

Western Technical College

32404326 Automotive Brake Systems

Course Outcome Summary

Course Information

Description	All aspects of safety are stressed as the course progresses through theory, construction, nomenclature and acceptable servicing procedures. A practical degree of proficiency is obtained in diagnosing, servicing and testing the complete automotive braking system and its related electrical and electronic components.
Career Cluster	Transportation, Distribution and Logistics
Instructional Level	Technical Diploma Courses
Total Credits	3
Total Hours	108

Textbooks

Fundamentals of Automotive Technology. 2nd Edition. Copyright 2018. CDX Automotive. Publisher: Jones & Bartlett Publishers. **ISBN-13**: 978-1-2842-0995-5. Required.

Learner Supplies

Safety glasses with side eye protection that meet Z87 OSHA guidelines. **Vendor**: To be discussed in class. Required.

Six inch ankle high, quality leather work shoes - \$75.00-100.00. **Vendor**: To be discussed in class. Required.

Pocket knife, six inch metal pocket ruler (English/metric measurement), small pocket flashlight, and pocket flat head screwdriver - \$20.00. **Vendor**: To be discussed in class. Required.

Success Abilities

1. Cultivate Passion: Enhance Personal Connections
2. Cultivate Passion: Expand a Growth-Mindset
3. Cultivate Passion: Increase Self-Awareness
4. Live Responsibly: Develop Resilience
5. Live Responsibly: Embrace Sustainability
6. Live Responsibly: Foster Accountability
7. Refine Professionalism: Act Ethically

8. Refine Professionalism: Improve Critical Thinking
9. Refine Professionalism: Participate Collaboratively
10. Refine Professionalism: Practice Effective Communication

Program Outcomes

1. Demonstrate professionalism appropriate for the auto service industry.
2. Perform diagnosis, service, and repair of automotive brake systems.
3. Perform diagnosis, service, and repair of automotive electrical and electronic systems.

Course Competencies

1. Outline critical elements of brake system diagnosis

Assessment Strategies

- 1.1. Skill Demonstration
- 1.2. Written Product

Criteria

You will know you are successful when:

- 1.1. you identify brake system concerns by performing a road test to check brake operation; including an anti-lock brake system (ABS)
- 1.2. you research vehicle service information.

Learning Objectives

- 1.a. Identify and interpret brake system concerns; determine needed action.
- 1.b. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.
- 1.c. Describe procedure for performing a road test to check brake system operation; including an anti-lock brake system (ABS).

2. Diagnose Brake Hydraulic Systems

Assessment Strategies

- 2.1. Skill Demonstration
- 2.2. Written Product
- 2.3. Written Objective Test

Criteria

You will know you are successful when:

- 2.1. you diagnose brake system concerns related to the hydraulic system.
- 2.2. you inspect condition of brake hydraulic system components, warning system and fluid.
- 2.3. you check brake hydraulic system components for proper operation.
- 2.4. you perform brake pedal measurements

Learning Objectives

- 2.a. Diagnose pressure concerns in the brake system using hydraulic principles (Pascal's Law).
- 2.b. Measure brake pedal height, travel, and free play (as applicable); determine needed action.
- 2.c. Check master cylinder for internal/external leaks and proper operation; determine needed action.
- 2.d. Diagnose poor stopping, pulling or dragging concerns caused by malfunctions in the hydraulic system; determine needed action.
- 2.e. Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear; and loose fittings/supports; determine needed action.
- 2.f. Inspect, test, and/or replace components of brake warning light system.
- 2.g. Identify components of hydraulic brake warning light system.
- 2.h. Test brake fluid for contamination.

3. Repair Brake Hydraulic Systems

Assessment Strategies

- 3.1. Skill Demonstration
- 3.2. Written Product

Criteria

You will know you are successful when:

- 3.1. you fill, bleed and /or flush brake fluid.
- 3.2. you inspect, test or replace brake system hydraulic components.

Learning Objectives

- 3.a. Remove, bench bleed, and reinstall master cylinder.
- 3.b. Replace brake lines, hoses, fittings, and supports.
- 3.c. Fabricate brake lines using proper material and flaring procedures (double flare and ISO types).
- 3.d. Select, handle, store, and fill brake fluids to proper level.
- 3.e. Bleed and/or flush brake system.

4. Diagnose Disc Brake Systems

Assessment Strategies

- 4.1. Skill Demonstration
- 4.2. Written Product

Criteria

You will know you are successful when:

- 4.1. you diagnose disc brake performance concerns.
- 4.2. you remove, clean and inspect disc brake components and related hardware.
- 4.3. you remove clean, inspect and measure disc brake pad, rotor and mounting surface.

Learning Objectives

- 4.a. Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or pedal pulsation concerns; determine needed action.
- 4.b. Remove and clean caliper assembly; inspect for leaks, damage, and wear; determine needed action.
- 4.c. Inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine needed action.
- 4.d. Clean and inspect rotor and mounting surface; measure rotor thickness, thickness variation, and lateral runout; determine needed action.
- 4.e. Check brake pad wear indicator; determine needed action.
- 4.f. Install wheel and torque lug nuts.

5. Repair Disc Brake Systems

Assessment Strategies

- 5.1. Skill Demonstration
- 5.2. Written Product

Criteria

You will know you are successful when:

- 5.1. you remove, inspect, and/or replace disc brake system components.
- 5.2. you describe brake pad burnish / break-in procedure.
- 5.3. you measure and refinish brake rotor on vehicle.
- 5.4. you measure and refinish brake rotor off vehicle.

