MANITOBA PUBLIC INSURANCE

MANDATORY ENTRY-LEVEL TRAINING MANITOBA CLASS 1

Lesson 2

Instructor's Guide

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Overview

Purpose/Objectives

This lesson provides information on the basic components and systems of trucks.

After completing this lesson, students should be able to:

- Identify and describe commercial vehicle systems and controls, and have the knowledge required to operate a commercial vehicle.

How long should it take?

Classroom (hours)			In-Yard (hours)			In-Cab (hours)			Total Training Duration (hours)
Deliver	Apply	Assess	Deliver	Apply	Assess	Deliver	Apply	Assess	
0.5		0.5	0.5	0.5	0.5				2.5

Required materials

- Whiteboard or flipchart
- Markers
- Projector
- PPT presentation
- Printed and electronic quizzes
- Pens

Using this document

This document is intended to guide you through the session. It includes the following icons for reference:

▶ **Direction on what you need to <u>do</u>**

Sample language for what you need to <u>say</u>

? Sample wording for what you need to <u>ask</u>

ⓘ Extra information to consider

Lesson Outline

Time (Approx. mins.)	Topic	Materials	Slides
5	Introduction		1-2
10	Systems and Components		3-19
5	Stability Control System		20-21
5	Anti-Lock Brake System		22
5	Wrap Up		23
30	Practical In-Yard Demo		24
30	Practical In-Yard Application		24
30	Practical In-Yard Assessment		25
30	Classroom Quiz		26

Total time = 2.5 hrs

ⓘ Times are an approximation of what is expected in a 15-student class with active participation. Times also include in-yard demonstration, application and assessments.

Student Materials

- Lesson 2: Exercise Book
- Textbook
- Vehicle Manual
- Government of Manitoba Guide to Transportation Safety
- Lesson 2 Practical Job Aid
- Filling out a Daily Log Job Aid

Introduction

Objectives: Introduces students to the lesson.

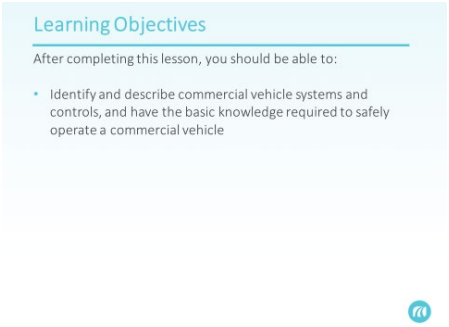
Time: 5 minutes

Slide: 1	Type: Presentation

- Welcome students and allow time to settle if this is a new day of classroom delivery.

Slide: 2	Type: Presentation

- This lesson is intended to provide you with a basic understanding of the components and systems of trucks. You should be able to identify and describe commercial vehicle systems and controls, and have the knowledge required to safely operate a commercial vehicle.



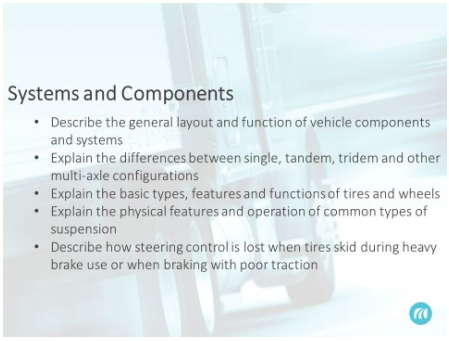
ⓘ A full list of the systems and components is in Section 2 of the **Textbook**. Use this as a reference throughout the lesson.

Systems and Components

Objectives: This section provides information about the basic components and systems of tractor-trailer units.

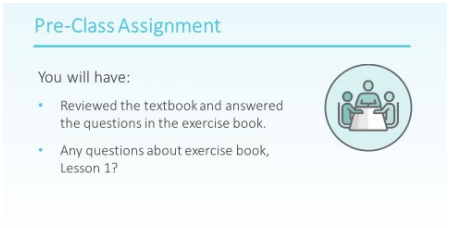
Time: 10 minutes

Slide: 3 Type: Section Break



- After completing this section, you should be able to:
  - Describe the general layout and function of vehicle components and systems
  - Explain the differences between single, tandem, tridem and other multi-axle configurations
  - Explain the physical features and operation of common types of suspension
  - Describe common safety technology like electronic stability control (ESC) and antilcok braking systems (ABS) and their role in imporving driver and vehicle safety in common conditions such as loss of steering control or when braking with poor traction

Slide: 4 Type: Discussion



- Your after-class assignment was to review the textbook and answer the questions in your exercise book.

