Shared Path Design
Technical Guidelines
Purpose and Intention

The Western Australian Bicycle Network (WABN) is a series of cycling routes comprising of on-road, path and end-of-trip infrastructure and forms part of a strategic and integrated transport network being developed for Perth’s future. The Department of Transport (DoT) has issued a number of grants to its local governments in WA with the intention of raising the cycling profile at local levels to encourage healthier lifestyle and eco-friendly and efficient travel.

The grants aim to raise the cycling profile by ensuring network infrastructure is complementary across the local boundaries. These grant programs are set out in accordance with State Government priorities set out in the WABN Plan (2014-2031) and particularly favour developments which provide connections to schools, train stations and activity centres for their given local government area. More information can be found on the DoT website.

It is recognised that a number of documents providing information regarding cycling infrastructure exist. The wide ranging nature of these documents, and the disparity of advice contained within them can make appropriate shared path construction difficult to determine. This has often resulted in poorly planned local cycle networks as noted by the Office of the Auditor General.

This document is intended to form a concise and comprehensive guideline (The Guide) for Local Governments in developing best practice design and scope of shared path projects in general, and under the Perth Bicycle Network (PBN) and Regional Bicycle Network (RBN) grant schemes. This Guide will serve to assist in safer, more consistent, better pathways and outcomes for shared path users and designers.

This Guide will focus on how to design and construct the best quality shared path facility, rather than on comparing shared paths with other design solutions (e.g. on-road treatments). This Guide is intended to be a convenient and practical reference for different practitioners of varying levels of experience.

This Guide includes the following items:

- Policy and Design Context: Australia
- Policy and Design Context: International
- Planning Framework
- Path Treatments and General Design Standards
- Civil Design Advice
- Location of Shared Paths
- Path Connections
- Connections between Shared Paths and Cycle Lanes
- Obstructions and Hazards
- Regional Infrastructure
- Design Advice for Regional and Metropolitan Shared Paths
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- Main Roads WA Policy and Standards
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- Department of Transport
- Policy and Design Context: International
- AASHTO Guideline (USA) Chapter 14 (Shared Use Path Design)
- NACTO Urban Bikeway Design Guide (USA)
- New York City Street Design Manual (USA) 2013
- Cycle Infrastructure Design Guide (UK) 2008
- Collection of Cycle Concepts 2012 (Denmark)

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<td>A path within an activated city-centre zone primarily for use by pedestrians</td>
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<td>Device to connect on-street cycle lanes with verge infrastructure</td>
<td>7.1.1</td>
</tr>
<tr>
<td>Types of Cyclists</td>
<td>Description of the different characteristics of cyclists</td>
<td>2.3.2</td>
</tr>
<tr>
<td>User Groups and Needs</td>
<td>Description of the different characteristics of path users</td>
<td>2.2</td>
</tr>
<tr>
<td>Vegetation</td>
<td>Soft landscaping elements</td>
<td>8.1.4</td>
</tr>
<tr>
<td>Visual Permeability</td>
<td>The ability to see through a permanent object</td>
<td>5.3, 8.2</td>
</tr>
<tr>
<td>Wombat Crossing</td>
<td>A raised zebra crossing</td>
<td>6.3</td>
</tr>
<tr>
<td>Zebra crossing</td>
<td>A pedestrian-only priority crossing of a road or driveway</td>
<td>6.3</td>
</tr>
<tr>
<td>Shared Path</td>
<td>A pathway that is primarily used by both pedestrians and riders of bicycles.</td>
<td>2</td>
</tr>
<tr>
<td>Sightlines</td>
<td>The visual envelope of vehicles and path users</td>
<td>3.3.1, 5.1, 8.2</td>
</tr>
<tr>
<td>Signage</td>
<td>Vertical signs providing wayfinding or safety advice for path users</td>
<td>4.5.4</td>
</tr>
</tbody>
</table>
1. Policy and Planning

Design Context

An outline of the policy and planning design documents, information and standards which provides context for this guideline are included in Appendix A. These documents are sourced both nationally and internationally.

It is understood that some local government areas (LGAs) have developed their own set of guidelines addressing local policies and planning criteria. This Guide is intended to provide information to inform local government specifications and should be used in conjunction with them.

2. Planning Framework

2.1 Key Shared Path Characteristics

A shared path is defined in the WA Road Rules to be a pathway that is primarily used by both pedestrians and riders of bicycles. As a result of the changes to the Road Traffic Code on 27 April 2016, bicycles are no longer prohibited on footpaths.

However, the provision of coherent networks of pedestrian and bicycle paths is important to local governments, because they:

- Encourage exercise which improves public health and reduces the strain on health services and hospital systems;
- Can assist in causing a shift from car to other forms of transport (walking, cycling and public transport) thereby reducing air pollution, greenhouse emissions and other forms of environmental pollution, as well as assisting in the management of traffic congestion;
- Benefit businesses through healthier employees who enjoy a better quality of life; and
- They usually have gentler bends and gradients than footpaths in order to ensure good visibility to maximise safety. Shared paths usually have a painted centre line and are signed (either with pavement stencils or with an upright sign).

2.2 Path Function

Shared paths for cyclists are primarily used for commuting, utility and recreational purposes.

2.2.1 Commuter and Utility Use

Commuters and utility cyclists will generally want to travel as fast as conditions allow. It is important, that paths provided for long distance commuting have the best possible alignment and are designed to cater for the anticipated speed of cyclists. Such paths should:

- Lead to useful destinations;
- Allow safe travel at a constant speed appropriate to the use; and
- Achieve a specific purpose such as providing a short cut or a by-pass of a busy section of road.

2.2.2 Recreational Use

A recreational path is a path that may be located along the coastline, a river, foreshore or along a linear public open space corridor. A path designed for recreation should:

- Offer an attractive and enjoyable ride of at least 10 minutes duration or a walk of 30 minutes;
- Where possible, generally have flat gradients to better provide for children and novice adult cyclists;
- Have few road crossings; and
- Be readily accessible.
Other functions include utility cycling trips (local trips to nearby destinations), pedestrian activity, disability access and more.

A shared path should be suitable for use by all groups likely to require it.

### 2.3 Shared Path Users and Individual Needs

A significant issue associated with shared use paths is the variety of users who display various characteristics that can lead to conflict between them. These characteristics include differences in speed, space requirements, age, user expectations and predictability. Examples of shared path users are shown in Table 1.

