train. If there is no white line painted on the pavement, you must stop the bus before the cross-buck sign. When the road crosses over more than one set of tracks, a sign below the cross-buck indicates the number of tracks. See Figure 10.7.

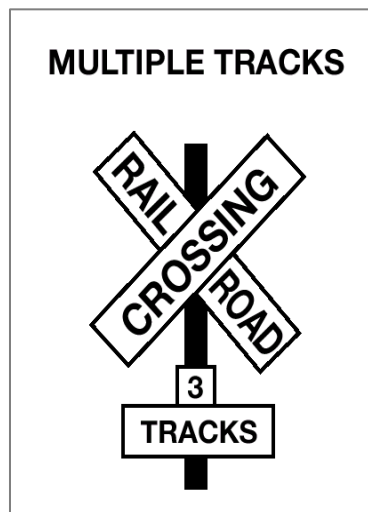


Figure 10.7

## FLASHING RED LIGHT SIGNALS

At many highway-rail grade crossings, the cross-buck sign has flashing red lights and bells. When the lights begin to flash, stop! A train is approaching. You must yield the right-of-way to the train. If there is more than one track, make sure all tracks are clear before crossing. See Figure 10.8.

## GATES

Many railroad-highway crossings have gates with flashing red lights and bells. Stop when the lights begin to flash and before the gate lowers across the road lane. Remain stopped until the gates go up and the lights have stopped flashing. Proceed when it is safe. If the gate stays down after the train passes, do not drive around the gate. Instead, call your dispatcher. See Figure 10.8.

### 10.4.3 – Recommended Procedures

Each state has laws governing how school buses must operate at railroad-highway crossings. It is important for you to understand and obey these state laws and regulations. In general, school buses must stop at all crossings and make sure it is safe before crossing the tracks. The specific procedures needed in each state vary.

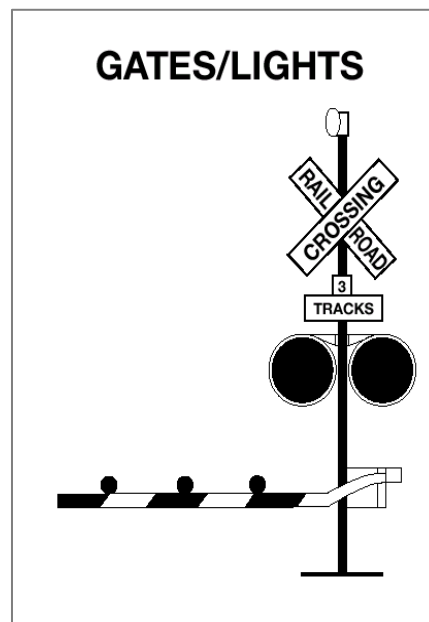


Figure 10.8

A school bus is one of the safest vehicles on the highway. However, a school bus does not have the slightest edge when involved in a crash with a train. Because of a train's size and weight, it cannot stop quickly. An emergency escape route does not exist for a train. You can prevent crashes by following these recommended procedures.

## **APPROACHING THE CROSSING**

- Slow down, including shifting to a lower gear in a manual transmission bus, and test your brakes.
- Activate hazard lights approximately 200 feet before the crossing. Make sure your intentions are known.
- Scan your surroundings and check for traffic behind you.
- Stay to the right of the roadway if possible.
- Choose an escape route in case of a brake failure or problems behind you.

## **AT THE CROSSING**

- Stop no closer than 15 feet and no farther than 50 feet from the nearest rail, where you have the best view of the tracks.
- Place the transmission in Park, or if there is no Park shift point, in Neutral and press down on the service brake or set the parking brakes.
- Turn off all radios and noisy equipment and silence the passengers.
- Open the service door and driver's window. Look and listen for an approaching train.

## **CROSSING THE TRACK**

- Check the crossing signals again before continuing.
- At a multiple-track crossing, stop only before the first set of tracks. When you are sure no train is approaching on any track, continue across all the tracks until you have completely cleared them.
- Cross the tracks in a low gear. Do not change gears while crossing.
- If the gate comes down after you have started across, drive through it even if it means you will break the gate.

## **10.4.4 – Special Situations**

### **BUS STALLS OR TRAPPED ON TRACKS**

If your bus stalls or is trapped on the tracks, get everyone out and off the tracks immediately. Move everyone far from the bus at an angle, which is both away from the tracks and toward the train.

### **POLICE OFFICER AT THE CROSSING**

If a police officer is at the crossing, obey directions. If there is no police officer, and you believe the signal is malfunctioning, call your dispatcher to report the situation and ask for instructions on how to continue.

## OBSTRUCTED VIEW OF TRACKS

Plan your route so it provides maximum sight distance at highway-rail grade crossings. Do not attempt to cross the tracks unless you can see far enough down the track to know for certain that no trains are approaching. Passive crossings are those that do not have any type of traffic control device. Be especially careful at “passive” crossings. Even if there are active railroad signals that indicate the tracks are clear, you must look and listen to be sure it is safe to proceed.

## CONTAINMENT OR STORAGE AREAS

If it won't fit, don't commit! Know the length of your bus and the size of the containment area at highway-rail crossings on the school bus route, as well as any crossing you encounter during a school activity trip. When approaching a crossing with a signal or stop sign on the opposite side, pay attention to the amount of room there. Be sure the bus has enough containment or storage area to completely clear the railroad tracks on the other side if you need to stop. Generally, add 15 feet to the length of the school bus to determine an acceptable amount of containment or storage area.

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## 10.5 – Student Management

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### 10.5.1 – Don't Deal With On-bus Problems When Loading and Unloading

To get students to and from school safely and on time, you need to be able to concentrate on the driving task.

Loading and unloading requires all your concentration. Don't take your eyes off what is happening outside the bus.

If there is a behavior problem on the bus, wait until the students unloading are safely off the bus and have moved away. If necessary, pull the bus over to handle the problem.

### 10.5.2 – Handling Serious Problems

Tips on handling serious problems:

- Follow your school's procedures for discipline or refusal of rights to ride the bus.
- Stop the bus. Park in a safe location off the road, perhaps a parking lot or a driveway.
- Secure the bus. Take the ignition key with you if you leave your seat.
- Stand up and speak respectfully to the offender or offenders. Speak in a courteous manner with a firm voice. Remind the offender of the expected behavior. Do not show anger but do show that you mean business.
- If a change of seating is needed, request that the student move to a seat near you.

- Never put a student off the bus except at school or at his or her designated school bus stop. If you feel that the offense is serious enough that you cannot safely drive the bus, call for a school administrator or the police to come and remove the student.
- Always follow your state or local procedures for requesting help.

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## 10.6 – Antilock Braking Systems

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### 10.6.1 – Vehicles Required to Have Antilock Braking Systems

The Department of Transportation requires that antilock braking systems be on:

- Air brakes vehicles, (trucks, buses, trailers and converter dollies) built on or after March 1, 1998.
- Hydraulically braked trucks and buses with a gross vehicle weight rating of 10,000 lbs or more built on or after March 1, 1999.

Many buses built before these dates have been voluntarily equipped with ABS.

Your school bus will have a yellow ABS malfunction lamp on the instrument panel if it is equipped with ABS.

### 10.6.2 – How ABS Helps You

When you brake hard on slippery surfaces in a vehicle without ABS, your wheels may lock up. When your steering wheels lock up, you lose steering control. When your other wheels lock up, you may skid or even spin the vehicle.

ABS helps you avoid wheel lock up and keep control. You may or may not be able to stop faster with ABS, but you should be able to steer around an obstacle while braking, and avoid skids caused by over braking.

### 10.6.3 – Braking with ABS

When you drive a vehicle with ABS, you should brake as you always have. In other words:

Use only the braking force necessary to stop safely and stay in control.

Brake the same way, regardless of whether you have ABS on the bus. However, in emergency braking, do not pump the brakes on a bus with ABS.

As you slow down, monitor your bus and back off the brakes (if it is safe to do so) to stay in control.

## 10.6.4 – Braking if ABS is Not Working

Without ABS, you still have normal brake functions. Drive and brake as you always have.

Vehicles with ABS have yellow malfunction lamps to tell you if something is not working. The yellow ABS malfunction lamp is on the bus's instrument panel. As a system check on newer vehicles, the malfunction lamp comes on at start-up for a bulb check and then goes out quickly. On older systems, the lamp could stay on until you are driving over five mph.

If the lamp stays on after the bulb check, or goes on once you are underway, you may have lost ABS control at one or more wheels.

Remember, if your ABS malfunctions, you still have regular brakes. Drive normally, but get the system serviced soon.

## 10.6.5 – Safety Reminders

ABS won't allow you to drive faster, follow more closely, or drive less carefully.

**ABS won't prevent power or turning skids.** ABS should prevent brake-induced skids but not those caused by spinning the drive wheels or going too fast in a turn.

**ABS won't necessarily shorten stopping distance.** ABS will help maintain vehicle control, but not always shorten stopping distance.

**ABS won't increase or decrease ultimate stopping power.** ABS is an "add-on" to your normal brakes, not a replacement for them.

**ABS won't change the way you normally brake.** Under normal brake conditions, your vehicle will stop as it always stopped. ABS only comes into play when a wheel would normally have locked up because of over braking.

ABS won't compensate for bad brakes or poor brake maintenance.

**Remember:** The best vehicle safety feature is still a safe driver.

**Remember:** Drive so you never need to use your ABS.

**Remember:** If you need it, ABS could help to prevent a serious crash.

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## 10.7 – Special Safety Considerations

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### 10.7.1 – Strobe Lights

Some school buses are equipped with roof-mounted, white strobe lights. If your bus has one, the overhead strobe light should be used when you have limited visibility. This means that you cannot easily see around you in front of, behind, or beside the school bus. Your visibility could only be slightly limited or it could be so bad you can see nothing at all. Understand and obey your state or local regulations concerning the use of these lights.

### 10.7.2 – Driving in High Winds

Strong winds affect the handling of the school bus! The side of a school bus acts like a sail on a sailboat. Strong winds can push the school bus sideways. They can even move the school bus off the road or, in extreme conditions, tip it over.

#### **If you are caught in strong winds:**

- Keep a strong grip on the steering wheel. Try to anticipate gusts.
- You should slow down to lessen the effect of the wind or pull off the roadway and wait.
- Contact your dispatcher to get more information on how to continue.

### 10.7.3 – Backing

It is very dangerous to back a school bus. You should only back your bus when you have no other safe way to move the vehicle. You should never back-up a school bus when students are outside of the bus. Backing increases your risk of a collision. If you have no choice and you must back your bus, follow these procedures:

- Assign a passenger to act as a lookout. The job of the lookout is to warn you about any obstacles, people approaching, and other vehicles. The lookout should not give directions on how to back the bus.
- Signal for quiet on the bus.
- Constantly check all mirrors and rear windows. Back slowly and smoothly.

If there is no one to be a lookout:

- Set the parking brake.
- Turn off the motor and take the keys with you.
- Walk to the rear of the bus to decide if the way is clear.

- If you must back-up at a student pick-up point:
  - Always be on the watch for students getting to the stop late.
  - Be sure to pick up students before backing.
  - Be sure that all students are in the bus before backing.
- If you must back-up at a student drop-off point, be sure to unload students after backing.

### 10.7.4 – Tail Swing

A school bus can have up to a three-foot tail swing. You need to check your mirrors before and during any turning movements to watch the tail swing.

