File in Section: 05 - Brakes
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Service Bulletin

WARRANTY ADMINISTRATION

Subject: **Disc Brake Warranty Service and Procedures**

Models: **2014 and Prior GM Passenger Cars and Light Duty Trucks**
EXCLUDING 2009-2013 Chevrolet Corvette ZR1 and Z06 Equipped with RPO Z07

This bulletin is being revised to add the 2013-2014 model years and update the labor operation and Warranty Information. Please discard Corporate Bulletin Number 00-05-22-002M (Section 05 – Brakes).

For your convenience, this bulletin updates and centralizes all GM's Standard Brake Service Procedures and Policy Guidelines for brake rotor and brake pad service and wear. For additional information, the Service Technical College lists a complete index of available Brake courses. This information can be accessed at www.centerlearning.com > resources > training materials > brakes courseware index. In Canada, refer to Service Know How course 55040.00V and Hydraulic Brake Certification program 15003.16H.

Important: PLEASE FAMILIARIZE YOURSELF WITH THESE UPDATES BEFORE PERFORMING YOUR NEXT GM BRAKE SERVICE.

The following four (4) key steps are a summary of this bulletin and are REQUIRED in completing a successful brake service.

1. **Measure and Document Pre-Service Rotor Thickness* (REQUIRED on Repair Order) – determine rotor clean-up/refinish/ replace**
2. **Properly clean ALL brake corner mating surfaces – hub, rotor and wheel**
3. **Properly clean-up/refinish rotor, measure and document post-service rotor thickness (REQUIRED on Repair Order)**

Important: If it is determined the rotor needs to be refinished, verify lathe equipment is properly calibrated.

4. **Properly reassemble the brake corner using proper torque tools, torque specification and torque sequence — wheel lug nuts.**

* The bulletin refers to Minimum Thickness specification as the minimum allowable thickness after refinish. Always refer to SI to verify the spec stamped on the rotor is the minimum thickness spec after refinish and not the discard spec.

Bulletin Format

Bulletin Topic
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Form: GM Brake Service Repair Order Documentation for Required Measurements

***REPAIR ORDER REQUIRED DOCUMENTATION

Important: When using any one of the brake labor operations listed in this bulletin (except for 2480018 — Brake Burnish), the following two rotor measurements (1. Original Rotor Thickness, 2. Refinished Rotor Thickness are required and MUST be written/documented on the repair order, or for your convenience, complete the form (GM Brake Service Repair Order Documentation for Required Measurements) found on the last page of this bulletin and attach it to the repair order. If the Warranty Parts Center generates a request, this Documentation/Form must be attached to the repair order that is sent back.

Important: Documentation of brake lathe maintenance and calibration as recommended by the lathe manufacturer must be available for review upon request.

Repair Order Documentation — Rotor Original And Refinished Thickness — REQUIRED

When resurfacing a brake rotor or drum, the ORIGINAL thickness (measured thickness before refinish) and REFINISHED thickness (measured thickness after refinish) MUST be written/documented on the repair order hard copy for each rotor serviced. If a rotor replacement is necessary, only the original thickness measurement needs to be recorded.

Repair Order Documentation — Explanation of Part Replacement — REQUIRED

If replacement of a brake component is necessary, proper documentation on the repair order is required. See the following examples:

- Brake rotor replacement — Customer comment was brake pulsation. Rotor was refinished on a prior brake service. After rotor measurement, it was determined that refinishing the rotor again would take it under the Minimum Thickness specification.
- Brake pad replacement — Customer comment was brake squeak noise. On inspection, found pads contaminated by fluid leak at caliper.

GM BRAKE SERVICE PROCEDURE

Brake Service Procedure

1. Remove the wheel and caliper.
2. Measure rotor thickness. In order to determine if the rotor can be refinished, do the following steps:

Important: If performing routine Brake Service for worn pads only, and the rotors are not damaged and measure within specification – DO NOT REFINISH ROTORS.

2.1. Remove the rotor(s).

2.2. Measure the rotor for original thickness using a brake micrometer. Multiple measure points should be taken and the lowest measurement should be recorded.

2.3. Reference the Minimum Thickness specification stamped on the backside of the rotor or SI for Minimum Thickness specification/other. In most cases, the rotor should be refinished unless the measurement taken makes it obvious that refinishing the rotor would take the measurement under the Minimum Thickness specification (then replacement is necessary). DO NOT use any other manufacturers rotor specifications.

3. ***Record the lowest ORIGINAL rotor thickness measurement on the repair order hard copy as noted in the "Repair Order Documentation — Rotor Refinish" section of this bulletin.

4. Clean all of the mating surfaces between the hub, the rotor and the wheel using the J 42450A – Wheel Hub Cleaning Kit and J 41013 – Whiz Wheel®.

   If rotors are not to be refinished – Go To Step 8.

Important: Cleaning all mating surfaces and making them free of corrosion, burrs and other debris (which includes removal of Hubless rotors) is critical and MUST be performed whether using an On-Car or Bench Lathe Refinish Procedure.