#### 2.3.1 Pedestrians

Walking is regarded as having significant benefits to the community. The key attributes of an environment required to encourage walking, referred to as the 5 Cs (DETR Encouraging walking: advice to local authorities, 2000) are that it should be:

- Connected: are there walking networks to give good access to key destinations?
- Comfortable: do local facilities meet design standards for footpath width, walking surfaces and planning for people with impairments?
- Convenient: can streets be crossed easily, safely and without delay?
- Convivial: are routes interesting, clean and free from threat?
- Conspicuous: are walking routes clearly signposted and are they published in local maps?

#### 2.3.2 Cyclist Requirements and Types

In relation to path and road engineering all cyclists have six (6) basic requirements whenever they ride. These are:

- Space to ride;
- A smooth surface, free of debris;
- Speed maintenance;
- Appropriate sight lines to path surface;
- Connectivity; and
- Information.

<table>
<thead>
<tr>
<th>Type of Use</th>
<th>Specific User Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrians</td>
<td>• children</td>
</tr>
<tr>
<td></td>
<td>• elderly</td>
</tr>
<tr>
<td></td>
<td>• prams &amp; strollers</td>
</tr>
<tr>
<td></td>
<td>• family groups</td>
</tr>
<tr>
<td></td>
<td>• dog walkers</td>
</tr>
<tr>
<td></td>
<td>• joggers</td>
</tr>
<tr>
<td>Cyclists</td>
<td>• children</td>
</tr>
<tr>
<td></td>
<td>• families</td>
</tr>
<tr>
<td></td>
<td>• adults</td>
</tr>
<tr>
<td></td>
<td>• individuals &amp; groups</td>
</tr>
<tr>
<td></td>
<td>• power assisted bicycles</td>
</tr>
<tr>
<td></td>
<td>• bike trailers</td>
</tr>
<tr>
<td></td>
<td>• cargo</td>
</tr>
<tr>
<td></td>
<td>• utility</td>
</tr>
<tr>
<td></td>
<td>• tandem &amp; recumbents</td>
</tr>
<tr>
<td>Users with disabilities (vision, hearing, mobility &amp; cognitively impaired users)</td>
<td>• pedestrians</td>
</tr>
<tr>
<td></td>
<td>• sporting users</td>
</tr>
<tr>
<td></td>
<td>• manual wheelchair users</td>
</tr>
<tr>
<td></td>
<td>• electric wheelchair/scooters</td>
</tr>
<tr>
<td>Small-wheeled vehicle users</td>
<td>• in-line skaters</td>
</tr>
<tr>
<td></td>
<td>• skate boarders</td>
</tr>
<tr>
<td></td>
<td>• roller skaters</td>
</tr>
<tr>
<td></td>
<td>• foot scooters</td>
</tr>
<tr>
<td>Others</td>
<td>• maintenance workers</td>
</tr>
<tr>
<td></td>
<td>• horse riders</td>
</tr>
<tr>
<td></td>
<td>• anglers</td>
</tr>
</tbody>
</table>
2.3.3 Commuter Cyclists

Most commuter trips are performed by students and adults commuting to either their education institution or place of work. The average trip length for this user group is 5km or more. Cycling preferences include:

- Good quality road surfaces;
- Most direct routes to their destinations;
- Minimal delays;
- End of trip facilities;
- Minimal conflicts at intersections; and
- Good lighting for evening trips.

Where a high quality shared path is available, many commuter cyclists will tend to favour traveling along these paths over roads.

2.3.4 Utility Cyclists

Neighbourhood cycling involves trips to local schools, shops, train stations and children playing on their bicycles. Most of these trips involve distances of less than 5km.

Travel speeds are typically less than 15km/h. The primary users generally ride on local bike links while some may use the Recreational Shared Paths (RSP) and Principal Shared Paths (PSP). Cycling preferences include:

- Highest degree of safety;
- Comfort and personal security;
- Low traffic speeds/ volumes;
- Facilities to minimize road conflict and cross intersections;
- End of trip facilities;
- Screening from weather; and
- A high level of accessibility that doesn’t hinder the movement of cargo bikes, bikes with trailers, etc.

2.3.5 Recreational Cyclists

Many recreational cyclists ride to experience high amenity value or do it as a form of exercise. They prefer riding on attractive and scenic routes at a lower speed compared to road cycling. Time is often not a major consideration and the skills and abilities of these cyclists vary quite a bit. Cycling preferences include:

- Comfort.
- Good surface.
- Preferably off-road paths.
- End of trip facilities.

2.3.6 Sports Cyclists

Sports cyclists often travel at speeds greater than 30km/h. These cyclists often travel distances of over 50km mainly along major urban arterial or regional roads. They often seek challenging terrain and frequently travel in groups of more than two. Cycling preferences include:

- High quality road surface;
- Minimal delays; and
- Generous path widths.

While sports cyclists will travel mostly on roads, there may be specific instances where shared path use is required, for example to link discontinuous local streets. Even, where a high quality shared path is available, many sports cyclists will tend to favour traveling within the roadway.

2.3.7 Mobility Impaired / Wheelchair Users

Mobility impaired refers to the inability of a person to use one or more of his/her extremities, or a lack of strength to walk, grasp, or lift objects. The use of a wheelchair, crutches, or a walker may be utilised to aid in mobility. In considering the minimum width required for a wheelchair, designers should also see AS 1428 Design for Access and Mobility regarding minimum widths for access ways, walkways, ramps, landings and doorways.
2.3.8 Visually Impaired / Hearing Impaired / Elderly

Many people with disabilities undertake much of their travel either on foot, in wheelchairs or on personal mobility devices (e.g. scooters) and so the development of a network of adequate footpaths is important for their mobility.

The provision of footpaths that meet recommended dimensions, surface requirements and are free of obstructions are important to ensure that they do not represent a hazard for people who have difficulty in detecting or manoeuvring around obstacles.

Designers should refer to AS 1428 Design for Access and Mobility regarding tactile paving, kerbing and other indicators to assist people with visual or hearing impairments.

2.3.9 Emergency Services Vehicles

The design of bollards, fencing and other obstructions must take into consideration emergency vehicle access and allow for emergency services vehicles to access and cross the paths where required (e.g. removable bollards).
3. Path Treatments and General Design Standards

Shared paths may vary greatly with respect to their function and use. The requirements for their construction should be consistent with the intent of the path. The four basic types of path are shown in Table 2 and include:

1. Low speed shared path
2. High quality shared path
3. Activity centre path
4. Separated pedestrian/ cycle path

For low speed and high quality applications, shared path line-marking is recommended under *WA Road Rules* after all road crossings. Repeater signage is recommended at path connections to the shared path (Refer to Section 4.5).