## Section 10 Test Your Knowledge

1. Define the danger zone.
2. How far does the danger zone extend around the bus?
3. What should you be able to see if the outside flat mirrors are adjusted properly?
4. What should you be able to see if the outside convex mirrors are adjusted properly?
5. What should you be able to see if the crossover mirrors are adjusted properly?
6. You are loading students along the route. When should you activate your alternating flashing amber warning lights?
7. You are unloading students along your route. Where should students walk to after exiting the bus?
8. After unloading at school, why should you walk through the bus?
9. What position should students be in front of the bus before they cross the roadway?
10. Under what conditions must you evacuate the bus?
11. How far from the nearest rail should you stop at a highway-rail crossing?
12. What is a passive highway-rail crossing?
13. Why should you be extra cautious at a passive highway-rail crossing?
14. How should you use your brakes if your vehicle is equipped with antilock brakes (ABS)?

These questions may be on your test. If you can't answer them all, re-read Section 10.

# Section 11: Vehicle Inspection Test

## This Section Covers:

1. Internal Inspections (All Vehicles)
2. Passenger Vehicle Inspections
3. School Bus Vehicle Inspections
4. Lights Operations Check (All Vehicles)
5. External Inspections (All Vehicles)
6. Combination Vehicle Inspections

Federal and jurisdictional laws require CDL drivers to inspect their vehicle to find out if it's safe to drive. A vehicle inspection will help you find problems that can cause a breakdown or, even worse, a crash. It is important to inspect all parts of your vehicle to be sure they are working properly.

To get your CDL, you must take and pass a CDL **Vehicle Inspection test**. The test will focus on the items which are the most important for operating your vehicle safely. During your CDL Vehicle Inspection test:

- You must show you have the knowledge to find out if the vehicle is safe to drive
- You will only be asked to inspect one vehicle axle; however, you should be prepared to perform the same inspection described in subsection 11.5.2 on all of the vehicle axles.

The vehicle inspection test does not cover all the federal inspection guidelines. It is your responsibility to know the Federal Motor Carrier Safety Regulations.

**For safety, you should use wheel chocks during the Vehicle Inspection test.** You will have to walk around, enter, and exit the vehicle as part of the inspection. When you exit the vehicle, you must set the parking brake(s) and place the vehicle in neutral.

When you enter or exit the vehicle, you must face the vehicle and always keep three (3) points of contact. When you enter or exit a bus, face forward and keep a firm grasp on the handrail.

**You only need to inspect the items on the CDL Vehicle Inspection checklist.** You may use the checklist at the end of this section for your test and check off items as you have completed them, but NO other markings or writing may be placed on this list prior to the test.

You **MUST** name, point to, or touch, and fully explain to the examiner **WHAT** you are inspecting each item for. If you do not, you will not get credit for the item(s). **You will NOT have to crawl under the vehicle.** Any vehicle that has components marked or labeled, other than by the manufacturer, **CANNOT** be used for the Vehicle Inspection test.

## Failure to Follow Instructions or Unsafe Act

If you do not follow your examiner's instructions for completing the test, it may result in an automatic failure, and the test may be ended by the examiner. Always follow the examiner's instructions and directions. If you do not understand the instructions, ask the examiner for clarification.

If you commit an "unsafe act" like forgetting to set the parking brake, the examiner may give you an automatic failure and end the test. Safety of the driver, the examiner, and the testing area is of the highest priority. Always think about safety.

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## 11.1 – Internal Inspection (All Vehicles)

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Study the following parts for the vehicle you will be using during the CDL Vehicle Inspection test. You should be able to identify each part and tell the examiner what you are looking for or inspecting.

### 11.1.1 – In-Vehicle/Engine Start

#### LIGHTING INDICATORS

**Description:** Dashboard indicator lights for signals, flashers, headlight high beam; Anti-lock Braking System (ABS); and Diesel Exhaust Fluid (DEF)/Diesel Particulate Filter (DPF).

**Why Inspect:** Shows which functions are active or warns of problem vehicle components.

**What and How to Inspect:** Each of the following items must be inspected. Inspect to make sure the dash indicators work when the vehicle starts and when corresponding lights are turned on including:

- Left turn signal indicator.
- Right turn signal indicator.
- Four-way emergency indicator.
- High beam headlight indicator.
- ABS indicator on dashboard;
  - For combination vehicles only: the rear driver's side trailer ABS light should turn on then off, if equipped.
- DEF indicator, if equipped.

**NOTE:** Operational inspection of actual turn signals, four-way indicators and high beam functions must be done separately during the lights' operation inspection described in Section 11.4.

## EMERGENCY EQUIPMENT

**Description:** Required emergency equipment.

**Why Inspect:** Emergency equipment must be available and in usable condition.

**What and How to Inspect:**

- Inspect for spare electrical fuses (if used) or identify circuit breakers.
- **NOTE:** If the vehicle is not equipped with electrical fuses, you must mention this to the examiner and identify that the vehicle runs on circuit breakers.
- Inspect for a properly charged and secured fire extinguisher.
- Inspect for three (3) red reflective triangles, six (6) fuse flares, or three (3) liquid burning flares.

## WINDSHIELD AND TRAFFIC MONITORING DEVICES

**Description:** Windshield, mirrors, and other monitoring devices, such as cameras.

**Why Inspect:** Cracks, obstructions, stickers, or dirt in the driver's viewing area can cause the driver to lose sight of changes in road conditions or other traffic around the vehicle.

**What and How to Inspect:**

- Inspect that the windshield is clean with no obstructions except for an inspection sticker. There can be no damage, such as cracks or flaws to the glass.
- Inspect that any mirrors are clean and adjusted properly from the inside
- If your vehicle has external cameras inspect that rear and side view monitoring devices are clean and in working condition. You should be able to see the feed from the devices inside the cab. The video display must be working and adjusted so you can see the screen.

## WIPERS/WASHERS

**Description:** Windshield wipers and washers.

**Why Inspect:** Wipers improve visibility during rain and snow. Worn blades reduce visibility. Washers assist in keeping the windshield clean.

**What and How to Inspect:**

- Inspect that wiper arms and blades are secure, not damaged, and show wipers work smoothly by turning them on and off.
- Inspect for windshield washer fluid and show windshield washers work correctly by activating the washers.

## HEATER/DEFROSTER

**Description:** Heats the cab or passenger compartment and keeps frost or condensation from forming on the windshield.

**Why Inspect:** The defroster improves visibility, especially during cold weather.

**What and How to Inspect:** Identify, describe, and show the heater(s) and defroster(s) work correctly by using the controls.

## HORN(S)

**Description:** Air and/or electrical horns used for warning other roadway users (e.g., cars, motorcyclists, bicyclists, and pedestrians).

**Why Inspect:** The horn is a device that must function properly to warn other roadway users of your presence and avoid potential collisions.

**How To Inspect:** Inspect that the air horn and/or electric horn work.

## PARKING AND TRAILER BRAKE CHECK

**Description:** Keeps vehicle from moving or rolling when parked.

**Why Inspect:** The parking brake(s) must function when a vehicle is parked, especially when on a grade. A vehicle allowed to roll could cause damage or injury to other roadway users or property.

**How To Inspect:** You must show the parking brake check (and trailer parking brake check, if equipped). This procedure is designed to decide that the parking brake(s) are working correctly, and they keep the vehicle from moving.

- **Parking Brake:** With the parking brake engaged, remove your foot from the service brake and inspect that the parking brake will hold the vehicle by gently pulling forward with the parking brake on. If you have a combination vehicle, make sure you release the trailer brakes.
- **Trailer Brake:** With the parking brake released and the trailer parking brake engaged for combination vehicles only, remove your foot from the service brake and inspect that the trailer parking brake will hold the vehicle by gently pulling forward with the trailer parking brake on. Also helps in checking the coupling connection with the trailer.

## SERVICE BRAKE CHECK

**Description:** Procedure to be followed to inspect the application of air, hydraulic or electric service brakes.

**Why Inspect:** This procedure is designed to make certain that air, hydraulic or electric service brakes are operating correctly for normal operation.

**How To Inspect:** You will have to show the application of air, hydraulic or electric service brakes. This procedure is designed to decide that the brakes are working correctly, and that the vehicle does not pull to one side or the other at a low speed.

Pull forward at 5 mph, apply the service (foot) brake and come to a complete stop. Inspect to see that the vehicle does not pull to either side and stops when the service brake is applied. If the vehicle pulls to either side or does not stop well, the brakes may not be working correctly.

## 11.1.2 – Air Brake or Hydraulic Brake Check (based on type of brake system)

### AIR BRAKE CHECK (AIR BRAKE EQUIPPED VEHICLES ONLY)

**Description:** Some vehicles have air brakes and these are the procedures to be followed in inspecting air brake systems.

**Why Inspect:** Air brake safety devices vary. This procedure is designed to make certain that safety devices are working correctly as air pressure drops from “normal” to “low air” conditions. Loss of air pressure will cause the emergency brakes to activate causing an abrupt and uncontrolled stop.

**How To Inspect:** Failure to explain and show all four (4) parts of the air brake check will result in an automatic failure of the CDL Vehicle Inspection test.

The proper procedures for inspecting the air brake system are as follows:

#### 1. Air Gauge and Governor Cutout Check

- Chock the wheels, if needed.
- Start the vehicle and inspect that the air gauge(s) is working.

2. Build the air pressure to governor cutout and identify the range of activation. This will happen at about 120 – 140 psi OR the level specified by the manufacturer.

#### 3. Air Leakage Rate Test

4. Shut off the engine, return the key to the “on” or “battery charge” position, release the parking brake and the tractor protection valve if you are using a combination vehicle.

- Fully apply the foot brake.
- Once the air gauge is stabilized after the first drop from applying the brakes, hold the foot brake for one (1) minute.
- Inspect the air gauge to see if the air pressure drops no more than:
  - Three (3) pounds in one (1) minute (single vehicle or trailer without airbrakes)  
or
  - Four (4) pounds in one (1) minute (combination vehicle) after first stabilization.

#### 5. Air Warning Device(s) Test

- Without re-starting the engine, make sure the key or electrical power is in the “on” or “battery charge” position.
6. Begin fanning off the air pressure by applying and releasing the foot brake and identify the level the low air warning devices (buzzer, light, and flag) activates. The low air warning devices (buzzer, light, and flag) should activate before air pressure drops below 55 psi.

### 7. Emergency Brake(s) Test

- Continue to fan off the air pressure. The parking brake (or emergency brake) valve should close (pop out) between 20 psi and 45 psi (no less than 20 psi and no more than 45 psi) OR level specified by the manufacturer.
  - On air operated trailers, the tractor protection valve and trailer parking brake (or emergency brake) valve should close (pop out) either before or at the same time as the valve for the power unit.
8. You will need to identify the level specified by the manufacturer for the vehicle you are testing in. If the vehicle’s valves are not designed to pop out, you will need to listen for the sound of air discharging from the air system, which shows the parking (or emergency) brakes have been applied. If the vehicle is equipped with a primary and secondary air brake system, you will need to explain that there is a backup system and that the valve(s) will not pop out due to loss of pressure in only one of the systems.

**NOTE:** You will need to explain the specific procedures specified by the manufacturer for the vehicle you are testing in. It is your responsibility to know and describe to the examiner the vehicle manufacturer’s specifications for air systems.

## HYDRAULIC BRAKE CHECK (HYDRAULIC BRAKE EQUIPPED VEHICLES ONLY)

**Description:** Follow this procedure when you are inspecting hydraulic brakes. Types of hydraulic brake systems and inspection procedures will vary.

**Why Inspect:** Damaged hydraulic hoses, leaks in the braking system or low hydraulic fluid will result in a partial or total loss of the braking system that may result in increased stopping distances or a crash.

