UNIT 2: GENERAL BRAKE SYSTEMS DIAGNOSIS

LESSON 1: TROUBLESHOOTING VARIOUS BRAKE SYSTEM PROBLEMS

I. Diagnosing brakes that pull, drag, or stop the vehicle poorly

A. Poor stopping (sometimes described as "hard pedal" or "excessive pedal effort") usually results from reduced friction coefficient between the brake lining and the drum or disc.

1. In power brake systems, poor stopping may also result from an ineffective booster.

2. In a vehicle that stops poorly, the brake pedal travel may be normal. But if the pedal bottoms (reaches the end of its travel), stopping ability reduces. Below is a procedure for diagnosing a brake problem that results in less than perfect stopping.

NOTE: If a vehicle is equipped with power brakes, a faulty power booster may cause poor stopping. Always check the general braking system before examining the power booster.

3. Check the fluid level in both master cylinder reservoirs. If either reservoir is low, one of the systems may be defective, thus reducing the braking power.

NOTE: In order to turn off the brake warning light, the differential pressure valve may have to be reset, depending on what type of valve is used.

4. If the fluid level in the master cylinder reservoir is normal, check the entire brake system for the following problems.

a. Check for oil contamination of the brake assemblies.

b. Check for glazing of the brake friction material.

c. Check for evidence of overheating in the drum or rotor. Overheating discolors the drum or rotor and the brake pads or shoes. Overheating may also cause small heat cracks to appear in the friction area of the drum or rotor.

d. Make sure that all pistons in the calipers, master cylinder, or wheel cylinders are free to travel in their bores.

e. Make sure that the brake pedal is free to move on its shaft.

f. Check all hydraulic lines and ports for blockages. Look for kinks in the brake lines, especially where lines run close to the frame or axle.

B. Brake problems can cause a vehicle to pull to the left or right either as the brakes are applied or as the vehicle travels down the road.

1. Before examining the brakes, make sure the suspension is not causing the vehicle to pull.

a. The following problems can cause the vehicle to pull: broken springs, loose control arms, loose steering linkages, severe alignment problems, dissimilar tires on either side of the vehicle, and uneven tire pressure.

2. One of two brake problems can cause vehicle pull: a grabbing brake on the side where the vehicle is pulling or an ineffective brake on the side opposite where the vehicle is pulling. Check the brakes for the following indications of a grabbing or dragging brake.

NOTE: The following problems are likely to cause vehicle pull if they are limited to one wheel.

a. Check for oil, grease, or brake fluid on the brake friction surfaces.

b. Check for severely worn shoes or pads. The brake lining material should be at least 1/16 in above the rivets or 1/8 in above the bonding surface.

c. Check for discoloration of the drum or rotor. Discoloration is a sign of overheating or burning.

d. Check for binding of the brake caliper in the adapter.

e. Check for binding of the pistons in the wheel cylinder or caliper.

f. Check for distorted or worn brake parts.

C. Brakes drag when either the shoes or pads do not completely release. One or more of the pads or shoes may drag.

1. If all brakes drag, the problem is usually in or around the master cylinder. Check for the following problems.

a. Check for contaminated or improper brake fluid (oil, power steering fluid, or some other inappropriate substance mixed with or substituted for brake fluid).

• Contaminated or improper brake fluid causes the rubber parts of the brake assembly to swell, thus blocking the fluid passages.

• Consequently, either the fluid is unable to return to the master cylinder or the master cylinder piston is unable to return to its rest position. Both problems cause all brakes to drag.

NOTE: If improper or contaminated fluid is found, flush the entire brake system and replace all rubber parts.

b. Make sure the master cylinder operating rod, which connects the brake pedal and the master cylinder, is not out of adjustment.

• If the rod is too long, it prevents the master cylinder piston from returning to its rest position, thus maintaining pressure on the fluid in the brake lines.

•If the brake fluid remains under pressure, the brakes may drag. Adjusting the rod length corrects this problem.

c. If the master cylinder is severely damaged or worn, overhaul or replace it.

2. If only one brake drags, check for the following problems.

NOTE: As stated above, a single dragging brake may cause the vehicle to pull to the left or right either as the brakes are applied or as the vehicle moves down the road.

a. Make sure the hydraulic system in any one wheel is not blocked.

b. Check for a broken or distorted return spring in the drum brake on any one wheel.

c. Check for a binding or distorted caliper or caliper adapter on any one wheel.

d. Check for a binding or distorted parking brake linkage in the rear brake system.

e. Check for a defective adjuster in a drum brake on any one wheel.

f. Check for severe contamination (oil, leaking brake fluid, or other such substances) on the brake assembly.

g. Check for binding of the brake shoes on the backing or anchor plate on any one wheel.

II. Contaminated or poor-quality brake fluid may cause the brake pedal to feel soft or spongy after hard braking.

NOTE: If the brake fluid is contaminated, drain, flush, and refill the brake system and replace all rubber parts.

A. Moisture in the brake fluid boils and forms gas bubbles in the wheel cylinders or calipers.

B. The bubbles easily compress and thus cause the pedal to feel soft or spongy. Check for the following problems that may cause spongy or soft pedal.

C. Check for soft spots in the brake hoses. Soft spots can cause the hoses to swell under pressure. If soft spots are found, replace all hoses and check for contaminated fluid.

D. Check for air in the hydraulic system. If air is found, bleed the system.

III. Troubleshooting the brake system

NOTE: The following are possible causes and corrections for different types of symptoms indicating brake malfunction. The possible cause is first and the correction second. Example: Leak in brake lines (possible cause) — Check and replace brake lines. (correction)

A. Poor stopping

1. Power brake malfunction — Check power brake and determine necessary action.

2. Failure of one hydraulic system (in dual hydraulic system) — Check front and rear systems for hydraulic failure and determine necessary action.

