
Winter Stud Tyre Test Report

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Introduction

This report has been compiled and written by the Mt Hotham Road Patrol operator and has been produced due to the increasing interest generated from the Winter Tyre Test Report of 2015. To fully appreciate this report the reader should avail themselves a copy of the 2015 Winter Tyre test report, this would provide a valuable insight and understanding of the conditions and issues experienced on the roads in the alpine regions of Australia during the winter months. While this report is titled Winter Stud Tyre Test Report it will cover some of the pertinent information from the previous report (Winter Tyre Test Report, 2015). The information provided in this document has been compiled from observations, extensive experimentation and testing conducted along the Great Alpine Road at Mount Hotham by the Mt Hotham Road Patrol during the winter months, over a period of 17 years.

The Mt Hotham Road Patrol began operation in 2001 to service the high number of motorists having difficulty on the Great Alpine Road due to the severe winter road conditions experienced. The Road Patrol provides a free 24/7 service to all distressed travellers on the Great Alpine Road during the winter months.

In providing this service the Road Patrol has travelled in excess of 221,000 km's in all types of weather conditions and on all types of winter road surfaces. Information and knowledge has also been gained from over 370 serious vehicle incidents and many more minor vehicle incidents experienced along the Great Alpine Road. Extensive research from Australian and especially overseas documentation has provided great insight into other countries' solutions and legal requirements to help prevent vehicle incidents and issues on ice and snow covered roads.

While practical terminology will be used throughout the report, technical terminology may be used but will be kept to a minimum. It should also be noted that if any vehicle name or model appears in this report it is not to be regarded as an endorsement or a criticism of that vehicle.

The testing of the winter stud tyres in this report was conducted during the 2016-17 snow seasons with the tyres being fitted to a 2006 Toyota Landcruiser 6 cyl 4.2 turbo Diesel, approximate weight 3000 kg. The tyres tested in this report are Nokian Hakkapeliitta LT2, Stud Tyre size 265/75/16.

The method of testing was in the nature of general driving that would be experienced by all motorists and in the everyday operational duties of the Road Patrol service. This would include but not be limited to, traction testing around corners, braking, moving off on uphill sections of the road, traversing soft snow and towing loads in ascending and descending situations.

While this report is written with the experienced alpine driver in mind, it could be a valuable resource for new drivers' planning to drive in the alpine regions of Australia during the winter months.

Victorian Alpine Roads

Mount Hotham

The Great Alpine Road between Harrietville and Omeo traverses some of the state's most picturesque alpine scenery and nestled between Harrietville and Omeo is the alpine resort villages of Mt Hotham and Dinner Plain, both of which are extremely popular tourist destinations especially during the winter months when the road is often covered with snow and ice.

This section of road is fully sealed and passes through the Mt Hotham Village and Dinner Plain; the road rises to an altitude of 1,840 metres and is subjected to considerable snowfalls, blizzards and high winds. This section of the Great Alpine Road also regularly experiences the formation of Black Ice. Black Ice is formed by a thin layer of water freezing on the surface of the road and has the appearance of a wet road.



Black Ice.

The road has numerous sharp corners and steep hills that can be covered with many different types of snow and ice at any time of the day and night. The extreme weather conditions can and do sometimes result in the road being closed between Harrietville and Omeo due to heavy snow and other safety concerns by authorities and while this may be inconvenient for some motorists it is safer for all.

In today's market a variety of motor vehicles are used by tourists, travellers, skiers and workers and while the road is utilized all year round it is the winter months that causes most of the safety concerns. In recent years there has been a considerable increase in the All-Wheel Drive (AWD) and Four-Wheel Drive (4WD) vehicles frequenting the alpine regions but unfortunately they are also the most common vehicles involved in vehicle incidents on the road during the winter months.

The Vehicles

Vehicle manufactures are offering more sophisticated AWD and 4WD systems than ever and the advancements in this area are in many ways good news for car buyers looking for off-road vehicle capabilities. There can also be a lot of confusion, especially with the growing number of different operating technologies utilised across dozens of manufacturers. For many years too much emphasis and reliance has been placed on the type of drive system the vehicle employs by the retailers, advertisers and to some extent the end user, but the one issue that never seems to be addressed is the importance of traction with the road surface.

In order for an AWD or a 4WD system to work as the vehicle manufacture designed it to it must have or the capability to have all four wheels near equal traction with the road surface. No matter what type of drive system the vehicle employs if the vehicle lacks traction with the road surface in icy conditions the vehicle is nothing more than a big expensive sled.

