



General Motors Position Statement Wheel Alignment Specifications, Requirements and Recommendations for GM Vehicles

- 2021 and Prior GM Passenger Cars and Light Duty Trucks

Purpose

The purpose of this document is to provide a clear position with General Motors' recommendations for customer concerns related to wheel alignment. For your convenience, this document updates and centralizes all of GM's Standard Wheel Alignment Service Procedures, and bulletins on wheel alignment service.

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

The following key steps are a summary of this document and are REQUIRED in completing a successful wheel alignment service.

1. Verify the vehicle is in an Original Equipment condition for kerb weight, tyres, wheels, suspension and steering configurations. Vehicles modified in any of these areas will require specific adjustments & consideration. Information should be sought direct from the manufacturers of the modified or non OE components.
2. Review the customer concern relative to "Normal Operation" definitions.
3. A copy of the alignment machine printout showing before and after alignment specifications should be attached to the job card.

Verify Original Equipment Condition of the Vehicle

- Verify that Original Equipment Tyres and Wheels or Genuine GM Accessory Tyres and Wheels are on the vehicle.
- Verify that aftermarket suspension "Lift" or "Lowering" Kits or other suspension alterations have NOT been done to the vehicle.
- Check for accidental damage to the vehicle; for example, severe pothole or curb impacts, collision damage that may have affected the wheel alignment of the vehicle; e.g., engine cradles, suspension control arms, axles, wheels, wheel covers, tyres may show evidence of damage/impact.
- Check to be sure vehicle has seen "Normal Use" rather than abuse; e.g., very aggressive driving may show up by looking at the tyres and condition of the vehicle.
- Check for other additional equipment items that may significantly affect vehicle mass such as large toolboxes, campers, etc. Significant additional mass can affect trim height and wheel alignment of the vehicle & it is important to realign the vehicle after placement of these types of items. (This typically applies to trucks and incomplete vehicles that can be upfit with equipment such as the above.)



Customer Concerns and "Normal Operation" Conditions Possible Concerns

The following are typical conditions that may require wheel alignment service:

1. Lead/Pull: defined as "at a constant highway speed on a typical straight road, the amount of effort required at the steering wheel to maintain the vehicle's straight heading."

Important: Please evaluate for the condition with hands-on the steering wheel. Follow the "Vehicle Leads/Pulls" diagnostic tree located in SI to determine the cause of a lead/pull concern. Lead/Pull concerns can be due to road crown or road slope, tyres, wheel alignment or even in rare circumstances a steering gear issue. Lead/pull concerns due to road crown are considered "Normal Operation". The customer should be advised that this is "Normal Operation."

Important: Some customers may comment on a "Lead/Pull" when they hold the steering wheel in a level condition. If so, this is more likely a "steering wheel angle" concern because the customer is "steering" the vehicle to obtain a "level" steering wheel.

2. Steering wheel angle to the left or right (counter-clockwise or clockwise, respectively): Defined as the steering wheel angle (clocking) deviation from "level" while maintaining a straight heading on a typical straight road.
3. Irregular or Premature tyre wear: Slight to very slight "feathering" or "edge" wear on the shoulders of tyres is NOT considered unusual and should even out with a tyre rotation; if the customer is concerned about a "feathering" condition of the tyres, the customer could be advised to rotate the tyres earlier than the next scheduled mileage/maintenance interval (but no later than the next interval). Be sure to understand the customer's driving habits as this will also heavily influence the tyre wear performance; tyre wear from aggressive or abusive driving habits is NOT a sign of abnormal or incorrect wheel alignment.

Important: Slight or mild feathering, cupping, edge or heel/toe wear of tyre tread shoulders is "normal" and can show up very early in a tyre/vehicle service mileage; in fact, some new tyres can show evidence of feathering from the factory. These issues do NOT affect the overall performance and tread life of the tyre. Repairers should always check the customer's maintenance records to ensure that tyre inflation pressure is being maintained to placard and that the tyres are being rotated at the proper mileage intervals. Wheel alignments are NOT to be performed for the types of "Normal" Tyre Feathering shown in Figures 1-4 below.