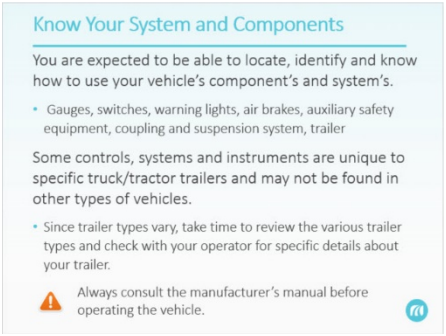
? Are there any questions from your after-class assignment?

- Review the answers for each exercise (1-3), using the Exercise Book – Answer Key.
- We will also review some of these components in class. Then we will go out to the yard and go over these systems and components on an actual truck. You will be asked to identify and describe these items.

  Be sure to ask about any items you are not sure about before we go out to the yard.

ⓘ Students will be assessed on their ability to identify and explain the purpose of all the components and systems that are found on the checklist in the textbook. The list is also in their exercise book for their reference.

Slide: 5 Type: Presentation



- As you develop driving skills, you will understand the importance of knowing the functions of all controls, systems and instruments found in a vehicle.

  Some controls, systems and instruments are unique to a specific truck/tractor trailer and may not be found in other types of vehicles.

  You are expected to know the components of the trailer you haul.

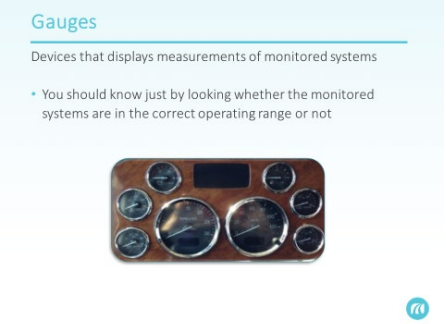
  Since trailer types vary, take time to review the various trailer types and check with your operator for specific details about your trailer.

  You must consult the manufacturer's manual of the vehicle you are driving to determine if the components and/or systems are functioning optimally.

ⓘ **Reference:** https://www.tptrucking.ca/2016/08/understanding-trailer-types/

ⓘ **Reference:** https://www.mpi.mb.ca/documents/ProfDriverHBookComp.pdf

Slide: 6 Type: Presentation



- **Gauges** are devices that display measurements of monitored systems through needles or pointers that move along a calibrated scale.

  The instrument panel in large trucks varies in style and number of gauges. For each instrument or gauge, there is a correct and incorrect operating range.

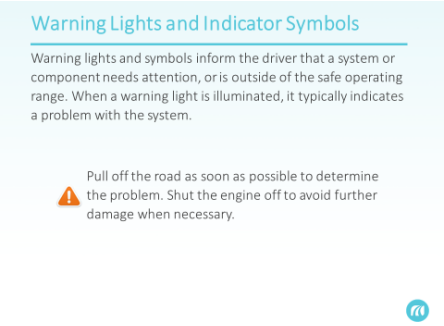
  You should know just by looking at your oil pressure, oil temperature, and water temperature gauges whether they are in the correct operating range or not. You must become familiar with the normal ranges as recommended by the manufacturer's manual. You will need to continuously monitor the gauges for any deviations from the safe operating ranges.

ⓘ **Textbook Reference**: Section 2 all gauges are listed in alphabetical order.

Slide: 7 Type: Presentation

- Commercial vehicles are equipped with warning lights and symbols to inform you that a system or component needs attention, or is outside the safe operating range. When a warning light is illuminated, it typically indicates a problem with the system. You must pull off the road as soon as possible to determine the problem, and in some cases, shut off the engine to avoid further damage.

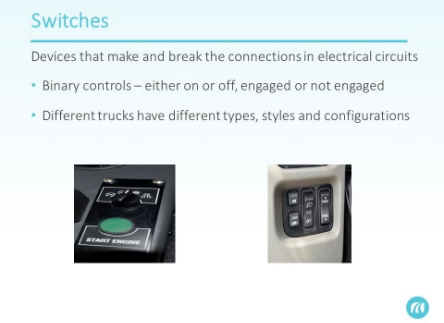
  Symbols, lights, and colors may differ slightly between manufacturers. Refer to the manufacturer's manual before driving.



Slide: 8 Type: Presentation

- A switch is a device for making and breaking the connection in an electrical circuit.