**How To Inspect:** Failure to explain and show the hydraulic brake check correctly will result in an automatic failure of the CDL Vehicle Inspection test. This check is designed to see that the hydraulic brakes work correctly. Use the following hydraulic brake check steps based on your vehicle’s system specifications:

1. Inspect that indicators and warning systems are functioning, as specified by the manufacturer, if equipped.
2. With the transmission placed in “park”:
3. Identify the normal height of the brake pedal
4. Inspect brake pedal pressure [i.e., pump the brake pedal three (3) times, and then hold it down for five (5) seconds], or as specified by the manufacturer. The brake pedal should not move

(depress) after initial application and should be firm and have enough reserve for brake pedal application.

5. Inspect that any equipped hydraulic power assist systems are functioning, as specified by the manufacturer.

**NOTE:** Hydraulic brake systems can be different. Your system may need the ignition to be in the “on” position with or without the engine running. You will need to show and explain to the examiner the procedures for your vehicle as specified by the manufacturer.

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## 11.2 – Passenger and School Bus Only

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### PASSENGER ENTRY AND LIFT

**Description:** Bus door(s) used for normal entry or exit. Passenger lift used for wheelchair accessibility.

**Why Inspect:** All passengers must be able to enter and exit safely.

**How To Inspect:**

- Inspect that entry door(s) are not damaged, operate smoothly and close securely from the inside.
- Inspect that handrails are secure and, if equipped, that the step light(s) are working.
- Inspect that the entry steps are clear, and the tread is not loose, or worn.
- If equipped with a passenger lift, inspect for leaking, damaged or missing parts, and explain how the lift should be inspected for correct operation.
- If equipped, lift must be fully retracted and latched securely.

### EMERGENCY EXITS

**Description:** Bus doors, roof hatches, or push-out windows used for emergency evacuation.

**Why Inspect:** Emergency exits must be operable to provide an escape for passengers during a crash or emergency.

**How To Inspect:**

- Inspect that all emergency exits are labeled, not damaged, run smoothly, and close securely from the inside. Demonstrate that at least one (1) emergency exit opens smoothly, closes securely, and is not damaged. Confirm that the exit and warnings work properly. Point out and describe how all other emergency exits work.

- Inspect that release handles can be used properly both from inside and outside the vehicle.
- With the key in the “on” or “charged” position, inspect that emergency exit warning devices are working.

## **PASSENGER SEATING**

**Description:** Passenger vehicle seats and frames.

**Why Inspect:** Seats must be safe for passengers to sit in.

**How To Inspect:**

- Inspect that there are no broken seat frames and inspect that seat frames are firmly attached to the floor.
- Inspect that seat cushions are attached securely to the seat frames.

## **PASSENGER MONITORING DEVICES**

**Description:** Mirrors and monitoring devices, such as cameras, for seeing and monitoring passengers or students.

**Why Inspect:** Internal (passenger) and external (fender, cross-over and other) mirrors or monitoring devices for seeing passengers or students help the driver to safely check passengers while driving, loading, and unloading. As a bus driver, you must be able to see when passengers board and discharge the bus.

**How To Inspect:**

- Inspect that all internal and external passenger mirrors and mirror brackets are not bent and are mounted securely with no missing parts.
- Inspect all internal and external passenger mirrors for proper adjustment and that they are clean.
- If equipped, inspect that passenger monitoring devices or cameras are clean and viewable from the inside and the video display is operable and adjusted for viewing.
- Inspect student crossover mirrors (school bus only).

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## **11.3 – School Bus Only**

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### **STUDENT LIGHTS (FRONT AND BACK)**

**Description:** Strobe light (if equipped), alternately flashing amber lights and alternately flashing red lights on school buses.

**Why Inspect:** Student lights allow the driver of a school bus to communicate presence and intentions to stop/resume student loading and unloading with other traffic.

**How To Inspect:** The following student lights must be inspected, and the operation demonstrated, on both the front and back of the vehicle:

- Inspect that any equipped strobe light is operational and is not broken. Inspect that the strobe light indicator on the dash is operational.
- Inspect that alternately flashing amber lights (if equipped), on both front and rear of vehicle, are operational and are not broken. Inspect that the flashing amber light indicator on the dash is operational.
- Inspect that alternately flashing red lights, on both front and rear of the vehicle, are operational and are not broken. Inspect that the flashing red light indicator on the dash is operational.

## **STOP ARM(S) AND SAFETY ARM**

**Description:** The stop arm and safety arm on school buses used when student loading and unloading lights are activated.

**Why Inspect:**

- **Stop Arm** – Warns other drivers a school bus is stopping or is stopped.
- **Safety Arm** – Forces school students to cross at least 10 feet away from the front of the school bus in the driver's view.

**How To Inspect:** The following school bus safety items must be inspected and the operation of must be described and shown.

- Inspect that any equipped stop arms are securely mounted to the vehicle frame and there are no loose, broken, or damaged parts. Inspect the stop arm extends fully when used, stop arm lights are operational and that the stop arm indicator on the dash is operational.
- Inspect that safety arm, if equipped, is securely mounted to the vehicle frame and there are no loose, broken, or damaged parts. Inspect that the safety arm functions properly in conjunction with the stop arm, it extends fully.

## **FIRST AID EMERGENCY AND BODY FLUID KITS**

**Description:** Required emergency equipment (including emergency first aid kit and body fluid cleanup kit) for a school bus.

**Why Inspect:** Emergency equipment must be available and in usable condition.

**How To Inspect:**

- Inspect that emergency first aid kit is present and the seal has not been broken, which may mean missing items.

- Inspect that body fluid cleanup kit is present and the seal has not been broken, which may mean missing items.

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## 11.4 – Lights Operations Check (All Vehicles)

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**Description:** Headlights, high-beam lights, turn signals, 4-way flashers, clearance lights, taillights, and brake lights on the front, sides and rear of a commercial motor vehicle and trailer (combination only).

**Why Inspect:** Lights allow the driver of a commercial vehicle to see and be seen and to communicate with other traffic.

**How To Inspect:**

- Inspect that all lights on the front, sides and rear of the vehicle work and illuminate when corresponding lights are turned on, including the left and right turn signals, 4-way flashers, low beam headlights, high beam headlights, clearance or marker lights, taillights, and brake lights.
- Inspect that brake lights come “on” when brakes are applied and turn “off” when brakes are released.

**NOTE:** on a combination vehicle, you need only inspect the rear of the trailer.

**NOTE:** The operation of all external lights must be inspected from outside the vehicle, including lights activated by an automated light check system. You may ask the examiner to help you in inspecting the external operation of the lights. You will need to direct the examiner to the front, sides and rear of the vehicle or trailer (combination only), as you conduct the inspection. You are responsible for telling the examiner exactly which lights you would like them to inspect as you activate the lights from inside the vehicle. You will need to roll the window down and speak loud enough for the examiner to hear. If you forget or leave out a specific light, you will not get credit.

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## 11.5 – External Inspection (All Vehicles)

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### 11.5.1 – Front of Vehicle / Engine Area (Engine Off)

#### LENSES

**Description:** Light lenses or covers on the front of the vehicle/tractor.

**Why Inspect:** Light lenses or covers must be clean and free of damage for lights to work properly.

**How To Inspect:** Inspect that light lenses or covers are the proper color, clean, not broken and not missing.

#### CRITICAL FLUID LEVELS

**Description:** Engine oil for engine lubrication; coolant for cooling the engine; steering fluid for helping wheel action to the front wheels; and brake fluid for vehicle braking (hydraulic brakes only).

**Why Inspect:** Proper fluid levels ensure that engine, cooling, steering and brake systems (hydraulic brakes only) work correctly and extends the life of the engine and these systems.

**How To Inspect:** With the engine off, indicate that fluids would be inspected for proper levels including the:

- engine oil;
- cooling system and coolant;
- power steering fluid; and
- brake fluid (hydraulic brakes only).

If applicable, show where to inspect the fluid level and where the dipstick(s) or sight glass(es) are located. Identify that you would inspect that the level is between the add and the full marks for each item.

Caution: If the engine is hot, do not remove the radiator cap.

#### FLUID AND AIR LEAKS

**Description:** Fluid leaks from engine and other vehicle systems; and air leaks, if applicable.

**Why Inspect:** Fluid loss could mean component failure in areas where levels might not be readily inspected (e.g., transmission or fuel systems). Air leaks could mean component failure in areas that may not be easily inspected (e.g., air compressor and other air components).

**How To Inspect:**

- Look for puddles on the ground.
- Look for dripping fluids around and on the underside of the engine and transmission.
- Inspect any hoses and air lines for their condition and leaks.

## STEERING SYSTEM

**Description:** Mechanisms that transform steering column action into wheel turning action.

**Why Inspect:** Worn, cracked, loose, or broken steering parts could result in loss of steering. Movement in the linkage can cause the vehicle to wander or experience other serious control problems.

### How To Inspect:

- Inspect that the power steering box is securely mounted and not leaking.
- Inspect that all steering hoses and connections are not cracked, worn, or leaking.
- Inspect that visible connecting links, arms, and rods from the steering box to the wheel are not worn or cracked and that joints and sockets are not worn or loose.
- Inspect for missing nuts, bolts, or cotter keys/pins in the steering connections.

## 11.5.2 – Axle Components/Steering Axle

### TIRES

**Description:** Tire/wheel assemblies in contact with the pavement.

**Why Inspect:** Underinflation increases the chance of blowout from excessive heat buildup due to increased flexing of the tire. Low tread depth increases the effect of hydroplaning, reduces traction and increases stopping distance.

Overinflation increases the chances of damage to the tire from curbs and potholes and loss of traction due to less tread in contact with the road. Cuts and bulges may cause tire failure, blowouts, and sudden loss of control.

**How To Inspect:** The following items must be inspected:

- **Tire inflation:** Inspect for proper inflation using a tire gauge. Make sure all valve stems are accessible.
- **Tire condition:** Inspect for cuts and damage that expose body plies to the tire in the tread and sidewall. Make sure that valve caps are not missing, and valve stems are not damaged or broken. Look for bumps and bulges in the sidewall and mismatched diameters in dual tires.
- **Tread depth:** Inspect for minimum tread depth with a tread depth gauge on all major tread grooves with wear bars. Tread depth should be at least 4/32 inches on steering axle tires and 2/32 inches on all other tires.

**NOTE:** You will not get credit if you only kick the tires or use a mallet to inspect for proper inflation. You must mention the use of a tire gauge.

**NOTE:** If the tires are equipped with an automatic tire inflation system (ATIS) or tire pressure monitoring system (TPMS) that has hoses connected to the tire valve stems, you only need to mention that tire pressure is monitored and adjusted by an automatic system and inspect that it is working properly.

## RIMS

**Description:** The metal rims or wheels on which tires are mounted.

**Why Inspect:** Damaged rims can result in loss of a tire from the rim, loss of a wheel from an axle, loss of air pressure in a tire, a wheel rolling off a rim due to damage to flange, or split rim. A damaged wheel can result in loss of vehicle control, leading to a crash. Wheels and rims should be inspected for conditions that could result in a complete or partial wheel separation or air loss in the tire.

**How To Inspect:**

- Inspect for damaged, cracked, or bent rims. Rims cannot have welding repairs. Inspect for rust trails that may mean the rim is loose on a wedge wheel.
- Inspect bolt holes to make sure they are not elongated (out of round).

