I-CAR NEW ZEALAND

TECHNICAL REPORT

Roadwheels - A Potential for Disaster

Asking this question over the past couple of years, it appears that many NZ collision repair facilities have at one time or another been faced with the embarrassment of a wheel becoming loose or even worse falling off after returning the vehicle to the customer following a repair. Although this is not an everyday occurrence, it is more common that you might think, wheels falling off cars and trucks when they are traveling at high speeds can lead to devastating results. There are some special considerations that should be taken when removing and replacing vehicle road wheels.

Who is at fault if a wheel falls off?

Usually the cause is a failure to tighten the lug nuts securely on the wheel assembly. When a wheel is taken off a vehicle and put back on there is a standard star pattern procedure for tightening the lug nuts. There are also standard torque pressures that have to be used. However, on some occasions wheels are not put back on correctly and the results can be disastrous. Too little or too much torque can cause a wheel to come off. The following media release highlights the result for one NZ company.

Truck Repair Company fined after loose wheel kills tourist
Media Release 11 April 2011

A Pukekohe based company has today been fined $5,000 and ordered to pay reparations of $68,582 after a man was killed in an accident on Auckland's southern motorway on 14 January 2010.

At the time of the accident a truck, recently serviced by the company, was travelling south on the motorway when its outer and inner left back wheels came off. One of the wheels bounced across the motorway into the oncoming lanes before smashing through the windscreen of a bus travelling north. The passenger sitting in the front seat of the bus was hit in the head and was taken to hospital but later died from his injuries.

The company ***had removed the left rear wheels while fixing the guard just days before*** the accident. The Department of Labour investigation found the employee who worked on the vehicle had no formal motor mechanic qualifications and failed to tighten the wheel nuts properly after fixing the guard.

"The saddest thing is that the accident could very easily have been prevented. The company should have had formal written procedures in place to let customers know their truck wheels had been removed and refitted and should have reminded them to have the wheel nuts checked before it had travelled the next 150 kilometres. This very basic step could have saved a life,"

"Employers and people in control of workplaces must realise that they have a responsibility to take

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all practicable steps to make sure that the actions or inactions of their employees don't cause harm. "In this instance it would have meant having a formal written check list in place, ensuring appropriate sign off procedures were in place, regularly supervising their employee's work and ensuring that equipment used was in good working order."

How too much torque can cause a wheel failure:

If a pneumatic wrench is used to tighten a lug nut on the stud and the setting is too high, or too much torque from a torque wrench is applied, this can cause the stud to be stretched. When the vehicle is driven in certain conditions the stud expands and contracts. If the stud is stretched under too much torque, the metal begins to weaken and the stud can snap. When one stud snaps the remaining studs then become loaded unevenly and can begin to fail causing the wheel to fall off the vehicle. The use of lubricants and anti-sizing compounds on the threads of the wheels studs or lug nuts can cause an even higher degree of over-torqueing. Fig 1

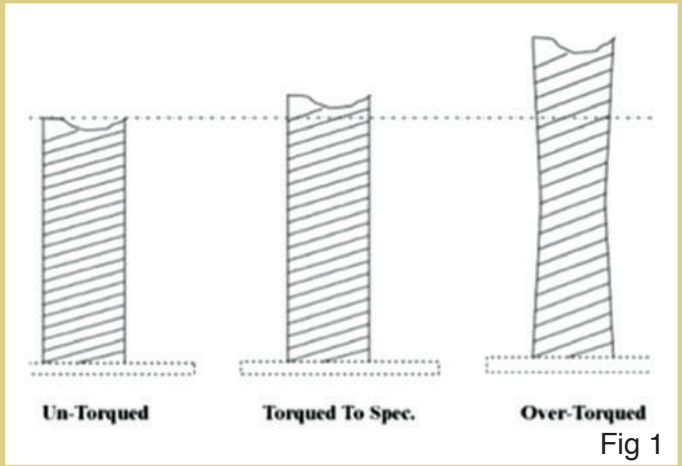

Fig 1

How too little torque can cause a wheel to fall off:

If too little torque is applied to each lug nut the wheel will not be held in place correctly. If there is even a little movement, as the vehicle proceeds down the road it can continue to work itself loose. When this happens the wheel working backwards and forward against the posts can weaken the posts and snap one off. Once one post fails the others are subjected to more torque and soon the entire wheel will fall off.