  Switches are binary controls – they are either on or off, engaged or not engaged. Some are operated electrically; others by air. Switches control important functions, so it is essential to know where they are, when to use them, and if they are in the correct operating position.

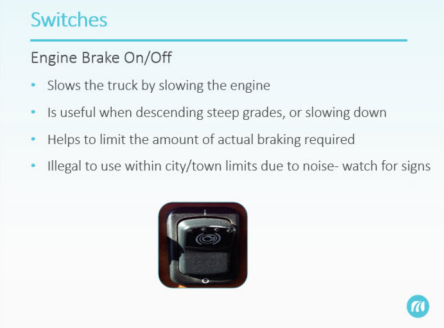


  Depending on the manufacturer, different trucks will have different types, styles, and configurations of switches. They could be rocker, toggle, button, or some other style and will be identified by either names or symbols. You must become familiar with all of the controls of the vehicle you are driving, referring to the manufacturer's manual when necessary.

Slide: 9 Type: Presentation

- **Engine Brake On/Off**: This is used to turn the engine brake ON or OFF. It is also referred to as "jake brake" or "engine retarder."

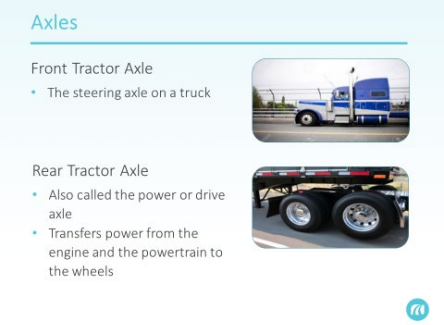
  The engine brake slows the truck down by slowing the engine and is useful when descending steep grades, or slowing down to come to a stop. It helps to limit the amount of actual braking required, which keeps your brakes from heating up. It is used together with the service brakes.



  It is illegal to use engine brakes within city/town limits due to the noise they create when in use. Watch for signs indicating this.

Slide: 10 Type: Presentation

The axle is a shaft on which two or more wheels revolve. It connects the wheel to the rest of the vehicle and also supports the weight of the vehicle. The tractor axle, along with the trailer axle, serve as connection points for brakes. Tractors have a front axle and one or more rear axles.



Front Tractor Axle: The front tractor axle is the steering axle on a truck. Steering axle means the articulated axle of a commercial vehicle you can control for the purpose of steering the vehicle.

Rear Tractor Axle: This is also called the power or drive axle. Power is transferred from the engine and the powertrain to the wheels by the rear axle.

Slide: 11 Type: Presentation

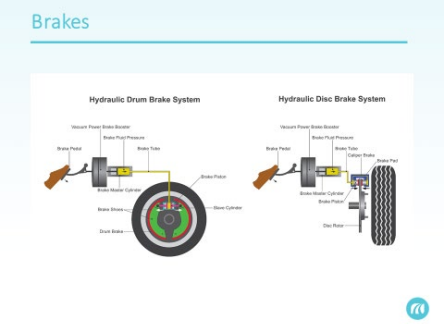
Single Axle: Two-axle trucks have one rear axle. The rear axle is called the single drive axle. This could also be any combination of two axles whose centres are less than one metre apart.

Tandem: Tandem trucks have two consecutive rear axles (two drive axles) where the axles have an axle spread of not less than 1.2 metres and not greater than 1.85 metres. In the case of a trailer manufactured before November 15, 1988, the axles have an axle spread of not less than 1.0 metre and not more than 2.4 metres.

Tridem/Tri-drive Axles: This is an axle group, on a trailer or tractor, consisting of any three consecutive axles where the axles are evenly spaced over a distance of not less than 2.4 metres and not greater than 3.7 metres, but does not include a lift axle in the down position or a single steer.

Slide: 12 Type: Presentation

- **Hydraulic Brake System**
  - Hydraulic brakes apply instantly
  - Hydraulic fluid is held in reservoir and brake lines so the system is constantly full
  - Brake fluid cannot be compressed (unlike air in an air brake system)
  - Brake fluid transfers pressure rather than flows
  - The force applied to the brake is immediate



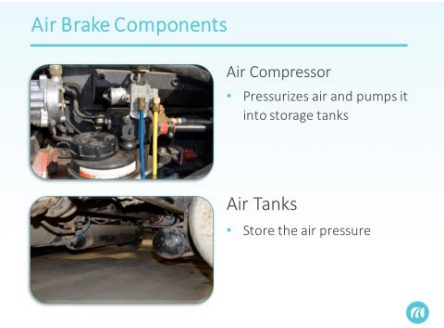
The components of a disc brake system consist of a disc and calliper. When the brakes are applied, the calliper squeezes the disc creating friction and slowing the vehicle.