5. Be sure to follow the appropriate refinishing procedure listed below for the type of lathe you are using.

Important: Only replace the rotors if they do not meet the Minimum Thickness specification.

Important: DO NOT REFINISH NEW ROTORS.

Important: Only remove the necessary amount of material from each side of the rotor and note that equal amounts of material do not have to be removed from both sides on any brake system using a floating caliper.

Important: Prior to making the cut, install the recommended clip-on style disc silencer supplied with the lathe. Use of this silencer is critical to prevent chatter from occurring during the cut.

Bench Type Lathe

5.1. Refinish the existing rotor on an approved, well-maintained lathe to guarantee smooth, flat and parallel surfaces.

5.2. Check for clean and true lathe adapters and make sure the arbor shoulder is clean and free of debris or burrs. For more information, see the "Brake Lathe Calibration Procedure (Bench-Type)" section in this bulletin.

5.3. On the outboard area of the rotor, position the cutting tools one eighth of an inch into the brake pad area of the rotor. Feed the cutting tools into the rotor until they cut the rotor to new metal, a full 360 degrees. Zero each dial and back off a full turn

5.4. Move the cutting bits to the middle of the rotor and do the same procedure. If zero is passed during the process, reset zero. Back off a full turn.

5.5. Position the cutting bits one eighth of an inch inside the inboard (closest to the hub) edge of the brake pad contact area. Do the same procedure. If zero is passed during the process, reset zero.

5.6. Back off a full turn and position the cutting bits all the way inboard in preparation to refinish the full rotor surface. Advance both tool cutters to the zero setting plus just enough to clean up the entire rotor surface.

5.7. After completing the refinish, sand both sides of the rotor for approximately one minute per side using a sanding block and 130–150 grit sandpaper to obtain a non-directional finish.

On-Car Type Lathe

5.1. Reinstall the rotor(s).

Important: When using the On-Car lathe on vehicles equipped with limited slip (or posi-trac) rear system, it is critical that the rear drive shaft is disconnected/ disengaged prior to operation of the On-Car lathe. Remember to mark and re-index the drive shaft correctly on re-assembly to prevent creating driveline vibration. Whenever the lathe drive motor is being switched on, the operator MUST keep their body out of the wheel well area until the machine has reached its normal operating RPM.

5.2. Refinish the existing rotor on an approved, well-maintained lathe to guarantee smooth, flat and parallel surfaces.

Important: When raising the vehicle on the lift, be sure to have it at a good working height (waist high is average) to accommodate mounting the On-Car lathe. Optimally, the center piston on the lathe trolley will be mid-travel. If the lathe trolley center piston is completely compressed (bottoming out) or inversely fully extended and hanging off the vehicle hub, this could affect the calibration time of the lathe.

5.3. Select the correct adapter for the vehicle you're working on and mount it to the hub with the vehicle lug nuts. Hand tighten 34-41 N•m (25-30 lb ft) the nuts using equal torque. DO NOT use impact wrenches, excessive torque will damage the adapter.

Important: Ensure the adapter sits flush on the rotor hat surface. Be sure to remove any rust, rotor retaining clips, etc. that may preclude the adapter from sitting flat on the mounting surface.

5.4. Connect the lathe to the adapter, turn on the lathe and activate the computer to compensate for run-out in the hub.

5.5. Once the computer indicates the compensation process was successful, on the outboard area of the rotor, position the cutting tools one eighth of an inch into the brake pad area of the rotor. Feed the cutting tools into the rotor until they cut the rotor to new metal, a full 360 degrees. Zero each dial and back off a full turn.

5.6. Move the cutting bits to the middle of the rotor and do the same procedure. If zero is passed during the process, reset zero. Back off a full turn.

5.7. Position the cutting bits one eighth of an inch inside the inboard (closest to the hub) edge of the brake pad contact area. Do the same procedure. If zero is passed during the process, reset zero.

5.8. Back off a full turn and position the cutting bits all the way inboard in preparation to refinish the full rotor surface. Advance both tool cutters to the zero setting plus just enough to clean up the entire rotor surface.

5.9. After completing the refinish, sand both sides of the rotor for approximately one minute per side using a sanding block and 130-150 grit sandpaper to obtain a non-directional finish.

5.10. Dismount the lathe, but leave the lathe adapter attached to the vehicle.

6. Once the rotor has been properly machined, wash the rotor with soap and water (use a mild dish washing soap) or wipe it clean with GM approved brake cleaner, P/N 88862650 (Canadian P/N 88901247).

Important: Thoroughly cleaning the rotor will prevent the possible transfer of finite metal dust left as a by-product of machining to the pad material during the seating process, thus reducing the opportunity for squeaks or other noises to occur.

7. ***Record the REFINISHED rotor thickness measurement on the repair order hard copy. Refer to the “Repair Order Documentation — Rotor Refinish” section of this bulletin.