It should also be noted that most of the AWD and 4WD vehicles on the road today are of an overseas origin and therefore designed for an overseas market. It is assumed by the manufacture that the people buying their vehicles to be driven in alpine conditions will be experienced enough to understand the requirements to drive on snow and ice covered roads and to abide by the laws of that country. However the vehicles are often exported to countries all around the world, including primarily dry countries like Australia where alpine driving is not widely appreciated.

In Australia most retailers and sales personnel have little knowledge or experience of driving in snow and icy conditions and therefore fail to pass on pertinent information to the purchaser, even to the extent of giving the buyer incorrect information. Not many motorists read or understand the driver's manual that is supplied with the vehicle and sometimes the information the sales personnel have told the motorist is in contravention to the manual. This often leads to the motorist believing that they know all they need to know for a safe and care free journey to the snow. But this leads to complacency and this is when the journey can come to grief.

Most overseas manufactures of AWD and 4WD vehicles recommend the fitting of snow tyres during the winter months and assume motorists will comply with the information provided in their drivers' manual. In many countries that experience snow it is mandatory by law that snow tyres are fitted to all vehicles for the duration of the winter period and heavy penalties apply for non-compliance.

In overseas countries that experience snow the vehicle and tyre manufactures have invested billions of dollars in research, development and testing. The vehicles have a multitude of different buttons, knobs and sensors to assist with traction control to keep the vehicle operational and the occupants safe on the road but the vehicle manufactures also know the great importance of traction with the road surface in such conditions for the systems to work as designed and therefore presume that tyres suitable for the conditions have been fitted to the vehicle.

Highway Tyres

The modern highway tyres available in Australia are designed and manufactured to be used specifically on Australian dry or wet paved roads to improve handling, fuel economy, safety and comfort. This type of tyre is made of a hardwearing rubber compound that is designed to withstand the higher temperatures experienced on Australian roads, while improving the durability and longevity of the tyre. The highway tyre is the most common type of tyre fitted to vehicles and this includes most AWD and 4WD vehicles sold in Australia today.

The majority of AWD and 4WD vehicles on the road today are driven on suburban roads and are rarely driven in snow or off road conditions therefore mostly standard highway tyres are fitted. Highway tyres service the vehicle and its occupants extremely well, after all that is what they are designed for.

However if an AWD or 4WD vehicle fitted with highway tyres is required to travel in snow and icy conditions the tyre's traction and safety capabilities can be severely limited and this will contribute to poor vehicle handling and/or possible loss of control. The rubber compound used in this type of tyre when below 10 degrees can become hard and works poorly at providing traction with the road surface. It also lacks ample cross grooves or adequate siping and this in turn compromises the tyres ability to perform well in frigid conditions or retain traction on a snow or ice covered road resulting in the vehicle becoming incapacitated on the road, blocking traffic or failing to be able to stop when required.



The photographs on page 5 are of four different AWD and 4WD vehicles fitted with road worthy highway tyres. Three of the four vehicles were involved in road incidents requiring the vehicles to be towed from the Mountain the other one was parked in a mountain car park. All four vehicles had less than suitable tyres for snow and ice conditions and none of the above vehicles were at the time, by law required to fit wheel chains. To help overcome the lack of traction issue, drivers are instructed to fit wheel chains by the Authorities. This decision is categorised by the type of drive system the vehicle employs and not the traction capabilities the tyres.



To exacerbate the situation, advertising and marketing companies promote AWD and 4WD vehicles driving on snow covered roads or across snow covered plains doing all kinds of vehicle manoeuvres without any issues. This has a tendency to portray to the onlooker that the vehicle in question is invincible in snow and ice conditions and is the safest and most dependable vehicle that they can purchase. This is more or less true but what is not made obvious or highlighted to the onlooker is that with the exception that the driver is an extremely experienced snow driver the vehicle is most likely fitted with good quality winter tyres.

This can be an honest oversight by advertisers in Australia, as most of the vehicle advertisements are filmed and produced overseas and are presumably licensed to be used worldwide. After all it is not the advertisers' responsibility to know if the product they promote works or not. Unfortunately the consequences of this oversight and the drivers' belief that they have all the necessary skills and equipment to drive on snow and ice covered roads can lead to catastrophic outcomes for the driver and other road users.



Wheel Chains

Wheel Chains or Snow Chains are traction devices that are fitted to the drive wheels of vehicles that are required to traverse over snow covered roads. Wheel Chains or similar types of traction methods have been used on vehicles for well over 100 years and have had many changes in design in that time but the principle has remained the same, to provide traction to rubber tyres in slippery icy conditions.