The choice of path type should correspond with desired function, and the volumes of pedestrians and cyclists using the path. The benchmark volumes presented in Table 2 provides a rough guide for the capacity of users on the path.

For path selection details, refer to *Austroads Guide to Road Design: Part 6A Section 6*. Guidelines for the selection of appropriate path widths are provided in Appendix B.

<table>
<thead>
<tr>
<th>Function</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low speed shared path</td>
<td>Design Speed</td>
</tr>
<tr>
<td></td>
<td>• &lt;20km/hr</td>
</tr>
<tr>
<td>Geometry</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 2.5m-3.0m width</td>
</tr>
<tr>
<td></td>
<td>• Recommended curve radius 10m</td>
</tr>
<tr>
<td></td>
<td>• Min. curve radius 5m</td>
</tr>
<tr>
<td></td>
<td>• Min. connection radius 1m</td>
</tr>
<tr>
<td></td>
<td>• Crossfall 2-2.5%</td>
</tr>
<tr>
<td></td>
<td>• Max gradient 3%</td>
</tr>
<tr>
<td>Surface Treatment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Concrete or Asphalt</td>
</tr>
<tr>
<td></td>
<td>• Consider centreline marking to provide guidance &amp; passive wayfinding.</td>
</tr>
<tr>
<td>Function</td>
<td>Example</td>
</tr>
<tr>
<td>----------</td>
<td>---------</td>
</tr>
<tr>
<td><strong>High quality shared path</strong></td>
<td>High speed or high volume paths with a mix of pedestrians and cyclists. Suitable for all users, including higher-speed commuters where pedestrian volumes are comparatively low.</td>
</tr>
<tr>
<td><strong>Design Speed</strong></td>
<td>• 30km/hr</td>
</tr>
<tr>
<td><strong>Geometry</strong></td>
<td>• 3.0m-4.0m width</td>
</tr>
<tr>
<td></td>
<td>• Recommended curve radius 25m</td>
</tr>
<tr>
<td></td>
<td>• Min. curve radius 10m</td>
</tr>
<tr>
<td></td>
<td>• Min. connection radius 3m</td>
</tr>
<tr>
<td></td>
<td>• Crossfall 2-2.5%</td>
</tr>
<tr>
<td></td>
<td>• Max gradient 3%</td>
</tr>
<tr>
<td><strong>Surface Treatment</strong></td>
<td>Red Asphalt</td>
</tr>
<tr>
<td></td>
<td>Centreline and edge-line marking to provide guidance &amp; passive wayfinding.</td>
</tr>
</tbody>
</table>

| Activity centre path | High volume pedestrian environment where low-speed cycling is permitted. It is expected that high-speed cyclists will be accommodated on-road in mixed traffic or dedicated cycle lanes. |
| **Design Speed** | • 10km/hr (high volume of pedestrians) |
| **Geometry** | • 4.0m-6.0m+ width |
| | • No minimum curve radius or connection radius as long as width requirements are met |
| | • Path geometry likely to consist of entire verge area from lot boundary to kerb. |
| | • Crossfall 2-2.5% |
| **Surface Treatment** | Faux Brick or other differentiated surface |
| | Consider the effect of surface texture to reduced speeds. |
| | No centreline marking. Potential for advisory signage to reinforce shared space. |

<table>
<thead>
<tr>
<th>Function</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sperated pedestrian/cycle path</strong></td>
<td>Suitable where high speed cycling and pedestrian activity occurs along the same section of infrastructure. Representative of Principal Shared Paths (PSP) and Recreational Shared Paths (RSP) function.</td>
</tr>
<tr>
<td><strong>Design Speed</strong></td>
<td>• 30km/hr +</td>
</tr>
<tr>
<td><strong>Geometry</strong></td>
<td>• Cycle Path: 2.5m-4.0m+ width</td>
</tr>
<tr>
<td></td>
<td>• Pedestrian Path: 1.8m-2.5m</td>
</tr>
<tr>
<td></td>
<td>• Separator strip consists of a 300mm painted buffer or vertical differentiation (tactile paint).</td>
</tr>
<tr>
<td></td>
<td>• Recommended curve radius 25m</td>
</tr>
<tr>
<td></td>
<td>• Min. curve radius 10m</td>
</tr>
<tr>
<td></td>
<td>• Min. connection radius 3m</td>
</tr>
<tr>
<td></td>
<td>• Crossfall 2-2.5%</td>
</tr>
<tr>
<td></td>
<td>• Max gradient 3% (pedestrian path)</td>
</tr>
<tr>
<td></td>
<td>• Max gradient 7% (cycle-only path)</td>
</tr>
<tr>
<td><strong>Surface Treatment</strong></td>
<td>High quality red asphalt and concrete/black asphalt</td>
</tr>
<tr>
<td></td>
<td>Differentiate the two path surfaces by the use of different pavement colours or bricks/pavers for pedestrian sections to reinforce separation between pedestrian and cycle paths.</td>
</tr>
</tbody>
</table>
3.1 Coloured Surfaces

Coloured surfaces provide differentiation and wayfinding for path users. The following provides some general guidance for the use of colouration, consistent with guidance in Austroads Guide to Road Design: Part 6A Section 6.

Red asphalt is a useful identifier to visually differentiate shared paths intended specifically for cyclists. That is, for sections of the higher-order cycling network. The colouration therefore acts as passive wayfinding, directing cyclists to safe paths in the network, and supported through wayfinding signage and other passive wayfinding techniques such as linemarking and grab rails.

Where a concrete path forms part of the cycling network, it may be distinguishable only by stencils and linemarking. The use of colour to reinforce shared path status can be of value when combined with these other forms of differentiation. However, the use of coloured concrete is inconsistent throughout WA and does not inherently define a shared path.

The use of green paint should be confined to conflict zones where pedestrians and cyclists have priority. This includes major driveway crossovers, and road crossings where pedestrian and cycle priority is provided. Colour composition and shade should be consistent with Australian Standards Emerald Green G13.

Painted coatings should be chosen so that they do not create an additional hazard. This may involve the addition of non-skid elements, with a corresponding maintenance requirement for replacement.