8. Setting up to measure for Lateral Run Out (LRO):

Important: Measuring for Lateral Run Out (LRO) (steps 8-15) is no longer required however, these steps are being left in the overall procedure as a good check to be performed in the case of a repeat pulsation complaint. If you are not checking for LRO, go to step 16.

Bench-Type Lathe

8.1. Ensure that the mating surfaces of the rotor hat section and the hub mating surface are clean and free of debris.

8.2. Mount the new, original or refinished rotor onto the vehicle hub.

Important: Always hold the rotor on the bottom half so any debris that may be dislodged from the vents will fall out instead of falling into the mounting area. Any movement or jarring from the rotor falling over on the studs can release rust from the vents on the rotor.

8.3. Tilt the top of the rotor in towards the vehicle so you can see the studs and ease the rotor onto the studs.

8.4. Slide the rotor all the way to the hub and hold it in place until you have placed one of the conical washers (with the tapered hole side facing out) and run the first lug nut up tight by hand so the rotor doesn't move when you release it.

8.5. Place the conical washers on the rest of the studs (with the tapered hole side facing out), start and snug the lug nuts by hand.

8.6. Using the one half inch drive impact wrench and a torque stick (J-39544) or equivalent, start with the lug nut opposite of the one you first tightened by hand and tighten the lug nuts using a star pattern until they touch the hub but do not completely torque. Then again, starting with the first lug nut you tightened by hand, tighten all the lug nuts in a star pattern to the specific vehicle torque specification.

8.7. DO NOT reinstall the caliper or the wheel at this time.

On-Car Type Lathe

8.1. Leave the On-Car adapter on the wheel.

8.2. Proceed to Step 9.

9. Fasten the dial indicator to the steering knuckle so that the indicator needle contacts the rotor outboard friction surface approximately 6.35 mm (0.25 in) from the rotor's outer edge. The stylus should be perpendicular to the friction surface of the rotor.

Important: Make sure the dial indicator needle tip is screwed tight, a loose tip could cause false readings.

10. Measure for LRO. Follow the procedure below to determine if the LRO is within specification (0.050 mm (0.002 in) or LESS).

10.1. Rotate the rotor and locate the point on the rotor where the lowest dial indicator reading is indicated and set the dial indicator to zero.

10.2. Rotate the rotor from the low point and locate the point with the highest dial indicator reading (rotor “high spot”). Note the amount and mark the location of the “high spot” on the rotor and mark the closest wheel stud relative to this location. If the high point falls between two studs, mark both studs. In instances where the vehicle has “capped lug nuts” you should mark the hub.

11. If the Lateral Run Out (LRO) measurement is 0.050 mm (0.002 in) or LESS, no correction is necessary. Go to Step 15 if this is the first rotor completed. Go to Step 16 if this is the second rotor completed. If the LRO is GREATER than 0.050 mm (0.002 in), go to Step 12.

12. If the LRO measurement is greater than 0.050 mm (0.002 in), use the following procedure to correct for LRO:

Important: If the LRO measurement is over 0.279 mm (0.011 in), determine the source or cause of the LRO and correct it (i.e. verify drive axle nut torque specification, refinished rotor is source of LRO due to a lathe qualification issue – see “Brake Lathe Calibration Procedure”).

Hubless Rotor

12.1. Remove the rotor and using the Brake Align® application chart **(found in the latest version of Corporate Bulletin Number 01-05-23-001)** , choose the correct plate to bring the rotor LRO to 0.050 mm (0.002 in) or less. The plates come in 0.0762 mm (0.003 in), 0.1524 mm (0.006 in) and 0.2286 (0.009 in) compensation. For more information on proper plate selection, see the instruction video/DVD included in the "Brake Align®" kit **or the latest version of Corporate Bulletin Number 01-05-23-001**.

12.2. Align the V-notch of the selected Brake Align® correction plate to the marked wheel stud ("high spot") or between the two points marked (if the "high spot" is between two wheel studs).

Important: IF Brake Align® Correction Plates are not available for the vehicle being serviced, refer to SI Document — Brake Rotor Assembled Lateral Runout Correction for correcting LRO.

Important: Per Brake Align® manufacturer, NEVER attempt to stack two or more Correction Plates together on one hub. NEVER attempt to reuse a previously installed Correction Plate.

12.3. Reinstall the rotor using the same method and precautions as the first time – found in Step 8. Make sure to index the rotor correctly to the marks made in step 10, otherwise LRO will be comprised.

Hubbed / Captured / Trapped Rotor

12.1. Measure the rotor thickness.

12.2. Refinish or replace the rotor (see Service Information for further details).

13. Use a Dial Indicator to measure the rotor to verify the LRO is within specification.
14. If using,

    BENCH LATHE — DO NOT remove conical washers and lug nuts at this time.

    ON—CAR LATHE — You must remove adapter and install conical washers and lug nuts to retain rotor position.

Important: For Hubless rotor design, while removing the adapter, you must hold the rotor tight to the hub and install the top conical washer and lug nut first to ensure no debris falls between the surface while removing the adapter. Then, install the remaining conical washers and lug nuts. Otherwise, LRO will be comprised.

