Whether you're new to the transportation industry or not, there's a lot to know to become a successful driver and excel in your chosen field. Key to this goal is a resource that provides the information and how-to guidance that will help you develop the expertise to become a skilled, professional, and safe driver.

Backed by over 60 years of transportation industry knowledge and experience, the J. J. Keller® Tractor-Trailer Driver Training Manual serves as a driver training tool and invaluable reference that:

- Provides all the information you need to become a safe and skilled professional driver
- Includes best practice information to ensure you understand the fundamentals of safe, professional driving and compliance with motor carrier safety requirements
- Contains a CDL pre-test at the end of each chapter to prepare you for the CDL written exam
- Uses full-color images, diagrams, and easily digestible information to engage you in active learning
- Is based on the FHWA Model Curriculum and follows the curriculum standards set by the Professional Truck Driver Institute (PTDI).

Based on the FHWA Model Curriculum
Follows PTDI’s curriculum standards

3rd Edition

Copyright J. J. Keller & Associates, Inc.
TRACTOR-TRAILER DRIVER TRAINING MANUAL

Published & Printed by
J. J. Keller & Associates, Inc.
3003 Breezewood Lane, P.O. Box 368
Neenah, Wisconsin 54957-0368
Phone: (800) 327-6868
Fax: (800) 727-7516
JJKeller.com

EDITORIAL

director – editorial resources          PAUL V. ARNOLD
project editor                        JILL M. SCHULTZ
sr. editorial manager – transportation BETTY J. B. WEILAND
sr. editor – transportation management THOMAS E. BRAY
sr. editor – transportation safety     DAREN B. HANSEN
sr. editor – hazardous materials transportation THOMAS J. ZIEBELL
editor – transportation safety        KATHY L. CLOSE
editor – transportation management    RICHARD J. MALCHOW
editor – transportation operations     HEATHER L. NESS
editor – transportation management    ROBERT J. ROSE
associate editor                      RANDALL J. SKOOG
sr. metator/xml analyst                MARY K. FLANAGAN
technical review                      ROB BEHNKE*
technical assistance                   SAM EUSTICE*

PUBLISHING GROUP

chairman                               ROBERT L. KELLER
vice chairman & treasurer              JAMES J. KELLER
president & ceo                        MARNE L. KELLER-KRIKAVA
evp & chief operating officer         RUSTIN R. KELLER
chief financial officer                DANA S. GILMAN
sr. director of product development    CAROL A. O’HERN
sr. product development manager       JENNIFER M. JUNG
product development specialist         SUZANNE IHRIG
product development specialist         ASHLEY C. PUCKER
director of manufacturing              TODD J. LUEKE
sr. electronic publishing & prepress manager    GERALD L. SABATKE

The Editorial Staff is available to provide information generally associated with this publication to a normal and reasonable extent, and at the option of, and as a courtesy of, the Publisher.

*The Editor would like to thank Rob Behnke and Sam Eustice of Fox Valley Technical College, Appleton, Wisconsin, for their expertise and assistance with this publication.
Chapter 1

Orientation .............................................................................................................................................. 1
  • Welcome to the trucking industry
  • A regulated industry
  • Obtaining your commercial driver’s license (CDL)
  • Driver qualifications
  • Driver disqualification
  • Alcohol and drug testing
  • The commercial motor vehicle — an overview
  • Summary
  • Orientation Quiz
  • General knowledge CDL pre-test

Chapter 2

Control systems...................................................................................................................................... 19
  • Engine controls
  • Primary vehicle controls
  • Secondary vehicle controls
  • Vehicle instruments
  • Summary
  • Control systems Quiz
  • General knowledge CDL pre-test

Chapter 3

Vehicle systems...................................................................................................................................... 33
  • Frame
  • Suspension system
  • Axles
TABLE OF CONTENTS

- Engine
- Fuel system
- Air intake and exhaust system
- Lubrication system
- Cooling system
- Electrical system
- Drive train
- Brake system
- Wheels and tires
- Steering system
- Coupling system
- Summary
- Vehicle systems Quiz
- General knowledge CDL pre-test

Chapter 4

Vehicle inspection ................................................................. 57
- The importance of inspections
- Types of inspections
- Conducting an inspection
- Pre-trip inspection
- En-route inspection
- Post-trip inspection
- Special rigs
- Summary
- Vehicle inspection Quiz

Chapter 5

Basic control ........................................................................ 75
- Starting, warming up, and shutting down
- Putting the vehicle in motion and stopping
- Straight line backing
- Turning
- Summary
- Basic control Quiz
- General knowledge CDL pre-test
# Chapter 6

**Shifting**

- Key elements of shifting
- Shifting gears
- Shifting patterns
- Summary
- Shifting Quiz
- General knowledge CDL pre-test

