

Making roads motorcycle friendly



A New Zealand guide for roading asset owners,
designers & maintenance contractors

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FOREWORD FROM

The Board Chair of the Motorcycle Safety Advisory Council

This booklet has been produced by the Motorcycle Safety Advisory Council (MSAC) to engage with road engineers and maintenance contractors about the impacts their decisions and actions can have on motorcyclists. There are many ways we can make New Zealand's roads safer for motorcyclists. This booklet provides the blueprint.

We could not have produced this booklet without the support of both the NZ Transport Agency and VicRoads Australia. MSAC sincerely thanks Julian Chisnall from NZTA, and all those who have provided input to make this project happen.

Like you, I look forward to riding roads that have been engineered and maintained based on recommendations from this publication.

Wishing you safe motorcycling



Mark Gilbert
Chairperson
Motorcycle Safety Advisory Council

The Chief Executive of the New Zealand Transport Agency

At the heart of Government's Safer Journeys Strategy is the safe system approach which recognises that people make mistakes and some crashes are inevitable. Our collective aim is to protect road users from crash forces by creating a more forgiving road system that reduces the price paid for human error. No one should pay for a mistake with their life or limb. The inherent vulnerability of motorcycling to crash forces makes this a particularly pertinent challenge.

As set out in this important guide, we require roads and roadsides that are self-explaining, forgiving and help to manage conflicts. But just as importantly, we require motorcycling travel speeds to be at an appropriate level and motorcycles to offer suitable levels of protection. A safe system also requires skilled and responsible drivers.

This guide reflects not only best practice from overseas in making roads motorcycle friendly, but also draws from our local learning from the Coromandel Safer Rides pilot project. The safety improvements along this 130km round-trip route in the southern Coromandel are solely focussed on the safety needs of motorcyclists, and as such represent a first for the Transport Agency and our road safety partners. This project is a practical demonstration of the guidance contained in this

document. Ongoing learning from this ground breaking project will not only be applied to other popular motorcycling routes but also to improving ongoing guidance for how to create a more forgiving road system.

The Transport Agency is committed to reducing the number and severity of crashes involving motorcyclists, and this guide is another step towards applying the safe system approach to this important challenge.



Geoff Dangerfield
Chief Executive
NZ Transport Agency



INTRODUCTION

The number of motorcycles and scooters on New Zealand roads is significantly increasing, and this growth is expected to continue.

Motorcycling is seen by many as a desirable recreational activity and by many others as an efficient means of transport, especially in response to rising fuel prices and increasing traffic congestion in our major urban centres.

In contrast with this continuing growth in motorcycling, motorcyclists are over-represented in the road toll. In New Zealand in 2012, 50 motorcyclists (48 riders + 2 pillion passengers) were killed representing 16 per cent of the road toll, yet only about 3 per cent of vehicles registered in New Zealand are motorcycles or scooters. Significant numbers of motorcyclists are also injured each year on New Zealand's roads (1,138 riders and pillion passengers in 2012)¹.

The crashes are not always on the open road. In the five years from 2008 to 2012 when 232 motorcyclists were killed, 65 of these fatal crashes occurred on urban roads (speed limit of 70km/h or less).

While many motorcycle crashes involve collisions with other vehicles, a significant number are single vehicle crashes. These crashes include a rider:

- 🏍️ Losing control and running off the road;
- 🏍️ Overtaking or crossing the centreline (usually on curves);
- 🏍️ Hitting another vehicle (or other obstruction) from behind; or
- 🏍️ Being thrown from the motorcycle and hitting the road surface.

From 2008 to 2012², almost 40 per cent of motorcyclists were killed or injured in crashes that did not involve another vehicle.

Motorcycle crashes generally involve a combination of factors. These include the behaviour of the drivers of other vehicles, the riders themselves, whether excessive speed is involved and other factors such as the influence of fatigue, alcohol or other drugs. However, the design and maintenance of the road surface and environment can have a significant impact on both the possibility of avoiding a crash, and on the severity of injury to a motorcyclist and/or pillion passenger, should a crash occur.

In any crash, motorcyclists, along with pedestrians and bicycle riders, are the most vulnerable of road users.

¹ MoT Motorcyclist Crash Factsheet 2012
<http://www.transport.govt.nz/assets/Uploads/Research/Documents/Motorcycles-2013-final.pdf>

² MoT Motorcyclist Crash Factsheet 2012
<http://www.transport.govt.nz/assets/Uploads/Research/Documents/Motorcycles-2013-final.pdf>

This provides increasing challenges for **everyone** involved in designing, constructing and maintaining New Zealand's road network. It also provides us with an opportunity to do things differently on the road network to reduce the over-representation of this group of network users in the national road toll.