15. Perform Steps 1 through 7 on the opposite side of the vehicle (steps 1-12, if performing LRO).
16. Reinstall the rotors on both sides of the vehicle and perform the following steps:

    16.1. Reinstall the calipers and pads.

    16.2. Pump the brakes to pressurize the calipers.

    16.3. Remove the lug nuts/conical washers.

    16.4. Install and properly torque the wheels.

Important: It is critical to follow the star pattern wheel torque procedure and use the proper tools (torque stick or torque wrench) as referenced in SI.

17. Road test the vehicle to verify the repairs.

BRAKE LATHE CALIBRATION PROCEDURE

Calibration of the brake lathe should be performed and recorded monthly or whenever post-service brake rotor LRO measurements are consistently reading above specification.

BENCH-TYPE LATHE

Use the following procedure to calibrate a Bench-type brake lathe:

1. After refinishing a rotor, loosen the arbor nut and while holding the inside bell clamp to keep it from rotating, rotate the rotor 180 degrees.
2. Retighten the arbor nut and set the dial indicator on the rotor using the same instructions as checking the run out on the vehicle.
3. Rotate the arbor and read the runout.
4. Divide the reading by two and this will give you the amount of runout the lathe is cutting into the rotor.

Important: If there is any runout, you will need to machine the inside bell clamp in place on the lathe (this procedure is for a Bench type lathe ONLY, DO NOT machine inside the bell clamp on an On-Car type lathe).

Machining the Inside Bell Clamp (Bench Type Lathe Only)

Any nicks or burrs on the shoulder of the arbor must be removed. An 80-grit stone can be used to accomplish this. Spray WD-40® on the shoulder and with the lathe running, hold the stone flat against the shoulder surface using slight pressure. When the burrs are gone, clean the surface. Burrs must also be removed from the hub of the inside bell clamp. This can be accomplished with the stone and WD-40®. Keep the stone flat on the hub while removing the burrs. After removing the burrs, clean the hub.

Place the bell clamp on the arbor of the lathe and use the small radius adapters first and then spacers to allow you to tighten the arbor nut to secure the bell clamp to the lathe. Position the tool bit in the left hand of the rotor truer so you can machine the face of the bell clamp. Machine the face of the bell clamp taking just enough off of it to cut the full face of the clamp the full 360 degrees. Before you loosen the arbor nut, match mark the hub of the bell clamp to the arbor and line up these marks before machining a rotor. A magic marker can be used to make the match marks. Machine a rotor and recheck the calibration. Repeat this procedure on all Inside Bell Clamps used.

Important: If runout is still present, contact the brake lathe supplier.

ON-CAR TYPE LATHE

Use the following procedure to calibrate an On-Car brake lathe:

1. Connect the lathe to a vehicle using the appropriate adapter.
2. Attach a vise-grip dial indicator to a fixed point in the wheel well and bring the dial indicator to a flat surface on the cutting head.
3. Turn on the lathe and press the “start” button so the lathe begins to compensate.
4. Once compensation is complete, note the runout as measured by the dial indicator. Measured runout at this point is overstated given that it is outside the rotor diameter.
5. If runout is in excess of 0.1016 mm (0.004 in) (0.050 mm (0.002 in) as measured within the rotor diameter), calibration must be tightened. Follow manufacturer's instructions for tightening the calibration of the lathe. This information is found in the manual supplied with the lathe.

Important: If the machine is taking a long time to compensate during normal use, prior to checking the lathe calibration, it is recommended that the machine be disconnected from the adapter and the adapter (still connected to the vehicle) is rotated 180 degrees and the machine reattached. This will accomplish two things:

- It will re-verify the machine is properly attached to the adapter.

- It will change the location of the runout (phase) relative to the machine and thus possibly allow for quick compensation as a result of the position change.

The following information has been added as a reference to ensure your Pro-Cut PFM lathe provides a consistent smooth surface finish over long term usage.

Cutting Tips / Depth of Cut / Tip Life

The cutting tips must be right side up. Reference marks always face up. The cutting tips may not have chips or dings in the surface of the points. Cuts of 0.1016-0.381 mm (0.004-0.015 in) will provide the best surface finish and the optimal tip life. When cleaning or rotating the cutting bits, make sure that the seat area for the tip on the tool is free and clear of debris.

Cutting Head

On each brake job, the technician must center the cutting head for that particular vehicle using one of the mounting bolt holes on the slide plate. Once the head is centered, it is vital that the technician use one hand to push the head firmly and squarely back into the dovetail on the slide plate while using the other hand to tighten the Allen-Hex bolt that secures the head. Failure to do this could result in chatter occurring during the cut.