3.2 Material Choice

Concrete and asphalt are the preferred material for hot climates as they radiate less heat and thus are the preferred materials for WA climate. The use of loose surface materials such as exposed aggregate, gravel, soil, sand, grass and tanbark should be avoided. Recommended materials are detailed in Table 2 and discussed further below.

3.2.1 Concrete

Concrete should be used over asphalt where environmental conditions support this construction. Examples include areas where grass is likely to grow out of pavement cracks, where the path alignment passes close to trees where root intrusion is an issue or where flooding is a common occurrence (as asphalt is more susceptible to water damage).

Concrete may also be the desired material where red asphalt is difficult to obtain, particularly in smaller regional towns.

In general, concrete is easy to maintain, longer lasting and more durable, resulting in lower maintenance costs. Therefore it is the preferred material choice in low cycling volume applications, where a low speed shared path is appropriate.

3.2.2 Asphalt

Asphalt provides a smoother surface than concrete, thereby making the path more attractive for cyclists. It is therefore preferable for paths with high bicycle traffic, including high quality and separated pedestrian/cycle paths.

Asphalt is widely used due to its application in a variety of ground conditions. This includes reactive soils (i.e. high clay proportions) that may move due to weather and seasonal change.

While the asphalt surface may crack or deteriorate over time, damage tends to be localised and relatively inexpensive to fix. This is in contrast to concrete paths, which tend to experience a greater extent of failure, often requiring the whole section of the path to be replaced.

- Edge Restraints:
The use of Concrete Edge Restraint is recommended alongside asphalt paths to minimise deterioration of the path edge.
3.3 Traffic Calming Measures to Slow Down Cyclists

Separate pedestrian and cyclist paths should be used to minimise pedestrian and cyclist conflict in high traffic areas. Where this is not possible, the following strategies and treatments can be applied.

Traffic calming encompasses a wide range of geometric and environmental design changes to reduce vehicle speeds. These principles can be applied to shared path designs. Below are a number of traffic calming strategies to slow down bicycle speeds which pose minimal hazard to the cyclist.

3.3.1 Horizontal Curve Treatment

The use of a horizontal curve can be used to slow cycling traffic or to redirect faster cyclists to a safe road environment. Appropriate curve radii can be implemented, with a minimum radius of 10m. Tight curves that may appear to cause potential hazards are not to be used.

3.3.2 Pavement Texturing Treatment

3.3.2.1 Change in Material and Colour

The use of surfacing materials such as brick and cobblestone may be used to discourage high speeds. This method is considered appropriate on low speed shared paths and activity centre path only.

The use of differentiated colouration can also be used reinforce the speed environments in an area, when accompanied by appropriate signage and linemarking.

3.3.2.2 Rumble Strips

The use of ‘rumble strips’ placed along a path may be used as a warning device to alert riders to slow down for changed conditions ahead. Care must be taken to ensure that these elements do not pose a trip hazard for pedestrians or a slip hazard for cyclists in wet conditions.

– See Main Roads Standard Drawing 200631-0043 for details

3.3.3 Speed Limit Signage

The use of speed limit signage is generally not recommended as cycling speeds are difficult to monitor and the restriction cannot be enforced. Alternative advisory signage is considered to have near equivalent impact. An example of this is shown below for reference.
4. Civil Design Advice

4.1 Path Construction

4.1.1 High Quality Shared Path Construction Standards

A representative construction standard for an asphalt shared path is shown in Figure 1, extracted from *Austroads Guide to Road Design Part 6A: Commentary 12*.

Figure 1 High Quality Shared Path Construction Standards

4.1.2 Lower Volume Shared Path Construction Standards

Low volume shared paths (Figure 2) may be constructed from concrete instead of asphalt, as appropriate.

Minimum requirements for a concrete shared path are as follows:

- Concrete to achieve a minimum 25MPa compressive strength at 28 days. Aggregate shall be 14 to 20mm with a slump of 75mm.
- Thickness of a concrete shared path shall be a minimum of 100mm.

Where expansion joints are used exclusively, they shall be located at a maximum of 10m spacing, and at all tangent points, around all services, at all pram ramps and vehicle crossings and at end of works.

Where contraction joints are used, they are to be of a ‘lock joint’ type rather than grooved. Contraction joints are to be placed at a maximum of 1.5 times the width of the path.

A lock joint uses a rigid material articulating, interlocking control and contraction joint which locks two concrete panels together resulting in a more even distribution of weight and keeping the joint even to avoid tripping. The use of a lock joint significantly reduces the chances of concrete panel displacement i.e. cracking, sinking, popping up.

- Where a contraction joint is used, an expansion joint should be placed every 50m along a straight section or at the start of a deviation of a curve in the path.
4.1.3 Grade and Crossfall
On sealed surfaces a crossfall of between 2% and 2.5% is recommended to effectively dispose of surface water, while being consistent with the requirements of people with disabilities.
- See AS1428.1 Design for Access and Mobility Section 10.1 for details.
- Maximum grade should not exceed 3%. If a grade steeper than 3% is required, it shall be treated as a ramp (refer to Section 4.1.4).

4.1.4 Ramps and landings
Ramps on shared paths should be a maximum of 7% and have minimum 1200mm wide landings positioned not more than 9m apart.
- See AS1428.1 Design for Access and Mobility Section 10.3 and Main Roads Standard Drawing 201131-0071 for details.

4.1.5 Steep Grades
Ramps on bicycle-only paths may have an increased grade for short sections only. An alternative alignment is recommended if consistently steep grades are required.

Where ramps exceed 5%, the area at the bottom of the ramp should be clear of sharp horizontal curves and fixed objects. Barriers may be required where ramp grades terminate at a road or other hazard.

The use of concrete instead of asphalt may be used on these paths to provide additional friction between bicycle tyres and the pavement surface.

4.1.6 Stairways and Wheeling Ramps
Where there are grades greater than 8% over very short distances and no alternative pathways are available, the use of stairs with wheeling ramps (3 to 5 steps each interval with landings of 1.2m length in between) may be used. Wheeling ramps however, have a range of restrictions including difficulty for wheelchair users and thus should be used only when there is no other option.

For design dimensions, refer to Austroads Guide to Road Design – Part 6A – Pedestrian and Cyclist Paths Section 11.4.

- Signage
Signage needs to be provided to effectively warn pedestrians and cyclists of steep grades and bends ahead. Clearances and details on signage can be viewed in Section 8.1.2 and Section 4.5, respectively.