It should also be noted that when wheel chains first came on to the market place, vehicles of the day had less torque, less horsepower, narrow wheels and a majority of roads were still greatly unpaved and chains therefore gained traction from the compacted snow as well as the surface of the road.

In order for wheel chains to work effectively the chain links must penetrate in to a compacted surface that has enough integrity to prevent the wheels from spinning when power is applied to the drive wheels of the vehicle. This is much the same principle as a Bulldozer cleat on dirt but unlike a Bulldozer track with cleats that spreads the weights of the machine over a wide area a wheel fitted with a chain will have a tendency to spin in soft, loose or deep snow, digging a hole rendering the vehicle bogged.

In the past the best and sometimes the only alternative to improve vehicle traction on snow covered roads in Australia was the fitting of wheel chains but they have not been without their issues. Wheel chains are generally only fitted to the front or rear drive wheels of a vehicle and while this will provide drive to a vehicle, it will do little to improve the handling of the vehicle. It should also be highlighted that wheel chain performance is greatly improved if fitted to a winter tyre as is the custom in overseas countries that experience heavy snow. This allows the wheel chain to assist the tyre if needed as opposed to the wheel chain being fitted to a highway tyre and the chain being relied on to supply the only form of traction.

Good quality Wheel Chains should be constructed from high quality steel and in a diamond pattern configuration across the entire tread width of the tyre. Wheel chains provide traction by being fitted around the tyre of the drive wheels of a vehicle to act as an aggressive tread that is able to gain leverage in compacted snow and ice and be able to clear itself of snow as the wheel turns.

It also needs to be appreciated that as mentioned, the vehicles in the past had less torque, less horsepower compared to the vehicles on the road today. Modern vehicles have a lot more torque, horsepower and are heavier and this in turn places a lot more stress on the wheel chains and this can contribute to the chains breaking, damage to vehicles and vehicles being left incapacitated on the road waiting for assistance.

In Australia due to the lack of regulations and official standards a multitude of inferior and inappropriate products are on the market and these products can and do cause problems for motorists. Wheel chains should only be purchased or hired from a reputable dealer that expertly fits and demonstrates fitting to the vehicle in question and always consult the drivers' manual in regard to correct wheel size and correct wheels to be fitted with chains.



The above photos are of a traction device removed from a vehicle in 2017 at Mt Hotham. This is a device that is currently being advertised on the internet and is nothing more than a plastic cable tie with knobs on it to serve as cleats. It is fitted to the wheel by placing each one through the wheel and pulling it tight. This product is not suitable for Australian alpine conditions or legal under Victorian regulations and must not be used.



The above photos are of traction device called the Snow Glove or another name for a similar product is Snow Sock. These items fit over the drive wheels of the vehicle a little like fitting a shower cap. The product in the left photo was tested in the past at Mt Hotham under Vic Roads regulations. It was made from a cloth based material and began to disintegrate after approximately 4km of normal road travel.

Buyer beware there are more unsuitable, inappropriate, poor quality and just plain dangerous traction devices on the market than there are good quality traction devices, if unsure consult your preferred ski resort for advice.

Most countries that experience snow use wheel chains in one form or another but most of these countries have extremely stringent regulations on the use of winter tyres. It is mandatory that all vehicles travelling on snow covered roads or in certain areas must have approved winter tyres fitted and these vehicles may still be required to fit chains by law.

In order for wheel chains to work effectively they must rely on the tread and rubber compound of the tyre to provide a certain amount of grip and traction with the road this helps prevent the wheel from spinning within certain the chain. It should also be noted that wheel chains are fitted to assist the tyre to maintain traction and are not designed to provide the only source of traction for the wheel

Wheel chains do not work efficiently on standard Australian highway tyres and if fitted to highway tyres the wheels have a predisposition to over-spin when acceleration is applied. This can cause vehicle loss of control and contributes to the destruction of the road surface and if the road is covered with compacted snow excessive wheel spin will churn the snow up to the point that the road surface will resemble deep beach sand. In this situation vehicle travel is made difficult and vehicles can break wheel chains and end up incapacitated in the middle of the road blocking traffic.



The above photo is of deep compacted snow churned up by excessive wheel spin on an uphill section of the road.