Tool Holder Plate (Cutting Head)

The tool holder plate is the plate that the cutting arms are attached to. It can bend or break if a technician accidently runs the cutting arms into the hub of the rotor while the rotor is turning. (Cuts of more than 0.508 mm (0.020 in) can also bend this plate). Once bent, the lathe will most likely not cut properly until the tool holder plate is replaced. In order to verify the condition of the tool holder plate on a machine that will not cut right, remove the mounting bolt and remove the cutting head from the slide plate. With the cutting head titled at an angle, lay the long edge of the tool holder plate down on the flat part of the slide plate. If any gap can be seen between the edge and the slide plate, the tool holder plate is bent and the source of vibration. Also check to ensure that the cutting arms are lying flat on the upper side of the tool holder plate. If the mounting arm post is bent, it will show itself by having the back of the cutting arm lifting off the surface of the tool holder.

Gib Adjustment / Loose Gib

As wear occurs between the slide plate and the box it rides on, you must take up the slack. You do this by way of a moveable wedge, which we call the gib. Your lathe manual details adjustment process, which you should perform when required after monthly checks or whenever surface finish is inconsistent.

BRAKE PULSATION

Brake pulsation is caused by brake rotor thickness variation. Brake rotor thickness variation causes the piston in the brake caliper, when applied, to “pump” in and out of the caliper housing. The “pumping” effect is transmitted hydraulically to the brake pedal. Brake pulsation concerns may result from two basic conditions:

1. Thickness Variation Pulsation is Caused by Lateral Run Out (LRO). LRO on a brake corner assembly is virtually undetectable unless measured **(with a dial indicator after the brake service) and will not be detected as brake pulsation during an after brake service test drive**. If the brake corner is assembled with excessive LRO (greater than 0.050 mm (0.002 in), thickness variation will develop on the brake rotor over time and miles. Excessive LRO will cause the brake pads to wear the brake rotors unevenly, which causes rotor thickness variation. Pulsation that is the result of excessive Lateral Run Out usually develops in 4,800-16,000 km (3,000-10,000 mi). **The more excessive the LRO, the faster the pulsation will develop**. LRO can also be induced when uneven torque is applied to wheel nuts (lug nuts). Improper wheel tightening after tire rotation, spare tire usage, brake inspection, etc. can be the cause of brake pulsation. Again, it usually takes 4,800-16,000 km (3,000-10,000 mi) AFTER the service event for the condition to develop. The customer does not usually make the connection between the service event and the awareness of the pulsation. The proper usage of torque wrenches (torque limiting sockets) will greatly reduce or eliminate the pulsation conditions after wheel service events. The improper use of impact wrenches on wheel nuts greatly increases the likelihood of pulsation after wheel service.

The following are examples of pulsation conditions and reimbursement recommendations:

- If the customer noticed the condition between 4,800-16,000 km (3,000-10,000 mi) and it gradually got worse, normally the repair would be covered. The customer may tolerate the condition until it becomes very apparent.
  - – If a GM dealer performed a prior brake service, consider paying for the repair and then strongly reinforce proper brake lathe maintenance.
  - – If the customer had the brake service done outside of a GM dealership, normally GM would not offer any assistance.
- If a customer indicated they had wheel service, ask who performed the service. Then;
  - – If a GM dealer performed the service, consider paying for the repair and then strongly reinforce the use of torque wrenches at the dealer. Two common size torque wrenches cover 90% of all GM products. Each technician needs to use torque wrenches properly every time the wheel nuts are tightened.
  - – If the customer had the wheel service done outside of a GM dealership, normally GM would not offer any assistance.

2. Thickness Variation Pulsation Caused by Brake Rotor Corrosion — Rotor corrosion is another form of thickness variation, which can cause a pulsation concern and can be addressed as follows:
   - **Cosmetic Corrosion:**

     In most instances rotor corrosion is cosmetic and refinishing the rotor is unnecessary.
   - **Corrosion — Pulsation Caused by Thickness Variation (Lot Rot / Low Miles — 0–321 km (0–200 mi):**

     At times more extensive corrosion can cause pulsation due to thickness variation. This usually happens when the vehicle is parked for long periods of time in humid type conditions and the braking surface area under the pads corrodes at a different rate compared to the rest of the braking surface area. Cleaning up of braking surfaces (burnishing) can be accomplished by 10 – 15 moderate stops from 56– 64 km/h (35 – 40 mph) with cooling time between stops. If multiple moderate braking stops do not correct this condition, follow the “Brake Rotor Clean-Up Procedure” below.
   - **Corrosion — Pulsation Caused by Thickness Variation (without rotor flaking / higher mileage — 3,200-8,000 km (2,000-5,000 mi):**

     In some cases, more extensive corrosion that is not cleaned up by the brake pad over time and miles can cause the same type of pulsation complaint due to thickness variation. In these cases, the rotor surface is usually darker instead of shiny and a brake pad foot print can be seen against the darker surface. This darker surface is usually due to build-up, on the rotor material surface, caused by a combination of corrosion, pad material and heat. To correct this condition, follow the “Brake Rotor Clean-up Procedure” below.
   - **Corrosion — Pulsation Caused by Thickness Variation (with rotor flaking / higher mileage — 8,000 + km (5,000 + miles)** :

     At times, more extensive corrosion over time and miles can cause pulsation due to thickness variation (flaking). This flaking is usually a build up, mostly on the rotor material surface, caused by a combination of corrosion, pad material and heat. When rotor measurements are taken, the low areas are usually close to the original rotor thickness (new rotor) measurement and the high areas usually measure more than the original rotor thickness (new rotor) measurement (depending on mileage and normal wear). To correct this condition, follow the “Brake Rotor Clean-up Procedure” described below.