# Chapter 7

**Backing**

- Backing principles and rules
- Sight side and blind side backing
- Basic backing maneuvers
- Summary
- Backing Quiz
- General knowledge CDL pre-test

# Chapter 8

**Coupling and uncoupling**

- Coupling tractor-trailers
- Uncoupling tractor-trailers
- Coupling twin trailers
- Uncoupling twin trailers
- Other combinations
- Summary
- Coupling and uncoupling Quiz
- General knowledge CDL pre-test

# Chapter 9

**Visual search**

- Seeing ahead and to the sides
- Use of mirrors
- Adjusting mirrors
- Seeing to the rear
- Summary
Chapter 10

Communication

- Communicating intent
- Communicating presence
- Communication from others
- Summary
- Communication Quiz
- Combination vehicle CDL pre-test

Chapter 11

Speed management

- Stopping distance
- Road conditions
- Road shape
- Speed and visibility
- Speed and traffic flow
- Use of cruise control
- Obeying the speed limit
- Summary
- Speed management Quiz
- Combination vehicle CDL pre-test

Chapter 12

Space management

- Managing space
- Turning space
- Space when crossing and entering traffic
- Summary
- Space management Quiz
- Combination vehicle CDL pre-test
Chapter 13

Night driving

- Night driving factors
- Night driving procedures
- Summary
- Night driving Quiz
- Combination vehicle CDL pre-test

Chapter 14

Extreme driving conditions

- Vehicle preparation
- Emergency equipment
- Tire chain installation
- Cold weather starting
- Driving hazards
- Skidding and jackknifing
- Slippery surfaces
- Wet brakes
- Freeing a stuck vehicle
- Breakdowns
- Mountain driving
- Summary
- Extreme driving conditions Quiz
- General knowledge CDL pre-test

Chapter 15

Hazard perception

- Hazard recognition
- Road hazards
- User hazards
- Plan ahead
- Summary
- Hazard perception Quiz
- General knowledge CDL pre-test
TABLE OF CONTENTS

■ Chapter 16

Railroad crossings ........................................................................................................ 199
  • The regulations
  • Types of warning devices
  • Signs and signals
  • Safety tips
  • Summary
  • Railroad crossings Quiz
  • General knowledge CDL pre-test

■ Chapter 17

Emergency maneuvers ............................................................................................... 211
  • The role of emergency maneuvers
  • Evasive steering
  • Emergency stopping
  • Off-road recovery
  • Brake failure
  • Blowouts
  • Summary
  • Emergency maneuvers Quiz
  • General knowledge CDL pre-test

■ Chapter 18

Skid control and recovery ......................................................................................... 223
  • Skid dynamics
  • Causes of skids
  • Tractor-trailer skids
  • Skid recovery
  • Summary
  • Skid control and recovery Quiz
  • General knowledge CDL pre-test

■ Chapter 19

Special rigs ................................................................................................................ 233
  • Multiple articulation vehicles
  • Oversize vehicles
| Chapter 20 | Preventive maintenance ................................................................. 245 |
|-----------------------------------------------|
| - Types of maintenance                        |
| - Your responsibility                        |
| - Regulatory requirements                    |
| - Pitfalls of poor vehicle maintenance       |
| - Summary                                    |
| - Preventive maintenance Quiz                |
| - General knowledge CDL pre-test             |

| Chapter 21 | Diagnosing and reporting malfunctions .................................................. 257 |
|-----------------------------------------------|
| - Diagnosing and reporting malfunctions       |
| - Troubleshooting                            |
| - DVIR requirements                          |
| - Summary                                    |
| - Diagnosing and reporting malfunctions Quiz  |
| - General knowledge CDL pre-test             |

| Chapter 22 | Handling cargo ................................................................. 265 |
|-----------------------------------------------|
| - The importance of proper cargo handling     |
| - Principles and methods of cargo securement  |
| - Principles of weight distribution           |
| - Safe loading responsibilities              |
| - Loading/unloading tools                     |
| - Summary                                    |
| - Handling cargo Quiz                        |
| - General knowledge CDL pre-test             |
Chapter 23
Cargo documentation ................................................................. 277
- Basic definitions
- Basic documents
- Pickup and delivery procedures
- Summary
- Cargo documentation Quiz
- CDL air brake pre-test

Chapter 24
Hazardous materials ................................................................. 289
- What is a hazardous material?
- The CDL and hazmat endorsement
- Hazard classes and divisions
- Shipping papers
- Shipping paper accessibility
- Loading and unloading
- On the road
- Summary
- Hazardous materials Quiz
- CDL air brake pre-test