4.2 Vertical Clearance
Adequate vertical clearance should be provided over the full width of the shared path, completely free of overhanging projections and obstructions (e.g. trees, signage).

For shared paths, the minimum vertical clearance is 2.5 m above the path surface.
- See AS1742.2 Clause D.2.3.5 for details.

4.3 Horizontal Clearance
A 1.0m clearance is desirable between the edges of the path and any obstacle which is a potential hazard for a cyclist. Additional clearance or a barrier fence is recommended where there is risk of serious injury to cyclists.

For extenuating circumstances, a lesser clearance of 0.3m absolute minimum may be acceptable for fences and other obstacles that have smooth features and are aligned parallel to the path.
- See Austroads Guide to Road Design Part 6A Section 7.7 for details.
- See Section 8 for advice regarding path design near obstructions and hazards.

4.4 Crossover Design
A recommended crossover design is shown in Figure 3 which satisfies WA requirements for stormwater management and Australian Standards requirements for radius and width, while providing a consistent surface for cyclists and pedestrians.

An example technical drawing has been provided in Appendix B.

The shared path is designed to continue through the crossover, reinforcing the priority of pedestrians and cyclists in accordance with Australian Road Rules.
Note that this design may require additional reinstatement works for established crossovers due to the need to rectify any severed reinforcement or adjust driveway levels. Due to the additional cost of works, treatment of the existing crossover may be preferable in some locations, through application of a matching coloured surface coating and edge-line markings.

### 4.4.1 Crossover design at a major driveway crossing

Where a shared path crosses a driveway which has a significant associated traffic volume (such as a shopping centre, service station, multi-storey car park etc), an alternative treatment may be appropriate.

In this case, the driveway should be treated as if it were a road, complete with pram ramps, tactile paving and grab rails as necessary. The path should be continued through the driveway in the form of an edgeline and a green painted surface, as per Section 5.

Where heavy vehicle traffic is expected, additional reinforcement may be required.

### 4.5 Signage and linemarking

#### 4.5.1 General Guidance

Pavement markings (including bicycle pavement symbols) line work and signs on shared paths should be installed in accordance with Austroads Part 14, Section 9 and AS1742.9.

Bicycle paths signs are recommended to be installed in accordance with RTC 2000, if the path is to be designated as a shared path. Main Roads WA Standard Drawing 201331-0058 provides geometric and placement details for the design and installation of stencils and linemarking.

Note that Main Roads is currently the only authority that can approve road pavement markings and regulatory road signs.

#### 4.5.2 Wayfinding Signage

Wayfinding provides shared path users information regarding their directions, nearby services and tourist facilities.

Components of wayfinding include sign base and lettering/symbol colours, bicycle symbols, typeface and lettering size, depiction of distances, sign of layout conventions and pavement markings.

Signage is to:

- Not intrude into the clear continuous path of travel.
- Needs to be appropriately oriented.
- Needs to be visible legible and understandable.

Directional signage for navigation purposes should be provided in accordance with Main Roads Bicycle Directional Signage and Department of Transport requirements.

For details of example wayfinding signage, refer to Main Roads WA Standard Drawing 200531-0009 and AS1742.9 Figure 5.2.
4.5.2.1 Colour schemes and Text
A good colour contrast should be provided such that there is a clear distinction between the background and text, the sign itself and its surrounding surface/background. Simple fonts such as Arial or Helvetica are recommended. Requirements for signage are described in AS 1428.2.

The use of Plain English and symbols are encouraged to enhance access to those with cognitive disabilities. The use of internationally recognised symbols is preferred, with details provided in AS 1428.1.

4.5.2.2 Reflection
Where night-time visibility is required, signs should be lit or be constructed from an appropriate retro-reflective material, in accordance with AS 1742.9 – Appendix A.

4.5.3 Pavement Markings
Pavement markings need to be visible and effective for all likely conditions, e.g. Day, night, rain, fog, rising/setting sun, oncoming headlights, light coloured pavement surfaces and poor lighting.

Pavement markings need to be slip resistant and maintained to a high standard. No redundant markings should be on the path.

4.5.4 Warning and Statutory Signage
Warning and statutory signage for road applications can be applied to the path environment either as vertical plate signs or, more appropriately, in the form of linemarking. Potential applications include ‘Give way’ signs and dashed lines, ‘Stop’ signs and lines, caution warnings for pedestrians, grades, intersections etc.

A selection of these are shown in Figure 4 and Appendix B, including a section of pavement with standard shared path linemarking and stencils.

4.5.5 Lane Markings
In general, cyclists are familiar with the road environment and as such, lane markings (turning pockets, give way and stop lines etc.) are an effective tool to encourage appropriate behaviours at critical decision points.
5. Location of Shared Paths

5.1 Preferred Intersection Alignment

5.1.1 Intersection offset
If sufficient space is available within the intersection truncation, it is desirable to set back the path a minimum 6.0m from the kerb-line. This allows a vehicle to be stopped at the intersection without obstructing pedestrian/cycle crossing.
- This distance also allows for pedestrian/cycle priority if desirable (see Section 6.4).
- Ensure sufficient sightlines available at lot truncation (Section 9.2).
- Maintain minimum path radius on approach (Section 4).

5.1.2 Central Median Break
If the crossing distance is wide or traffic volumes/speeds are high (>3000 vehicles per day), a central median and median break is required.
A median width of 2.5m is sufficient to accommodate a bicycle or parent with pram comfortably. If this cannot be achieved, a minimum median width of 2.0m required. The median break should be at least as wide as the path.
- See Section 6.2 for details of road crossings.

5.2 Alternative Intersection Alignment
If sufficient space is not available within the intersection truncation, retain a straight alignment for the path to the extent possible. Minimise intersection kerb radius to reduce crossing distance.

5.3 Preferred Path Alignment

5.3.1 Path location relative to kerb edge
The preferred location for a shared path is 1.0m from the kerb face. This distance allows for road furniture and bins to be positioned at the kerb-line without impacting the operation and safety of the shared path, as well providing a buffer between path users and traffic. A minimum of 0.5m is required for clearance to the roadway.
This path location also avoids sightline issues at driveways, created when the path is placed along the property boundary.
To minimise maintenance of the strip between path and road, an alternative surface treatment is recommended (e.g. concrete or faux brick).