Everyone has a part to play!

Road Controlling Authorities

Are expected to establish reasonable standards for road construction, inspection, maintenance and repair to include motorcyclists. These standards take into account a range of factors, such as risk, level and type of use, community expectation, affordability, resource availability and practicability.

Maintenance contractors and utilities providers

Have an obligation to ensure that where works are carried out on the road, these are done in a manner that ensures the safety of all road users, and that the road surface is correctly reinstated or altered.

Road users

All road users also have an obligation to use the road responsibly having regard to the physical characteristics of the road, prevailing traffic and weather conditions, visibility, condition of the vehicle (including motor cycles and scooters) and relevant road laws and advisory signs.

Action

To assist in the identification and treatment of high risk motorcycling routes, the NZ Transport Agency has produced a Practitioners Guide - *Safer journeys for motorcycling on New Zealand roads* (<http://www.nzta.govt.nz/resources/safer-journeys-motorcyclists/index.html>)

Why are motorcyclists at risk?

The design of motorcycles and scooters means that they have dynamic stability characteristics that are unique when compared with other vehicles on our roads. They are very sensitive to changes in the shape, texture or skid resistance of the road surface, including the presence of water, potholes or debris on the road.

The nature and likely consequences of hazards differ significantly for motorcyclists compared to drivers of other vehicles. Something that is of no real consequence for a car driver may present a serious crash and injury risk for a motorcycle rider. The available statistics suggest that, on average, the risk of being involved in a fatal or injury crash is 22 times higher for a motorcyclist than for a car driver over the same distance travelled (2008–2012 data).

Any rapid or unplanned adjustments have a destabilising effect on the motorcycle which is compounded when the rider is required to make simultaneous adjustments to both speed and position, especially when riding through curves and around corners.

In the event of a crash, motorcyclists are very vulnerable to injury due to their lack of protection. Good protective riding gear helps, but the likelihood of injury in a crash is high. Injuries are usually caused by hitting another vehicle, objects on the side of the road or the road itself.

Motorcyclists generally pay far more attention to the road surface than a car driver does. The rider will be looking further ahead and through the approaches to curves to gain more information about the shape and nature of the road ahead. Riders, more so than drivers, habitually seek out information that may be visible through gaps in fences, hedges and foliage on the roadsides.

This all determines where the rider will look in order to gain the information needed to judge the safest line around the curves on a road. They will generally seek to use wider and later entry points, utilising more of the outside of the curve than drivers.

Understanding where the rider will look for these clues and how they influences the rider's eventual position on the road is a key factor for roading asset owners, designers and contractors in making roads motorcycle friendly.

Motorcycles work differently to cars and this can put a rider at risk



- A Tyres provide only two small points of contact with the road surface.
- B Motorcyclists rely on consistent tyre grip.
- C The majority of braking force is through the front tyre.
- D Motorcycles work differently:
 - 🏍️ Motorcyclists lean into corners.
 - 🏍️ Motorcycles tend to have higher power to mass ratio and accelerate more quickly than other vehicles on the road.
 - 🏍️ Because of their size, and limited frontal profile, motorcycles can be difficult for other road users to see.
 - 🏍️ Motorcyclists are vulnerable to injury in a crash.
 - 🏍️ Motorcyclists may travel anywhere in the traffic lane, and do not always follow car, truck or bus wheel paths.

Targeting popular motorcycle routes

It is important to ensure popular motorcycle routes are given precedence for motorcycle friendly treatments.

Popular motorcycle routes include many inner city and suburban roads where motorcycles and scooters are used for commuting and business purposes.

Some popular routes are in rural areas and can sometimes be found where total traffic volumes may be relatively low. These routes are often places with a mix of narrow winding mountain roads and scenery that are popular on weekends with motorcyclists – such as the Coromandel Loop, Banks Peninsula or the Rimutaka Hill.

These routes should be prioritised for the types of treatments and maintenance outlined in this booklet.







It is important to target popular motorcycle routes



ROADING DESIGN AND CONSTRUCTION

During both design and construction of a new road or improvement/maintenance of existing roads, it is essential that specific hazards for motorcyclists are avoided.

