Suspension Jounce Clearance Study and Rear Ground Clearance

**SUSPENSION JOUNCE CLEARANCE STUDY** -- The following is a suspension jounce study guide. It is offered to vehicle modifiers to help them document and qualify suspension and wheel travel clearances and interferences likely to occur under most driving conditions.

Clearances are checked with the axles in the following positions:

**FULL JOUNCE:** The axle assembly is positioned in full metal-to-metal contact with the frame or the metal jounce stop (rubber jounce bumpers are removed.)

**FULL REBOUND:** The axle assembly is allowed to hang freely by the springs alone. Then it is forced ½ inch beyond full shock absorber extension to simulate normal shock absorber bushing distortion. *(Note: The brake hoses should be of sufficient length to prevent stretching of the hose when the suspension is forced to 1.0 inch beyond full shock extension. This is to protect the brake system against the complete loss of a shock absorber.)*

**MODIFIED JOUNCE:** One side of the axle is placed in full metal-to-metal jounce while the other side is held at a ride height that is ¾ inch greater than "design" ride height. Design ride height is the distance between the axle and the frame when the axle is loaded to the Gross Axle Weight Rating.

To facilitate the positioning of the axles in these relatively extreme positions, weight can be added to the chassis and several spring leaves can be replaced with wood, plastic, or fiberglass blocks. This avoids fighting the high spring rates. Removing the torsion in rubber spring systems and exhausting air pressure from air bags are also good methods for those systems.

Include a reasonable assumption for lateral (side-to-side) axle movement in vehicle cornering. Driving the vehicle under various loading conditions, with modeler’s clay placed in critical areas to capture evidence of dynamic clearances or interferences, is recommended. Also, include reasonable assumptions for clearance changes due to rubber suspension bushing deflection and aging.

**Clearance measurements and assumptions should reflect the following requirements:**

• There must be at least ½ inch (13mm) in the body wheelhouse opening, as illustrated on the next page, to facilitate wheel and tire removal.

• Maintain sufficient clearance between components in relative motion to preclude contact that would adversely affect the safe operation, functional performance, and reliability of the vehicle and its systems. Noise (squeak and rattle) should also be given attention.

• Maintain sufficient body clearance above the frame and sufficient space inside the wheelhouse to preclude any occurrence of body contact with the axle and suspension system. Minimal, "friendly" surface contact between the tire tread and the body or wheelhouse is acceptable at the extremes of the suspension travel. Any tire sidewall contact with the body is unacceptable.

**REAR GROUND CLEARANCE** -- The following definitions and guidelines, illustrated on the next page, will be used to qualify body builder designs of rear overhang relative to ground clearance.

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Definitions:

**ANGLE OF DEPARTURE:** Departure angle is an angle between the ground line and a line formed by the two points "A" and "B," as shown below, measured with the vehicle loaded simultaneously to the maximum front and rear GAWR's. Point "B" is any point on the vehicle rearward of the rear most laden tire. The primary departure angle will use the end of the frame, rearmost crossmember, or rear bumper as Point-B. Permanently mounted trailer hitch (non-removable components only) or robust skid bars can increase the protection area.

**VULNERABLE COMPONENTS:** Vulnerable components include any part of the vehicle system that is likely to be damaged if the vehicle contacts the ground and, as a result, adversely affects the operation of the vehicle.

Guidelines:

- Vulnerable components should remain within a “protection area” defined by a minimum ground clearance line, which shall be at least 30 mm above the line defined as the Primary Departure Angle (PDA) and no less than 210 mm above the ground.
- A spare tire, rear entrance step, or other “easily removable part” may extend below the primary departure angle to the limit of a 9 degree departure angle.
- A permanently mounted trailer hitch or skid bars may be used to increase the protection zone for vulnerable components.

![Diagram of definitions and guidelines](image)

**WHEELHOUSE CLEARANCE FOR TIRE REMOVAL**

**REAR OVERHANG GROUND CLEARANCE**

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