UNIT 5: DISC BRAKE DIAGNOSIS AND REPAIR

LESSON 2: INSPECT AND DIAGNOSE DISC BRAKE SYSTEMS

I. Terms and definitions

A. **Brake fade —** The loss of brake effectiveness due to heat created during prolonged hard braking.

B. **Brake pedal pulsation —** A condition in which the brake pedal pulsates (moves up and down) when depressed. The frequency of the pulsations relates to vehicle speed.

C. **Encapsulation —** The act of capturing and holding harmful brake dust.

D. **Minimum rotor thickness —** The minimum thickness that a rotor must maintain to operate safely. A dimension imprinted on the rotor or its hub indicates its minimum thickness.

E. **Rivets —** Metal fasteners. Rivets fasten some brake friction materials.

F. **Rotor parallelism —** A state in which both sides of a brake rotor are parallel when the rotor turns. If the rotor sides are not parallel, the brake pedal pulsates.

G. **Rotor runout —** A condition in which the brake rotor wobbles as it turns. Rotor runout may occur even if the rotor is parallel.

II. Visually inspecting the disc brake system

A. Check the fluid level in the master cylinder and inspect the brake hydraulic system.

B. Use proper lifting equipment to raise the vehicle. Remove the wheels.

CAUTION: When lifting a vehicle, always use proper lifting equipment and observe all safety precautions.

NOTE: If both brake pads are not visible after removing the wheel, remove the caliper.

C. Encapsulate and thoroughly clean the disc and rotor.

CAUTION: Asbestos is a cancer-causing substance. Never breathe asbestos dust or allow it to escape into the air. Special equipment is available to encapsulate the dust and prepare it for safe disposal. If this equipment is unavailable or in poor working order, do not perform brake work.

CAUTION: Carefully follow the manufacturer's instructions when using the encapsulator.

D. Inspect the brake.

1. Carefully inspect the brake assembly and note any indication of leaks. Identify the source of any leaks.

2. Inspect the brake lining.

   a. Check the thickness of the brake lining on the pads.

   • If the brake lining is riveted to the pad, the rivet heads should be at least 1/16 in below the lining surface to prevent contact with the rotor surface.

   • Brake lining that is bonded to the pad should be at least as thick as the pad itself.

   • Replace any pads that do not clearly meet the thickness standards.

NOTE: Periodically check the brake lining on all vehicles. Annual checks are recommended for vehicles with more than 40,000 miles. Also check the brake lining if there are unusual sounds during braking or if the brakes fade, pull, vibrate, or lose power.

NOTE: If there is any doubt about the condition of the friction material, remove the caliper to allow for more careful inspection.

   b. Replace the pads if the brake lining is cracked, worn, glazed, distorted, or saturated with fluid. Also replace the pads if the backing plates are distorted or saturated with fluid.

III. Determining the cause of pulsating pedal or brake fade in disc brake systems

A. A rotor that is too thin may cause a pulsating pedal or brake fade. Outlined below is a procedure for determining rotor thickness.

1. Use proper lifting equipment to raise the vehicle. Remove the wheel.

CAUTION: When lifting a vehicle, always use proper lifting equipment and observe all safety precautions.

2. Using a micrometer, measure the rotor thickness at 12 different points.

3. Compare this measurement with the minimum thickness specification imprinted on the rotor or its hub. If the thickness is less than the specification, discard the rotor.

4. Check the rotor for grooves at this time.

a. If significant grooves are not found, check the rotor for parallelism according to section B below.

b. If significant grooves are found, measure the depth of the grooves.

c. If grooving causes the rotor to fall below its minimum thickness at any point, discard the rotor.

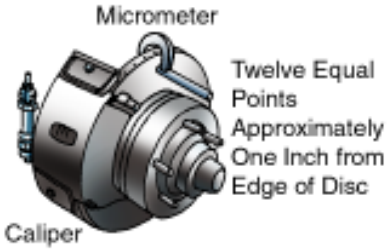
d. If the rotor is still above its minimum thickness, machine the grooves out of the rotor. Do not machine the rotor below its minimum thickness, however.

NOTE: Rotors can be reworked if they exceed their minimum thickness. To determine the rotor's thickness after reworking, measure to the bottom of the deepest grooves on both sides. If reworking causes the rotor to drop below its minimum thickness specification, discard the rotor.

NOTE: The manufacturer machines grooves into some discs. Do not measure these grooves when using the above procedure.

B. Rotors that are not parallel may cause pulsating pedal or brake fade. Outlined below is a procedure for determining if the rotors are parallel.

1. Using a micrometer, measure the thickness of the rotor at 12 different locations. Record each measurement. If any one reading exceeds any of the others by .001 in, the rotor is not parallel.



2. If the rotor is parallel, proceed to section C below and measure the rotor runout. If the rotor is not parallel, calculate the rotor's thickness if it is machined to the smallest micrometer measurement.

a. Discard the rotor if machining drops it below its minimum thickness.

b. If machining does not drop the rotor below its minimum thickness, machine the rotor until there is no more than .001 in variation between any two points.

NOTE: Some minor grooving in the rotor after reworking is acceptable.

C. Rotors with too much runout may cause a pulsating pedal or brake fade. Outlined below is a procedure for measuring rotor runout.

NOTE: If the rotor is not integral with the hub assembly, retighten the wheel nuts onto the hub to hold the rotor in place. In some cases, it may be necessary to install a spacer before installing the wheel nuts. Follow the manufacturer's recommended procedure.

1. With the vehicle properly supported and the wheel off, fasten the dial indicator base to the spindle, knuckle, or some other solid area that allows the indicator to touch the disc.

2. Adjust the dial indicator so that it contacts the rotor somewhere near the center of the friction surface.

3. Rotate the rotor while watching the dial indicator.

4. Stop and zero the dial indicator at the point of its lowest reading.

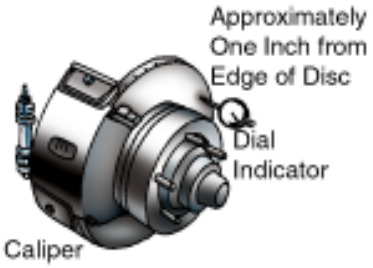
5. Continue turning the rotor.

   a. Stop the dial indicator at its highest reading. Subtract the lowest reading from the highest reading; the difference is the rotor runout.

   b. If there is no difference between the lowest and highest reading, then the runout is zero.

   c. If the difference is greater than .005 in, machine the rotor.

      NOTE: A worn or poorly adjusted bearing can cause excessive rotor runout. Inspect the bearing for excessive wear and check the bearing adjustment before machining rotors. Use the procedures for wheel bearing service and adjustment outlined in Unit 7 Lesson 1.



6. To remove runout, reduce the rotor thickness by one half of the runout measurement. For example, if the runout is .006 in, then reduce the rotor thickness by .003 in.

7. Calculate the thickness of the rotor if it is machined. If the thickness is less than the minimum thickness specifications, discard the rotor. If the thickness still exceeds the minimum thickness specifications, machine the rotor until runout is under .001 in.