Chapter 25
Hours of service ................................................................. 299
- Who is regulated?
- 11 hours driving rule
- 14 consecutive hours duty rule
- Mandatory break provision
- On-duty time
- 60-hour/7-day and 70-hour/8-day limits
- Record of duty status/electronic logging device
- Exceptions
- Summary
- Hours of service Quiz
- CDL air brake pre-test
# Chapter 26

**International driving**

- Operating in Canada
- Crossing the Canadian border
- Border crossing programs
- Returning to the United States from Canada
- Motor carrier safety and licensing
- Vehicle sizes and weights
- Metric measurements and conversions
- Summary
- International driving Quiz
- CDL air brake pre-test

# Chapter 27

**Trip planning**

- The five basic steps of trip planning
- Paperwork
- Route selection
- Vehicle and cargo restrictions
- Estimating time
- Estimating fuel usage
- Estimating trip expenses
- Summary
- Trip planning Quiz
- CDL air brake pre-test

# Chapter 28

**Accident procedures**

- Definitions
- Accident register
- Securing the scene
- At the scene
- Hazardous materials
- Vehicle fires
- Summary
- Accident procedures Quiz
- CDL air brake pre-test
#### Chapter 29

**Security of cargo, truck, and driver**

- Cargo theft
- Personal security
- In-transit security tips
- Summary
- Security of cargo, truck, and driver Quiz
- General knowledge CDL pre-test

#### Chapter 30

**Personal health and safety**

- Personal health and driving
- Weight, diet, and exercise
- Stress
- Fatigue
- Alcohol use and drug abuse
- Safety equipment and practices
- Summary
- Personal health and safety Quiz
- General knowledge CDL pre-test

#### Chapter 31

**Public and employer relations**

- Trucking industry image
- Contact with the public
- Customer relations
- What do employers look for?
- Company policy
- Whistleblower protection
- Coercion
- Opportunities for advancement
- Applying for a job
- Summary
- Public and employer relations Quiz
- General knowledge CDL pre-test
Chapter 32

Basic business practices ........................................................................................................... 393
- Cost determination and control
- Fuel management
- Growing revenue
- Summary
- Basic business practices Quiz
- General knowledge CDL pre-test

Chapter 33

CSA ........................................................................................................................................ 401
- What is CSA?
- Data collection
- Safety measurement system (SMS)
- Behavior Analysis and Safety Improvement Categories (BASICs)
- Assigning value
- Safety evaluation
- Interventions
- Your role in CSA
- CSA-related data
- Summary
- CSA Quiz
- General knowledge CDL pre-test

Troubleshooting guide ........................................................................................................... 413

Glossary .................................................................................................................................. 417

Index ........................................................................................................................................ 447
Seeing ahead and to the sides

A tractor-trailer covers more distance than your personal vehicle when stopping, changing lanes, or reacting to problems on the road. Because of this, it is important that you continually scan your entire sight area. This includes focusing on:

- The road, vehicles, and other problems ahead;
- Vehicles and other problems to the left and right; and
- Vehicles behind.

Distance scanning

Looking ahead can help you travel safely. Always look far enough ahead to:

- Give yourself time to spot a problem;
- Give yourself time to decide on the best way to avoid a problem;
- Check for adverse traffic conditions; and
- Give yourself enough time to maneuver away from a potential problem situation.

As a general rule, look about 12-15 seconds ahead of your vehicle. In the city, 12-15 seconds is equal to about two to three blocks. On the highway, 12-15 seconds is equal to just over one quarter of a mile. If you can’t see that far ahead, you should slow down.

As well as looking ahead, you should be scanning to the sides and behind your vehicle. Watch road signs and check your vehicle’s instruments. Your eyes should be continually moving from far to near. When scanning ahead, pay special attention to anything that could affect your path of travel including:

- Other vehicles;
- Road signs;
- Traffic signals;
- Debris;
- Animals;
- Weather-related hazards (ice, rain, snow);
- Intersections;
CHAPTER 9

- Work/construction zones;
- Stopped vehicles;
- Emergency vehicles; and
- Accidents.

There are several benefits to distance scanning including being able to identify hazards early, and having additional time to react/respond to situations including finding ways to avoid the situation. Distance scanning helps you avoid abrupt stops and radical speed changes. Also, effective scanning can help reduce fatigue. Your eyes are continually moving and are not fixed on a single object.

**Scanning to the sides**

When on the road, you should be periodically scanning to the sides, but there are certain situations where scanning to the sides is critical including crosswalks, intersections, and school zones.

At crosswalks you should use extra caution. As well as watching the entire area, you should pay additional attention to what is happening to your right. Pedestrians, bicycles, etc. are often hidden from your line of sight when closest to your vehicle. Also, remember to yield the right of way to pedestrians when turning on green.

At intersections, move your vehicle forward slowly. Look left, right, and left again. Start to pull into the intersection, continuing to scan as you pull through the intersection.