Black ice can also contribute to vehicle issues when wheel chains are fitted. Vehicles in this situation can experience excessive wheel spin particularly when travelling uphill or moving off from a stopped position. This is due to the ice being too thin to offer any resistance for the chain to gain purchase and combined with the vehicle's weight with increased acceleration the wheels will spin and sparks can fly from the steel chains and then the chain can break and this can happen within seconds depending on the drivers experience or inexperience. Black ice also has a tendency to make braking difficult and wheel chains may contribute to the problem if the driver over estimates the chain capabilities to provide traction. Steel chain on frozen asphalt can slide; this is dependent on the speed and weight of the vehicle and driver experience.

The modern vehicles of today are often designed with many different types of sensory systems to aid in the control and handling of the vehicle, often known as a traction control system. But for the traction control system of a vehicle to work as designed, the vehicle's all four wheels must have the capabilities to achieve an equal amount of traction with the road surface. This can be problematical if the vehicle has little chance of obtaining traction which is often the case if fitted with highway tyres or if wheel chains are fitted to one set of drive wheels only. Without a certain amount of traction with the road surface these systems can be rendered useless and sometimes dangerous.

Wheel chains can also contribute to vehicles with traction control systems to have operational issues due to the differential between the chained wheels circumference and the unchained wheels. The chained wheels circumference is increased and this has a tendency to confuse the traction control system and this in turn can become detrimental to the handling of the vehicle. Many drivers have reported that they had no control of their vehicle just prior to colliding with a solid object. Some owner's manuals state that traction control systems should be turned off when wheel chains are fitted.


Winter Tyres

Winter Tyres (also known as Snow Tyres) have deeper tread patterns specifically designed to compact and grip on to snow to provide traction. Winter tyres are made from a softer rubber compound compared to other types of tyres on the market. This allows the winter tyre to retain flexibility in cold conditions and in conjunction with the many small serrated grooves known as sipes and sipe activators provide extra traction in snow and icy conditions compared to Highway and All Terrain tyres commonly fitted to vehicles today. The wider sipe activators located on the side of the tyre assists in opening the narrower ones thus providing traction with the snow.



Winter Tyre


In Australia Winter or Snow tyres are relatively unheard of and most AWD and 4WD vehicles travelling to the snow are fitted with standard highway tyres or in regard to 4WD vehicles some may have large lug type tyres fitted but they too can be problematic in snow and ice conditions.


Winter tyres are identified by M+S and  symbol on the side wall of the tyre however winter tyres are often confused with All Terrain M+S (Mud & Snow) tyres however there is a considerable difference between the two.

Winter tyres are designed and manufactured specifically for snow and ice and can provide enhanced braking performance in snow and icy conditions compared to other types of tyres. They perform well in all types of winter conditions including snow, ice, sleet, slush, wet and cold dry roads as well as roads covered with loose snow churned up by vehicles fitted with snow chains. The tread reduces snow build up and most drivers' experience an improved vehicle control and handling due to the aggressive tread and softer rubber compound used to manufacture the winter tyre, wheel chains also work more effectively when fitted to the winter tyres.

However while snow tyres are an excellent option for winter snow driving they should be removed from the vehicle at the end of each winter and replaced with suitable summer tyres. If stored correctly they can be refitted to the vehicle at the start of the following winter and the motorist should be able to achieve a good few winter seasons from a set of good quality winter tyres.



In overseas countries the introduction of a legal marking related to the performance of the snow tyre has made the identification of winter tyres simpler. The "Alpine" symbol,  or the three-peak-mountain with snowflake ('3PMSF') came into force in November 2012 under EU Regulation 661/2009 on the Safety of Motor Vehicles. The 3PMSF can only be used if a tyre passes a minimum required performance on snow - the so called "snow grip index".

"Mud and Snow" (either marked as M+S, M.S or M&S) has been used to indicate winter tyres for many years. Although M+S has a legal definition, it is not related to minimum performance requirements but has been widely used by tyre manufacturers to indicate winter products. M+S remains a permitted marking but while M+S tyre have better snow traction than regular tires, they do not necessarily pass the legal snow grip threshold. True winter tyres carry both M+S and  3PMSF markings.

Studded Winter Tyres

While the winter tyre provides excellent handling and control of the vehicle compared to other types of tyres used on winter roads, the studded tyre provides improved vehicle control, braking and handling in icy conditions.