Figure 1: Full Tread View – “NORMAL” Tyre “Feathering” Wear on the Shoulder/Adjacent/Center Ribs



Figure 2: Tyre Shoulder View Example 1 - “NORMAL” Tyre “Feathering” Wear on the Shoulder

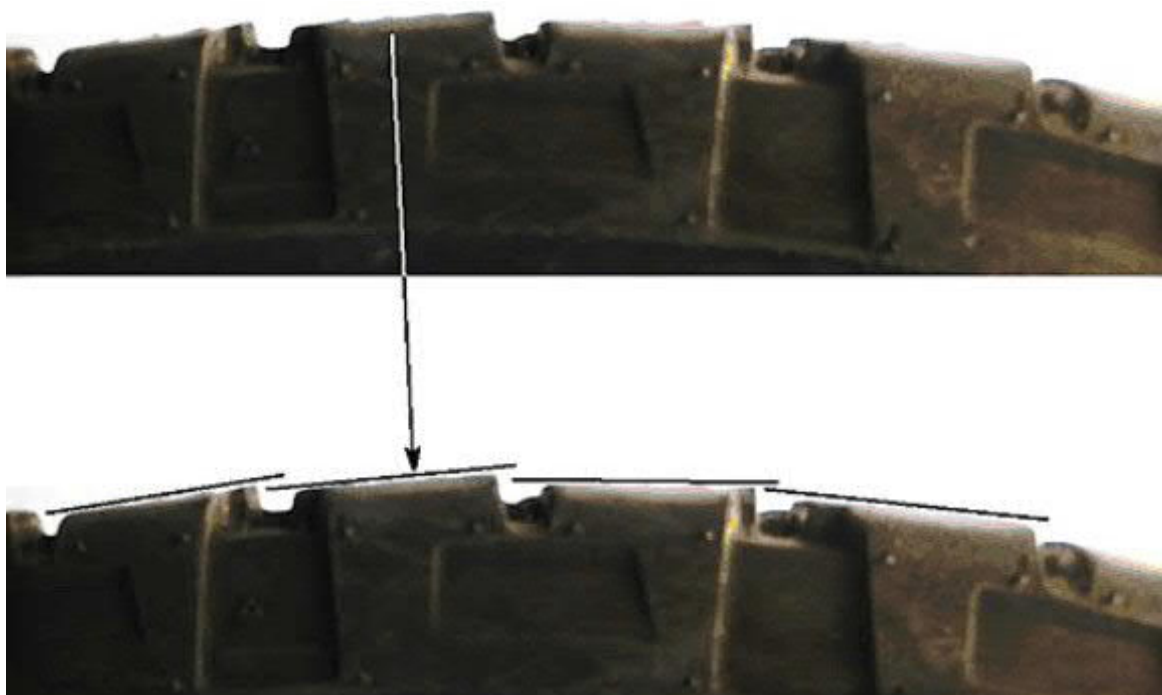




Figure 3: Tyre Shoulder View Example 2 - "NORMAL" Tyre "Feathering" Wear



Figure 4: Detail Side View of Tyre Shoulder Area - "NORMAL" Tyre "Feathering" Wear



Important: When a wheel alignment is deemed necessary for tyre wear, be sure to document on the repair order, in as much detail as possible, the severity and type of tyre wear (e.g., severe centre wear or severe inside or outside shoulder wear) and the position of the tyre on the vehicle (RF, LF, LR, RR). Please note the customer's concern with the wear such as, noise, appearance, wear life, etc.



- Other repairs that affect wheel alignment; e.g., certain component replacement such as suspension control arm replacement, engine cradle adjustment/replace, steering gear replacement, steering tie rod replace, suspension strut/shock, steering knuckle, etc. may require a wheel alignment.

Important: Vibration type customer concerns are generally NOT due to wheel alignment except in the rare cases; e.g., extreme diagonal wear across the tread. In general, wheel alignments are NOT to be performed as an investigation/correction for vibration concerns.

"Normal Operation" Conditions

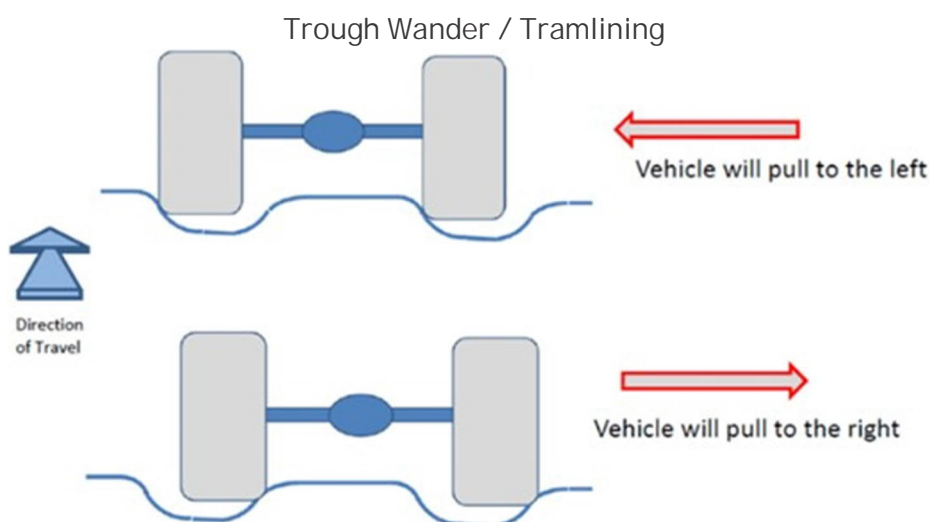
Vehicle Lead/Pull Due to Road Crown or Slope:

