

## **Course Level Assessment**

*AUT 199-A13 - Braking Systems*

*Fall 2008*

**Submitted by: Larry Bloom**

**June 10, 2009**

Assessment Committee Approval: 9/14/09

Approved by LOT: September 21, 2009

## **Purpose**

The purpose of this report is to present the methodology and findings for the course level assessment of AUT 199-A13 Braking Systems. This course is in the first semester of the Automotive Technology curriculum. The course designation has since been changed to ATT 103 – Braking Systems. Only the designation has been changed. The course content and objectives have remained the same.

The purpose of the assessment is to determine if this course is obtaining the proper results intended and that students are achieving the defined course learning outcomes on the Master Course Record Form (see Attachment A). This course has ATT 100 – Introduction to Automotive Technology as a prerequisite. Through the placement testing, if it is recommended that the student should take a developmental reading course (RDG 090), then there is a pre/co-requisite for this course. AUT 199 is not a pre/co-requisite for any other course.

## **Methodology**

The AUT 199 – Braking Systems course will be assessed each time it is offered. The assessment of the Fall 2008 class was the first evaluation. It is planned to assess all of the Automotive Technology courses each time they are offered for the first couple of years since this is a new program. This will help eliminating the skewing of data due to low enrollment existing at the present time. The courses have never been conducted and the assessment is an integral part of maintaining the quality and proper course content as intended.

The assessment consisted of a quiz given to the students when they took their final exam for the class. It was an addendum consisting of five multiple-choice questions. The questions were based on five selected course outcomes listed in the Master Course Record Form (MCRF). The data from the quizzes were then compiled and analyzed. The minimum acceptable performance standard was set at 80%. This means that if at least 80% of the students completing the quiz selected the

correct answer the objective was met. If the minimum standard is not met then further evaluation and/or review needs to be completed. Either the outcome was vague, not appropriate or not properly addressed in the course.

The major obstacles for this particular assessment are a relatively small number of respondents (7). If one person has the wrong answer for a question, the average decreases at a rate of 14% (see Chart 1). This may skew the validity of the outcome or instruction. By assessing the course over several sessions, and with an increased population, a more authentic evaluation would be achieved. This would provide a stronger foundation for altering or revising the course and outcomes.

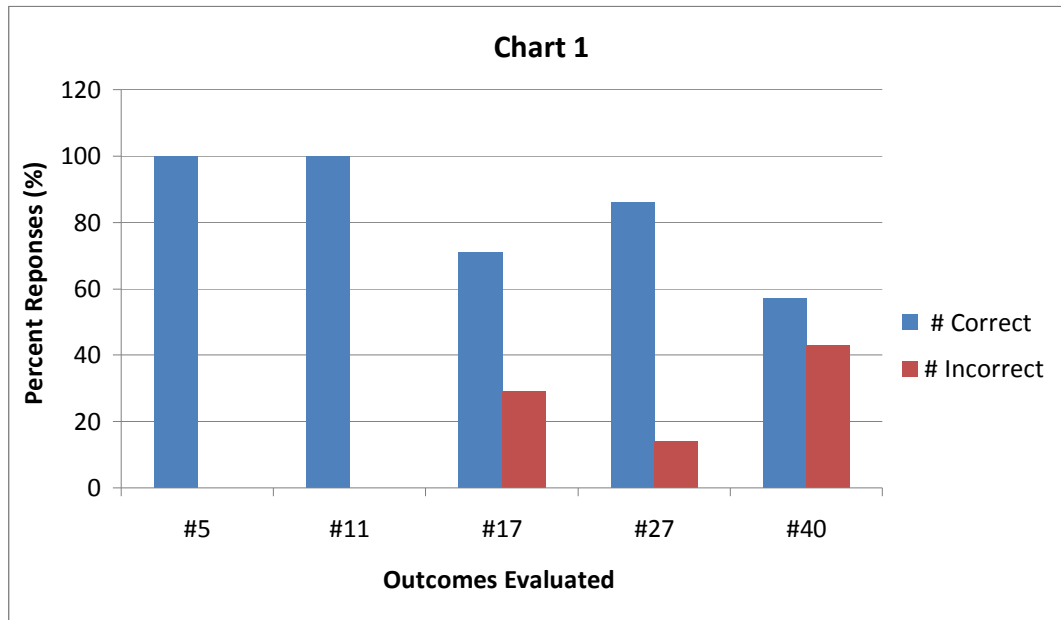
The questions that were contained on the quiz are in Appendix B. The specific outcomes and their corresponding listing number (from the MCRF) are as follows:

