



Workhorse Custom Chassis Service Bulletin

Bulletin Number: 50902-I

September 23, 2009

Bulletin Type: Information

Subject: Safety Recall 50901-C Interim Repair Procedure

**Models: All W20, W21, W22 Models Produced from July 24, 2000,
through December 19, 2007, and Equipped with Bosch ZOPS
or ZOHT Hydraulic Disc Brake Assemblies**

Attention: All Service Managers

Workhorse Custom Chassis ("Workhorse") has inspected certain Bosch brake caliper assemblies returned as a result of the safety recall interim repairs that have been performed to date. This bulletin is intended to share some of the results of those inspections and to provide information likely to assist in determining if reported and/or identified brake problems/conditions may relate to this safety recall.

In May 2009 Workhorse mailed an interim notice to owners of the affected vehicles to alert them to this safety defect. That notice described the authorized interim repair procedure. The authorized plan is to repair, at no cost to the customer, all caliper assemblies that a corresponding analysis determines have failed to meet design specifications for reason that may relate to this safety defect. In addition, any associated components that experience collateral damage will also be replaced at no cost to the customer.

Background:

The Workhorse chassis models identified as W20, W21, and W22 use the Bosch 2 x 66 mm brake caliper assembly at all four wheel ends. Each caliper contains two pistons which are made of a phenolic material similar to Bakelite. It has now been determined that if the vehicle is not driven for extended periods of time (typically six months or longer) the phenolic material may absorb and retain moisture from the atmosphere which may result in an increase of the diameter of the brake caliper piston.

Vehicles equipped with the brake systems identified above that are operated more frequently are not likely to experience this condition because the heat generated during brake applications under normal driving conditions inhibits the absorption and retention of moisture in the phenolic material.

It should also be noted that the highest percentage of customer complaints received by NHTSA, that may relate to this issue, are from owners with vehicles that have been in service for five years or longer.

Piston Evaluation:

- The piston clearances in the caliper are fairly small - the specified clearance of a new phenolic piston is .004 to .008 of an inch.
- Measurements taken of certain phenolic pistons removed from RVs that have been in service for several years have shown an increase in diameter up to .0035 inches.
- During normal operation the brake caliper piston absorbs some heat from the pads resulting in an increase of the piston diameter. This heat generated expansion of the phenolic piston has been accounted for in the design of the caliper.
- During normal operation the internal caliper piston seal pulls the piston back into the caliper bore when the actuating force on the brake system is released. If the phenolic piston experiences growth due to moisture absorption and heat, the seal may not be able to pull the piston back (referred to as “binding”) which may result in the brake pad dragging on the rotor.
- If a brake pad drags as described above, and the vehicle is subsequently parked for a sufficient amount of time (may be as short as 20 minutes), the piston may cool and experience a corresponding decrease in piston diameter. This reduction in piston diameter may be sufficient to allow the

piston to release from a binding condition. This heating and cooling cycle described above may increase the difficulty of performing an accurate diagnosis.

Caliper and Associated Component Evaluation:

- To assist in identifying a caliper assembly that is experiencing degraded performance that may be related to this safety defect inquire about and/or look for the following:
 - Customer complaint of a distinct brake burning smell;
 - Complaints of having to apply more engine power to overcome an unaccounted for slowing of the vehicle that is commonly associated with brake drag;
 - An ABS light that is on continuously and/or a heat damaged sensor;
 - Smoke coming from the wheel end;
 - A soft or spongy feel when applying the brakes;
 - Piston dust seals/boots that are cracked or appear discolored (white powder markings);
 - Front wheel seals that show signs of heat damage; and
 - Front spindle caps that show signs of heat damage and leaking.
- White residue on the piston dust seal/boot and caliper



- **Cracked piston dust seal/boot (white residue may also be present)**



- **Heat damaged ABS system wheel speed sensors**



ABS sensors experiencing heat damage that may be related to the safety recall have stopped functioning at various speeds and may have intermittent or complete loss of functionality and associated fault codes.

Rotor Evaluation:

- **Rotors with radial cracks and “star” cracks have been evaluated and are not considered collateral damage. The following are several factors that can cause rotors to crack that are not related to this safety defect:**
 - “Riding” the brakes downhill;
 - Absence of a tow car brake system; and
 - Continued “hard” braking.

- Short radial cracks on the rotor surface that comes into contact with the brake pads (“heat checking”) is caused by heating and cooling of the disc during normal operation. No corrective action or replacement is required.