Where no kerb is present, the minimum clearance between the path and the roadway is 1.0m, or 1.5m for high speed/volume roads.

The preferred path alignment may not be achievable in some locations due to a variety of obstructions.

- See Section 8 for advice regarding path design adjacent to obstructions and hazards.

If the path alignment must be moved to the property boundary due to no viable alternative, the impact of driveways and associated sightline issues must be considered.

- See AS2890.1:2004 Off-Street Car Parking Figure 3.3 for details regarding sightline requirements.
- See Section 8.2 for advice regarding fence construction and visual permeability.

5.3.2 Path through a small driveway crossover

The continuation of the shared path surface across the driveway reinforces pedestrian/cyclist priority.

If the driveway is of significant width, or path continuation is unviable, differentiate by means of green paint, pedestrian/cycle markings and painted edgeline marking.

- See Section 4.4 for details regarding driveway crossover geometry.

5.3.3 Path through a large driveway crossover

Where a shared path crosses a driveway which has a significant associated traffic volume (such as a shopping centre, service station, multi-storey car park etc), an alternative treatment may be appropriate.

In this case, the driveway should be treated as if it were a road, complete with pram ramps, tactile paving and grab rails as necessary. The path should be continued through the driveway in the form of an edgeline and a green painted surface, as per the above. Give way signage should also be provided before the green painted surface.
6. Path Connections

6.1 Path Connections

Where two paths connect, consideration should be given to ‘passive wayfinding’. That is, using path orientation, linemarking, grab rails and surface treatment to indicate the preferential direction of travel. This allows the infrastructure itself to direct users along the designed route, without the need for additional signage.

Shared path stencils are recommended on the departure side of all path connections.

6.1.1 Connection of two paths of equal importance

Where two shared paths, or two PSP-quality paths meet, the path geometry should support all turning movements equally. This creates a requirement for larger radius (3.0m) transitions to allow cyclists to turn onto the adjacent path. Where one path terminates or crosses the through movement, it is recommended that give-way linemarking including pavement stencils be installed on the minor approach.

The intersection of two equal paths should be maintained at close to 90 degrees wherever possible. At the intersection of two PSP or strategic shared paths, additional wayfinding signage, consisting of direction signs or on-path stencils, is recommended.

6.1.2 Connection of a shared path to a path of lesser importance

Where a PSP-quality path meets a standard shared path, or a shared path meets a footpath, the path geometry should be chosen to preferentially favour the higher-order infrastructure.
The major path will generally retain its preferred alignment, with the minor path forming a T-intersection. Differential surface treatment and edge line markings are recommended to reinforce the primary direction.

**6.2 Road Crossings**

**6.2.1 Shared Path Stencils**

Shared path stencils are recommended in the *WA Road Rules* immediately after a road crossing. No signage is needed at the termination of path to road to indicate that the path has ended.

- See AS1742.9 Figure 3.1 for additional detail regarding path stencils geometric designs.

**6.2.2 Kerb Ramps**

The preferred alignment for a shared path (1.0m back from the kerb) allows little space for cyclists to wait for a crossing opportunity. Two standards are therefore recommended, generally consistent with the need to install grab rails.

Space constraints are particularly an issue where traffic volumes, cyclist crossing, cycling speeds or volumes are high. Kerb ramps from high quality shared paths and separated paths should satisfy the standards for ‘busy’ crossing points.

**6.2.3 Grab Rails**

Grab rails are recommended at any crossing point considered to be ‘busy’. That is, where a shared path runs alongside or abuts a road with significant traffic volumes or high speeds, or where cyclist crossing volumes are high. Grab rails should also be installed at busy intersections where there is likely to be a high demand by people with disabilities or mobility issues.

Grab rails should be installed only where they provide a benefit with respect to staging for crossing a ‘busy’ road and only where they do not create a hazard for through movements along the shared path. Grab rails should always be positioned on the left-hand side of the kerb ramp, and on both sides of the median break if installed in the median. Grab rails should never be installed in the middle of the kerb ramp or path, and shall not obstruct the path in any way.

- See Main Roads Standard Drawing 9831-5649 for details.

**6.2.3.1 Kerb ramps at ‘quiet’ crossing points**

No deviation of the standard path alignment is required. Kerb ramps should be installed without grab rails. No central median is considered necessary for the purpose of supporting cycling movements.

**6.2.3.2 Kerb ramps at ‘busy’ crossing points**

A gradual deviation of the path alignment to allow for a 2.0m separation is recommended at any crossing point considered to be ‘busy’. That is, where a shared path runs alongside or abuts a road with significant traffic volumes or high speeds, or where cyclist crossing volumes are high. A central median is recommended for pedestrian and cycling refuge. This median should be a minimum of 2.0m wide. ‘Cut-through’ treatments (where the crossing is maintained at road level) are generally the preferred treatment for cyclist/pedestrian crossing facilities at major intersections.

The kerb ramps for both ‘quiet’ and ‘busy’ crossing points shall show a clear distinction from the path and the kerb ramp such that one is not within the other.

Kerb ramp geometry should be consistent with Main Roads Standard Drawing 9831-5649. Tactile paving should be included in accordance with AS1428.4 and Main Roads WA Standard Drawing 200931-0089, 200931-0090 and 200931-0091.
6.3 Pedestrian/Cycle Priority Road Crossing

One of the major drawbacks of shared paths for cyclists is the lack of priority at intersections, which considerably slows cycling journeys.

Higher order shared paths should be given priority over minor intersecting roads through implementation of a specific crossing treatment. This treatment combines give-way signage with a raised zebra (a wombat crossing) to require traffic to cede priority to pedestrians and cyclists. This form of intersection is relatively common in the Netherlands and is necessary if priority is to be provided to path users, due to the requirements of the current Road Traffic Code 2000.

The 6m offset to the roadway control line is required to allow for cars to enter the major road without obstructing the shared path, and for cars to stop after entering the minor road without impeding through movements.

- See NSW Bicycle Guidelines Section 7.2.2 for detailed geometric design of a standard pedestrian/cycle priority crossing.

6.4 Suggestions for Shared Paths at Roundabouts

The location and design of off-street shared paths facilities at roundabouts should generally be in accordance with Austroads Part 14, Section 5.5.2, while meeting the curve radii requirements in Section 3 of this Guide.

During design, special consideration will need to be given to the sight distance requirements of cyclists and turning motorists.