- **#5** Measure brake pedal height; determine necessary action.
- **#11** Select, handle, store, and fill brake fluids to proper level.
- **#17** Diagnose poor stopping, noise, pulling, grabbing, dragging or pedal pulsation concerns; determine necessary action.
- **#27** Remove, clean, and inspect pads and retaining hardware; determine necessary action.
- **#40** Remove, clean, inspect, repack, and install wheel bearings and replace seals; install hub and adjust wheel bearings.

The questions were based on sample questions using the format used in the ASE certification examination. The ones chosen were in alignment with the objectives (see above) stated in the Master Course Record Form for the course.

## Results

The quizzes were checked and the results tabulated (see Appendix C). The results are as follows:



Although the results show that three of the selected outcomes evaluated were achieved at 80% or higher. The low number of respondents (7) may be skewing the data. Outcome #40 should be re-evaluated as well as the coverage in the lectures and labs. A major factor that does come into play is the lack of sufficient and proper laboratory and training equipment. Scores on quizzes, tests and laboratory exercises contradict the results of this analysis. The students did well in the class and are competent in their knowledge and skills relating to Automotive Technology.

I believe increased sample population will provide results of the data analysis that will be more accurate and representative of the success of the course. Adequate training and laboratory equipment will improve the understanding of the concepts, procedures and skills required to master the course objectives. After additional data is collected from further classes, a more accurate evaluation will increase validity.

Appendix A

Master Course Record Form

Eastern WV Community & Technical College

Master Course Record

<b>Course Prefix and Number: AUT 199-A13</b>
<b>Course Title: Braking Systems</b>
<b>Recommended Transcript Title: Braking Systems</b>
<b>Date Approved/Revised</b>
<b>Credit Hours: 4</b> <b>Contact hours per week (based on 5 week term):</b> <b>Lecture: 9</b> <b>Lab: 9</b>
<b>Prerequisite:</b> <b>Corequisite:</b> <b>Pre/Co-requisite:</b>
<b>Grading Mode: Letter grade</b>
<b>Catalog Description:</b> This course will introduce students to the basic fundamental skills, technology, and service of automotive brake systems. Students will learn how to diagnose and repair hydraulic systems, brake drums, disk brakes, power assist units, anti-lock brake systems,
<b>Course Outcomes:</b> <ol style="list-style-type: none"><li>1. Identify and interpret brake system concern; determine necessary action</li><li>2. Research applicable vehicle and service information, such as brake system operation, vehicle service history, service precautions, and technical service bulletins</li><li>3. Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels, calibration decals)</li><li>4. Diagnose pressure concerns in the brake system using hydraulic principles (Pascal's Law)</li><li>5. Measure brake pedal height; determine necessary action</li><li>6. Check master cylinder for internal and external leaks and proper operation; determine necessary action</li><li>7. Remove, bench bleed, and reinstall master cylinder</li><li>8. Diagnose poor stopping, pulling or dragging concerns caused by malfunctions in the hydraulic system; determine necessary action</li><li>9. Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging or wear; tighten loose fittings and supports; determine necessary action</li><li>10. Fabricate and/or install brake lines (double flare and ISO types); replace hoses, fittings, and supports as needed</li><li>11. Select, handle, store, and fill brake fluids to proper level</li><li>12. Inspect, test, and/or replace metering (hold-off), proportioning (balance), pressure differential, and combination valves</li><li>13. Inspect, test, and adjust height (load) sensing proportioning valve</li></ol>