## LUG NUTS

**Description:** Holds wheel on axle.

**Why Inspect:** Loose or missing lug nuts could result in the loss of a wheel and lead to a crash.

**How To Inspect:**

- Inspect that all lug nuts are present.
- Inspect that lug nuts are not loose and there are no signs of rust trails or shiny threads that may show looseness.
- Inspect that there are no bent, broken, or missing studs.

## SPRINGS/MOUNTS, U-BOLTS AND AIR BAGS AND SHOCKS

**Description:** Leaf or coil springs for dampening wheel vibration forces created by rolling over road surface. U-shaped bolts and mounting bolts used for attaching suspension assembly to the axle. Air bags that work with springs or serve as the primary suspension system. Gas or hydraulic devices (shocks) that cushion vehicle suspension and stabilize the vehicle.

**Why Inspect:** Damaged or missing leaf springs or coils may lead to loss of control or rollover if the vehicle falls on the frame or on a tire. Shifted springs may strike a tire causing a blowout or

interference with steering. Loose or broken U-bolts may lead to loss of vehicle control or rollover. Damaged air bags or shocks can affect vehicle handling and stopping distances.

**How To Inspect:** The following items must be inspected, where visible and accessible:

- Inspect for missing, shifted, cracked, or broken leaf springs and inspect that spring mounts are not cracked, broken, or missing any parts.
- Inspect for broken or distorted coil springs and inspect that mounts are not cracked, broken or have any missing parts.
- Inspect that U-bolts and mounting bolts are not broken, missing, or loose.
- Inspect that the air ride suspension is secure, not damaged, and not leaking (if equipped).
- Inspect that shock absorbers are secure, not damaged, and not leaking (if equipped).
- Inspect that the vehicle is sitting level (front to rear and side to side).

**NOTE:** You need to tell the examiner if the suspension components are not visible or accessible, on vehicles like transit or motor coach buses. Inspect that the vehicle is sitting level from front to rear and side to side. Note that if your vehicle is leaning, that is a sign there may be a suspension problem.

## **BRAKE LINES / HOSES / LEAKS**

**Description:** Carries air or hydraulic fluid to wheel brake assembly.

**Why Inspect:** Loss of hydraulic fluid may lead to loss of brake power and response. Loss of air pressure may cause wheel lockup.

**How To Inspect:**

- Inspect that hoses or lines can supply air or hydraulic fluid to the brakes and are not leaking.
- Inspect for cracked, worn or frayed hoses or lines.
- Inspect that all hose or line couplings and fittings are secure.
- Note: If electric brakes, inspect that electric lines are secure, and casing is not worn or cracked.

## **BRAKE CONTAMINATES**

**Description:** Contamination, such as grease, oil, etc., that can affect braking performance when slowing or stopping the vehicle.

**Why Inspect:** Contaminates on the brakes can cause a reduction in braking friction which may lead to a crash. Contaminates can also create a fire hazard.

**How To Inspect:** If accessible, inspect for contaminants such as grease or oil on the brake lining or pads and the brake drum or disc that can affect braking.

### 11.5.3 – Side of Vehicle

#### LENSES AND REFLECTORS

**Description:** Light lenses or covers and reflectors on the sides of the vehicle and trailer (combination only).

**Why Inspect:** Light lenses or covers must be free of damage for lights to work properly. Reflectors allow the commercial vehicle to be seen and to communicate your presence with other traffic.

**Inspection:**

- Inspect that light lenses or covers on the sides of the vehicle and trailer (combination only) are the proper color, clean, not broken, or missing.
- Inspect that reflectors on the sides of the vehicle and trailer (combination only) are the proper color, clean, not broken, or missing.

#### TRAFFIC MONITORING DEVICES

**Description:** Side view mirrors for rear view of traffic to the sides and behind (all vehicles). Other monitoring devices, such as cameras, may be used with mirrors or instead of mirrors.

**Why Inspect:** Mirrors or other monitoring devices provide visibility to the sides and rear of the vehicle. The driver must be able to see other traffic, especially in blind areas.

**How To Inspect:**

- Inspect that mirror(s) are clean and not cracked and mirror brackets are not bent and are mounted securely with no missing parts.
- If equipped, rear and side view monitoring devices or cameras must be clean to view from the inside.

#### BATTERY

**Description:** Batteries that supply electrical current for vehicle functions or serve as a partial or primary source for vehicle power.

**Why Inspect:** Damage to the batteries, electrical system or electric motor can cause vehicle breakdowns or electrical shortage leading to a fire onboard the vehicle.

**How To Inspect:** Wherever they are located:

- Inspect that batteries are secure, if visible.

- Inspect that all connections are tight and should not show signs of excessive corrosion, if visible.
- Inspect all electrical system cables and lines are secure and not cracked or worn.
- Inspect that the battery box, cover, or door is secure, if applicable.

**NOTE:** Inform the examiner if the batteries are not visible or accessible. If they are not visible or accessible, you should describe what you are inspecting.

## FUEL TANK/DEF TANK

**Description:** A container that holds fuel.

**Why Inspect:** Leaks are a fire hazard and can cause driving hazards to other traffic. Fuel on pavement can be very slippery.

**How To Inspect:** Inspect that the fuel tank, including a Diesel Exhaust Fluid (DEF) tank, if equipped, is securely mounted, the cap is tight, and there are no leaks from the tank or line.

## FRAME(S)

**Description:** Structural members for supporting vehicle body or trailer body.

**Why Inspect:** Loose or cracked frame members may reduce vehicle stability, cause handling and cornering problems (e.g., wandering, possible rollover) resulting in total loss of vehicle control. Cracks, breaks, or holes in the cargo area can result in possible loss of cargo.

**How To Inspect:**

- Inspect for cracks, broken welds, holes, or other damage to the frame members, including the trailer, if applicable.
- Inspect for cracks, breaks, or holes in the cargo area or floor, including the trailer, if applicable.
- Inspect that trailer tandem release lever and pins are secure, if applicable.

## 11.5.4 – Rear of Vehicle or Trailer:

### LENSES AND REFLECTORS

**Description:** Light lenses or covers and reflectors on rear of vehicle or trailer (combination only).

**Why Inspect:** Light lenses or covers must be free of damage for lights to work properly. Reflectors allow the driver of a commercial vehicle to be seen and to communicate presence with other traffic.

**How To Inspect:**

- Inspect that light lenses or covers are the proper color, clean, not broken and not missing.
- Inspect that reflectors are the proper color, clean, not broken and not missing.

**NOTE:** on a combination vehicle, you need only inspect the rear of the trailer.

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## 11.6 – Combination Vehicles

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### 11.6.1 – Combination Vehicles Only

#### AIR AND ELECTRIC LINES / CONNECTORS

**Description:** Carry air and electricity from power unit to trailer.

**Why Inspect:** Air Brakes - Loss of air to the trailer will result in a partial or total loss of braking to the towed unit. A low air condition will cause sudden application of the trailer's spring brakes, which may result in loss of control and lead to a crash.

- **Electric Brakes** – Loss of electrical connection to the trailer will result in total loss of braking and control to the towed unit and can lead to a crash.
- **Electric Lines** – Damaged lines may result in loss of the vehicle's ability to communicate its maneuvers to other drivers (no turn, or brake lights). Not being seen by other traffic at night is a serious traffic hazard and can lead to a crash.

#### How To Inspect:

- Inspect that air and electric connectors on the power unit and trailer are seated and sealed, free of damage and locked into place.
- Inspect that air hoses and electrical lines are not cut, cracked, chafed, spliced, taped, or worn (steel braid/electrical conductor must not show through). Listen for air leaks (air brake systems only).
- Inspect that electrical lines and air lines (if equipped) are not tangled, crimped, or pinched, or dragging against vehicle parts or the ground.

**NOTE:** You must inspect the connections on both the power unit and trailer to receive credit.

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**For the rest of this section (11.6.1), you will need to study the type of coupling system your vehicle is equipped with – that you will be using for your Vehicle Inspection test:**

- Fifth Wheel Combination, or
  - Pintle Hook Combination, or
  - All Other Types of Combinations.
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## **FOR FIFTH WHEEL COMBINATIONS ONLY**

### **Fifth Wheel Skid Plate**

**Description:** Plate on which the trailer rests and secures the trailer kingpin.

**Why Inspect:** A faulty or damaged fifth wheel skid plate and an improper connection between the tractor and the trailer can result in handling problems, rollover, or separation of the tractor and trailer leading to a crash.

#### **How To Inspect:**

- Inspect that the fifth wheel skid plate is securely mounted to the vehicle by the fifth wheel platform.
- Inspect for cracks, breaks or excessive wear.
- Inspect for proper lubrication, if applicable.

### **Kingpin, Apron & Gap**

**Description:** Pin that attaches the semi-trailer to tractor (kingpin) and the metal plate attached to the kingpin that provides the surface for resting the trailer on the fifth wheel (apron).

**Why Inspect:** Wear or damage to the kingpin can result in handling problems, rollover, or separation of the tractor and trailer leading to a crash.

#### **How To Inspect:**

- Inspect that the kingpin is in place and not bent, damaged or worn.
- Inspect that the visible part of the apron is not bent, cracked, or broken.
- Inspect that the trailer is lying flat on the fifth wheel skid plate and there is no space between the apron and fifth wheel (no gap).
- Inspect for proper lubrication, if applicable.

## FOR PINTLE HOOK COMBINATIONS ONLY

### Pintle Hook

**Description:** Tow hitch or receiving coupling which the trailer drawbar ring/eye locks into.

**Why Inspect:** A faulty or damaged pintle hook and an improper connection between the power unit and the trailer can result in handling problems, rollover, or separation of the power unit and trailer leading to a crash.

#### How To Inspect:

- Inspect that the pintle hook is securely mounted to the vehicle frame.
- Inspect for loose or missing parts including mounting bolts, nuts, pins, brackets, and clamps.
- Inspect for cracks, breaks or excessive wear.

### Trailer Drawbar Ring & Tongue

**Description:** Trailer drawbar ring or eye attached to the front of the trailer tongue that secures into the pintle hook for coupling. The trailer tongue that extends from the trailer's main body frame to allow for coupling and turning.

**Why Inspect:** Wear, damage, cracks or improper welds in the drawbar ring and trailer tongue may result in loss of the trailer leading to a crash.

#### How To Inspect:

- Inspect that the drawbar ring or eye is not bent or twisted.
- Inspect that the drawbar ring or eye is secured to the trailer tongue and there are no loose or missing bolts, broken welds, or cracks.
- Inspect that the drawbar ring or eye is not worn.
- Inspect the trailer tongue for dents, twists, cracks, and broken welds and that the trailer tongue can support the weight of the load. If extendable, inspect that bolts, locking pins, and cotter pins are in place.

## ALL OTHER TYPES OF COMBINATIONS

**NOTE:** Coupling systems vary. If you have another type of coupling system, you will need to describe to the examiner how it works and what you are inspecting.

### Tow Hitch

**Description:** Tow or receiver hitch and trailer ball, which the trailer coupler rests on.

**Why Inspect:** A faulty or damaged tow hitch or other mechanism and an improper connection between the power unit and the trailer can result in handling problems, rollover, or separation of the power unit and trailer leading to a crash.

**How To Inspect:**

- Inspect that the tow hitch or other mechanism is securely mounted to the vehicle frame. Inspect sway bar/control, if equipped.
- Inspect for loose or missing parts including mounting bolts, nuts, pins, brackets, and clamps, including the trailer ball or other mechanism.
- Inspect for cracks, breaks or excessive wear.