Important: In some flaking instances, cleaning-up this type of corrosion may require more rotor material to be removed then desired. Customer consideration should be taken in these situations and handled on a case by case basis, depending on the amount/percentage of rotor life remaining and the vehicle's warranty time and miles.

BRAKE ROTOR CLEAN-UP PROCEDURE

Clean-up the rotors on an approved, well-maintained brake lathe to guarantee smooth, flat and parallel surfaces. Check for clean and true lathe adapters and make sure the arbor shoulder is clean and free of debris or burrs. For more information see the “Brake Lathe Calibration Procedure” section in this bulletin.

1. On the outboard area of the rotor, position the cutting tools one eighth of an inch into the brake pad area of the rotor. Feed the cutting tools into the rotor until they cut the rotor to new metal, a full 360 degrees. Zero each dial and back off a full turn.
2. Move the cutting bits to the middle of the rotor and do the same procedure. If zero is passed during the process, reset zero. Back off a full turn.
3. Position the cutting bits one eighth of an inch inside the inboard (closest to the hub) edge of the brake pad contact area. Do the same procedure. If zero is passed during the process, reset zero.
4. Back off a full turn and position the cutting bits all the way inboard in preparation to refinish the full rotor surface. Advance both tool cutters to the zero setting plus just enough to clean up the entire rotor surface.
5. After completing the refinish, sand both sides of the rotor for approximately one minute per side using a sanding block and 130-150 grit sandpaper to obtain a non-directional finish.

Important: Only remove the necessary amount of material from each side of the rotor and note that equal amounts of material do not have to be removed from both sides on any brake system using a floating caliper.

Important: In many of these instances, such a minimal amount of material is removed from the rotor that customer satisfaction is not a concern for future brake services. This procedure is intended to "Clean-up" the rotor surface and should be conveyed to the customer as such – not as "cut", "refinish" or "machine", which tends to be terms understood as a substantial reduction of rotor material/life. If the brake lathe equipment being used is not capable of removing minor amounts of material while holding tolerances, further lathe maintenance, repair, updates or equipment replacement may be necessary.

BRAKE NOISE

Some brake noise is normal and differences in loading, type of driving, or driving style can make a difference in brake wear on the same make and model. Depending on weather conditions, driving patterns and the local environment, brake noise may become more or less apparent. Verify all metal-to-metal contact areas between pads, pad guides, caliper and knuckles are clean and lubricated with a thin layer of high temperature silicone grease. Brake noise is caused by a "slip-stick" vibration of brake components. While intermittent brake noise may be normal, performing 3 to 4 aggressive stops may temporarily reduce or eliminate most brake squeal. If the noise persists and is consistently occurring, a brake dampening compound may be applied to the back of each pad. This allows parts to slide freely and not vibrate when moving relative to each other. Use Silicone Brake Lubricant, ACDelco P/N 88862182 (Canadian P/N 88862496) or equivalent.

The following noises are characteristics of all braking systems and are unavoidable. They may not indicate improper operation of the brake system.

Squeak/Squeal Noise:

- Occurs with front semi-metallic brake pads at medium speeds when light to medium pressure is applied to the brake pedal.
- Occasionally a noise may occur on rear brakes during the first few stops or with cold brakes and/or high humidity.

Grinding Noise:

- Common to rear brakes and some front disc brakes during initial stops after the vehicle has been parked overnight.
- Caused by corrosion on the metal surfaces during vehicle non-use. Usually disappears after a few stops.

Groan Noise:

A groan type noise may be heard when stopping quickly or moving forward slowly from a complete stop. This is normal. On vehicles equipped with ABS, a groan or moan type noise during hard braking applications or loose gravel, wet or icy road conditions is a normal function of the ABS activation.

KEY POINTS — FREQUENTLY ASKED QUESTIONS

- **Q:** How do on-car lathes react to Axle Float? Does the play affect the machining of the rotor, either surface finish or LRO?

  A: Because the Pro-Cut on-car lathe adjusts in a live mode while spinning the hub/rotor, the dynamics of a floating axle are effectively eliminated. Once the lathe is compensated, there is no difference in the cutting/surface finish and LRO are just the same as with a non-floating axle.
- **Q:** Which lathe is essential for performing brake work, the bench or on-car?

  A: Dealers must have a well maintained bench lathe and well maintained on-car lathe. These lathes need to be calibrated on a monthly basis. BOTH lathes are essential to providing quality brake service.
- **Q:** What is the expected tip life for an on-car lathe?