Good practice should ensure that:

-  The road surface provides adequate grip and is free from defects.
-  There are clear unobstructed sight lines on curves, corners and at intersections.
-  Roadsides are free from obstructions.
-  Road shoulders are designed to allow for a safe recovery area in the event of a motorcycle leaving the road.
-  The drainage system is designed to minimise manholes in the roadway (especially on corners).
-  Service providers minimise the number of chambers in the roadway (and place them away from corners).

Special attention needs to be given to the precise location of signage and other roadside furniture, to ensure that all roadside features are passively safe (or frangible). Otherwise a minor crash for motorcyclists can result in serious injury, or death.

Currently the design of roadside infrastructure is based almost entirely on passenger vehicle occupant safety and thus does not reflect the injury potential of infrastructure to motorcyclists.

ROAD SURFACE

Motorcycles and scooters are particularly susceptible to a range of issues associated with the road surface that can lead to a crash. This is especially the case in locations where the rider may be braking and/or turning, such as at an intersection or on a curve in the road. The road needs to have uniform and predictable surface friction (skid resistance). Any change in surface that may reduce surface friction should be avoided where practical, and where this is not possible it should be clearly signed and made visible during all weather conditions and at night.

Pavement width

Extending the available seal width as far as practicable, gives motorcyclists (and other road users) the best opportunity to maintain or regain control in the moments before a crash. This can reduce the likelihood of a crash occurring and reduce speeds to more survivable levels reducing severity.

Pavement markings

Markings can pose a significant threat to motorcyclists who are especially at risk when cornering and braking, and when roads are wet. Skid resistant pavement markings should be used to allow motorcycle tyres to have a better grip on the road. Pavement markings that take up a large area on the road surface should be avoided. Where significant areas of pavement marking are required, the appropriate sight distances must be provided.

Loose surfaces

These can be created on roads due to gravel and other material being deposited by vehicles or being washed across the road from unsealed road shoulders, roadside parking areas or at intersections with gravel roads and driveways. Consideration should be given during design and construction to sealing shoulders especially on curves and sealing all intersection approaches, especially along popular motorcycle routes. Sealing road shoulders in rural areas has been shown to be effective in reducing the incidence of run-off-road crashes. Where sealing road shoulders is not practical, use of motorcycle specific warning signs can improve safety.

Raised features

A number of treatments that are used for traffic control and/or area beautification involve creating a step in the road surface that can be very hazardous for motorcycles and scooters, such as:

- 🏍️ Cyclist support bars and pedestrian refuges.
- 🏍️ Raised painted islands to direct traffic or protect pedestrians/cyclists.
- 🏍️ Cobblestones.

Similarly traffic control treatments on local roads can create significant hazards for motorcyclists. For example, a small roundabout with a low profile can have edges that are difficult to detect and could cause a rider to lose control if they run over these - an issue that is not experienced by cars and other larger vehicles. Similarly an angled hump in the road can force a rider to have to swing out quite widely to be able to cross at a safer right angle, in order to avoid potential loss of traction.

Installing such treatments should be carefully planned and the needs of motorcyclists considered, including where necessary the use of warning signs.

Where possible semi-mountable kerbing should be used, particularly along popular motorcycle routes.



Low profile roundabouts and kerbs can cause loss of control crashes for motorcycles and scooters



METAL SURFACES

Service covers

Metal service covers for telecommunications cables, manholes and service valves can present a very slippery surface to a motorcycle or scooter. The problem is often compounded by the cover sitting either above or below the road surface, or at the apex of a corner. Wherever practical, such access points should be located off the road. Where they need to be located on the road, covers with rough-textured surfaces or skid resistant coatings should be used. Ensure the covers are kept flush with the road surface to avoid unexpected bumps that could lead to a loss of traction.



Poorly located steel service covers can present a very slippery surface to a motorcycle or scooter particularly on the apex of a corner.

Rail crossings

Rail crossings can be very hazardous for motorcycles and scooters. The road surface approaching and between the tracks should be level with the tracks, to avoid a rise or dip which may cause a loss of traction.

A well-designed rail crossing with rubber mats between tracks reduces loss of control risks.



Bridge joints

Improperly positioned and maintained bridge joints can present a significant hazard to motorcyclists. Try to avoid installing them at locations where motorcyclist may be leaned over (such when taking a curve) or braking. If possible, ensure the bridge joint system incorporates a high grip surface.



Bridge joints present a significant risk to motorcyclists, especially in braking areas or on curves. High grip coatings are recommended but must be maintained.

ENVIRONMENT

Weather conditions and the ability of the road network to manage their effects can play a significant part in motorcycle safety.