### Trailer Coupler & Tongue

**Description:** Trailer coupler attached to the front of the trailer tongue that latches to the trailer hitch and trailer ball. The trailer tongue extends from the trailer's main body frame to allow for coupling and turning.

**Why Inspect:** Wear, damage, cracks or improper welds in the trailer coupler and trailer tongue may result in loss of the trailer, leading to a crash.

**How To Inspect:**

- Inspect that the trailer coupler is not bent or twisted.
- Inspect that the trailer coupler is secured to the trailer tongue and there are no loose or missing bolts, broken welds, or cracks.
- Inspect that the trailer coupler is not worn.
- Inspect the trailer tongue for dents, twists, cracks, and broken welds and that the trailer tongue can support the weight of the load. If the trailer is extendable, inspect that bolts, locking pins and cotter pins are in place.

### Locking and Safety Devices

**Description:** Locking connection and safety devices that keep the trailer locked into place.

**Why Inspect:** The trailer could uncouple during travel if the locking mechanisms are not secured. Safety devices help to keep the locking mechanism in place and help should the connection fail.

**How To Inspect:** Fifth Wheel Coupling Systems Only

- Look into fifth wheel gap and inspect that locking jaws or lever are fully secured around the kingpin and inspect for play between kingpin and locking jaws/lever.
- Inspect that the release arm is in the engaged position and the safety latch or lock (if equipped) is in place.
- Inspect the sliding fifth wheel locking pins (if equipped) for damage and the pins are fully engaged.

## HOW TO INSPECT ALL OTHER COUPLING SYSTEMS

- Inspect the locking mechanism or latch for missing or broken parts and make sure the pintle or hitch release lever or latch is locked in place and secure.
- Inspect that safety pins and cotter pins are in place and not missing, if present.
- Inspect that safety cables or chains are secure, crossed, and free of kinks and excessive slack, if present. Breakaway cables must be engaged.

### 11.6.2 – Trailers Only

#### LANDING GEAR AND CLEARANCE

**Description:** Supports front end of trailer when trailer is not coupled to a truck or tractor.

**Why Inspect:** Landing gear must be raised properly so that it will not strike the ground during travel and must clear the back of the power unit while turning. Its handle must be secured to the vehicle so it will not move and strike other traffic. Any damage to landing gear supports may result in the trailer tipping or falling over when disconnected.

**How To Inspect:**

- Inspect that the landing gear is fully raised, has no missing parts, the crank handle is secure, and the support frame and landing pads are not damaged.
- If power operated, inspect for air or hydraulic leaks.
- If you are using a tractor semi-trailer, inspect that the fifth wheel is positioned properly so that the tractor frame will clear the landing gear during turns (fixed or sliding fifth wheel).

#### REFLECTIVE TAPE

**Description:** Reflective tape on the side and rear of the trailer, if needed.

**Why Inspect:** Reflective tape on a trailer allows the driver of a commercial vehicle to be seen and to communicate presence with other traffic.

**How To Inspect:**

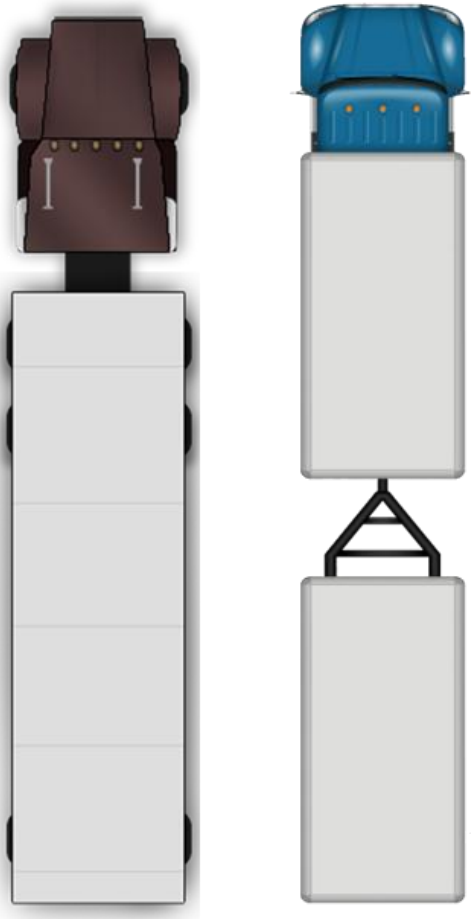
- Inspect that reflector tape on the sides and rear of the trailer are present and affixed securely to the vehicle.
- Note: Reflective tape is only required for trailers. Some jurisdictional laws may require reflective tape for school buses.

## Basic Control Skills Test

Remember, the Vehicle Inspection test must be passed before you can continue to the Basic Control Skills test (covered in the next section).

# Class A Checklist

## Tractor Semi-Trailer or Truck & Trailer or Bus & Trailer



### Lights Operations Check

- all external lights

### Front of Vehicle/Engine Area

- lenses
- fluid levels
- fluid & air leaks
- steering systems

### Steering Axle

- tires
- rims
- lug nuts
- springs/mounts & u-bolts & air bags & shocks
- brake lines or hoses & leaks
- brake contaminates

### Side of Vehicle

- lenses & reflectors
- traffic monitoring devices
- battery
- fuel tank/DEF tank
- frame(s) & tandem release

### Combination Vehicles Only

- air & electric lines & connectors
- fifth wheel skid plate or pintle hook or tow hitch
- kingpin & apron & gap or drawbar ring & tongue or coupler & tongue
- locking & safety devices

### Trailer Only

- landing gear & clearance
- reflective tape

### Rear of Trailer

#### Passenger and School Bus Only

- passenger entry & lift
- emergency exits
- passenger seating
- passenger monitoring devices

#### School Bus Only

- student lights (front & back)
- stop arm(s) & safety arm
- first aid & body fluid kits
- lenses & reflectors

### In-Vehicle/Engine Start

- \*air or \*hydraulic brake check
- parking & trailer brake check
- service brake check
- lighting indicators
- emergency equipment
- windshield & traffic monitoring devices
- wipers & washers
- heater & defroster
- horn(s)

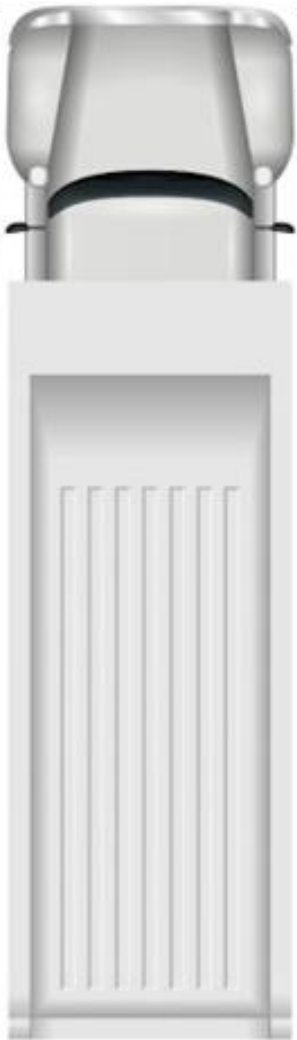
### \*Automatic failure if not performed correctly

You are only required to inspect the items on the CDL Vehicle Inspection checklist. You may use this checklist for your test and check off items as you have completed them, **NO** additional markings or writing may be placed on this list. You **MUST** name, point to and/or touch, and fully explain what you are inspecting each safety critical item for. If you do not do so, you will not get credit for the item(s).

# Class B or Class C Checklist

## Straight Truck or Other Straight Vehicle

---



### In-Vehicle/Engine Start

- \*air or \*hydraulic brake check
- parking & trailer brake check
- service brake check
- lighting indicators
- emergency equipment
- windshield & traffic monitoring devices
- wipers & washers
- heater & defroster
- horn(s)

### Lights Operations Check

- all external lights

### Front of Vehicle/Engine Area

- lenses
- fluid levels
- fluid & air leaks
- steering systems

### Steering Axle

- tires
- rims
- lug nuts
- springs/mounts & u-bolts & air bags & shocks
- brake lines or hoses & leaks
- brake contaminates

### Side of Vehicle

- lenses & reflectors
- traffic monitoring devices
- battery
- fuel tank/DEF tank
- frame

### Rear of Vehicle

- lenses & reflectors

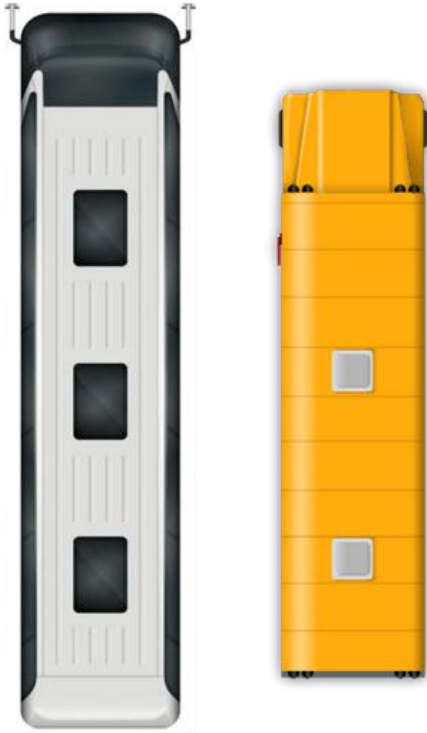
**\*Automatic failure if not performed correctly**

**You are only required to inspect the items on the CDL Vehicle Inspection checklist.** You may use this checklist for your test and check off items as you have completed them, **NO** additional markings or writing may be placed on this list. You **MUST** name, point to and/or touch and fully explain what you are inspecting each safety critical item for. If you do not do so, you will not get credit for the item(s).

# Class B or Class C Checklist

## Passenger or School Bus

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### In-Vehicle/Engine Start

- \*air or \*hydraulic brake check
- parking & trailer brake check
- service brake check
- lighting indicators
- emergency equipment
- windshield & traffic monitoring devices
- wipers & washers
- heater & defroster
- horn(s)

### Passenger and School Bus Only

- passenger entry & lift
- emergency exits
- passenger seating
- passenger monitoring devices

### School Bus Only

- student lights (front & back)
- stop arm(s) & safety arm
- first aid & body fluid kits

### Lights Operations Check

- all external lights

### Front of Vehicle/Engine Area

- lenses
- fluid levels
- fluid & air leaks
- steering systems

### Steering Axle

- tires
- rims
- lug nut
- springs/mounts & u-bolts & air bags & shocks
- brake lines or hoses & leaks
- brake contaminates

### Side of Vehicle

- lenses & reflectors
- traffic monitoring devices
- battery
- fuel tank/DEF tank
- frame

### Rear of Vehicle

- lenses & reflectors

### \*Automatic failure if not performed correctly

You are only required to inspect the items on the CDL Vehicle Inspection checklist. You may use this checklist for your test and check off items as you have completed them, **NO** additional markings or writing may be placed on this list. You **MUST** name, point to and/or touch, and fully explain what you are inspecting each safety critical item for. If you do not do so, you will not get credit for the item(s).

# Section 12: Basic Control Skills Test

## This Section Covers

6. Basic Control Skills Test Scoring
7. Basic Control Skills Test Exercises


For the Basic Control Skills test, you will show basic skills in controlling a commercial vehicle and judging its position in relation to other objects.

It tests for the basic skills needed for safe control and operation of the vehicle. The types of judgment and skills needed for these basic control skills are also needed in many different driving situations.

If you make mistakes or errors during the test, you will be given points. You will get points for changing direction to gain a better position, crossing over or touching boundary lines or cones and for your final position.