The studded winter tyre is designed to provide improved traction on hard compacted or glazed icy roads by the studs penetrating in to the hard ice while the tyre itself provides traction from the loose ice and snow on the surface of the road. Contrary to popular belief the studs do not resemble spikes or the studs found on a dog collar but are small little metal protrusions that protrude outwards from the tyre surface. The stud housing is imbedded in the tyre and the stud protrudes out of the housing approximately the thickness of a five cent coin. This enables the tyre tread to provide maximum traction with loose snow and ice on the surface of the road while the studs penetrate in to any hard compacted ice on the road surface to greater improve the tyre's traction capability.

Another characteristic of the studded winter tyre is the minimal stud length, the tyre's rubber compound and tread design. When black ice is experienced the studs penetrate the thin layer of ice just enough to provide traction while allowing the tyre tread to maintain contact with the surface of the road allowing the tyre to provide maximum traction with the road without any excessive wheel spinning that can cause detrimental damage to the road surface.

Wheel chains when fitted in a black ice situation prevent the tread of the tyre making adequate contact with the road surface thus the vehicle is relying just on the steel chain to provide traction for the vehicle and this contributes to wheel spin and slippage.



The photo on the left is of a winter studded tyre after its second season of operation and the photo on the right is of an actual stud. The section of the stud above the yellow line is what protrudes from the tyre surface to make contact with the surface of the road. The section of the stud below the yellow line is imbedded in to the tyre.



Winter Road Trial

The Road

The section of road the trial was conducted on is fully sealed and traverses through Mt Hotham and Dinner Plain, it rises to an altitude of 1,845 metres and is subjected to considerable snowfalls, blizzards and high winds. The Great Alpine road is also regularly subjected to the formation of Black Ice due to the snow melting and leaving a thin layer of water on the road surface and then re-freezing. The road has numerous sharp corners and steep hills that can be covered with different types of snow and ice at any time of the day and night. Extreme weather conditions and visibility issues can sometimes result in the road being closed between Harrietville and Omeo for safety reasons. The surface of the road can differ greatly and this may include varying degrees of ice and snow cover, slush, dry, frozen and wet and often all during the same day.

The Trial Vehicle

As mentioned in the introduction of this report the vehicle used for testing was a 2006 Toyota 4WD Landcruiser 6 cyl 4.2 turbo diesel steel tray utility. The approximate weight of this vehicle is 3000 kg with tools and equipment and the tyres fitted and tested in this report are Nokian Hakkapeliitta LT2 (Studded).



The Trial

The studded winter tyre trial has been conducted on The Great Alpine Road between Harrietville and Omeo during the winter snow seasons of 2016 and 2017, over a combined period of 23 weeks. The trial and assessments have been made from observations, investigations and experimentations and has been conducted during normal road patrol operational procedures.

Due to the weather conditions and traffic flow it is imperative that all road patrol issues are conducted quickly, efficiently and safely, with minimal disruption to the public and other road users. The road patrol vehicle is required to travel quickly and safely to the scene of vehicle incidents and for this to be achieved it is essential that the Road Patrol vehicle has the maximum possible traction with the surface of the road at all times.

Please Note: It is assumed that all motorists will be driving to the requirements of the law or the conditions, whichever is the safer. However certain parameters, with authorisation, have been exceeded when safe to do so for the benefit of this trial and under no circumstance should any member of the public attempt any type of driving procedure outside the requirements of the law or conditions. Also for the benefit of this trial it should be assumed that all roads are covered with snow and ice unless mentioned to the contrary.

Flat Road Test

Driving on flat sections of road with fresh snow depths of approximately 25 to 100 mm the vehicle fitted with the previously mentioned winter tyres has a remarkable holding ability. The vehicle tracks extremely well in a straight line and the rear of the vehicle has minimal to no indication of slippage when power is applied via the accelerator whilst the vehicle is in 2WD drive mode.

Cornering to the road conditions is accomplished with ease with no rear end slippage or loss of control detected. Hard rapid acceleration was applied and minimal rear end slippage outwards was detected without any loss of control of the vehicle and once the acceleration was eased off the slippage ceased.

When the vehicle was placed in 4WD mode and the same test applied to the vehicle, it performed without any slippage at all.

In 2WD mode when travelling at 60 km/h, the brake was applied at an even constant pressure; the vehicle draws to a stop without any slippage.

Travelling in the same scenario but this time applying the brake hard and fast the vehicle begins to slide but comes to a halt rapidly. At no time did the vehicle gain speed by sliding on ice or feel out of control which is often the outcome with a comparable vehicle fitted with highway tyres or wheel chains if fitted to the front wheels.

In the 4WD mode when travelling at 60 km/h, the brake was applied at an even constant pressure and the vehicle draws to a stop without any slippage.