3. Brake linings worn beyond specifications — Recondition pads and shoes.

4. Sticking or frozen pistons in calipers or wheel cylinders — Check action of calipers and wheel cylinders and determine necessary action.

5. Brake linings contaminated with grease, oil, or brake fluid — Replace contaminated parts and eliminate source of contamination.

6. Brake fade — Make sure that pads and shoes are of correct quality. Change driver technique.

7. Glazed linings — Lightly sand friction lining or replace and recondition brake linings.

B. Dragging brakes

1. Broken or weak return springs on drum brakes — Replace return springs.

2. Frozen or sticking wheel cylinder pistons or caliper pistons — Recondition wheel cylinders and calipers.

3. Plugged master cylinder port or incorrect valving — Check master cylinder port action. Make sure that no residual check valve is on the disc brake system.

4. Power brake malfunction — Check operation of power brake booster.

5. Sticking or binding pedal linkage — Free and lubricate pedal linkage.

6. Incorrect master cylinder push rod adjustment — Adjust push rod.

7. Frozen or improper parking brake adjustments — Free up and lubricate or replace brake cables. Check parking brake adjustment.

8. Restriction in hydraulic system — Check lines/hoses for blockage. Check soft parts for possible contamination damage.

C. Pulling (uneven) braking

1. Front end out of alignment — Check alignment. Replace worn parts. Realign front end.

2. Incorrect tire pressure — Inflate tires to recommended pressure.

3. Unmatched tires — Make sure tires on the same axle have approximately the same amount of tread and the same type of construction.

4. Restriction in hydraulic system — Check hoses and lines for damage and replace as necessary.

5. Loose caliper mounting — Replace hardware on single-piston calipers. Torque mounting bolts to specification.

6. Improper, contaminated, or damaged lining pad — Recondition and repair shoes and pads as necessary.

7. Malfunctioning metering or proportioning valve — Replace metering or proportioning valve.

8. Power brake unit defective — Repair or replace power brake unit.

9. Malfunctioning caliper or wheel cylinder assembly — Recondition caliper and wheel cylinder assembly. Flush hydraulic system with brake fluid if seals are swollen.

D. Soft (spongy) pedal

1. Leak in brake lines — Check and replace brake lines.

2. Air in hydraulic system — Bleed system and fill master cylinder.

3. Leaky wheel cylinders and caliper seals — Repair or replace seals.

4. Internal leak in master cylinder — Recondition and repair master cylinder.

5. Soft spot in rubber brake line — Inspect rubber brake lines.

6. Cracked or very thin brake drums — Check and replace drums as necessary.

E. Excessive pedal travel

1. No fluid in master cylinder — Fill master cylinder. Check for leaks. Bleed system.

2. Air in hydraulic system — Bleed system.

3. Hydraulic leak in the system — Locate and repair leak.

4. Excessive clearance between shoes and drums — Check brake adjustment. Check brake adjusters.

F. Excessively hot brakes or failure of brakes to release

1. Broken brake return springs on drum brakes — Replace return springs in axle sets.

2. Frozen or sticking caliper pistons — Recondition calipers.

3. Driver's foot riding brake pedal — Instruct driver not to rest foot on pedal.

4. Master cylinder or power brake malfunction — Repair or replace master cylinder or power brake unit.

5. Sticking or binding pedal linkage — Free up and lubricate linkage.

G. Premature rear-wheel lockup during hard brake application

1. Proportioning valve malfunctioning — Replace proportioning valve and bleed system.

H. Front disc brakes very sensitive to light brake application

1. Metering valve malfunctioning — Replace metering valve and bleed system.

I. Brake pedal can be depressed without activating brakes

1. No fluid in master cylinder reservoir — Check for leaks and make repairs. Fill master cylinder and bleed system.

2. Air in hydraulic system — Bleed system and fill master cylinder.

3. Rear brakes out of adjustment — Check and repair self-adjusting system. Adjust rear brakes.

4. Leaking wheel cylinders — Recondition or replace wheel cylinder.

5. Internal leak in master cylinder — Recondition or replace master cylinder.

6. Leaking caliper seals — Recondition calipers.

J. Brake warning light will not light

1. Bulb burned out — Replace bulb.

2. Open circuit in warning switch — Check circuit and repair.

3. Damaged warning light switch — Replace switch.

K. Brake warning light stays on

1. One section of dual brake system inoperative — Check for leaks and make repairs.

2. Differential pressure valve not centered — Center valve.

3. Grounded wire to warning light switch — Correct grounded wire.

4. Damaged warning light switch — Replace switch.

L. Brake scraping

1. Loose wheel bearings — Adjust to specifications.

2. Rotor rubbing caliper housing or splash shield — Check for rust or mud buildup on caliper or splash shield next to rotor. Check for bent splash shield.

3. Loose caliper mounting — Replace hardware on single piston caliper. Torque mounting bolts to specifications.

4. Broken return spring on drum brakes — Replace return springs in axle set.

M. Brake chatter, roughness, or pulsation

1. Loose wheel bearings — Adjust to specifications.

2. Front end out of alignment — Check alignment. Replace worn parts. Realign front end.

3. Rear drums out of round — Resurface or replace rear drums.

4. Lining contaminated with grease, oil, or brake fluid — Recondition calipers.

5. Excessive lateral runout of rotor — Check runout with dial indicator. Resurface or replace motor.

6. Rotor excessively out of parallel — Check rotor and resurface or replace.

N. Rattle in brake system

1. Loose caliper mounting — Replace hardware on single piston caliper. Torque mounting bolts to specification.

2. Brake shoe antirattle spring weak or missing — Replace antirattle springs.

3. Excessive shoe to caliper or shoe to piston clearance — Recondition calipers.