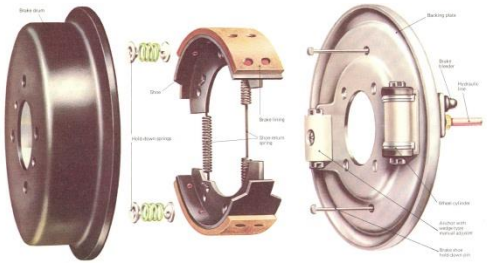
LAB – Drum Brake Inspection

Students: 1. _____
2. _____
3. _____



Fill in each box with the appropriate information.
Be sure to have the Instructor's initials before moving on to the next step. These are there to ensure everything is SAFE and CORRECT. Each team member must be able to answer questions from your instructor to receive credit for this lab.

VEHICLE IDENTIFICATION			
Year:		Make:	
Model:		Mileage:	

BEFORE YOU BEGIN

CAUTION!

IMPROPER USE OF THE HOIST or JACK STANDS CAN BE FATAL!

CORRECT SETUP IS CRITICAL FOR YOUR SAFETY AND THE SAFETY OF OTHERS!

GET YOUR INSTRUCTOR TO HELP!

CAUTION!

Brake dust may contain ASBESTOS: a very fine, cancerous particle that NEVER leaves your body. Make extra effort to ensure the brake dust does not become airborne.

NO FINGERPRINTS on Brake Rotors or Brake Pads

EMERGENCY BRAKE

1

THE EMERGENCY BRAKE

All vehicles are required to have a mechanically-operated Emergency Brake that will apply the brakes, should the hydraulic system fail. While most people with Automatic Transmissions never use the E-Brake, they should!! If the E-Brake is not used, it usually seizes and then either never works, or once applied never comes off. Most E-Brakes also self-adjust drum brakes when they are used. **USE YOUR E-BRAKE REGULARLY!**

TEST #1: EMERGENCY BRAKE SYSTEM

- Apply the Emergency Brake
- Try to drive away

GIVE RESULTS NEXT PAGE →

✓ **FINDINGS (check):**

_____ Vehicle does not move
(This is normal)
_____ Vehicle drives with little or no difficulty
(Indicates a faulty E-Brake System - 90% of the time it is poorly adjusted drum brakes. Next likely is seized E-Brake cables)

RAISING THE VEHICLE

2

Jack Stands

2-Post

4-Post

☐ Raise and support the vehicle properly – see your instructor if you are unsure

Jack Stands:
Raise the vehicle with jack in correct place, ALWAYS use jack stands in correct place

Two-Post Hoists:
Position and LOCK arms, raise car slightly, check stability, continue raising.

Drive-On Hoists:
In Gear/Park, E-Brake on, wheel chocks, raise, and then LOCK rails.

STOP!!! **INSTRUCTOR'S INITIALS:**

TESTING

3

The Brake System has two parts - a hydraulic component to transfer your braking foot force to each wheel, and a mechanical component to apply the friction material against the rotors.

THE HYDRAULIC SYSTEM

TEST #2: BRAKE PEDAL FEEL

DO NOT WEAR COVERALLS IN THE VEHICLE

- Step on the brake pedal ONCE with "reasonable" effort.

✓ **FINDINGS (check):**

_____ The brake pedal travels only a couple inches and is reasonably firm
(This is normal)
_____ The brake pedal travels excessively, but is firm
(Indicates poorly adjusted drum brakes - easy fix)
_____ The brake pedal travels excessively, but is mushy
(Indicates air bubbles in the brake fluid, fluid must be bled - easy fix)

TEST #3: MASTER CYLINDER OPERATION

- The Master Cylinder converts the Brake Pedal force to hydraulic pressure. It is kind of like a Syringe - it has a moveable pistons inside a cylinder
- Step on the brake pedal LIGHTLY, maintaining LIGHT pressure

✓ **FINDINGS (check):**

_____ The brake pedal doesn't move
(This is normal)
_____ The brake pedal slowly sinks to the floor
(Indicates the seals inside the master cylinder are leaking internally)

STOP! ***INSTRUCTOR'S INITALS:***

4

BRAKE FLUID

Brake fluid is a hydraulic fluid.

It is **HYGROSCOPIC** - it absorbs moisture out of the air, which would then boil under heavy braking, creating air in the system and a spongy pedal. Moisture can also cause the brake components to rust together. Because of this, **CHANG EVERY TWO YEARS MINIMUM**.

It is also a fantastic paint stripper - so **NEVER** let any get on the paint of the car, **WASH IT OFF IMMEDIATELY!**

It is also **VERY BITTER TASTING**, so if you have a leak and you don't know what it is, taste it. If it's bitter, it's brake fluid.

TEST #4: MASTER CYLINDER & FLUID RESERVIOUR LEAKS

- Inspect the back of the master cylinder for leaks
- Inspect the line fittings for leaks

✓ **FINDINGS (check)**

_____ No leaks
(This is normal. Duh)
_____ Leaks at fittings
(Could be loose - try snugging them up. Otherwise likely a damaged fitting)
_____ Leaks at back, dripping down brake booster
(Indicates bad Master Cylinder Seal)

TEST #5: BRAKE FLUID

- OPEN the reservoir lid
- Note the colour of the fluid
- Run your finger along the bottom of reservoir (yes, in the fluid) to check the level of crud at bottom

✓ **FINDINGS (check)**

_____ Fluid is fairly clear or only slightly coloured
(This is normal)
_____ Fluid is very dark
(Needs changing)
_____ No crud in bottom of reservoir
(This is normal)
_____ Heavy crud in bottom of reservoir
(Imagine how much crud is down at the wheels?? Ewwww! Needs changing)

STOP! ***INSTRUCTOR'S INITALS:***

5

You may now remove the wheels

BRAKE DRUMS

Brake drums are usually held on in two ways:

	
Slip onto Hub Once wheel is removed, brake drum slips off wheel studs and hub	**One-Piece with Hub** Wheel bearing retaining nut must be removed, and entire hub/drum slid off spindle.