The examiner may allow you to exit the vehicle to check around the vehicle during backing exercises. When entering or exiting the vehicle, you must set your parking brake, place the vehicle in neutral, and safely exit/enter by facing the vehicle and keeping three (3) points of contact at all times. When entering or exiting a bus, face forward and keep a firm grasp on the handrail.

If at any time you open the door, move from a seated position when in physical control of the vehicle, (or on a bus, walk to the back to get a better view), you will be scored for a look.

You will receive specific instructions for each exercise prior to performing them. You will have an opportunity to ask questions. You must complete the exercise as directed. If you see the examiner raise their hand (like this ) , stop and return your vehicle within the exercise boundary lines.

Your Basic Control Skills test will include the following exercises, either off-road or somewhere on the street during the Road test:

- Step 1 – Forward Stop,
- Step 2 – Straight-Line Backing,
- Step 3 – Forward Offset Tracking, and
- Step 4 – Reverse Offset Backing.

These exercises are shown in Figures 12.1 through 12.4.

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## 12.1 – Scoring

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During the Basic Control Skills test exercises, you will be scored for:

**Pull-ups** – pulling forward on a backing exercise to clear an encroachment or to get a better position is scored as a “pull-up.” These exercises include:

- Exercise 2 – Straight-Line Backing and
- Exercise 4 – Reverse Offset Backing.

The examiner will score the number of times you pull-up.

Stopping without changing direction does not count as a pull-up.

You will not be penalized for your first pull-ups. However, an excessive number of pull-ups will count as errors. Your examiner will cover pull-ups when giving instructions for these exercises.

**Encroachments** – touching or crossing over an exercise boundary line or cone with any part of your vehicle **EXCEPT**:

- Your vehicle’s mirrors (door or fender) **OR**
- Unique vehicle parts **at or higher than** door mirror height, such as a bucket truck.

Touching or crossing over and exercise boundary line or cone with unique parts below door mirror height are counted as an encroachment.

If you have encroached, the examiner will stop you and you must return the vehicle within the exercise boundaries. You must stop immediately when signaled by the examiner. The examiner will score the number of times you touch or cross over an exercise boundary line or cone. Each encroachment will count as an error.

**Looks** – exiting the vehicle while performing an exercise to check the vehicle’s position while backing. You may be allowed to safely stop and exit the vehicle to check the external position of the vehicle (look).

When doing so, you must set the parking brake(s) and place the vehicle in Neutral or Park. Then, when exiting/entering the vehicle, you must be facing the vehicle and always keeping three (3) points of contact with the vehicle (when exiting/entering a bus, you may face forward and keep a firm grasp on the handrail). If you do not safely secure the vehicle or safely exit and enter the vehicle, it may result in an automatic failure for an unsafe act.

If you open your door or move from a seated position, it will count as a look. If you open your door while the vehicle is moving, it may result in an automatic failure for an unsafe act.

On a bus, if you walk to the back of the bus to get a better view, it will count as a look.

You may be allowed a maximum of one (1) free look on Exercise 2 – Straight-line Backing, and two (2) free looks on Exercise 4 – Reverse Offset Backing, to check the position of your vehicle. Your examiner will cover looks when giving instructions for these exercises.

**Final Position** – the final position of the vehicle for backing exercises. You will be scored for final vehicle position on Exercise 2 – Straight-Line Backing and on Exercise 4 – Reverse Offset Backing.

After completing of an exercise:

- set the parking brake,
- place the vehicle in neutral or park, and
- sound the horn indicating you have completed the exercise.

It is important that you finish each exercise exactly as the examiner has instructed. Your vehicle must be within final exercise boundaries (other than mirrors and unique vehicle parts at or higher than door mirror height, such as a bucket truck). If you do not maneuver the vehicle into its final position as described by the examiner, you will be penalized and will fail the Basic Control Skills test. You **MUST** complete the exercises as directed.

**Failure to Follow Instructions or Unsafe Act** – Failure to follow examiner instructions for completing the exercise as directed may result in an automatic failure and the test may be stopped by the examiner. Always follow the examiner’s instructions and directions. If you do not understand the instructions or understand how to complete the exercises, ask the examiner for clarification. **If you ask, the examiner may allow you to walk through the exercise area.**

Committing an “unsafe act” (e.g., forgetting to set the parking brake or opening the door while in motion), may result in an automatic failure for an unsafe act and the test may be stopped by the examiner. Safety of the driver, the examiner and the testing area is of the highest priority. Always think **SAFETY**.

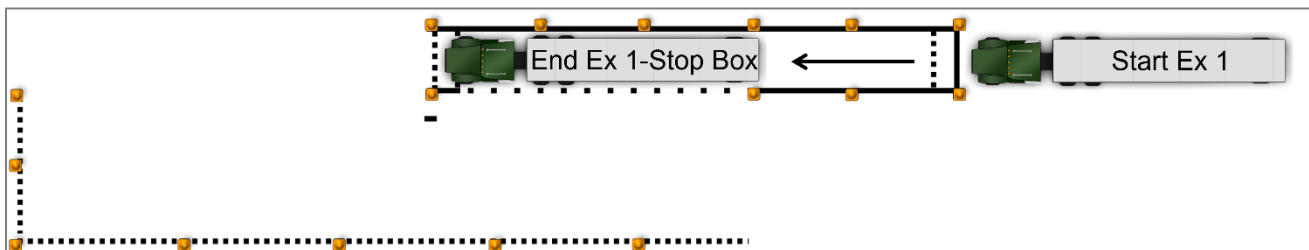
## 12.2 – Exercises

### 12.2.1 – Exercise 1: Forward Stop

You will show your ability to judge the front of your vehicle during a controlled stop. Drive forward through the alley and stop with the front most part of the vehicle within the box at the end of the alley without going past it. You may stop only once.

Your examiner will point out the front part of your vehicle when giving instructions for this exercise.

When you have stopped, set your parking brake, shift to neutral or park, and sound the horn. You will receive points if the front most part of the vehicle (other than unique vehicle parts at or higher than door mirror height, such as a bucket truck) is not in the stop box. See Figure 12.1.

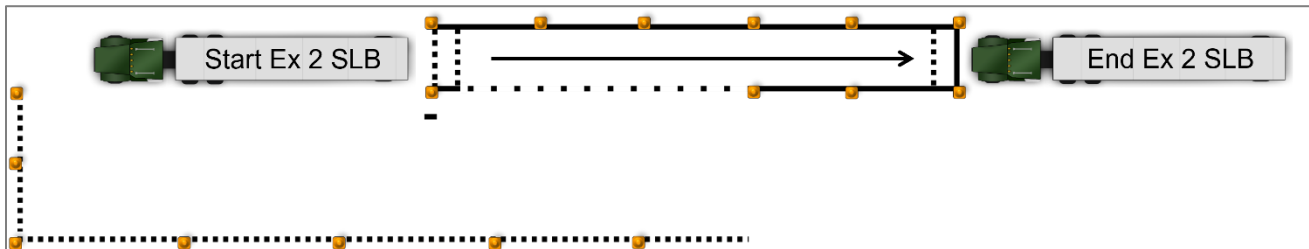


**Figure 12.1: Exercise 1 – Forward Stop**

## 12.2.2 – Exercise 2: Straight Line Backing

You will show your ability to back a vehicle in a straight line. From your stopped position from the earlier exercise, the examiner will ask you to pull forward and stop when they raise their hand (like this 🙅).

Then back straight through the alley until the front of your vehicle has cleared the last set of cones at the far end of the alley. See Figure 12.2.



**Figure 12.2: Exercise 2 – Straight Line Backing**

You will be scored for pull-ups, encroachments, and final position.

You are allowed one (1) free pull-up and may safely exit the vehicle only one (1) time to check around the vehicle.

When you have completed the exercise, set your parking brake, shift to neutral/park, and sound your horn. This will inform the examiner you have completed the exercise.

## 12.2.3 – Exercise 3: Forward Offset Tracking

You will show your ability to maneuver a vehicle around other objects while moving forward without stopping.

You will drive forward and steer to the left through the opening into the opposite lane, keeping the right most rear tire between the cone and the line without stopping.

You will be scored for encroachments and forward tracking clearance (rear tire between the cone and the line).

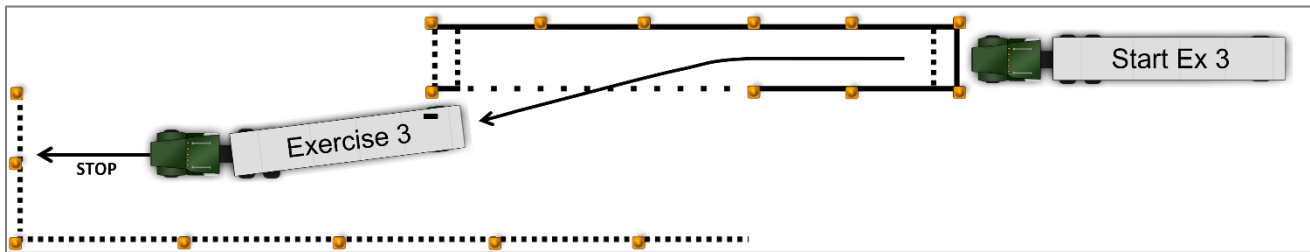
You are NOT allowed to stop, back-up, or exit the vehicle during this exercise. If you stop, the exercise will be over.

Stop your vehicle when you are:

- parallel to the outer boundary AND

- before or at the cones at the far end of the exercise.

Then, set your parking brake, shift to neutral/park, and sound your horn. This will inform the examiner you have completed the exercise. See Figure 12.3.



**Figure 12.3: Exercise 3 – Forward Offset Tracking**

### 12.2.4 – Exercise 4: Reverse Offset Backing

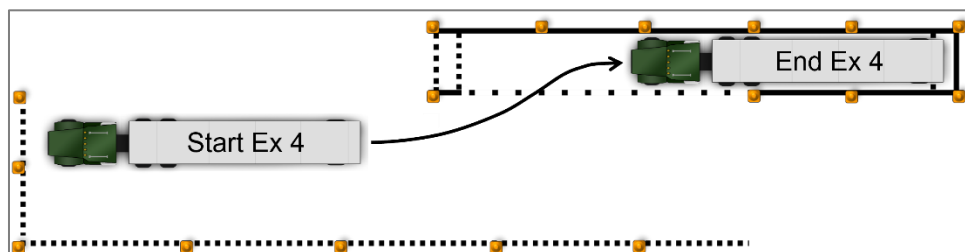
You will show your ability to offset back and park a vehicle at the end of an alley. From the stopped position of the earlier exercise and parallel with the outer boundary, offset back into the alley, bringing the rear most part of your vehicle within three (3) feet of the rear of the alley.

Stop with the rear most part of the vehicle in the three (3) foot box at the end of the alley.

Your examiner will point out the rear most part of your vehicle when giving instructions for this exercise.

If you back beyond the rear boundary of the alley, you will be asked to pull straight forward past the alley entrance until you are signaled by the examiner to stop, prior to resuming the exercise.

Your vehicle must be straight within the alley when completed. Your vehicle must be completely within the defined exercise boundaries when completed. You may not go beyond the outer boundary line. See Figure 12.4



**Figure 12.4: Exercise 4 – Reverse Offset Backing**

You will be scored for pull-ups, encroachments, and final position.

