WALGA

mainroads WESTERN AUSTRALIA

MRA Western Australia

MOTORCYCLE & SCOOTER
Safety Advisory Group

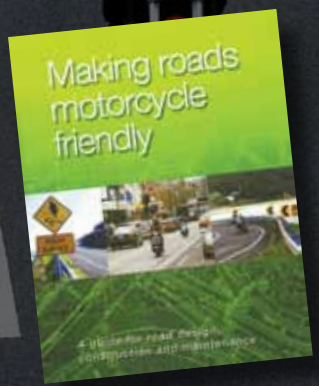
The representative organisations on the Motorcycle and Scooter Safety Advisory Group are: RAC WA, Office of Road Safety, Main Roads WA, Department of Transport, WA Police, Motor Trades Association, Motorcycle Riders Association and WALGA.

Making roads motorcycle friendly

A guide for road design, construction and maintenance

Acknowledgements

The Western Australian Local Government Association and Main Roads WA acknowledges Vic Roads for their work in the development of the "Making roads motorcycle friendly" Victorian publication and for their support in allowing intellectual property rights to amend and produce this Western Australian publication.



The Western Australian Local Government Association and Main Roads WA would also like to acknowledge the Western Australian Motorcycle and Scooter Safety Advisory Group and the Motorcycle Riders Association for their contribution to the development of this publication.

Contents

Introduction

The number of motorcycles and scooters on Western Australian 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 higher fuel prices and increased traffic congestion.

Motorcycle and scooter use in Western Australia has been steadily growing in recent years, with the number of registered motorcycles in the state increasing by 26,000 between 1998 and 2007. The number of motorcycle rider casualties in WA is also rising, from 247 recorded in 2001, to 380 in 2007.

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

- losing control and running off the road
- hitting objects on the side of the road, such as a tree or pole
- being thrown from the motorcycle and hitting the road surface.

As outlined in the safe system, a combination of factors are generally at play in any crash. 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 engineering 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, should a crash occur. In a crash, motorcyclists along with pedestrians and bicycle riders, are the most vulnerable of road users.

This provides increasing challenges for those involved in designing, constructing and maintaining the Western Australia road network.

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 Motorcyclists lean into corners

- Motorcyclists tend to have higher power to mass ratio and greater acceleration than most other vehicles
- 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

The unique features of a motorcycle that can put a rider at risk

Road authorities are expected to establish reasonable standards for road construction, inspection, maintenance and repair that take into account a range of factors, such as risk, level and type of use, community expectation, affordability, resource availability and practicability. 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. All road users also have an obligation under the Western Australian road laws to use the road responsibly having regard to the physical characteristics of the road, prevailing traffic and weather conditions, level of visibility, condition of the vehicle (including motorcycles and scooters) and relevant advisory signs.

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 or debris on the road.

Motorcyclists are very vulnerable to injury in the event of a crash due to their lack of protection. Good protective riding gear is essential, 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.

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 such as courier and delivery services.

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 Avon Valley tourist roads, Southern Karri Forest roads and the Ferguson Valley roads.

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

It is important to target popular motorcycle routes.

Design and construction considerations

At the design and construction stages 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 sight lines on curves, corners and at intersections
- roadsides have clear zones free from obstructions
- road shoulders are designed to allow for a safe recovery area in the event of a motorcycle leaving the road.
- Appropriate and sufficient warning/ advisory signs are used.
- Installation of frangible white posts are used. Frangible white posts are highly cost effective in terms of installation costs and maintenance balance and are an effective safety countermeasure.

Special attention needs to be given to the precise location of signage and other roadside furniture, to ensure that clear zones are provided. Without adequate clear zones for motorcyclists, what could be quite a minor crash, can result instead, in a more serious incident.

Sealed road shoulders can provide additional safety for motorcycles, scooters and other vehicles.

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 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.

Loose surfaces

These can be created on roads due to gravel and other material being deposited by vehicles or being washed across the road. This can come 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 such intersections, 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 points

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

- Raised painted blocks to direct traffic
- Roundabouts
- Raised pavement markers
- Entrance statement paving
- Barrier kerbing
- Speed humps/plateus on or near corners and bends
- Anti- Hoon speed humps

Gravel and loose stones from unsealed side roads and shoulders can present a hazard to motorcyclists.

Speed humps located within and close to bends can present a serious hazard to motorcyclists.