Where a cycle lane is provided on the approach to a roundabout, it is recommended that provision be made for cyclists to transition (if they so desire) to an adjacent off-street facility via a 20 degree transition ramp (See Section 7.1.1)

6.5 Signalised Road Crossing

Where a shared path intersects with a signalised crossing, a toucan signal (pedestrian and bicycle lanterns) is required at least along the primary flow direction.

Note that is not currently legal to cycle across a signalised crossing showing only a ‘pedestrian walk’ signal.

This can be installed only where the crossing can be fully protected, as ‘parallel walks’ (i.e. pedestrian filter movements) are incompatible with higherspeed cycling due to the limitations of sightlines and vehicle priority.

It is recommended that signal phasing be changed as required, in coordination with Main Roads, to allow for protected crossing by cyclists along the shared path route.

- See Main Roads Standard Drawing 201431-0041 and Drawing 9748-1098 for details of standard signal treatments, including pedestrian crossing details.
7. Connections between Shared Paths and Cycle Lanes

Every cycle lane requires connectivity to adjacent shared path infrastructure to allow cyclists to access all aspects of the cycling network.

The preferred design references connection between a cycle lane and a parallel shared path. It has a number of aspects, as follows:

7.1.1 Transition Ramps

Transition ramps are required to bring verge-level off-road cyclists down to road grade. A 20 degree approach angle allows for a gradual grade change and relatively high speed transition for commuter cyclists.

These transition ramps are appropriate for both road-to-path and path-to-road movements.

– See Austroads’ Guide to Road Design - Part 3: Figure 4.25 for ramp details.

7.1.2 Road Crossing

Cyclists exiting from the on-road facility may need to cross the traffic lanes to access the shared path. To complete this manoeuvre safely where an appropriate path is absent, a crossing facility is recommended as shown above. This geometry allows cyclists to safely stage to cross the road outside of any potential conflict zone.

Grab rails are required on the approach side only. This assists with passive wayfinding.

– See Section 6.2.3 for grab rail details.
8 Obstructions and Hazards

8.1 General
All street furniture should be installed at least 1.0m from the shared path. Provision of rubbish bins and drinking fountains/tap are recommended at regular intervals (5-10km apart) on arterial paths that are popular with sports cyclists (e.g. freeway path). This will reduce the rubbish they tend to leave behind and also enable them to refill water bottles.

8.1.1 Seating
Seating should be located off the path of travel, with at least 1.0m from the front of the seat to the shared path.

8.1.2 Signage
The edge of a sign face should be installed at least 0.5m clear of the shared path. Where this is not possible, signposts shall be located outside of the path envelope with the use of modular sign structures as necessary to maintain appropriate sign face locations.

8.1.3 Drinking Fountains
To accommodate the needs of most people, drinking fountains at two different heights are preferable. Drinking fountains should be set 2.0m clear of the path to avoid creating temporary obstruction.

8.1.4 Street Trees and Vegetation
Overhanging bushes or trees provide valuable shade, but can also act as a visual barrier or obstruction to a path. Local Government should regularly upkeep paths and act on hazard reports, to maintain the usability and safety of paths.

Soft landscaping should be maintained 500mm from the shared path edge, with any solid obstruction 1.0m from the path. Overhanging leaves and branches should be maintained at a height of 2.5m or above.

Should community members identify a hazard regarding the street trees and vegetation, hazard reports can be submitted directly to the relevant local Council or through the Main Roads or Department of Transport’s hazard reporting systems, according to asset ownership.

8.1.5 Utility Services
Street lights are to be located with a clearance of 0.8m-1.0m (Planning and Designing for Pedestrians Guidelines: Section 7.1.5) from the edge of the path and are not to obstruct pedestrians or cyclists. Poles located near an intersection should to be located 1m away from the roadway.

Utility provider services such as telecommunications domes, light poles, etc. shall be located with a minimum side clearance of 0.5m from the path edge.

8.1.6 Bus Stops
Details regarding design guidelines for bus stops are available in the Public Transport Bus Stop Site Layout Guidelines (2010). The preferred layout for shared path position is given in Figure 3A and 3B of the above guideline, requiring a deviation of the path behind the shelter or hardstand area.

If this cannot be achieved due to signage, seating, shelter infrastructure or other obstructions, a shared zone should be maintained for the full path width along the kerbline, including adequate clearance to all obstructions and hazards.

8.1.7 Centre-of-Path Obstructions
It may not be feasible to deviate the path or relocate obstructions. Overhead power poles and bollards are the most likely obstruction that may impact a shared path alignment.

Where obstructions are present, the path should be separated into two one-way sections of minimum 1.4m width. Reflective warning markings and chevron linemarking should be applied as per Main Roads Standard Drawing 200531-0008.
8.2 Sightlines and Visual Permeability

The visual truncations described in AS2890.1 Off-Street Car Parking are considered appropriate for minimising pedestrian conflict. However, cyclists travel significantly faster than pedestrians and there is an inherent risk of vehicle/cycling crashes where the footpath abuts the property line.

To alleviate this risk, fencing regulations attempt to extend the sightlines for reversing vehicles so that drivers can properly assess the potential risk of conflict.

It is recommended that where a shared path runs adjacent to the property boundary, fencing regulations require a minimum standard as follows:

- 2.5m truncation between the crossover and property boundary.
- Solid wall height of no more than 1.2m.
- Visually permeable section up to a total of 1.8m in height.

Visually permeable materials may be defined as having a maximum of 50% solid material. By preference solid inserts would constitute horizontal slats rather than the vertical inserts, to maximise the range of visibility to the path.

Truncation and visual permeability should be considered for all crossovers that address a path, whether this interaction occurs at the front or side boundary. This may require modification of existing design guidelines which often limit permeability requirements explicitly to the front boundary.

8.3 Paths Adjacent to Hazards

A shared path may be installed alongside a hazard, such as a steep drop or watercourse, which have the potential to cause injury to the shared path user. In this case, an appropriate fence or barrier should be installed. This fence should be a minimum of 1400mm high. Fences and handrails installed adjacent to shared paths should be constructed to minimise the risk to cyclists, while providing benefit to pedestrians and people with disabilities.

- Figure 5 shows fence requirement at batters and vertical drops, extracted from Austroads Guide to Road Design: Part 6A Section 7.7.
The greatest risk of a fence or handrail itself is that bicycle handlebars can 'snag' on vertical supporting elements. A 'bike safe' handrail is recommended in this instance, which curves inwards to protect cyclists, as shown below Figure 6.