How are your Brake Drums attached?

Brake Drums need to be strong, and they must be able to dissipate heat.

Drums may be FINNED (for extra cooling). They become thinner and thinner as they wear. If they cannot dissipate enough heat, they usually warp ("vibration" in pedal and/or steering wheel). If they are TOO THIN, they will either WARP, or BREAK.

REMOVE YOUR BRAKE DRUMS - SEE YOUR INSTRUCTOR FOR TIPS & HELP

Use a Brake Drum Micrometer to measure the INSIDE DIAMETER of the brake drum

What is the MAXIMUM allowable diameter of the Brake Drums? (Usually cast into the drum somewhere) _____ (in. or mm)

What is the EXISTING diameter of your Brake Drums? _____ (in. or mm)

TEST #6: BRAKE DRUM

- Inspect the friction surface inside
- Inspect the casting inside and outside

TIP

I gently wash the brake dust off the brakes with a garden hose. The dust tends to stay in the water and out of the air.

✓ **FINDINGS (check)**

_____ Smooth and solid
(This is normal)
_____ Gouges, grooves or cracks in friction surface
(Indicates severe wear)
_____ Blue discolouration or heat-checks
(indicates severe overheating - may be abuse, overloaded, or seized wheel cylinder, or e-brake left on whilst driving)
_____ Entire brake system is coated with wet, black, fibrous yuck all over everything
(Indicates severely leaking wheel cylinder or axle seal – REQUIRES FIX NOW!)

STOP! ***INSTRUCTOR'S INITALS:***

6

BRAKE SHOES

Brake shoes may contain **ASBESTOS**, which is cancerous and never leaves the body. **TRY NOT TO GET ANY BRAKE DUST AIRBORN!**

Brake Shoes are consumable and do not last forever. They can be made from a variety of materials, with a balance of GRIP versus LIFE. Really grippy brakes do not last long. Long life shoes may not grip, or may eat the drum instead. There is nothing for free.

Brake Shoes are usually worn out when the friction material is about as thick as the plate it is glued or riveted to.

TEST #7: BRAKE SHOES

- Inspect the brake pads thickness, note distance to rivets (if applicable)

✓ **FINDINGS (check)**

_____ Friction materials is GLUED to the backing plate
(This is normal)
_____ Friction material is RIVETED to the backing plate
(This is normal)

Remaining Friction Material Thickness (in mm): _____

STOP! ***INSTRUCTOR'S INITALS:***

5

WHEEL CYLINDER

The Wheel Cylinder is a hydraulic cylinder where hydraulic fluid enters the center, pushing pistons out at either end. The piston seals can wear, causing **LEAKS**. Moisture in the brake fluid can cause corrosion, and **RUST** the wheel cylinder solid.

TEST #8: WHEEL CYLINDERS

- Gently peel back just a bit of the Dust Seal to check for leaks
- Smack one brake shoe with your hand, so force transfers THROUGH the wheel cylinder to move the *other* brake shoe

✓ **FINDINGS (check)**

_____ No brake fluid leaks out
(This is normal)
_____ Brake fluid leaks out
(Indicates worn wheel cylinder seals – should be rebuilt or replaced)
_____ Force travels through the wheel cylinder; other brake shoe moves
(This is normal)
_____ Force does not travel through
(May indicate a seized wheel cylinder, or normal for non-self-energizing brakes – talk to your Instructor)

STOP! ***INSTRUCTOR'S INITALS:***

7

Spray the Brake Shoes and the Drum Friction Surface with Brake Clean to remove ALL FINGER PRINTS (oil on brakes is bad, mmkay?)

Replace the drums on the vehicle.

NOTE:

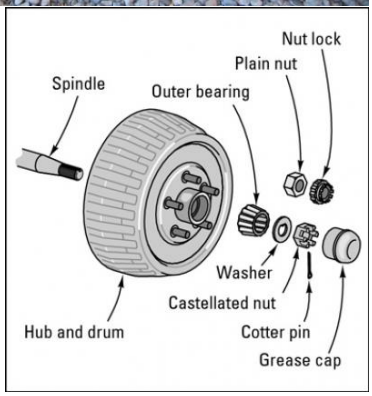
For Drums that are one-piece with the hub, there are certain procedures that must be followed:

Some hubs are secured by a highly-torqued lock-nut.

- Torqued to the correct specification with a **TORQUE-WRENCH**
- Re-stake the locknut (if designed so).

Some hubs are secured by a hand-tight castellated nut and cotterpin.

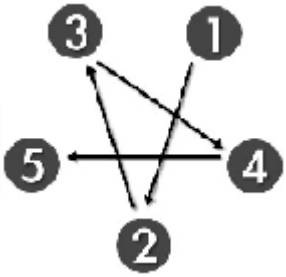
- Tighten the nut very tightly with a wrench whilst rotating the drum (this seats the bearings)
- Back off the nut
- Re-tighten the nut as tight as you can with your **FINGERS ONLY**
- Install stamped sheet metal nut and a **NEW** cotterpin
- Yes, your entire wheel AND brake is held on by one nut done up finger-tight.



STOP! ***INSTRUCTOR'S INITALS:***

8

Replace the wheels, TORQUED in a criss-cross pattern to SPECIFICATION.



What was the most fascinating part of this lab for you?