  A: The geometry and composition of the Pro-Cut tips are designed for "single pass" cutting. When using the Pro-Cut the cutting depth should be set to take all material needed to get below rust grooves, eliminate all run-out and resurface the entire disc in a single pass. Cuts of 0.1016-0.381 mm (0.004-0.015 in) will provide the best surface finish and the optimal tip life. No "skim cut" or "finish cut" is needed. Failure to follow this procedure will shorten tip life. The Pro-cut tips will last between 7-12 cuts per corner. With three usable corners, a pair of tips is good for at least 21 cuts.
- **Q:** Why does GM recommend the use of single pass (referred to as "positive rake") bench and on-car brake lathes?

  A: GM Service and GM Brake Engineering have performed competitive evaluations on a significant number of bench and on-car brake lathes. These tests measured critical performance characteristics such as flatness, surface finish and the ability of the lathe to repeat accuracy over many uses. In each test, single pass lathe designs out performed the competitors. Single pass brake lathes are more productive requiring less time to perform the same procedure.
- **Q:** Is it okay to leave the caliper/pads installed while cutting rotors using an on-car lathe?

  A: On-car lathes should never be used with the pads and calipers installed on the vehicle. The debris from cutting the rotors can contaminate the brake pads/calipers which can lead to other brake concerns and comebacks.
- **Q:** What information needs to be documented on the Repair Order?

  A: Any claim that is submitted using the labor operations in this bulletin, must have the Original Rotor Thickness and Refinish Rotor Thickness (if refinished) documented on the repair order. For more information, refer to the "Repair Order Required Documentation" section of this bulletin.

All Warranty Repair Orders paid by GM, are subject to review for compliance and may be debited where the repair does not comply with this procedure.

BRAKE WARRANTY

Brake Rotors:

- Brake rotor warranty is covered under the terms of the GM New Vehicle Limited Warranty. Reference the vehicle's warranty guide for verification.
- Rotors should not be refinished or replaced during normal/routine pad replacement.
- Rotors should not be refinished or replaced and is ineffective in correcting brake squeal type noises and/or premature lining wear out.
- Rotors should not be refinished or replaced for cosmetic corrosion. Clean up of braking surfaces can be accomplished by 10–15 moderate stops from 56-64 km/h (35-40 mph) with cooling time between stops.
- Rotors should not be refinished or replaced for rotor discoloration/hard spots.
- Rotors should be refinished NOT replaced for Customer Pulsation concerns. This condition is a result of rotor thickness variation, usually caused by LRO (wear induced over time and miles) or corrosion (Lot Rot).
- When rotor refinishing, only remove the necessary amount of material from each side of the rotor and note that equal amounts of material do not have to be removed from both sides on any brake system using a floating caliper.
- Rotors should be refinished for severe scoring — depth in excess of 1.5 mm (0.060 in).

Important: If the scoring depth is more than 1.5 mm (0.060 in) after the rotor is refinished, it should be replaced.

- It is not necessary to replace rotors in pairs. Rotors may be replaced individually. However, caution should be exercised, as a variance in surface finish may cause a brake pull condition.
- New rotors should not be refinished before installation. Original equipment rotor surfaces are ground to ensure smooth finish and parallelism between mounting and friction surfaces. If a new rotor has more than 0.050 mm (0.002 in) Lateral Run Out (LRO) when properly mounted on the hub, correct it using one of the following methods:
  - 10.1. For hubless rotor designs, use the correction plate procedure found in the “GM Brake Service Procedure for Hubless Rotors” outlined in this bulletin.
  - 10.2. For hubbed/trapped/captured rotor designs, refinish the rotor using an On-Car lathe and the procedure outlined in this bulletin.
- Never reuse rotors that measure under the Minimum Thickness specification. In this instance, the rotor should be replaced.

Important: If the Minimum Thickness specification is not visible on the rotor, reference Service Information (SI) for the specific vehicle application. DO NOT use any other manufacturers rotor specifications.

Brake Pads:

Important: When determining the warranty coverage (as an example) – if all four front or four rear brake pads are excessively worn evenly, that would NOT be covered under warranty since this type of wear is most likely due to driving habits or trailering. However, if the brake pads are excessively worn un-evenly, side-to-side or same side/inner-to-outer pads, then consideration should be given to cover this under warranty since this type of wear is most likely due to poor operation of other braking components.

- Consideration should be given for covering brake pads up to 39,000 km (24,000 mi) (excluding owner abuse, excessive trailering, or the situations that would not be considered normal use).
- Installation of new rotors does not require pad replacement. Do not replace pads unless their condition requires it – excessively worn, damage or contaminated.