As part of "Normal Operation," vehicles will follow side-to-side or left to right road crown or slope. Be sure to verify from the customer the types of roads they are driving as they may not recognize the influence of road crown on vehicle lead/pull and steering wheel angle. If a vehicle requires significant steering effort to prevent it from "climbing" the road crown there may be an issue to be looked into further.

Important: A wheel alignment will generally NOT correct vehicles that follow the road crown since this is within "Normal Operation."

Trough Wander/Tramlining:

Some customers may comment about their vehicle having a tendency to pull left or right depending on road conditions. Typical descriptions may refer to the vehicle not tracking properly or that the car wanders. Additional comments may include that the car follows grooves or inconsistencies in the road to the extent that the vehicle must be steered or directed with additional force to overcome these roadway characteristics.





What is Tramlining?

"Tramlining" is an industry term used to describe a vehicle's tendency to follow the longitudinal ruts and/or grooves present in the road. (Also called "trough wander"). The name comes from the feeling on a tram or trolley as the vehicle follows along the tracks. Any vehicle can exhibit tramlining due to uneven pavement or severe rutting in the roads surface. All vehicles tramline to some degree, however vehicles equipped with low aspect ratio, wide tyres tend to be more sensitive to this condition (e.g., Commodore SS, VX-R, HSV, Camaro, Corvette etc).

Vehicles experiencing this condition can feel "pulled" in both directions depending on the positions of the tyres in the trough (ruts).

If a similarly equipped vehicle experiences the same condition as the customer's car, the customer's car is most likely experiencing tramlining, which is a normal characteristic of a car with low aspect ratio, wide tyres.

Important: It should be noted that adjusting alignment settings will NOT improve this condition.

Wheel Alignment Equipment and Process

Wheel alignments must be performed with a quality machine that will give accurate results when performing checks. "External Reference" (image-based camera technology) is preferred.

Requirements:

- Computerized four wheel alignment system.
- Computer capable of printing before and after alignment reports.
- Computer capable of time and date stamp printout.
- Racking system must have jacking capability.
- Racking system must be capable of level to 1.6 mm (1/16 in).
- Appropriate wheel stops and safety certification.
- Built-in turn plates and slip plates.
- Wheel clamps capable of attaching to 20" or larger wheels
- Racking capable of accepting any GM passenger car or light duty truck.
- Operator properly trained and ASE-certified (U.S. only) in wheel alignment.

Recommendations:

Racking should have front and rear jacking capability.

Equipment Maintenance and Calibration:

Alignment machines must be regularly calibrated in order to give correct information. Most manufacturers recommend the following:

- Alignment machines with "internal reference" sensors should be checked (and calibrated, if necessary) every six months.
- Alignment machines with "external reference" (image-based camera technology) should be checked (and calibrated, if necessary) once a year.
- Racks must be kept level to within 1.6 mm (1/16 in).
- If any instrument that is part of the alignment machine is dropped or damaged in some way, check the calibration immediately.

Check with the manufacturer of your specific equipment for their recommended service/calibration schedule.



Wheel Alignment Process

When performing wheel alignment measurement and/or adjustment, the following steps should be taken:

Preliminary Steps:

1. Verify that the vehicle has a full tank of fuel (compensate as necessary).
2. Inspect the wheels and the tyres for damage.
3. Inspect the tyres for the proper inflation and irregular tyre wear.
4. Inspect the wheel bearings for excessive play.
5. Inspect all suspension and steering parts for looseness, wear, or damage.
6. Inspect the steering wheel for excessive drag or poor return due to stiff or rusted linkage or suspension components.
7. Inspect the vehicle trim height.
8. Compensate for frame angle on targeted vehicles (refer to Wheel Alignment Specifications in SI).

Satisfactory vehicle operation may occur over a wide range of alignment angles. However, if the wheel alignment angles are not within the range of specifications, adjust the wheel alignment to the specifications. Refer to Wheel Alignment Specifications in SI. Give consideration to excess loads, such as toolboxes, sample cases, etc. Follow the wheel alignment equipment manufacturer's instructions.