A drum brake is a drum attached to each side of the axle by bolts, to stop or slow down tire rotation when the you apply pressure on the brake pedal. When the brake is applied, friction is created when the brake shoe linings are forced against the inside of the brake drum.

Slide: 13 Type: Presentation

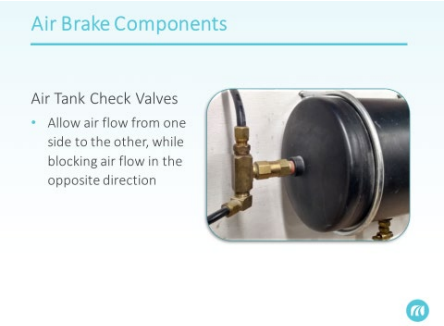
- **Air Compressor:** This pressurizes air and pumps it into storage tanks. It is directly driven from the internal gearing of the engine and can be either single or multiple piston pump. It takes in air from the atmosphere and compresses (pressurizes) it.

  Air Tanks: These store the air pressure. The size of the air tanks depends on the air volume required for the brake lines and chambers.



Slide: 14 Type: Presentation

- **Air Tank Check Valves**: Typically, these are one-way valves. The one-way check valves are located at the entrance of the primary and secondary air tanks, and are a major fail-safe of the air brake system. They allow air flow from one side to the other, while blocking air flow in the opposite direction.

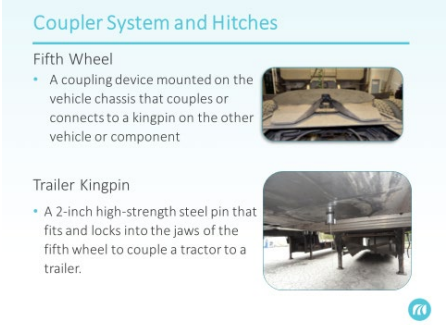


ⓘ **Textbook Reference**: Section 2 - Other Truck Systems – Air Brakes. Lesson 3 has more details.

Slide: 15 Type: Presentation

- **Fifth Wheel:** This is a coupling device mounted on the vehicle chassis and consists of a skid plate, associated mounting brackets and a latching mechanism that couples or connects to a kingpin located on the other vehicle or component. It is used to support and tow a semi-trailer. There are two types of fifth wheels: stationary and sliding.

  A stationary fifth wheel is mounted on the frame rails of the tractor and is positioned in a way that the optimum weight distribution is achieved between the front and the rear axles of a properly loaded trailer.

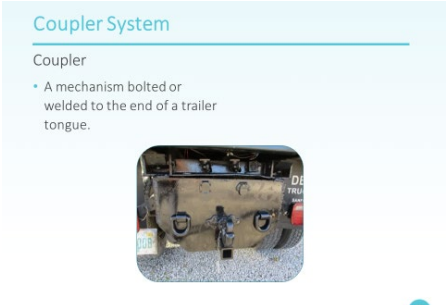


  A sliding or adjustable fifth wheel can be adjusted back and forth along the frame rail to ensure even weight distribution on each axle. It can adjust the overall length of the tractor-trailer and hence, the turning radius of the vehicle.

  Trailer Kingpin: This is usually a 2-inch high-strength steel pin that fits and locks into the jaws of the fifth wheel to couple the tractor to the trailer.

Slide: 16 Type: Presentation

- **Coupler**: A coupler is a mechanism bolted or welded onto the end of a trailer tongue. It fits securely over, and pivots on, the tow vehicle hitch ball.

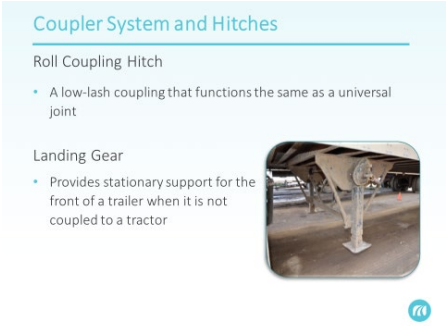


ⓘ **Textbook Reference**: Section 2 - Other Truck Systems – Coupling System.

Slide: 17 Type: Presentation

- **Roll Coupling Hitch**: This is a low-lash coupling that provides the same function as a universal joint – it allows motion around the yaw axis (turning corners) and pitch axis (driving over bumps) and prevents twisting unless the hitch is equipped with optional selective roll-coupling.