Brake Wear:

Several factors impact brake lining wear and should be taken into account when reviewing related issues:

- heavy loads / high temperatures / towing / mountainous driving / city driving / aggressive driving / driver braking characteristics (left foot or two feet)

The following are conditions that may extend brake lining wear:

- light loads / highway driving / conservative driving / level terrain

TOOL INFORMATION

Tool Description	Tool Number
Brake Rotor Micrometer — English	J 45021
Brake Rotor Micrometer — Metric	J 44279
Wheel Hub Cleaning Kit	J 42450A
Whiz Wheel®	J 41013
Torque Stick	J 39544 Kit
Dial Indicator Kit (.001 Increments)	J 45101
Conical Washers	J 45101–100

CORRECTION PLATE PART INFORMATION

Correction Plate
Correction Plate — 0.0762 mm (0.003 in)
Correction Plate — 0.1524 mm (0.006 in)
Correction Plate — 0.2286 mm (0.009 in)

Refer to Corporate Bulletin Number 01-05-23-001 for the Brake Align® application chart.

For vehicles repaired under warranty, Brake Align® Run-Out Correction Plates should be submitted in the Net Amount at cost plus 40%. Brake Align® Run-Out Correction Plates are available through the following suppliers:

- Dealer Equipment and Services at 1-800-GM TOOLS
- Brake Align® LLC at 1-888-447-1872 (U.S. Dealers Only)

* We believe this source and their products to be reliable. There may be additional manufacturers of such products. General Motors does not endorse, indicate any preference for or assume any responsibility for the products from this firm or for any such items, which may be available from other sources.

WARRANTY INFORMATION

Important:

- Labor operation 2480018 — Brake Burnish is not a published labor operation and will not be found in the Labor Time Guide. This labor operation should be used to claim the necessary time for cleaning up the braking surfaces for thickness variation pulsation due to “lot rot” corrosion – refer to Brake Pulsation section of this bulletin for procedure. Thickness Variation Pulsation due to “lot rot” corrosion occurs when vehicles are not driven for an extended period of time. This type of corrosion clean-up is covered under the terms of the new vehicle warranty coverage.
- If correcting for LRO, claim the use of correction plates as OLH. The times for using correction plates are not to exceed 0.2 hr for one side and 0.4 hr for both sides. Guidelines for submitting OLH per General Motors Policy & Procedures should be followed.
- Model years 2005 to current — labor operations 2420670, 2420671 and 2420760, 2420761, are to be used only when replacing rotors.
- Model years 2005 to current — labor operations 2420672, 2420762, 2430032 and 2430052 have been established for Brake Rotor/ Drum Refinishing.
- For model years in which the new labor operations do not apply, the time for refinishing the rotor is in labor operations 2420670, 2420671 and 2420760, 2420761.

For vehicles repaired under warranty, use:

Labor Operation	Description	Labor Time
2480018*	Brake Burnish	0.3 hr
2420150	Pads, Front Disc Brake – Replace	Use Published Labor Operation Time
2420170	Pads, Disc Brake-Rear – R&R or Replace	
2420670	Rotor Asm-Front Replacement	
2420671	Rotor Asm-Front Both – Replace	
2420760	Rotor Asm-Rear R&R or Replacement	
2420761	Rotor Asm-Rear Both – Replace	
2420672	Brake Rotor Refinishing – Front	
2420762	Brake Rotor Refinishing – Rear	
2430032	Brake Drum Refinishing – Front	
2430052	Brake Drum Refinishing – Rear	
*This is a unique labor operation for bulletin use only. It will not be published in the Labor Time Guide.		

WORKSHEET — BRAKE LATHE CALIBRATION

Important: Brake lathe calibration should be performed and recorded monthly or if you are consistently measuring high LRO after rotor refinishing.

BRAKE LATHE CALIBRATION CHECK SHEET

Dealer Code: _____

Date: _____

Lathe Type: _____

Lathe Model:_____

What is the Lathe's Run Out?_____

Is the Lathe within Specification? _____ Yes _____ No

Comments:

ATTACHMENT FORM — GM BRAKE SERVICE REPAIR ORDER DOCUMENTATION FOR REQUIRED MEASUREMENTS

PART MEASUREMENT/REPLACEMENT DOCUMENTATION

Dealer Code: _____

Repair Order Number: _____

Front Rotor - ORIGINAL/REFINISHED thickness measurements (required when front labor operation is used):

- Thickness Specification (Min. Thickness/Discard Stamped on Rotor/SI): _____ inch/mm (Circle One)
- ORIGINAL measured thickness before refinish: Left Front (OLF)_____ inch/mm Right Front (ORF)_____ inch/mm
- REFINISHED measured thickness after refinish: Left Front (RLF)_____ inch/mm Right Front (RRF)_____ inch/mm

Rear Rotor - ORIGINAL/REFINISHED thickness measurements (required when rear labor operation is used):

- Thickness Specification (Min. Thickness/Discard Stamped on Rotor/SI): _____ inch/mm (Circle One)
- ORIGINAL measured thickness before refinish: Left Rear (OLR)_____ inch/mm
  Right Rear (ORR)_____ inch/mm
- REFINISHED measured thickness after refinish: Left Rear (RLR)_____ inch/mm
  Right Rear (RRR)_____ inch/mm

Rotor Replacement:
If rotors are replaced, you must indicate reason for replacement

_____

_____

_____

Pad Replacement:
If Pads are replaced, you must indicate reason for replacement:

_____

_____

_____