

Cardan Shaft (Transmission) Park Brake



You may have seen some of the recent publicity about Cardan Shaft Park Brakes in the form of safety alerts from both Worksafe and the Transport Agency and wondered what it is all about.

As you can see from the photo a Cardan Shaft Park Brake (CSB), also known as a transmission or driveshaft brake, is a brake mounted on the end of the gearbox between the gearbox and the drive shaft. It does not act directly on the wheels but, when applied, stops the drive shaft from turning and acts as a brake on the wheels through the diff. A CSB is cable operated from the park brake lever and can be either a disc or drum brake but most commonly drum.

There have been a number of runaways of parked vehicles with these brakes with catastrophic results, even causing deaths where the operator or bystander has been killed.

Due to the mounting concern about these park brake systems Waka Kotahi, the Transport Agency carried out a roadside testing programme with the CVST at their Paramatta weigh station north of Porirua. Ninety vehicles equipped with CSB were randomly chosen and tested over a two-week period. After being subjected to a stall test as required by CoF to confirm that they met the minimum standard required by the Agency each vehicle had its park brake applied and a pull load was applied through a load cell to check that the vehicles met what was the equivalent of being fully laden on a 1 in 5 (20%) slope. This test was completed in both directions. Drivers were also questioned about their knowledge and understanding of CSB and their understanding of the advantages and limitations of the system and a brief summary of results is detailed below:

Operator knowledge:

- 2/3 of drivers were unaware of the type of park brake fitted to the vehicle they were driving
- Over 2/3 of drivers had no knowledge or understanding of CSB
- 2/3 of drivers were unaware that CSB should not be applied when the vehicle is moving
- Almost 80% of drivers were unaware of when the most recent park brake servicing had occurred
- Over 70% of drivers had had park brake issues, including roll-aways, with the vehicles they were driving

The park brake:

- Almost 8% of vehicles could not be effectively stall tested as they had automatic or automated manual transmissions.
- Of the remainder 80% passed the stall test
- 72% of vehicles passed the pull test in the forward direction [downhill] although one vehicle was so lightly loaded it started to skid.
- 79% of vehicles passed the pull test in the rearward direction [uphill]
- Only 2/3 of vehicles held in both directions
- Probably due to lack of maintenance, most vehicles required more than the recommended maximum force to be used on the park brake lever to get the brake to work, in some cases up to a 50kg pull, not something that can be done easy from the driver's normal driving position.

While it is true that, if properly maintained to the manufacturers' specifications, a CSB is likely to hold the parked vehicle stationary if used correctly, as designed, this type of brake, in service, reacts differently to brakes that act directly on the wheels and the following precautions should be followed;

- A CSB is a park brake – not a hand brake.
- Don't use a CSB park brake for stopping. These brakes are not designed to be part of the foundation braking system and, if used while the vehicle is moving, can damage the driveline, the brake or both.
- A CSB is not an Emergency Brake. If the CSB park brake is used as an emergency brake it can result in catastrophic failure of the driveline and subsequent loss of control.
- The park brake must be fully released before moving away from a stop. Engine power will quickly overcome a partially applied park brake and it will wear out making it ineffective for later use as well as being very wasteful of fuel.
- These brakes are very sensitive to changes in load and the brake should be fully applied before adding load even if this requires more than the normal pull you would expect to apply to the park brake.
- When parking on a slope always ensure the front wheels are turned into the kerb if facing downhill or away from the kerb if facing uphill so, in the event of a runaway, the vehicle will run into the kerb.
- Ensure the vehicle is left in first or reverse (depending on direction) or, if an automatic or automated manual, in park.
- Chocks must be sized correctly to be effective
- Use of chocks may mask a faulty or poorly applied park brake and should not be removed unless someone is in the driver's seat with the service brake applied, especially when being used on a slope.
- Care must be taken when parking in an area where the braked wheels will be on dissimilar surfaces such as where one side of the vehicle is on grass or gravel while the other is on seal as if the wheel on gravel or grass starts to skid the other will rotate allowing the vehicle to run away. This is due to the fact that the park brake does not act directly on the wheels but through the differential and the differential allows the wheels to rotate independently.
- If you must jack up the braked axle you must use chocks as the park brake will no longer be effective as soon as one wheel loses contact with the ground.
- Similarly, if, in the event of a breakdown, the diff head, an axle or the driveshaft is removed to allow the vehicle to be towed, then the CSB is no longer connected and cannot work
- If you are towing any trailer it must have its own independent park brake. The CSB on the towing vehicle is not designed to support the unbraked weight of any laden trailer when parked.

In light of these results and the issues with these types of park brake in service, Waka Kotahi, the Transport Agency, has made changes to the CoF test for Cardan shaft park brakes. From 1. December 2022 the stall test will no longer be used for testing CS park brakes except in special circumstances and they will be tested on the RBM in a similar manner to the service brake with the vehicle laden to at least 65% of the rated axle weight per axle. The test procedure is outlined in the new version of the HV Brake Protocol due to come into force on 1. December 2022.