Learning Objectives

- 5.a. Remove, inspect, and/or replace brake pads and retaining hardware; determine needed action.
- 5.b. Lubricate and reinstall caliper, brake pads, and related hardware; seat brake pads; inspect for leaks.
- 5.c. Remove and reinstall/replace rotor.
- 5.d. Refinish rotor on vehicle; measure final rotor thickness and compare with specifications.
- 5.e. Refinish rotor off vehicle; measure final rotor thickness and compare with specifications.
- 5.f. Retract and re-adjust caliper piston on an integrated parking brake system.
- 5.g. Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer's recommendations.

6. Diagnose Drum Brake Systems

Assessment Strategies

- 6.1. Skill Demonstration
- 6.2. Written Product

Criteria

Performance will be satisfactory when:

- 6.1. you diagnose drum brake performance concerns.
- 6.2. you inspect and measure brake drums.
- 6.3. you install wheel and torque lug nuts

Learning Objectives

- 6.a. Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging, or pulsation concerns; determine needed action.
- 6.b. Remove, clean, and inspect brake drum; measure brake drum diameter; determine serviceability.
- 6.c. Install wheel and torque lug nuts.

7. Repair Drum Brake Systems

Assessment Strategies

- 7.1. Skill Demonstration
- 7.2. Written Product

Criteria

You will know you are successful when:

- 7.1. you inspect, test and replace drum brake shoes, hardware and related components.
- 7.2. you measure and refinish brake drums.
- 7.3. you inspect, test and replace wheel cylinders.
- 7.4. you perform adjustments to brake shoes and parking brakes.

Learning Objectives

- 7.a. Refinish brake drum and measure final drum diameter; compare with specifications.
- 7.b. Inspect wheel cylinders for leaks and proper operation; remove and replace as needed.
- 7.c. Remove, clean, inspect, and/or replace brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble.
- 7.d. Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; perform final checks and adjustments.

8. Repair Related Components of Brake Systems

Assessment Strategies

- 8.1. Skill Demonstration
- 8.2. Written Product

Criteria

You will know you are successful when:

- 8.1. you inspect, test or replace wheel bearings and seals
- 8.2. you inspect, test or replace parking brake system components.
- 8.3. you inspect and replace wheel studs

Learning Objectives

- 8.a. Remove, clean, inspect, repack, and install wheel bearings; replace seals; install hub and adjust bearings.
- 8.b. Check parking brake system and components for wear, binding, and corrosion; clean, lubricate, adjust and/or replace as needed.
- 8.c. Check parking brake operation and parking brake indicator light system operation; determine needed action.
- 8.d. Replace wheel bearing and race.
- 8.e. Inspect and replace wheel studs.

9. Diagnose Power-Assist Units

Assessment Strategies

- 9.1. Skill Demonstration
- 9.2. Written Product

Criteria

You will know you are successful when:

- 9.1. you perform brake pedal travel checks
- 9.2. you identify, inspect and diagnose brake power assist system components (vacuum and hydraulic)

Learning Objectives

- 9.a. Check brake pedal travel with, and without, engine running to verify proper power booster operation.
- 9.b. Identify components of the brake power assist system (vacuum and hydraulic); check vacuum supply (manifold or auxiliary pump) to vacuum- type power booster.
- 9.c. Inspect vacuum-type power booster unit for leaks; inspect the check-valve for proper operation; determine needed action.
- 9.d. Inspect and test hydraulically-assisted power brake system for leaks and proper operation; determine needed action.

10. Repair Power-Assist Units

Assessment Strategies

- 10.1. Skill Demonstration
- 10.2. Written Product

Criteria

You will know you are successful when:

- 10.1. you measure and adjust master cylinder pushrod length

Learning Objectives

- 10.a. Measure and adjust master cylinder pushrod length.

11. Diagnose Electronic Brake, Traction and Stability Control Systems

Assessment Strategies

- 11.1. Skill Demonstration
- 11.2. Written Product

Criteria

You will know you are successful when:

- 11.1. you identify and inspect electronic brake control system components
- 11.2. you diagnose electronic braking system performance concerns
- 11.3. you test, diagnose and service electronic brake control speed sensors
- 11.4. you select the correct tools, equipment, instruments, materials and supplies

Learning Objectives

- 11.a. Identify and inspect electronic brake control system components (ABS, TCS, ESC); determine needed action.
- 11.b. Diagnose poor stopping, wheel lock-up, abnormal pedal feel, unwanted application, and noise concerns associated with the electronic brake control system; determine needed action.
- 11.c. Diagnose electronic brake control system electronic control(s) and components by retrieving diagnostic trouble codes, and/or using recommended test equipment; determine needed action.
- 11.d. Test, diagnose, and service electronic brake control system speed sensors (digital and analog), toothed ring (tone wheel), and circuits using a graphing multimeter (GMM)/digital storage oscilloscope (DSO) (includes output signal, resistance, shorts to voltage/ground, and frequency data).

12. Repair Electronic Brake, Traction and Stability Control Systems

Assessment Strategies

- 12.1. Skill Demonstration
- 12.2. Written Product

Criteria

You will know you are successful when:

- 12.1. you depressurize high-pressure components of an electronic brake control system
- 12.2. you bleed electronic brake control system hydraulic circuits

Learning Objectives

- 12.a. Depressurize high-pressure components of an electronic brake control system.
- 12.b. Bleed the electronic brake control system hydraulic circuits.