Travelling in 4WD mode and applying the brake hard and fast the vehicle draws to a stop without any slippage at all. In fact when the vehicle speed was increased to 75kmh in this situation the vehicle still failed to slide. However in a black ice situation with no snow on the road surface at all, the vehicle did experience a small amount of slippage of approximately less than 1.0 meter but at no time did the vehicle feel out of control.

During this trial numerous skid tests were conducted on varying road surfaces under varying snow conditions including smooth glazed ice and black ice situations. A skid test is conducted by travelling at near the legal speed limit and applying the foot brake rapidly when safe to do so to encourage the vehicle to slide. A skid is normally achieved quite effortlessly but using the Nokian Winter Stud Tyres it was quite difficult to achieve any form of slide or skid. This is a similar result achieved when the Nokian Hakkapeliitta LT2 Non-Stud tyre was tested during 2015 under similar conditions.

Up Hill Test

The uphill test was conducted on varying road surfaces due to the different types of road conditions experienced it included black ice, smooth thick ice, fresh snow and deep snow churned up by vehicles fitted with wheel chains.

Driving up hill in 2WD mode was exceedingly improved compared to standard highway tyres and a mark improvement over standard All Terrain tyres.

When acceleration was applied the rear wheels experienced no excessive wheel spin and traction and control was not lost to the point to cause a concern. When rapid acceleration was applied a small amount of wheel spin was detected but ceased at soon as acceleration was eased off and traction was regained. The test vehicle was able to conduct this test regularly with little change to the outcome each time.

When the 4WD mode was engaged the vehicles steering was more responsive when driving around corners and when acceleration was applied around corners the vehicle control was improved. This was due to the vehicles front wheels pulling the vehicle with the rear wheel pushing as oppose to just the rear wheel pushing the vehicle. This result was only possible because all wheels had good equal traction with the road surface.

When traversing around corners if the rear of the vehicle has greater traction in this situation than the front wheels, the rear of the vehicle will try to overtake the front of the vehicle by pushing the front of the vehicle to the side. The same occurs if the front wheels have more traction than the rear wheels of the vehicle and the rear of the vehicle can slide out around the corner. This often happens if wheel chains are fitted and the driver is a little over enthusiastic with the accelerator.

It is imperative that vehicle momentum is maintained while driving uphill on snow or ice. If vehicle momentum is lost due to wheel spin or a driver fails to maintain a suitable amount of acceleration and traction with the road when driving uphill and/or around corners the vehicle will slow down and this can often result with a vehicle stopped on the road, blocking traffic.

It has been observed over many seasons that vehicles with highway tyres and fitted with wheel chains when travelling in uphill situations experience excessive wheel spin due to the lack of traction and this is exacerbated by drivers applying excessive acceleration.

It is often seen on uphill lanes of the road that are covered with thick ice that has been churned up to the consistence of beach sand while the downhill side of the road remains compacted as covered earlier in this report.

During the 2017 road test Mt Hotham enjoyed heavy snow falls and this contributed to a great amount of snow and ice covering the road. The winter stud tyres had no issue with the deep churned up ice on the road. The winter stud tyres have the ability to travel over soft snow and ice and compact it so to provide traction without digging in to the snow and becoming bogged.

The test vehicle conducted test by travelling uphill and coming to a full stop on icy sections of the road. This test was conducted on sections of the road in shadows or shade, this is often where the road will experience a slicker type of ice depending on the time of day due to the lack of sun light on the road surface. On the Great Alpine road at Mt Hotham, CRB Hill and Diamantina Corner are two of the places utilised for this assessment due to the steepness of the gradient.

It must be noted that a vehicle travelling uphill at a moderate speed can maintain traction but once the vehicle is required to stop, traction can be lost and the vehicle will have difficulty regaining traction and moving off. This has been seen to happen to numerous vehicles including many new AWD and 4WD European vehicles designed to operate in the snow. In this situation the road can often be blocked and other vehicles are required to stop on the steep section of road and this leads to more vehicles losing traction and becoming incapacitated.

The test vehicle had little issue regaining traction after stopping on uphill sections of the road. The many Sipes and Sipe Activators incorporated in to the soft rubber compound of the tyre with the addition of the studs, no slippage was experienced. This would allow the tyres to grip and compress the smallest amount of snow on the surface of the road to regain traction to allow the vehicle to move off when acceleration was applied slowly and gradually and once momentum was achieved the vehicle travelled as normal.