Measure/Adjust:

Important: Prior to making any adjustments to wheel alignment on a vehicle, technicians must verify that the wheel alignment specifications loaded into their wheel alignment machine are up-to-date by comparing these to the wheel alignment specifications for the appropriate model and model year in SI. Using incorrect and/or outdated specifications may result in unnecessary adjustments, irregular and/or premature tyre wear and repeat customer concerns.

Important: When performing adjustments to vehicles requiring a 4-wheel alignment, set the rear wheel alignment angles first in order to obtain proper front wheel alignment angles.

Perform the following steps in order to measure the front and rear alignment angles:

1. Install the alignment equipment according to the manufacturer's instructions.
2. Jounce the front and the rear bumpers 3 times prior to checking the wheel alignment.
3. Measure the alignment angles and record the readings.

If necessary, adjust the wheel alignment to vehicle specification and record the before and after measurements. Refer to Wheel Alignment Specifications in SI.

Important: Technicians should refer to GMSi or ACDelco Techconnect for the correct wheel alignment specifications. These are the only source of GM wheel alignment specifications that are kept up-to-date throughout the year.

Test drive the vehicle to ensure a proper repair.



Understanding the Effects of Wheel Alignment on a Vehicle vs. Customer Complaints (Quick Reference Section)

Note: Refer to SI for complete alignment specifications.

- Prior to any measurement on the alignment machine, you must confirm the current specifications and tolerances as listed in GM's Service Information System. Do not assume that numbers in the alignment machine are correct, as it may not have been recently updated.
- Always use the correct specifications for that vehicle based on confirmed vehicle option content.
- It is important to always include as much information as possible in the RO – including the confirmed customer complaint and the complete before and after alignment measurements on the vehicle.

Steering Wheel Angle Complaints:

A true steering wheel angle complaint can be diagnosed as a vehicle that goes straight down the road without extra steering input, but the steering wheel angle is clocked to one side or the other. Make sure to always note which direction the steering wheel is clocked on the Repair Order ("Left/CCW" or "Right/CW").

If a steering wheel angle complaint has been verified, it should be noted that front and rear toes are the only alignment values that affect the angle of the steering wheel.

Vehicle Pull Complaints:

Prior to any adjusts, the vehicle must be driven to confirm the customer complaint. Use this drive to verify that the vehicle does have a pull and it is not a steering wheel angle issue. Try and use same stretch of road for all drives so that you understand the different characteristics of that specific road.

A true vehicle pull only complaint will have the vehicle pull to one side or the other regardless of steering wheel angle. It may require more than normal effort to keep the vehicle going straight.

Important: It is possible for customers to confuse a steering wheel off angle issue as a vehicle pull, as they may be trying to hold the wheel centred (level) on a straight road which would be adding a slight steering input to the wheels. If this is the case, please note this on the Repair Order, including the direction the vehicle is pulling.

Please note the following on what can cause a vehicle pull:

- Tyres
- Alignment settings

Tyres: If a pull complaint has been verified but all the alignment settings all are within specifications, the issue may be in the tyres. Certain tyre differences left to right may cause a vehicle pull. Swapping the front tyres left to right and re-evaluating is a simple way to verify a tyre issue.



Important: Always ensure tyre pressures are set to correct specifications before and after evaluating a vehicle.

Important: Always note if tyres are directional and not able to be permanently swapped side to side.

Alignment Information

Alignment Settings:	Positive Value	Negative Value
Front Cross Camber (LH minus RH)	Pulls Left	Pulls Right
Front Cross Caster (LH minus RH)	Pulls Right	Pulls Left
Front and Rear Toe	Does Not Cause Vehicle Pulls	Does Not Cause Vehicle Pulls

Important: Front or rear toe values being out of specifications do not cause a true vehicle pull. If only front or rear toe values are out of specification on a confirmed vehicle pull issue, something else is causing the pull.

Important: If Cross Camber and Cross Caster are within GM specifications listed in the Service Information System, it generally means they are not the reason for a vehicle pull complaint.