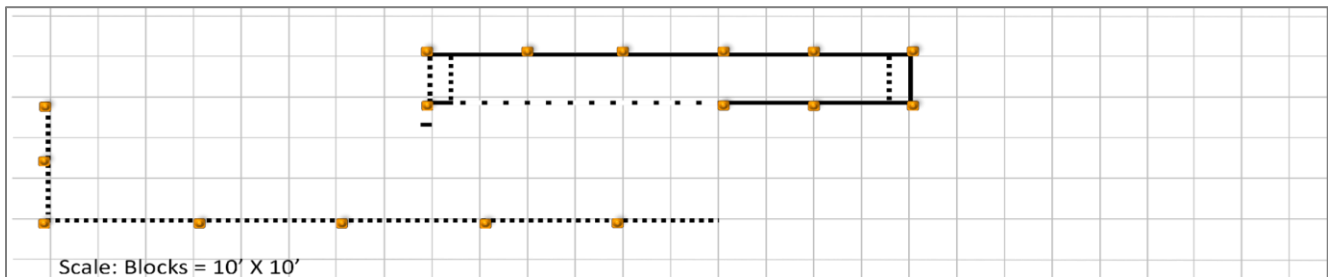
You are allowed two (2) free pull-ups and may exit the vehicle a maximum of two (2) times to check around the vehicle during this exercise.

When you have completed the exercise, set your parking brake, shift to neutral or park, and sound your horn. This will inform the examiner you have completed the exercise.

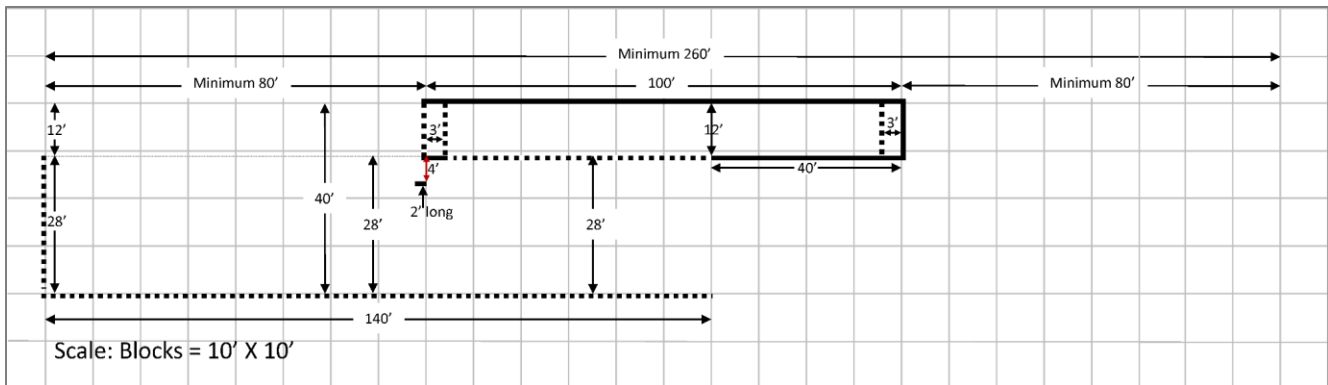
## Road Test

Remember, the Basic Control Skills test must be passed before you can proceed to the Road Test.

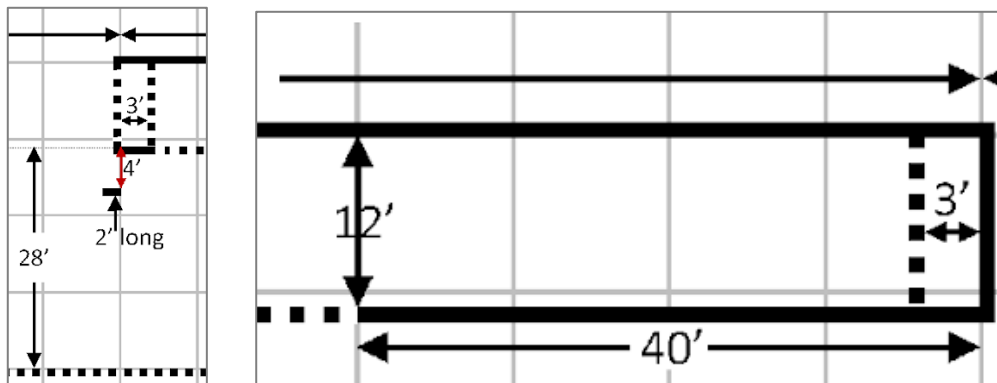
### BASIC CONTROL SKILLS DIAGRAM W/ CONE PLACEMENT:



### BASIC CONTROL SKILLS DIMENSIONS - DIMENSIONS



### BASIC CONTROL SKILLS DIMENSIONS - LARGER VIEWS OF MARKERS AND BOXES



# Section 13: On-road Driving

**This Section Covers:** How you will be tested.

You will drive over a test route that has a variety of traffic situations. During the test, you must drive safely and responsibly.

- Wear your safety belt.
- Obey all traffic signs, signals, and laws.
- Complete the test without an accident or moving violation.

During the driving test, the examiner will be scoring you on specific driving maneuvers as well as on your general driving behavior. You will follow the directions of the examiner. Directions will be given to you so you will have plenty of time to do what the examiner has asked. You will not be asked to drive in an unsafe manner.

If your test route does not have certain traffic situations, you may be asked to simulate a traffic situation. You will do this by telling the examiner what you are or would be doing if you were in that traffic situation.

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## 13.1 – How You Will Be Tested

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### 13.1.1 – Turns

**When the examiner asks you to make a turn:**

- Check traffic in all directions.
- Use turn signals and safely get into the lane needed for the turn.

**As you approach the turn:**

- Use turn signals to warn others of your turn.
- Slow down smoothly, change gears as needed to keep power, but do not coast unsafely. Unsafe coasting occurs when your vehicle is out of gear (clutch depressed or gearshift in neutral) for more than the length of your vehicle.

**If you need to stop before making the turn:**

- Come to a smooth stop without skidding.
- Come to a complete stop behind the stop line, crosswalk, or stop sign.

**If stopping behind another vehicle, stop where you can see the rear tires on the vehicle ahead of you (safe gap).**

- Do not let your vehicle roll.
- Keep the front wheels aimed straight ahead.

**When you are ready to turn:**

- Check traffic in all directions.
- Keep both hands on the steering wheel during the turn.
- Keep checking your mirror to make sure the vehicle does not hit anything on the inside of the turn.
- Your vehicle should not move into oncoming traffic. Your vehicle should finish the turn in the correct lane.

**After making the turn:**

- Make sure the turn signal is off.
- Get up to speed of traffic, use turn signal, and move into the right-most lane when safe to do so (if not already there).
- Check mirrors and traffic.

## 13.1.2 – Intersections

**As you approach an intersection:**

- Check traffic thoroughly in all directions. Decelerate gently.
- Brake smoothly and, if necessary, change gears.
- If necessary, come to a complete stop (no coasting) behind any stop signs, signals, sidewalks, or stop lines maintaining a safe gap behind any vehicle in front of you.
- Your vehicle must not roll forward or backward.

**When driving through an intersection:**

- Check traffic thoroughly in all directions.
- Decelerate and yield to any pedestrians and traffic in the intersection.
- Do not change lanes while proceeding through the intersection.
- Keep your hands on the wheel.

**Once through the intersection:**

- Continue checking mirrors and traffic.
- Accelerate smoothly and change gears as necessary.

### 13.1.3 – Urban Business

During this part of the 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 without exceeding the posted speed limit.

### 13.1.4 – Lane Changes

During multiple lane portions of the test, 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.

### 13.1.5 – Expressway or Rural or Limited Access Highway

#### **Before you enter the expressway:**

- Check traffic.
- Use proper signals.
- Merge smoothly into the proper lane of traffic.

#### **Once you are on the expressway:**

- Maintain proper lane positioning, vehicle spacing, and vehicle speed.
- Continue to check traffic thoroughly in all directions.

#### **When you exit the expressway:**

- Make necessary traffic checks.
- Use proper signals.
- Decelerate smoothly in the exit lane.
- Once you are on the exit ramp, you must continue to decelerate within the lane markings and keep adequate spacing between your vehicle and other vehicles.

### 13.1.6 – Stop and Start

For this maneuver, you will be asked to pull your vehicle over to the side of the road and stop as if you were going to get out and check something on your vehicle. You must check traffic thoroughly in all directions and move to the right-most lane or shoulder of road.

#### **As you prepare for the stop:**

- Check traffic.
- Activate your right turn signal.

- Decelerate smoothly, brake evenly, change gears as necessary.
- Bring your vehicle to a full stop without coasting.

**Once you are stopped:**

- The vehicle must be parallel to the curb or shoulder of the road and safely out of the traffic flow.
- The vehicle should not be blocking driveways, fire hydrants, intersections, signs, etc.
- Cancel your turn signal.
- Activate your four-way emergency flashers. Apply the parking brake.
- Move the gear shift to neutral or park.
- Remove your feet from the brake and clutch pedals.

**When you are instructed to resume:**

- Check traffic and your mirrors thoroughly in all directions.
- Turn off your four-way flashers. Activate the left turn signal.
- When traffic permits, you should release the parking brake and pull straight ahead.
- Do not turn the wheel before your vehicle moves.
- Check traffic from all directions, especially to the left.
- Steer and accelerate smoothly into the proper lane when safe to do so.
- Once your vehicle is back into the flow of traffic, cancel your left turn signal.

## 13.1.7 – Curve

**When you approach a curve:**

- Check traffic thoroughly in all directions.
- Before entering the curve, reduce speed so you don't need to keep braking or shifting in the curve.
- Keep your vehicle in the lane.
- Continue checking traffic in all directions.

## 13.1.8 – Railroad Crossing

**Before you reach the crossing, you should:**

- Decelerate, brake smoothly, and shift gears as necessary.
- Look and listen for the presence of trains.

- Check traffic in all directions.

Do not stop, change gears, pass another vehicle, or change lanes while any part of your vehicle is in the crossing.

**If you are driving a bus, a school bus, or a vehicle displaying placards, you should be prepared to practice the following procedures at a railroad crossing:**

- As the vehicle approaches a railroad crossing, activate the four-way 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 alerting the approach of a train. If driving a bus, you may also be asked to open the window and door prior to 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 going across the tracks.
- Four-way flashers should be deactivated after the vehicle crosses the tracks.
- Continue to check mirrors and traffic.

Not all driving road test routes will have a railroad crossing. You may be asked to explain and show the proper railroad crossing procedures to the examiner at a simulated location.

### 13.1.9 – Bridge, Overpass, and Sign

After driving under an overpass, the examiner may ask you what the posted clearance or height was. After going over a bridge, the examiner may ask you what the posted weight limit was. If your test route does not have a bridge or overpass, you may be asked about another traffic sign. When asked, be prepared to name and explain to the examiner any traffic sign which may appear on the route.

### 13.1.10 – Student Discharge (School Bus)

If you are applying for a School Bus endorsement, you will be asked to practice a student discharge. Please refer to section 10 of this manual.

**As you approach the student pick up, you must:**

- Decelerate and approach at a slow speed while continuing to check traffic.
- Activate amber warning lights and right turn signals.
- Move as far as possible to the right on the traveled part of the roadway.
- Recheck traffic.

**As you stop for the student discharge, you must:**

- Bring the school bus to a complete stop at least 10 feet away from students at the stop.

- Place the transmission in Neutral or Park and set the parking brake.
- Activate the stop arm and red warning lights.

**When discharging students, you must:**

- Communicate to students.
- Check traffic.
- Open the student door.
- Check for students.

**When students are crossing, you must:**

- Check traffic.
- Communicate to students.
- Check for students.

**When resuming from the student discharge, you must:**

- Check all mirrors.
- Turn off warning lights and stop arm.
- Close the door
- Check traffic.
- Accelerate away from the stop area.