In the same situation all terrain tyres require a lot more soft dry snow to regain traction and this is also dependant on the amount of tread left on the tyre. This often requires the driver to roll the vehicle backwards into soft dry snow on the side of the road and use the same procedure to move off slowly. However this is no guarantee that the vehicle will move off and wheel chains may be required to be fitted.

As for vehicles fitted with Highway tyres, regardless of what type of vehicle it is (Four or All Wheel Drive) this procedure will most likely fail and wheel chains will need to be fitted to the drive wheels to assist the vehicle to move off and this often involves a lot of wheel spinning and the strong possibility of the chain breaking.

However the only time during the trial that the tyres had difficulty in gaining traction was on a steep, sharp uphill corner of the road after the test vehicle had stopped and this was due to the road being covered by smooth ice with the absence of any snow. Traction was soon regained once a few shovel full's of snow were applied to the surface of the ice and normal travel was soon achieved.

Braking on uphill sections of the road was not a major issue as soon as the accelerator was released the vehicle would soon come to a halt without any loss of control.



Down Hill

Travelling downhill and remaining in control of a vehicle on any type of tyre in icy conditions can be difficult. As a general rule regardless of whether the vehicle is a 4WD or AWD, this will not assist in the braking process and may worsen the situation due to the increased weight of the vehicle. This is more or less true in regard to the newer 4WD vehicles that employ an electronic braking system but the older mechanical system still used in the Toyota Land Cruiser and some other models of vehicles do benefit from being in the 4WD mode when braking. This was found to be the outcome during the testing of the studded snow tyres, using a Toyota Land Cruiser as the test vehicle.

When travelling downhill in a straight line braking was applied by applying pressure to the brake pedal with the foot just long enough to slow the vehicle down and then released. This was repeated until the desired speed was achieved.

This method helps prevent the vehicle from sliding and if the vehicle does slide the foot brake is released, the wheels begin to turn and the sliding stops. This is known as feathering the brake.

The Nokian Hakkapeliitta LT2 (Studded) tyre handled this situation with ease; the test vehicle remained in the tracking line of the front wheels at all times with no indication of slippage. Slippage was only achieved for testing purposes when speed was increased and the clutch pedal and brake pedal applied abruptly. Once the brake and clutch was released slippage stopped and the front wheel begun turning.

When negotiating a corner the on/off braking method or feathering was applied before entering the corner to slow the vehicle down to the desired speed. Once in the corner the vehicle continued to track perfectly and the feathering braking method was employed while turning and no control was lost at anytime or slippage detected.

A similar test was performed on the same corner 10 minutes later at an increased speed and using abrupt braking methods. The vehicle slid in a straight line but as soon as the brake was released the slide stopped. When travelling around the corner the rear of the vehicle slid out slightly but regained traction as soon as the brake was released.

It should be noted that in this situation braking should be applied slowly and carefully to help prevent sliding. However it was noted that the smallest amount of snow on an ice covered road greatly assisted with traction but this can be dependent on several factors, the type of ice under the snow, the steepness of the road and the weight and speed of the vehicle.

Many vehicle accidents on snow and ice covered roads are due to vehicles not being able to stop when required and this is particularly true on downhill sections of the road.



Summing Up

After extensive testing and experimentation of the Nokian Hakkapeliitta LT2 (Studded) tyre, it has proven to be a remarkable tyre. It has all the positive characteristics of the Nokian Hakkapeliitta LT2 Non-Studded tyre but with the added ability to provide that extra traction when needed on hard smooth icy road surfaces including black ice situations.

The tyres are able to provide traction across soft snow without spinning the wheels thus getting bogged. They provide the motorist with the reassurance to drive comfortably and consistently in a relaxed manner, while handling the varying road conditions experienced on the Great Alpine Road during winter whilst allowing the vehicle to operate as the manufacturer had intended.

The 2017 snow season provided Mt Hotham with a period of intense snow falls not seen for many years and during this period the road was closed to the general public for two days due to the heavy volume of snow on the road. This provided a unique opportunity to test the winter tyres beyond the requirements of normal driving. This involved driving through and over deep snow at various speeds, stopping and moving off on steep sections of the road and towing the odd stranded vehicle off the carriage way. This was all conducted without any issues or problems and not once did the tyres fail to provide the necessary traction to accomplish an operation.

In the past similar heavy snow situations would require the fitting of wheel chains and this would greatly reduce the capabilities of the vehicle due to wheel spinning and the increased likelihood of the chained wheels digging in to the deep snow and the vehicle becoming bogged and then in many cases requiring assistance.