14. Inspect, test, and/or replace components of brake warning light system
15. Bleed (manual, pressure, vacuum or surge) brake system
16. Flush hydraulic system
17. Diagnose poor stopping, noise, pulling, grabbing, dragging or pedal pulsation concerns; determine necessary action
18. Remove, clean (using proper safety procedures), inspect, and measure brake drums; determine necessary action
19. Refinish brake drum
20. Remove, clean, and inspect brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble
21. Remove, inspect, and install wheel cylinders
22. Pre-adjust brake shoes and parking brake before installing brake drums or drum/hub assemblies and wheel bearings
23. Install wheel, torque lug nuts, and make final checks and adjustments
24. Diagnose poor stopping, noise, pulling, grabbing, dragging or pedal pulsation concerns; determine necessary action
25. Remove caliper assembly from mountings; clean and inspect for leaks and damage to caliper housing; determine necessary action
26. Clean and inspect caliper mounting and slides for wear and damage; determine necessary action
27. Remove, clean, and inspect pads and retaining hardware; determine necessary action
28. Disassemble and clean caliper assembly; inspect parts for wear, rust, scoring, and damage; replace seal, boot, and damaged or worn parts
29. Reassemble, lubricate, and reinstall caliper, pads, and related hardware; seat pads, and inspect for leaks
30. Clean, inspect, and measure rotor with a dial indicator and a micrometer; follow manufacturer's recommendations in determining need to machine or replace
31. Remove and reinstall rotor
32. Refinish rotor according to manufacturer's recommendations
33. Adjust calipers equipped with an integrated parking brake system
34. Install wheel, torque lug nuts, and make final checks and adjustments
35. Test pedal free travel with and without engine running; check power assist operation
36. Check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster
37. Inspect the vacuum-type power booster unit for vacuum leaks; inspect the check valve for proper operation; determine necessary action
38. Inspect and test hydro-boost system and accumulator for leaks and proper operation; determine necessary action
39. Diagnose wheel bearing noises, wheel shimmy, and vibration concerns; determine necessary action
40. Remove, clean, inspect, repack, and install wheel bearings and replace seals; install hub and adjust wheel bearings
41. Check parking brake cables and components for wear, rusting, binding, and corrosion; clean, lubricate, or replace as needed
42. Check parking brake operation; determine necessary action
43. Check operation of parking brake indicator light system
44. Check operation of brake stop light system; determine necessary action
45. Replace wheel bearing and race
46. Inspect and replace wheel studs
47. Remove and reinstall sealed wheel bearing assembly
48. Identify and inspect antilock brake system (ABS) components; determine necessary action
49. Diagnose poor stopping, wheel lock-up, abnormal pedal feel or pulsation, and noise concerns caused by the antilock brake system (ABS); determine necessary action
50. Diagnose antilock brake system (ABS) electronic control(s) and components using self-diagnosis and/or recommended test equipment; determine necessary action
51. Depressurize high-pressure components of the antilock brake system (ABS)
52. Bleed the antilock brake system's (ABS) front and rear hydraulic circuits

- 53. Remove and install antilock brake system (ABS) electrical/electronic and hydraulic components
- 54. Test, diagnose and service ABS speed sensors, 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)
- 55. Diagnose antilock brake system (ABS) braking concerns caused by vehicle modifications (tire size, curb height, final drive ratio, etc)
- 56. Identify traction control system components

**Implementation Cycle: Fall**

**Role in College Curriculum: (Check all that apply)**

- General Education Core (Specify category)
- Technical Core: Automotive Technology**
- Restricted Elective (Specify Program)
- General Elective

**Course Fee: Yes**

**Instructor's Qualifications: BS Automotive Technology or related discipline and/or expertise and experience in the field.**

**Expanded Course Description:**

This course introduces the student to diagnosis and repair of master cylinders, brake lines and fittings, brake drums, rotors, calipers, power assist units, bearings and bearing assemblies, indicators, and anti-lock brake systems. Students will also learn general braking system maintenance including the replacement/adjustment of fluids, cables, rotors, and pads.

Prepared by:

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Signature, Title

Date

Approved by:

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Dean, Academic Services

Date



Appendix B

Outcomes Assessment Quiz

## AUT 199-A13 – Braking Systems

### Outcomes Quiz

(Fall 2008)

Circle the letter of the **most correct** answer. **Do not put your name on this quiz.**

- 1) Technician A says that the brake pedal height should be checked as part of a thorough visual inspection of the brake system. Technician B says the pedal free play and pedal reserve should be checked.