### 13.1.11 – General Driving Behaviors

You will be scored on your overall performance in the following general driving behavior categories:

#### 13.1.11(A) – CLUTCH USAGE (FOR MANUAL TRANSMISSION)

- Always use the clutch to shift.
- If your vehicle has an unsynchronized manual transmission, you must double-clutch when shifting. Do not rev or lug the engine.
- Do not ride clutch to control speed, coast with the clutch depressed, or "pop" the clutch.

#### 13.1.12(B) – GEAR USAGE (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.

### **13.1.13(C) – BRAKE USAGE**

- Do not ride or pump the brakes.
- Do not brake harshly. Brake smoothly using steady pressure.

### **13.1.14(D) – LANE USAGE**

- Do not put your vehicle over curbs, sidewalks, or lane markings.
- Stop behind stop lines, crosswalks, or stop signs.
- Complete a turn in the proper lane on a multiple lane road (vehicle should finish a left turn in the lane directly to the right of the center line).
- Finish a right turn in the right-most (curb) lane.
- Move to or remain in the right-most lane unless the lane is blocked.

### **13.1.15 – STEERING**

- Do not over or under steer the vehicle.
- Always keep both hands on the steering wheel unless you are shifting.
- Once you have completed the shift, return both hands to the steering wheel.

### **13.1.16 – REGULAR TRAFFIC CHECKS**

- Check traffic regularly.
- Check mirrors regularly.
- Check mirrors and traffic before, while in and after an intersection.
- Scan and check traffic in high volume areas and areas where pedestrians are expected to be present.

### **13.1.17 – USE OF TURN SIGNALS**

- Use turn signals properly.
- Activate turn signals when required. Activate turn signals at appropriate times.
- Cancel turn signals after finishing a turn or lane change.

# Section 14: Slang Dictionary

Term	Definition	Sections Term is Mentioned In
<b>Jug Handle</b>	A maneuver where the driver moves left before turning right. This can confuse other drivers on the road and cause them to drive into the tractor-trailer's turning zone which could cause a crash.	<a href="#">Section 2.7.6</a> <a href="#">Section 6.1.6</a>
<b>Button Hook</b>	A maneuver where the driver keeps the truck's wheels close to the curb during the approach of a right turn and swings wide after starting the turn. This helps avoid crashes with oncoming traffic and is the preferred method of turning.	<a href="#">Section 2.7.6</a> <a href="#">Section 6.1.6</a>
<b>Brake Fanning</b>	A braking technique where the driver intermittently applies and releases the brakes to allow the breaks to cool as the vehicle slows.	<a href="#">Section 5.3</a>
<b>Rig</b>	A large truck with a semi-trailer, which is a combination of a truck tractor and one or more semi-trailers used to transport freight.	<a href="#">Section 2.7.1</a> <a href="#">Section 6.1</a> <a href="#">Section 6.4</a> <a href="#">Section 6.5.2</a> <a href="#">Section 7.2</a> <a href="#">Section 7.4</a>
<b>Semitrailer</b>	A heavy-duty truck with a tractor unit and a detachable trailer. The truck unit usually has a cab.	<a href="#">Section 4.1.1</a> <a href="#">Section 6.1.3</a> <a href="#">Section 6.4</a> <a href="#">Section 7.2.1</a>

<b>Low Slung</b>	The name given to the open deck trailer with heightened front and back ends and a lower-middle well area usually measuring between 26 and 30 feet in length. These trailers are often used to help keep a load within legal height limits.	<a href="#">Section 2.15.6</a> <a href="#">Section 6.1.3</a>
<b>Lowboy</b>	The name given to the open deck trailer with heightened front and back ends and a lower-middle well area that usually measures between 26 and 30 feet in length. These trailers are often used to help keep a load within legal height limits.	<a href="#">Section 2.15.6</a> <a href="#">Section 6.1.3</a>
<b>Car Carrier</b>	A specialized vehicle designed to transport multiple cars simultaneously	<a href="#">Section 2.15.6</a> <a href="#">Section 6.1.3</a>
<b>Moving Van</b>	A vehicle designed to carry cargo that is low to the ground. Commonly used for transporting furniture, appliances, and other heavy or bulky cargo	<a href="#">Section 2.15.6</a> <a href="#">Section 6.1.3</a>
<b>Possam-belly</b>	A trailer that is typically designed with an open top and a sloped under-deck storage area, allowing for more cargo capacity.	<a href="#">Section 2.15.6</a> <a href="#">Section 6.1.3</a>
<b>Livestock Trailer</b>	A specialized vehicle designed for the transportation of animals such as cattle, sheep, pigs, horses, and poultry.	<a href="#">Section 2.15.6</a> <a href="#">Section 6.1.3</a>
<b>Trailer Hand Valve</b>	A hand-operated lever used to control the trailer brakes	<a href="#">Section 6.2.1</a>
<b>Trolley Valve</b>	A hand-operated lever used to control the trailer brakes	<a href="#">Section 6.2.1</a> <a href="#">Section 6.5.2</a> <a href="#">Section 7.4.1</a>
<b>Johnson Bar</b>	A hand-operated lever used to control the trailer brakes	<a href="#">Section 6.2.1</a>

<b>Shut-off valves</b>	Type of valve used on connections to close off the connection	<a href="#">Section 6.2.7</a> <a href="#">Section 6.5.2</a> <a href="#">Section 7.2.1</a> <a href="#">Section 7.3.1</a> <a href="#">Section 7.4.1</a>
<b>Cut-out cocks</b>	Type of valve used on high pressure connections to close off the connection	<a href="#">Section 6.2.7</a>
<b>Dollies</b>	Enable the connection of multiple trailers to a single truck, creating what is known as a road train configuration.	<a href="#">Section 2.18.2</a> <a href="#">Section 2.18.3</a> <a href="#">Section 5.1.15</a> <a href="#">Section 6.2.8</a> <a href="#">Section 6.3.1</a> <a href="#">Section 7.1.8</a> <a href="#">Section 10.6.1</a>
<b>Anti-lock braking system (ABS)</b>	A braking system that prevents the wheels from locking-up during braking, allowing the driver to keep steering control and stability.	<a href="#">Section 2.1.5</a> <a href="#">Section 5.1.15</a> <a href="#">Section 5.3</a> <a href="#">Section 5.4.2</a> <a href="#">Section 6.3</a> <a href="#">Section 10.6</a> <a href="#">Section 11.1.1</a>

<b>Electronic Control Unit (ECU)</b>	Acts as the brain of the truck engine, managing and coordinating various electronic systems such as fuel injection control, ignition timing, emission control, and engine diagnostics. Also known as the Engine Control Module (ECM)	<a href="#">Section 2.18.1</a> <a href="#">Section 2.18.3</a> <a href="#">Section 5.1.15</a> <a href="#">Section 6.3.1</a>
<b>Converter dolly</b>	Designed to connect multiple trailers to a semi-truck and typically consists of a fifth wheel coupling axle(s), and a tow bar that links the first trailer to the second one, allowing for efficient hauling of more than one trailer.	<a href="#">Section 6.2.6</a> <a href="#">Section 7.2</a> <a href="#">Section 7.3.1</a>
<b>Blade for leaf spring</b>	A leaf spring is a part of a commercial vehicle's suspension system. Each layer of a leaf spring is called a blade	<a href="#">Section 2.1.3</a> <a href="#">Section 11.5.2</a>
<b>International Registration Plan (IRP)</b>	A cooperative agreement among the United States and Canadian provinces that simplifies the registration process for commercial vehicles working across multiple jurisdictions.	<a href="#">Section 1.6</a>
<b>Dead axle or non-driven Axle</b>	A type of axle that does not get power from the engine and primarily supports the vehicle's weight.	<a href="#">Section 7.1.6</a>
<b>Wheel chocks</b>	A wedge device used in the trucking industry to prevent vehicles from rolling during the loading and unloading processes to stabilize the tires and vehicles.	<a href="#">Section 5.4.8</a> <a href="#">Section 6.2.1</a> <a href="#">Section 6.2.8</a> <a href="#">Section 6.4.1</a> <a href="#">Section 11</a>
<b>Wig wag</b>	A device that shows low air pressure in air brake systems on trucks, helping drivers to stop safely.	<a href="#">Section 5.1.11</a>

<p><b>Jackknife/Jacknife</b></p>	<p>Term used when a trailer of a truck swings out to the side, resembling a folded pocket knife. Can happen for various reasons, such as improper braking, mechanical failures, speeding, and extreme weather conditions.</p>	<p><a href="#">Section 2.13.2</a>  <a href="#">Section 2.18.4</a>  <a href="#">Section 2.18.5</a>  <a href="#">Section 2.18.8</a>  <a href="#">Section 2.19.1</a>  <a href="#">Section 5.4.2</a>  <a href="#">Section 6.1.3</a>  <a href="#">Section 6.1.5</a>  <a href="#">Section 6.2.1</a>  <a href="#">Section 6.3.2</a>  <a href="#">Section 7.1.4</a>  <a href="#">Section 8.3</a></p>
<p><b>Straight truck</b></p>	<p>Single-frame design where the cab and cargo area are permanently attached and all axles are connected to one frame, making one solid unit.</p>	<p><a href="#">Section 1.2.1</a>  <a href="#">Section 2.18.6</a>  <a href="#">Section 2.19.1</a>  <a href="#">Section 5.1.14</a>  <a href="#">Section 5.4.2</a>  <a href="#">Section 6.1.1</a>  <a href="#">Section 6.1.7</a>  <a href="#">Section 7.1.1</a>  <a href="#">Section 11.6.2</a></p>
<p><b>Brake Lag</b></p>	<p>The delay in response of the braking system after the driver applies the brake pedal. This is a common issue with air brake systems and will increase the distance it takes to stop a commercial vehicle.</p>	<p><a href="#">Section 5.4.4</a></p>

<p><b>Brake fade</b></p>	<p>When your brakes lose effectiveness due to overheating</p>	<p><a href="#">Section 2.16.3</a>  <a href="#">Section 2.17.3</a>  <a href="#">Section 5.4.5</a></p>
<p><b>Power unit</b></p>	<p>The self-propelled, motorized vehicle that can generate its own power. Can tow freight as a combination vehicle or operating independently.</p>	<p><a href="#">Section 1.2.2</a>  <a href="#">Section 1.6</a>  <a href="#">Section 2.1.5</a>  <a href="#">Section 3.2.1</a>  <a href="#">Section 9.5.4</a>  <a href="#">Section 9.6.8</a>  <a href="#">Section 11.1.2</a>  <a href="#">Section 11.6.1</a>  <a href="#">Section 11.6.2</a></p>
<p><b>Cargo Tank</b></p>	<p>A type of bulk packaging used for the transportation of hazardous materials. These tanks are commonly used to carry products like gasoline or other flammable liquids and typically feature a heavy, built-up top to contain small spills.</p>	<p><a href="#">Section 2.23.2</a>  <a href="#">Section 8.2.6</a>  <a href="#">Section 9</a>  <a href="#">Section 9.2.1</a>  <a href="#">Section 9.3.3</a>  <a href="#">Section 9.3.6</a>  <a href="#">Section 9.3.11</a>  <a href="#">Section 9.4</a>  <a href="#">Section 9.5</a>  <a href="#">Section 9.6.6</a>  <a href="#">Section 9.6.11</a>  <a href="#">Section 9.7.4</a>  <a href="#">Section 9.8</a></p>

# For More Information

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## Maryland Commercial Driver's License Manual

DL-151 (03/26)

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