School zones are another place where you need to be especially careful. Watch for children, bikes, balls, etc. darting into traffic.

In cities, scanning to the sides is crucial to your safety and the safety of others. Cars parked along the shoulder create increased hazards that may not be seen if you are not constantly scanning. Often, people will walk between cars or will open their door into traffic without even looking. By scanning you can avoid a possible accident or injury caused by the inattentiveness of others.

**Use of mirrors**

Mirrors provide your only view of the rear of your vehicle. You must check your mirrors before changing speed or position in traffic. You should check your mirrors about every four seconds. Also, use mirrors to assist in checking your vehicle’s blind spots.

Most tractors are equipped with two types of mirrors:

- Plane or west coast; and
- Convex.

**Plane/west coast**

A plane or west coast mirror assists you in seeing down the sides and toward the rear of your trailer and the roadway behind. It doesn’t give as wide a view as the convex mirror does, but it does allow for
better visibility down the length of the trailer. The left mirror is closer and reflects a larger image which means you have a greater field of view from that mirror.

![Diagram of mirror views](image)

Remember that mirrors do not allow you to see everything. There are blind spots on both sides of your vehicle. This makes lane changes, passing, and other maneuvers risky. Tight turns can also pose a problem. You can’t see smaller vehicles or pedestrians that are next to the vehicle. Along with using your mirrors, signal and wait a moment before changing direction or lanes.

Images in your side mirror will appear to be similar to those when you are driving your personal vehicle. When using your plane mirror in this situation, you should be able to judge the speed and distance of overtaking vehicles.

**Convex**

Convex mirrors are designed with an outward curvature to provide a wide-angle view. They give a broader view than plane mirrors and, if adjusted correctly, eliminate much of the blind area. Convex mirrors provide the best close-up view of the sides of your vehicle.

![Diagram of mirror views](image)

One negative aspect of convex mirrors is that they show a distorted image. Overtaking vehicles appear smaller and farther away than they really are. When using this mirror, you need to gain a solid understanding of what you are looking at. This will take practice as this view is not something you are used to in your personal vehicle.
A combination of plane and convex mirrors work best. They provide maximum side and rear vision. The drawback is that the combination can be a bit confusing at first. Frequently making sure the mirrors are clean and properly adjusted can be a great aid in reducing any confusion.

### Adjusting mirrors

Proper adjustment is important. It ensures that you have the best view possible to the sides and rear of your vehicle.

#### Left side plane/west coast

You should see the trailer body on the inside vertical edge of the mirror. The rest of the mirror should show what is next to and behind the trailer. You should be able to see a point on the ground about 30 feet away on the bottom, horizontal edge of the mirror.

#### Left side convex

You should see part of the trailer on the inside vertical edge of the mirror. The top, horizontal edge of the mirror should show a point on the ground that is about 35 feet away. The bottom, horizontal edge should show a point on the ground that is about 7 feet away.

#### Right side plane/west coast

You should see the trailer body on the inside vertical edge of the mirror. The rest of the mirror should show what is next to and behind the trailer. You should be able to see a point on the ground about 60 feet away on the bottom, horizontal edge of the mirror.

#### Right side convex

You should see part of the trailer on the inside vertical edge of the mirror. The top, horizontal edge of the mirror should show a point on the ground that is about 65 feet away. The bottom, horizontal edge of the mirror should show a point on the ground that is about 8 feet away.

Some vehicles also make use of fender mirrors, which are mounted on the right and left corners of the front fenders. Companies have also started exploring the use of certain types of collision avoidance systems. Although these two types of visual aids are not on every commercial motor vehicle, they do provide an additional level of sight around the vehicle which adds to safer driving operations in many instances.

### Seeing to the rear

Continually use your mirrors to monitor the rear of your vehicle.

Check load and cargo security. Watch for loose or falling cargo. If operating a flatbed, watch for loose straps, ropes, chains, or tarps.

Keep an eye on your tires. Look for potential problems including flat or damaged tires or tire fires.

Use your mirrors to check for vehicles beside your tractor and trailer. Be alert. Know what is going on at all times.
Use your mirrors when changing lanes. Check your mirrors:

- Before you change lanes (making sure there’s room to change lanes);
- After you signal (making sure no one/thing moved into your blind spot);
- Right after you begin the lane change (making sure your path is still clear); and
- After you complete the lane change.

Also check your mirrors when you slow down, merge, or turn.

Use of mirrors is also important when approaching alleys and intersections. Mirrors must be used more frequently when in traffic tie-ups and when approaching or driving alongside parked or stopped vehicles.

**Summary**

In this chapter, you have learned about the skills required to conduct an effective visual search. This includes seeing ahead, to the sides, and behind your vehicle as well as proper use and adjustment of mirrors.