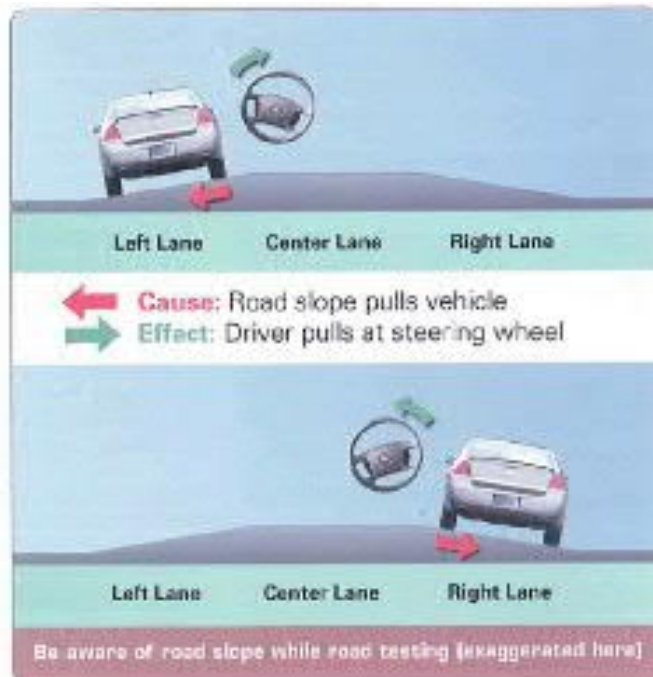
Note: Although not normally an adjustable setting on many vehicles, you should always verify the caster repair procedure in GM's Service Information System.

Road Slope:

It is important to always note road slope during a drive, high angles can cause a vehicle to drift one way or the other. As flat of road as possible should be used for evaluations.



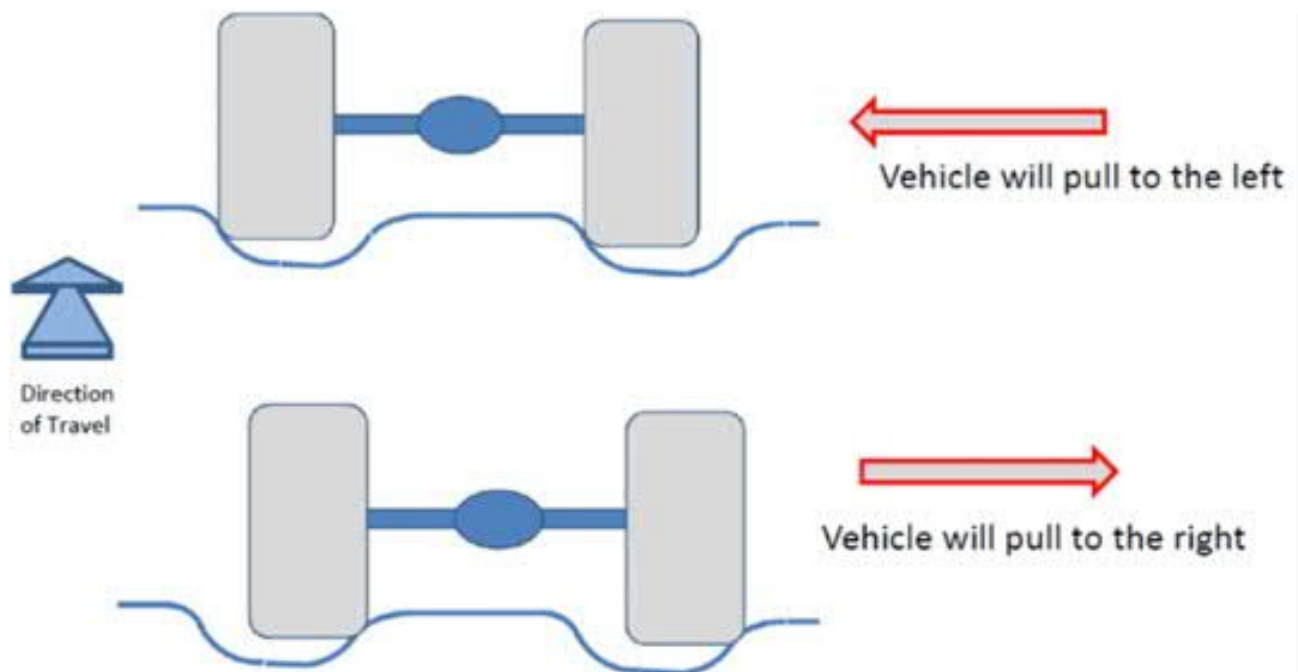
Effect of Road Slope



Trough Wander / Tramlining

Troughs or grooves in the road can pull a vehicle to either side depending on where in the groove the tyre is. The tyres will always want to pull the vehicle up the wall of the trough.

Trough Wander / Tramlining





Further details specifically available for each applicable vehicle model – please refer to GM Service Information Document ID # 5525750 – Collision Repair Position Statements.

Available online at : www.gmtradeparts.com.au