Drainage

This needs to be able to cope with storms to minimise the amount of water running across the road or pooling on the surface. It is also important to ensure that roadside drains and pits are maintained to prevent any debris from being spread across the road.

Watch for areas of ponded water on the road surface or adjacent to road markings, particularly where audio tactile profiled (ATP) markings have been installed.

Damp or frosty patches

The location of potentially damp areas and frosty patches that can lead to slippery conditions should be anticipated. It is important to anticipate the location of potentially damp areas and frosty patches that can lead to slippery conditions. Where possible, warning signs could be placed leading up to these areas, encouraging riders to slow down and prepare for potential problems ahead.

Overhanging trees and/or shelter belts require special attention.

Wind gusts

Where strong winds can be hazardous to motorcyclists (as well as other road users), installation of the appropriate wind gust warning sign should be considered.



ROAD SIDES

There are a number of factors which make the design and construction of roadsides critical for maximising safety for motorcyclists, including the placement of roadside objects, such as poles and signs. In particular:

- 🏍️ Motorcycles and scooters can be difficult for other road users to see and can be easily obscured by roadside objects at intersections and on corners in the road.
- 🏍️ As a motorcycle leans into a corner in order to change direction it can potentially position a rider close to roadside objects.
- 🏍️ A rider involved in a crash is at significant risk of serious injury from hitting objects on the roadside as they are thrown from the motorcycle.

Creating safe clearances for motorcycles

Because motorcyclists lean into corners at up to a 45 degree angle, this can place the rider very close to roadside objects. This has the potential to lead to a crash should the rider lose control trying to avoid a roadside object or if they actually impact with it. Examples of objects that can be positioned too close to the road include signs, posts, guardrails and fencing.

Careful consideration should be given to the clear zone allowed for motorcycles in the event of a crash. Riders are often thrown from their motorcycle in a crash and then can slide into road side objects, such as barriers, poles or trees. Unlike car occupants who are protected to a significant extent inside the vehicle, a rider is far more vulnerable in a crash.

Motorcycles lean into corners which means that objects close to the kerb create hazards.



Pedestrian refuge areas can present impact and/or snag hazards to motorcycles or scooters unless designed appropriately.



Consideration should be given to using frangible poles and signs that are more forgiving if hit by a fallen rider or pillion, especially along popular motorcycle routes.



Using non-frangible roadside hardware (such as these 100x100mm posts) significantly increases the risk of injury should a rider fall.



Where possible utilities should be placed underground and utility poles should be located as far from the edge of the road as possible, preferably on or beyond the road reserve boundary.

Barrier (or bullnose) kerbing can create a serious hazard for motorcycles, as it creates a lip that can snag a foot peg and can cause a crash if ridden over. Where possible, semi- or fully mountable kerbing should be used particularly along popular motorcycle routes.



Semi- or fully mountable kerbing reduces the likelihood of a crash if ridden over by a motorcyclist.

Advertising signs can present a hazard to motorcyclists when improperly positioned.



Maximising visibility

Visibility is particularly important for motorcyclists. Unlike other larger vehicles on the road, motorcycles and scooters have a limited frontal profile and so can be more difficult to see, especially if obscured by things, such as plantings, fencing, barriers or signage. Good design and traffic engineering can ensure that this is addressed by ensuring a clear view for road users at critical locations such as roundabouts, intersections or on bends.

A common issue can be vegetation, presenting a significant hazard for a rider by obstructing the view of them by other traffic. It is important when designing such areas that plants that grow to a limited height are used, and regular trimming and maintenance is planned.

ROAD MAINTENANCE & REINSTATEMENT CONSIDERATIONS

Motorcycles and scooters travelling on roads require an even and consistent road surface to ensure that they are able to maintain stability and not lose traction, particularly during braking and cornering.

Road repairs, maintenance and reinstatement works should be carried out in a timely and effective manner to avoid creating significant hazards for motorcyclists. Adequate warning of hazards should be provided if repairs cannot be made immediately.

Road shoulders

Road shoulders provide a safe recovery area for any vehicle that runs off the sealed roadway. If road edges are broken or contain loose gravel surfaces this can create a serious hazard and make recovery more difficult, especially for motorcycles and scooters.

Line-marking of road edges is also important and needs ongoing maintenance. Line-marking may reduce the likelihood of a motorcyclist running off the road, especially when visibility is poor such as at night, in rain or fog.