Earlier in this report I made reference to the way wheel chains work like a Bulldozer cleat on dirt but unlike a Bulldozer track with cleats that spreads the weight of the machine over a large area, a vehicle fitted with wheel chains will not easily travel across deep snow without spinning a wheel. A wheel of a road vehicle concentrates the weight of the vehicle directly at the bottom of the tyre, approximately the size of a CD cover. If the tyre offers little to no traction the wheel will spin and the vehicle will fail to travel. If wheel chains are fitted to a tyre that lacks the appropriate traction the wheel chains will dig the wheel into the snow as the wheel spins.

For a vehicle fitted with wheel chains to work at the optimum, the vehicle needs to be travelling on a hard compacted surface that can provide enough penetration of the chain links and also enough strength to allow for the chain to gain resistance from the compacted surface to allow the torque of the vehicle to rotate the wheel without spinning. The same applies when braking and if the surface is too thin or soft for the chains to gain any resistance the vehicle will slide.

There are other factors that must also be considered and they are the weight of the vehicle, the type and condition of tyres fitted to the vehicle, the gradient of the road, driver expertise and to some point the drive system utilized in the vehicle.

Up until 2014 the Road Patrol vehicle was fitted with Bridgestone Dueller All Terrain tyres and they serviced the vehicle very well for the whole year. During the winter months they performed equally well but it would be necessary to fit wheel chains on a regular basis due to the varying road conditions.

However in doing so the vehicle's handling ability changed dramatically requiring constant readjustment of driving skills to maintain safe uninterrupted travel. The chains also had a disposition to contribute to damaging the vehicle and the road pavement if excessive wheel spin occurred or contributed to further damage if the road pavement had already been compromised.

Conclusion

After extensive experimentation, testing and assessments and considering the safety factor, vehicle handling, driver experience or inexperience, vehicle manufacture's expectations and the varying road conditions, the certified winter tyre and the studded winter tyre are a major improvement for winter conditions over any other tyre seen in Australia to date. While the fitting of wheel chains to highway tyres improves the traction capabilities of the vehicle, it is an inferior and sometimes problematic solution to gain traction compared to the use of good quality certified winter tyres. This is not to say that wheel chains are obsolete, they are an inexpensive method of gaining traction for the general motorist and have serviced many motorist in this country extremely well for many years and will continue to do so in to the future. But over recent years overseas Tyre Manufactures have improved tyre design way beyond the capabilities of the wheel chain. This is due to factors like; vehicle manufactures requirements, new rubber compounds being produced, driver convenience and safety.

This is not to say that wheel chains will never be required to be fitted to winter tyres. Wheel chains should still be carried but would not need to be fitted as often due to winter tyres being able to provide increased traction over the use of wheel chains in a multitude of road conditions. But in certain icy situations wheel chains would improve traction with the road surface and when fitted to winter tyres will perform as they are intended to.

After all that has been covered in this report and due to the many varying factors involved there are few hard and fast rules that can be adhered to. But the one rule that is always present is the law of physics, the lack of traction with the road results in serious issues on the road.....and sometimes off the road.

The Studded Tyres would not be suitable for vehicles travelling to and from the snow fields on non snow covered roads but would be of a major advantage to vehicles that travel on snow covered roads a majority of the time this would most likely be mountain staff vehicles or people living above the snow line during winter. The non-studded winter tyre is more than capable to travel on snow and non snow covered roads but should be removed from the vehicle at the end of each winter season and stored for the following season.

It is with absolute conviction that I strongly believe without equivocation, that good quality certified winter tyres, studded and non-studded are a superior method of gaining traction on snow and ice covered roads for passenger vehicles.

I would also like to advocate for consideration by Authorities for the introduction of certified winter tyres as a superior alternative to wheel chains (as is the custom in overseas countries) for motorists who wish to utilise them here in Australia. This would not be a practical option for most travellers to the snow but for the regular travellers and mountain residents who are willing to invest in winter tyres this would be an advantage.

But while this would help improve road safety it would need to be closely monitored possibly with the introduction of a self funded permit system. The permit system would help keep unacceptable cheap quality uncertified winter tyres off the road unlike the present system due to the lack of an Australian standard the market place has been inundated with substandard inappropriate cheap quality wheel chains.

Certain requirements and safeguards would need to be implemented for a winter tyre permit system to work reliably and flawlessly, recommendations are available on request.

This report has been compiled and written by Glenn Billman Mt Hotham Road Patrol.

This concludes the 2017 Winter Stud Tyre Report.

Kind regards to all.

Glenn Billman.