



Trucks Must Use Low Gear – But what does it mean?

The two most challenging aspects of heavy vehicle driving are driving on windy narrow roads with sharp bends and going down long steep hills. Often the two aspects occur together. Drivers need to use skill and experience to choose a safe entry speed to a sharp corner or long slope, which will vary depending on the vehicle that is being driven and the load being carried. This situation is stressful and tiring, so I have written this article to hopefully provide guidance about the safe starting speed for long downhill descents. Road Rule 108 states, "If the driver of a truck or bus is driving on a length of road to which a trucks and buses low gear sign applies, the driver must drive the truck or bus in a gear that is low enough to limit the speed of the truck or bus without the use of the primary brake."

This means that the foot brake cannot be legally used when the truck is in the zone to which the sign applies. Why not? The answer is that the rule is trying to force the driver to make full use of the engine retardation, whether it is from the engine alone or from an exhaust brake, engine brake or transmission retarder. The foot brake can be unreliable on a steep long grade because it gets hot and can fade, so it should be treated as a reserve brake on a steep hill.

Making full use of engine retardation requires the engine speed to be kept close to rated RPM all the way down the hill.

Engines can be over-revved moderately under emergency conditions to, say, 120 per cent. The table below shows the engine speed for selected road speeds with an 11R22.5 drive tyre, an RTLO 16913 (13-speed) gearbox box and a 4.33 diff ratio. The formula for calculating the engine speed is given below the table. Whilst drivers don't need to carry a calculator, they do need to know what road speeds apply at near-full engine revs in low gears.

For a 2,100rpm-rated engine with 11R22.5 drive tyres, the selected road speed to comply with Road Rule 108 is a maximum of 20km/h. Most drivers will consider this a crawling speed, but it is the correct speed for most trucks. This speed allows the full engine and engine brake/exhaust brake retardation to be utilised. If the truck has

a powerful transmission retarder then a higher road speed will be okay, because the retarder is more powerful at low engine speeds than an engine brake. So why can't the foot brake be legally used? Drum brakes fade when they are very hot. The brake performance starts to fall off when the brake temperature exceeds about 250°C, and it is substantially reduced above 400°C. The reason for this is that the lining friction falls off at high temperatures and the brake drum expands, which happens even when the brakes are in good adjustment. If the brakes are in poor adjustment, particularly with worn drums, the actuators will run out of push and the driver will say that the brakes failed. Brakes in good condition and adjustment will probably allow the speed to be controlled, but brakes in poor

	Tyre 11R22.5 (315 turns/km)	Diff & Gear ratios
Road Speed = 15	2080	Diff = 4.33 Gear ratio = 6.1 (3 rd)
Road Speed = 20	2000	Diff = 4.33 Gear ratio = 4.4 (4 th)
Road Speed = 30	1569	Diff = 4.33 Gear ratio = 2.3 (6 th)
Road Speed = 40	1459	Diff = 4.33 Gear ratio = 1.6 (8 th)
Road Speed = 60	1637	Diff = 4.33 Gear ratio = 1.2 (10 th)
Engine speed (RPM) = Road speed x Diff ratio x Gear ratio x Tyre revs/km / 60		

adjustment will probably not. The foot brake is the brake of last resort. My rule of thumb is that very hot drum brakes in good adjustment will have reduced performance to the 75 per cent level, and brakes in poor adjustment will have reduced performance to the 25 per cent level. Australian Design Rule (ADR) 35 on brakes has deceleration standards that are about half for hot brakes compared to cold brakes. Disc brakes have only minor fade vulnerability. The problem with disc brakes is making them robust enough to cope with extreme brake applications. Disc brakes also should not be used on long hill descents.

Drivers will often not know that the drum brakes are about to fade. I am often asked whether a prudent driver should have known that the brakes were in poor condition. It is expecting too much for a driver to inspect the brakes or adjust the brakes at the start of the day. It is generally unsafe for a driver to get underneath a truck and look at the brakes – this is the workshop's job. Drivers should always do a sharp brake stop at low speed at the start of the journey to get a feel for the brake performance. If the truck has a trailer handpiece then the trailer brakes should be checked independently. A prudent driver will also monitor the brake performance when travelling in stop-start traffic. If the brake pedal push becomes noticeably harder after multiple traffic light stops then the chances are that the brakes need to be adjusted. Danger bells should ring. Despite these prudent checks, a driver will often be surprised when brake fade occurs. It seems to occur without prior warning. Therefore, it is sensible to assume that the foot brake will be inadequate on



a long downhill run. It is essential to get the starting speed right even if this means a long line of cars behind the truck. Trying to change gears halfway down the hill is a no-no, because the most likely result is to end up in neutral with no engine retardation at all.

I consider that brake condition is graduated into four conditions:

- Excellent – linings and drums have minor wear and adjustment is tight.
- Satisfactory – modest wear with good adjustment.
- Degraded – moderate wear to linings and drums with adjustment needed and minor over-stroking exists. Performance is degraded but adequate under most conditions.
- Poor – substantial wear to linings and drums and poor adjustment. Significant over-stroking is occurring and performance is unacceptable when cold and deplorable when hot.

When drum brakes are very hot, the ranking goes down one level. If the

condition is Degraded or Poor then the brakes need immediate repair.

So to answer the question I posed on what using a low gear actually means, I'd say it means to travel at 20km/h in most cases.

Google Maps now provides drivers and operators with a great resource for checking out the dangerous sections of a route before travelling along it, and it is also a useful resource for meetings where drivers can discuss the difficulties they experience on particular routes. If the logistical difficulties of face-to-face meetings are too difficult, then I suggest starting an online driver chat room and appointing a leader to oversee the process. Drivers do need to discuss particular problems they experience when driving and share their experiences, so a chat room is a sensible idea.

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