Gravel and loose stones from unsealed shoulders; edge break; and missing line markings can be dangerous for motorcyclists



Potholes

Potholes can be a significant hazard for motorcyclists, and can cause a loss of stability and control. Regular inspections and prompt repairs should be undertaken according to road maintenance plans. It is also important to respond to public reports of potholes.



A badly repaired pothole can be dangerous for motorcyclists

Moss / lichen build up

Older pavements often develop a build up of moss and lichen which results in a slippery surface that presents a significant risk to motorcyclists. The presence of moss and lichen is also detrimental to the pavement surface.

Lengths of pavement showing signs of moss and/or lichen should be programmed for appropriate treatment as soon as practicable.

Moss and lichen can create a slippery surface that presents a significant risk to motorcyclists.



Ruts, shoves and corrugations

Deep wheel ruts, pavement shoves and corrugations in the road surface can present difficulties for riders and lead to a loss of stability and control, particularly when encountered on fast flowing corners. Ruts, shoves and corrugations can collect water during rainfall. Appropriate warning signs should be used until repairs are carried out.



Deep ruts or corrugations can lead to loss of stability and control, especially on curves

Crack sealing

There is a need to ensure that a slippery surface is not created for motorcyclists as a result of crack sealing work, especially by avoiding wide areas of sealant.

Excessive areas of crack sealing can present a wet weather hazard to riders, especially in braking areas or on curves



Bleeding bitumen/flushing seals

Excess bitumen on the road surface can provide a slippery hazard for motorcyclists in wet and dry conditions. In this situation resurfacing or removal of the excess bitumen should be carried out. Prior to this, signs warning of the slippery surface should be installed.



Flushed or polished surfaces present a significant risk to motorcyclists, especially in wet conditions

Pavement surfacing work

Poor quality control of pavement surfacing works can result in a surface that can adversely affect the braking performance of motorcycles and scooters. Any areas of irregular coverage or chip loss must be repaired immediately.

Lack of pavement texture due to poor sealing practice can present a hazard to motorcyclists



Road grooving

While horizontal grooving of road surfaces can improve the drainage, parallel grooving (in the direction of the traffic flow) can adversely affect the steering characteristics of motorcycles and scooters.

Parallel grooving should be avoided, specifically in areas where braking will be undertaken, and appropriate warning signs for motorcyclists should be installed to indicate any road grooving.

Pavement markings

When pavement markings are renewed, skid resistant paint should be used to allow motorcycle tyres to have a better grip on the road. Old pavement markings should be removed and in areas, such as intersections, consideration should be given to resurfacing the road.

Painting over old markings is not a suitable treatment as the resulting black-painted surface has lower skid resistance and is often very difficult to see in some light conditions. In wet weather such markings can be confusing to all road users.

Maintenance of roadside vegetation

Any overhanging vegetation should be trimmed to ensure a clear view of all traffic, especially of motorcyclists. Care should be taken to clean up all debris following any maintenance work because this material on the road surface can create a hazard for motorcycles and scooters.

Removal of debris, gravel and loose stones

Loose material from a variety of sources can collect on the road surface. Debris from overhanging and roadside vegetation can build up over time on the road surface. It can also collect quickly during a storm or in strong winds. Gravel and loose stones can come from unsealed side roads, entrances, shoulders, wayside stops and spillages from trucks. Warning signs should be installed until clean up has been completed.



Gravel and loose stones from unsealed shoulders can present a hazard to motorcyclists, particularly when beyond a blind crest

For rural networks, developing a policy for entranceway and side road seal backs should be undertaken and the work programmed through maintenance contracts.

Gravel migration from unsealed rural driveways is a hazard to motorcyclists



Clean up of liquid spills

Fuel, lubricant, paint and other liquid spills on the road can lead to a catastrophic loss of traction and stability for a motorcycle or scooter. A rapid response to cleaning up any spills is vital and warning signs should be installed.

Build-up of grease and oil

In heavily trafficked areas, at locations such as roundabouts and intersections, a build-up of oil and grease deposits can occur on the road. This is generally in the centre of the lane, where motorcycles tend to travel, and requires ongoing maintenance.

Temporary large steel plates

Large steel plates placed temporarily over trenches in the road can be slippery for a motorcycle or scooter and become even worse when wet. A skid resistant coating should be used on the metal surface and warning signs should be placed well before the hazard. The plates should be fixed to the road surface to prevent movement and any sharp edges treated to minimise the risk of loss of control or punctures.