Steel utility covers can present a very slippery surface to a motorcycle or scooter.

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.

Drainage

This needs to be able to cope with poor weather conditions 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.

Metal surfaces

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

Steel utility covers for service valves and access manholes 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. Where practical such access points should be located off the road. Where they need to be located on the road, covers with textured surfaces or skid resistant coatings should be used. Ensuring the covers are kept flush with the road surface to avoid unexpected bumps that could lead to a loss of traction.

Roadsides

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.

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 obstructions, 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.

Creating safe clearances for motorcycles

Because motorcycles can lean into corners at up to a 45 degree angle it 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.

Use of motorcycle friendly (frangible when hit by a rider or pillion) guide posts can improve safety.

An example of additional protection added to a barrier to allow a rider to slide along the barrier and prevent colliding with a post in a crash.

Mountable and semi-mountable kerbing reduces the likelihood of a crash if ridden over by a cyclist.

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

Where possible utilities should be placed underground and, if required, utility poles should be placed the correct distance from the edge of the road according to road type and speed limit.

Barrier kerbing can create a serious hazard for motorcycles, as it creates a lip that can snag a footpeg and can cause a crash if ridden over. Where possible mountable kerbing should be used as the leading edge is more forgiving to errors, particularly along popular motorcycle routes.

Road maintenance and reinstatement considerations

Motorcycles and scooters travelling on roads require an even 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 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.

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.

Ruts and corrugation

Deep wheel ruts and corrugations in the road surface can present difficulties for riders and lead to a loss of stability and control. Ruts and corrugations can collect water during rainfall. Appropriate warning signs should be used until repairs are carried out.

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.

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.

Gravel and loose stones from unsealed side roads and shoulders 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, and appropriate warning signs for motorcyclists should be installed to indicate 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.

Similarly, markings on roads such as for pedestrian and children's crossings can often be more slippery than the surrounding road. Consideration needs to be given to ensure motorcycle tyres have sufficient grip on the road.

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.

Clean up of liquid spills

Fuel, lubricant, paint and other liquid spills on the road can lead to a 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 some motorcycles tend to travel, and requires ongoing maintenance.

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.

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.

Maintenance of rail crossings

Rail crossings can be very hazardous for motorcyclists. It is important that the road surface and pavement around the rail crossing is not broken and is well maintained. Contact Perth Transport Association (PTA) or Westnet if maintenance is required within 3metres of rail crossings.

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.

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.

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.

Trenches across the road that are not reinstated correctly can be dangerous for motorcyclists. Trenches should be cut in square with the road, not round or angular in shape.

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.

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.
- Temporary steel coverings over road trenches should provide adequate traction for motorcycles and scooters. Such hazards should have signs warning of a slippery surface.
- The road surface to be used by traffic during works should be free of bumps, potholes and uneven surfaces. Where a problem arises it should be treated as soon as possible.
- 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.
- Where road grooving has been carried out warning signs need to be used.

  Metal surfaces need to provide adequate traction for motorcycles and scooters.
- Any 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 rainfall.

It is important to consider the needs of motorcyclists at road works.

Signs

- Warning signs nee d to be erected in advance of the road works, to allow for all road users to 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 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. This is very important on narrow sealed rural roads
- Although warning lights are not required at night, consideration should be given to having them and ensuring they are 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

- Signs, barriers, fencing and bollards used need to be placed to ensure a clear view of intersections, around curves, and of approaching and turning traffic.
- Signs, barriers, fencing and bollards need to be placed well clear of traffic lanes, so as not to cause a traffic hazard.
- Water filled barriers should be half filled or not filled on motorbike conflict points if possible.

Warning signs about specific hazards during road works are important for motorcycle safety.

Further information

Austroads, 1999, *Guide to Traffic Engineering Practice: Motorcycle safety (Part 15)*

Office of Road Safety Motorcyclists & Motorised Scooters Fact sheet
- available to download from www.ors.wa.gov.au

WALGA Roadwise Program (08) 9213 2066

Main Roads WA 138 138

MOTORCYCLE & SCOOTER
Safety Advisory Group

The representative organisations on the Motorcycle and Scooter Safety Advisory Group are: RAC WA, Office of Road Safety, Main Roads WA, Department of Transport, WA Police, Motor Trades Association, Motorcycle Riders Association and WALGA.