  Landing Gear: This provides stationary support for the front of a trailer when it is not coupled to a tractor.



- Show class examples of roll coupling hitches.

Slide: 18 Type: Presentation

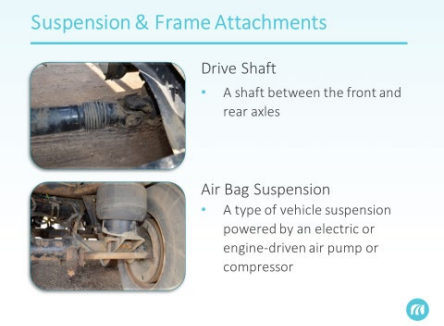
- Let's go over some of the controls and equipment that you need to know. We won't go over all of the items now, but there is a complete list in your textbook. Become familiar with all of the items before the quiz. If you have any questions, don't hesitate to ask.

Suspension & Frame Attachments: The body of the tractor-trailer is connected to and strengthened by the frame. The frame rests on the suspension system. The suspension system carries and distributes the weight of vehicle. The suspension system also supports the axles by enabling axle movement when the surface or ground changes. The system is divided into spring leaf (also known as fixed) suspension and air bag suspension.

Slide: 19 Type: Presentation

- **Drive Shaft**: This is a shaft that runs between the front and the rear axles.

Air Bag Suspension: This is a type of vehicle suspension that is powered by an electric or engine-driven air pump or compressor.



? Before we move on to the next section, are there any questions about systems and components?

- Let the students answer.
- Remind students that the full list of vehicle systems and components they are expected to be familiar with are listed in the textbook as well as in the exercise book.

ⓘ **Textbook Reference**: Section 2 - Other Truck Systems - Suspension.

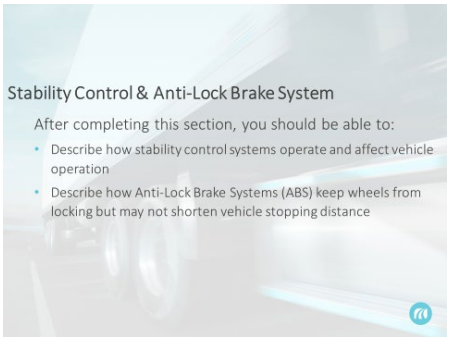
Stability Control & Anti-Lock Brake System

Objectives: In this section students learn about the electronic stability control system, including Anti-Lock Brakes.

Time: 5 minutes

Slide: 20 Type: Section Break

- After completing this section, you should be able to:
  - Describe how stability control systems operate and affect vehicle operation.
  - Describe how anti-lock brake systems (ABS) keep wheels from locking but may not shorten vehicle stopping distance.

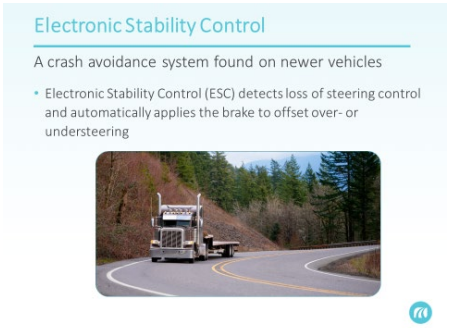


Slide: 21 Type: Presentation

- **Electronic Stability Control**: New tractor trailers are equipped with Electronic Stability Control (ESC), a crash avoidance system.

  This system helps you remain in control of your vehicle by detecting loss of steering control. It automatically applies the brakes to offset oversteering or understeering.

  Through application of brakes, ESC can help you reduce the risk of vehicle instability while in a slippery curve, or with a sudden application of brakes to avoid obstacles.



ⓘ **Textbook Reference**: Section 6 - High-Risk Driving Situations/Techniques – Skid Control

Slide: 22 Type: Presentation

- **Anti-Lock Brake System (ABS):** This is an electronic system that monitors and controls wheel slip during vehicle braking by minimizing lock-up. The wheel sensors detect wheel lock-up and automatically release and reapply the brakes repeatedly through a pulsing application. ABS enables you to maintain steering control and to stop the vehicle in the shortest possible distance, under most conditions.

ⓘ **Textbook Reference:** Section 6 - High-Risk Driving Situations/Techniques – Emergency Braking.