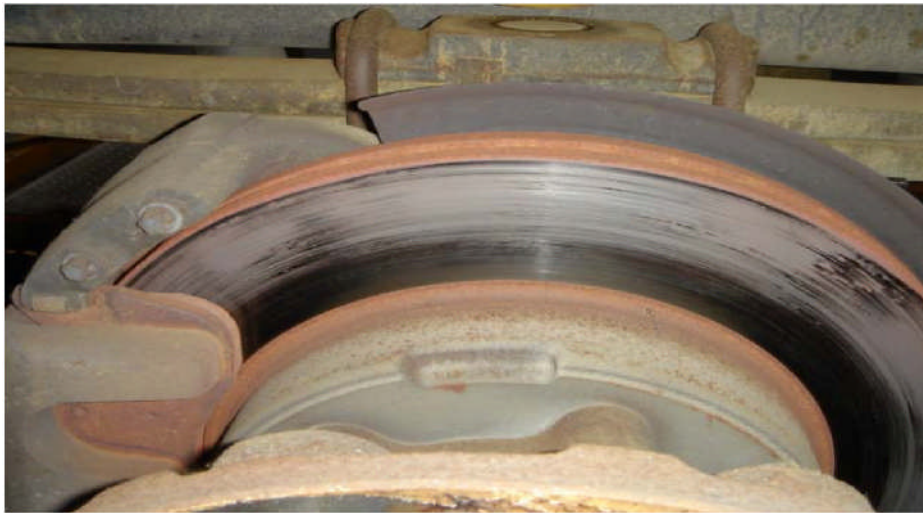
The existence of cracked rotors as described above, and without any other evidence (see additional items described below), would not justify a caliper replacement per the interim letter – neither would the replacement of the rotor qualify for a goodwill policy replacement. A replacement of the rotor under these conditions would be the responsibility of the customer.

- A rotor with a large radial crack that has migrated through the outer surface, as shown below, will need to be replaced.

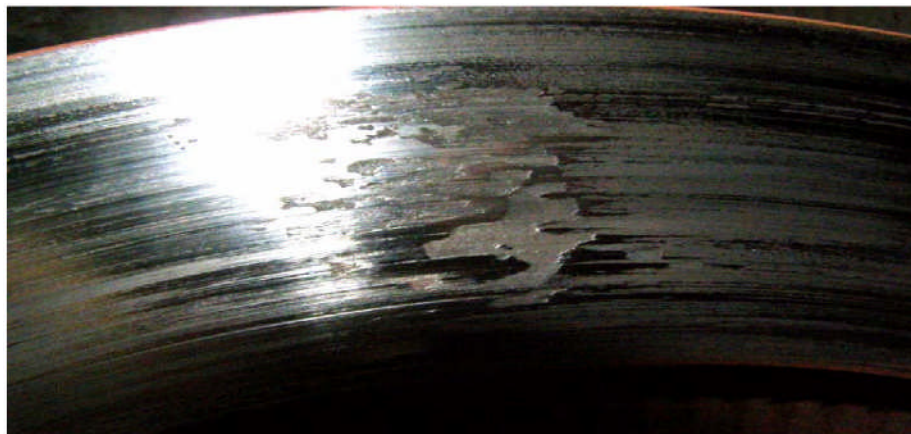


Again, without any other evidence of damage that may be related to the safety defect, the replacement costs for this condition would be the responsibility of the customer.

- Rotor colors vary from vehicle to vehicle. The rotor below shows some normal discoloration and light transfer of brake pad material. If necessary, the rotor may be machined during a related interim repair but does not require a mandatory replacement. Rotor thickness will have to be measured to verify it is within the specified minimum thickness prior to turning.



The rotor shown below exhibits severe brake pad material transfer and is a good indicator that the brake caliper assembly at this wheel end had experienced brake drag that may be related to the safety defect. The excessive amount of brake pad material transferred on to the rotor would be considered collateral damage and will require the replacement of the rotor. The associated cost is covered by the interim repair procedure if a caliper failure has occurred.



Note: If the only evidence or complaint by the owner is a cracked rotor or one that exhibits slight to moderate brake pad material transfer – this is NOT sufficient evidence of a related brake caliper piston sticking condition.

Brake Pad Evaluation:

- Pads below show normal brake pad wear noted by a smooth surface with no resin or material transfer from the pad. No repair action is required.



- The brake pad shown below exhibits the rough/damaged surface typically associated with material transfer from the pad to the rotor due to excessive heat. The corresponding rotor will most likely exhibit corresponding material deposits from these pads. Replacement of a brake pad in this condition is considered collateral damage and is covered by the interim repair procedure.



More Information:

- Bosch also has their guidelines for brake repairs available on line at the following web site:

<http://rbkwin.bosch.com/us/en/automotivetechology/overview/technicalsolutionsforcommercialvehicles/brakingsystems/index.html>