**Which technician is correct?**

- A. Technician A only
- B. Technician B only
- C. Both Technician A and B
- D. Neither Technician A nor B

- 2) Technician A says brake fluid should be filled to the top of the reservoir to be assured of proper brake pressure when the brakes are applied. Technician B says that the brake fluid level should be filled only to the maximum level line to allow for expansion when the brake fluid gets hot during normal operation.

**Which technician is correct?**

- A. Technician A only
- B. Technician B only
- C. Both Technician A and B
- D. Neither Technician A nor B

- 3) A vehicle pulls to the left during braking. Technician A says that the metering valve may be defective. Technician B says the proportioning valve may be defective.

**Which technician is correct?**

- A. Technician A only
- B. Technician B only
- C. Both Technician A and B
- D. Neither Technician A nor B

- 4) One disc brake pad is worn more than the other. Technician A says that the caliper piston may be stuck in the caliper bore. Technician B says that the caliper slides may need to be cleaned and lubricated.

**Which technician is correct?**

- A. Technician A only
- B. Technician B only
- C. Both Technician A and B
- D. Neither Technician A nor B

- 5) Two technicians are discussing wheel bearings. Technician A says that conventional tapered roller bearings as used on the front of most rear-wheel drive vehicles should be slightly loose when adjusted properly. Technician B says that the spindle nut should not be tightened more than finger tight as the final step.

**Which technician is correct?**

- A. Technician A only
- B. Technician B only
- C. Both Technician A and B
- D. Neither Technician A nor B

Appendix C

Assessment Results

Course Level Assessment Results: Fall 2008 AUT 199-A13 – Braking Systems				
Outcome Evaluated	Indicator	Percent Correct (number)	Percent Incorrect (number)	80% Minimum
<b>Outcome #5</b> Measure brake pedal height; determine necessary action.	Technician A says that the brake pedal height should be checked as part of a thorough visual inspection of the brake system. Technician B says the pedal free play and pedal reserve should be checked. <b>Which technician is correct?</b> A. Technician A only. B. Technician B only. C. Both Technician A and B. D. Neither Technician A nor B. <b>Answer: C</b>	100% (7)	0% (0)	YES
<b>Outcome #11</b> Select, handle, store, and fill brake fluids to proper level.	Technician A says brake fluid should be filled to the top of the reservoir to be assured of proper brake pressure when the brakes are applied. Technician B says that the brake fluid level should be filled only to the maximum level line to allow for expansion when the brake fluid gets hot during normal operation. <b>Which technician is correct?</b> A. Technician A only. B. Technician B only. C. Both Technician A and B. D. Neither Technician A nor B. <b>Answer: B</b>	100% (7)	0% (0)	YES
<b>Outcome #17</b> Diagnose poor stopping, noise, pulling, grabbing, dragging or pedal pulsation concerns; determine necessary action.	A vehicle pulls to the left during braking. Technician A says that the metering valve may be defective. Technician B says the proportioning valve may be defective. <b>Which technician is correct?</b> A. Technician A only. B. Technician B only. C. Both Technician A and B. D. Neither Technician A nor B. <b>Answer: D</b>	71% (5)	29% (2)	NO
<b>Outcome #27</b> Remove, clean, and inspect pads and retaining hardware; determine necessary action.	One disc brake pad is worn more than the other. Technician A says that the caliper piston may be stuck in the caliper bore. Technician B says that the caliper slides may need to be cleaned and lubricated. <b>Which technician is correct?</b> A. Technician A only. B. Technician B only. C. Both Technician A and B. D. Neither Technician A nor B. <b>Answer: C</b>	86% (6)	14% (1)	YES
<b>Outcome #40</b> Remove, clean, inspect, repack, and install wheel bearings and replace seals; install hub and adjust wheel bearings.	Two technicians are discussing wheel bearings. Technician A says that conventional tapered roller bearings as used on the front of most rear-wheel drive vehicles should be slightly loose when adjusted properly. Technician B says that the spindle nut should not be tightened more than finger tight as the final step. <b>Which technician is correct?</b> A. Technician A only. B. Technician B only. C. Both Technician A and B. D. Neither Technician A nor B. <b>Answer: B</b>	57% (4)	43% (3)	NO