Wrap Up

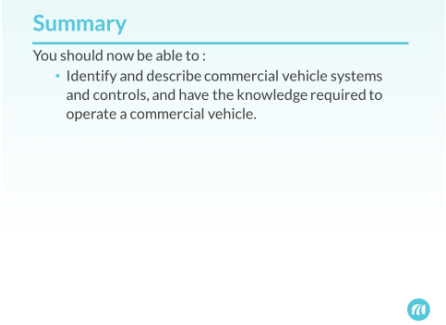
Time: 5 minutes

Slide: 23 Type: Presentation

- We have now reviewed the systems and components of a truck. Next, we will go into the yard, see them on an actual truck, and practice identifying and describing them.

? **Are there any further questions about vehicle systems and components?**

- Let the students answer.



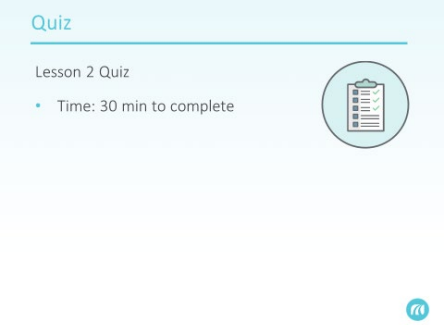
Knowledge Check

Objectives: Assess knowledge of vehicle components and systems.

Time: 30 minutes

Slide: 2 4 Type: Quiz

- Provide students with a printed copy of the Lesson 2 - Quiz. Time provided for this quiz is 30 minutes.
- When complete, fill out Instructors Student Summary for each student and fill out the Instructors Class Summary for your records.



Practical In-Yard Training

Time: 60 minutes

Preparation

- Organize students and time in-yard in order to maximize efficiency.
- Print **Lesson 2 – Practical Job Aid** sheets for each student.
- Print **Filling out a Daily Log Job Aid** for each student.
- Advise students that the vehicle manual may be used during training.
- Ensure yard is prepared for training

Slide: 25 Type: Practical Training

You will now head out to the yard where an instructor will demonstrate how to identify vehicle components and systems. Then you get time to practice. This session is split into 30 minutes for instructor demonstration and 30 minutes for student practice. You may wish to take your exercise book with the procedure job aid. Your instructor will provide you with a copy of your in-yard assessment for your review. More information about assessment will be shared later.

? Are there any questions about the practical in-yard training?

▶ Let the students answer.

ⓘ Students must document hours of service for time spent in in-yard and in-cab training. As this will be covered in detail in Lesson 8 – Trip Planning, please refer to the following resources to review with students or assign as self-study.

- **Filling out a Daily Log** Job Aid
- Government of Manitoba Guide to Transportation Safety https://www.gov.mb.ca/mit/mcd/carriers_drivers/safetyguide.html
- Safety Driven BC: Hours of Service Overview Podcast https://safetydriven.ca/resource/national-safety-code-hours-of-service/

Filling out a Daily Log Job Aid

▶ Decisions about how to organize yard time will need to flex with each class based on numbers of students, available instructors for proper yard ratio, and physical training space.

Use one practical assessment sheet each time the student performs the activities. Encourage students to bring their textbook and/or exercise book with the lists of procedures and checklists.

Practical In-Yard Assessment

Time: 30 minutes

Preparation

- Ensure the yard is set up for assessment.
- Print the **Practical Assessment Rubric Evaluator Job Aid** for the evaluator.
- Review **Performing Practical Assessments.**
- Prepare to record assessment performance either on printed **Lesson 2 – Practical Job Aid** sheets or directly into the Practical Assessments Excel file.
- Ensure you have access to the **Practical Assessments** Excel file.
- Print **Instructors Class Summary**.
- Print **Instructors Student Summary**.

Slide: 26 Type: Practical Assessment

ⓘ You must be familiar with the assessment rubric before evaluating the student's practical knowledge and skills.

- You will now be assessed on your ability to identify vehicle components and systems and understand their functions. This assessment counts for your final course mark.

▶ Students must be able to identify and explain the functions of vehicle components prior to conducting vehicle inspection in Lesson 4. The instructor will use the in-yard assessment to grade students. The assessment takes a minimum of 30 minutes.

- The components and systems on the Practical Assessment are chosen to assist the students in the vehicle inspection section of the training program.
- Provide the completed assessment form to the student as a learning aid.
- The instructor or a qualified evaluator may perform the assessment.

ⓘ Evaluators may record performance on printed sheets, but they are required to enter the results into the **Practical Assessments** Excel file for automated scoring. A copy should then be printed and signed.