Fig 2

Paint thickness on mating surfaces:

Another common cause of wheels coming off is too much paint thickness on the wheels or hubs mating surfaces. If the paint on these surfaces is too thick the joint will most likely fail even if torqued up correctly, as the paint will melt or burn off when the hubs or drums get hot from heavy braking, this then allows the wheel nuts to loosen. Paint thickness defects are most often caused by repainting the chassis, axle and wheels when refurbishing the vehicle. (A good rule to prevent this happening is to mask the mating surfaces so they remain unpainted.) Shown in Fig 2

Signs of Wheel Failure:

Unfortunately the most common sign that the lug nuts are not tightened properly is the wheel coming off the vehicle. There are usually some shakes and vibrations but at high speeds there are only seconds from when these may be noticed until complete

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wheel failure. On rough pavement or in noisy conditions a driver may be completely unaware that the wheel is falling off.

The following are just a few incidents where a wheel coming off has resulted in death, injury or good luck:

A man suffered chest injuries when two giant rear wheels from a truck and trailer unit came off and smashed into his car. The 57-year-old Te Puke man was injured in the accident on State Highway 2 in the Bay of Plenty.

Australian police have praised a bus driver who managed to keep a bus carrying 80 school children on the road after its back wheels came off in the New South Wales Hunter region.
It is estimated that runaway wheels kill 8-10 people and injure many more each year in the UK.

Investigators say the wheel came off a pickup truck then bounced across the westbound lanes and into the eastbound lanes, striking the SUV. The driver had to be cut out of the vehicle after the wheel hit his roof; he was taken to the hospital with non-life threatening injuries.

A woman was killed today when her car was hit by a tire that fell off another vehicle. She was driving northbound when the tire came flying across the median and right at her. The extensive damage to the victim's white Nissan is shown in Fig 3.


Fig 3

Preventing this happening:

Prevention of the wrong or lost clamping force is to have the wheel nuts re-torqued after a short driving distance. Although wheel separations are rare, they should be entirely preventable with re-torqueing. When installing new wheels you should re-torque the wheel lugs after driving the first 50 to 100 kilometres in case the clamping loads have changed following the initial installation. This is necessary due to the possibility of metal compression / elongation or thermal stresses affecting the wheels as they are breaking in, as well as to verify the accuracy of the original installation. When rechecking torque value, wait for the wheels to cool to ambient temperature (never torque a hot wheel). Loosen and retighten to value, in sequence. Simply repeat the same torque procedure shown in Fig 4.

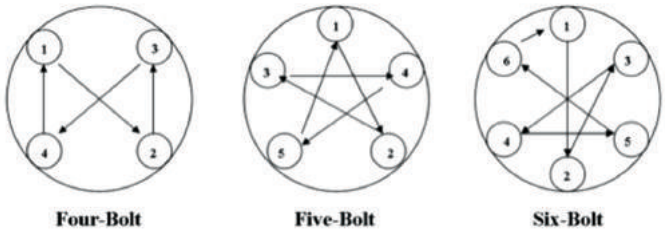

Fig 4

Wheel lug torque specifications are for clean threads that are free of dirt, grit, etc. If applying an anti-seize lubricant, it is important to note it can be applied only on the threads of nuts or bolts.
The lubricant must not be used on either the hub or wheel mating surfaces.

You can get the correct torque setting from your dealership or just enter your request on-line as there are plenty of sites giving this information.