Temporary large steel plates can present a serious hazard to motorcyclists (and cyclists)



Reinstatement of services trenches

Trenches across the road that have been overfilled or that subside over time can cause problems for motorcyclists. An uneven surface can cause a loss of stability and control for a motorcycle or scooter.



Trenches across the road that are not reinstated correctly can be dangerous for motorcyclists



Maintenance of rail crossings

Steel tracks can be very hazardous for motorcyclists. The tracks are slippery and narrow tyres can be caught in the grooves. It is important that the road surface and pavement around tracks is not broken and is well maintained. Contact KiwiRail if maintenance is required within 500mm of a rail crossing.



Poorly maintained surfaces at rail crossings are a hazard to motorcyclists (as well as cyclists and pedestrians)

Clean up during and after road works

Loose material on road surfaces should be cleaned up during and after road works. Loose gravel and other material can be scattered on the road surface, and mud and other debris can be dropped from construction vehicles onto the road. This loose material needs to be swept from the road as it can lead to a motorcycle or scooter losing traction.

Appropriate signs must be placed where milled surfaces are to be trafficked as these can be tricky for less experienced riders to negotiate.

Loose material left after maintenance works (such as milling) is a hazard to motorcyclists



Clean up and repairs after road crashes

When cleaning the road after a crash all debris should be removed from the road. This may consist of sharp objects and liquids that may be spread across the road surface, and present a serious hazard to motorcyclists and other road users.



Use of appropriate incident signage can greatly reduce the risks to motorcyclists (and other road users)

Priority must be given to fixing damage to any barriers, fences, poles or signs on the roadside at a crash site to ensure that there are no protruding sharp edges and fittings.

KEEPING ROAD WORKS SAFE FOR MOTORCYCLISTS

Road works can present serious challenges for motorcyclists.

Ensuring road works are carried out in a manner that maximises safety for motorcyclists can have benefits for all road users.

Where a problem arises it should be treated as soon as possible.

Road surface

- 🏍️ The road surface will need to be swept down and any loose gravel or debris which may be on the road cleared as required.
- 🏍️ 'Loose Stones' signs should be left in place after road sealing until loose material is removed.
- 🏍️ Where road grooving has been carried out warning signs need to be used.
- 🏍️ Temporary steel coverings over road trenches should provide adequate traction for motorcycles and scooters. Such hazards should have signs warning of a slippery surface.
- 🏍️ Metal surfaces need to provide adequate traction for motorcycles and scooters.
- 🏍️ The road surface to be used by traffic during works should be free of bumps, potholes and uneven surfaces.
- 🏍️ During road works there is often a step down from the road surface to the area which is being repaired. Appropriate signage should be placed to warn motorcyclists until all works are completed.
- 🏍️ Any diesel or oil spills need to be cleaned up immediately and appropriate warning signs used.
- 🏍️ Adequate drainage needs to be provided during road works to ensure water doesn't collect on the road surface during heavy rainfall.

Signs

Warning signs need to be erected well in advance of the road works, to allow for all road users to anticipate the likely impacts, adapt to the change in conditions and/or make changes to their travel plans. In the case of motorcyclists this may be using an alternative route to avoid the road works altogether.

- 🏍️ Speed limits for road works should be set to ensure safety for workers and all road users.
- 🏍️ To improve safety for motorcyclists, signage is needed to warn of the type of conditions they should expect, such as a loose surface or defects in the road.
- 🏍️ Any specific hazards on the road, such as steel plates on the road surface, should be well signed and, if possible, lit at night.
- 🏍️ Temporary line marking may be required to ensure there is clear delineation of traffic lanes, including road edges, especially at night.
- 🏍️ Warning lights may be required at night, and these must be in good working order.

- 🚲 Signs should be clearly seen at night. They need to be in good condition and clean, and may require ongoing maintenance during the works, such as washing at the end of each working day to remove dust and dirt build-up.
- 🚲 Consideration should be given to using frangible sign and supports that are more forgiving if hit by a fallen rider or pillion.

Roadside hazards

All signs, barriers, fencing and bollards

- 🚲 Must be placed to ensure a clear view of intersections, around curves, and of approaching and turning traffic.
- 🚲 Must be placed well clear of traffic lanes, so as not to cause a traffic hazard.

FURTHER INFORMATION

Austrroads, 2010, *Guide to Road Design Part 6 Roadside Design, Safety and Barriers*

Ministry of Transport, 2013, *Motorcyclists Crash Factsheet*

NZ Transport Agency, 2012, *Safer journeys for motorcycling on New Zealand roads*