Figure 6  “Bike Safe” Handrail

8.4 Lighting

A path should be considered for lighting if it forms part of an arterial bicycle route or a principal bicycle network where cyclists desire to travel at relatively high speeds for commuting or recreation, where the path is not lit by adjacent street lighting or where it forms a link that attracts a high degree of night-time traffic.

Street lighting may be sufficient, but should be considered in the context of shading by trees, the distance of the path from the road edge and the location of the street lighting – i.e. lighting in the centre of the road is unlikely to provide sufficient light to a path on the verge.

Modifications to street light luminaires may be a reasonable alternative to dedicated pedestrian lighting in some instances.

Where path lighting is provided, it should be installed in accordance with the performance and design requirements of AS/NZS 1158.3.1:2005, Pedestrian area (Category P).

Where path lighting is likely in the future, conduits and other preparatory works should be installed during path construction to minimise the cost and disruption to path users in the future.

8.5 Bollards and Gates

8.5.1 Bollards

Because bollards located within the shared path envelope are a hazard to pedestrians and cyclists, ideally they should not be used. Where necessary, bollards can be installed to prevent vehicular access to the path where there is evidence of existing unauthorised motor vehicle access or a clear desireline for such access.

If bollards are to be used on paths they must be used in conjunction with features on either side of the path (e.g. a fence or another bollard) to provide openings of between 1.4m and 1.6 m wide. If vehicular access to the path is available even with the bollard in place, the bollard shall not be installed.

Bollards installed at or near curves should be avoided as they restrict the manoeuvrability of cyclists, significantly increasing the crash risk. Bollards should also be conspicuous to cyclists and include linemarking to direct cyclists away from the bollard, as well as sufficient delineation to ensure visibility at night.

Bollards should be positioned a minimum of 5m from the road.

For paths wider than 4m, installing a u-rail and hazard board should be considered instead of bollards.

- See Austroads Guide to Road Design: Part 6A Section 10.4.2 and Main Roads Standard Drawing 200531-0008 for details of bollards.

- See Austroads Guide to Road Design: Part 6A Chapter 10.4 for more information on where and when to use bollards.

Retractable bollards should be installed wherever emergency vehicular access could be required. Retractable bollards should be designed to leave the path...
safe with nothing protruding above path level when the bollard is removed or lowered.

8.5.2 Gates

‘Gates’ (two u-rails positioned across the shared path) provide an alternative to bollards to limit motor vehicle access. They may also be used to protect cyclists where a downhill section of path terminates at a road. Gate elements must be positioned a minimum of 3m apart to enable cyclists to pass through without dismounting and enable easy passage by wheelchairs, prams and bicycle trailers.

– See Austroads’ Guide to Road Design: Part 3, Section 10.4.3 for details

The use of gates to control access should be carefully considered, and only when alternative treatments are unlikely to provide sufficient control.

8.6 Road Works

Roadworks signs shall not be installed across shared paths unless absolutely necessary and/or no other suitable location is available. All warning signs placed on bicycle facilities shall be clearly visible under all conditions, including when path users are blinded by oncoming car lights. Adequate advance warning to oncoming cyclists shall be given when temporary signs block part or all of a path through the use of traffic cones and/or linemarking.

Traffic management plans for road-works shall make, and clearly show, provisions for cyclists and pedestrians. Preference shall be given to minimising the length of detours to cyclists and pedestrians.

– Details of roadwork requirements are provided in MRWA Guidelines on the provisions for all path users at roadwork sites in built-up areas and AS 1742.3.

The following represents a summary of critical components for roadworks in and around shared paths.

8.6.1 Traffic Management Plans

A Traffic Management Plan (TMP) must be prepared to adequately provide for the safety of workers, road users and all path users. Where path facilities in built-up areas are affected by road works, the TMP must clearly indicate the provisions that will be made for all path users. As part of the TMP, the following is required:

– Potential path users must be considered
– Path users should not be led into the path of work site vehicles and equipment or other vehicles moving through or around the site
– Path users should be provided with a safe, accessible path that adequately replicates the original path, for the entire duration of the roadworks
– Path users must be fully aware that the changes to the original path have been made and for how long the changes are to occur

8.6.2 Surfacing

Surfacing of road works needs to satisfy AS 1742.3 Part 3 2.3.7, 2.3.8(b) and 2.3.8(d). A temporary pathway must also be maintained for the entire duration of the road works. The surface should be smooth, hard, free of loose materials, and remain intact with the passing of wheeled devices such as wheelchairs and bicycles. Temporary hoses or cables that run along the path should be placed at right angles to the path. Extremely thick cables need to be protected by a smoothly ramped solid cover treatment.

After the roadworks are completed, paths should be returned to their pre-construction condition or better.

8.6.3 Short-Term Roadworks

Short-term road works can have a duration of up to one single work shift. Detours and temporary paths need to cater for all path users. Detours on grass or compacted sand around a work site may be used for one day only with appropriate signage.
8.6.4 Long-Term Roadworks
Where long-term roadwork requires a design of a temporary footpath the following are recommended:
- Surface treatments should be stable, firm, even and relatively smooth but slip resistant.
- Avoid the use of exposed aggregate, gravel, soil, sand, grass and tanbark surfacing on pedestrian routes, other than recreational routes.
- Grades and dimensions should be in accordance with that outlined in Section 4.
- Regular inspection and maintenance to remove any loose material.

8.6.5 Dimensions
Where possible, the width of the detour should be the same as the width of the original path. Horizontal and vertical Clearances should be in accordance with Section 4.2 and Section 4.3 of this document.

8.6.6 Signage
Signage should be in accordance with AS 1742.3 with regards to the condition and positioning of signs and devices at work sites. Signage should be provided to separate the movements of path users from road users.

8.6.7 Fencing
Fencing and barricades around roadworks site should be used in all situations where a hazard is adjacent to a shared path facility. Temporary fencing shall not be installed on a path without providing adequate pathway width and lateral clearance.

8.6.8 Advance Warnings
Advance warning using signs and devices are to be provided for path users to warn them of the upcoming roadwork.

8.6.9 Behavioural Issues
Performing works on dual carriage roadways may cause traffic to travel temporarily in the wrong direction. This may create a risk to path users who do not look both ways. Signage should be used in these instances and dedicated personnel assisting pedestrians and cyclists crossing at intersections is recommended.

8.6.10 Advanced Public Notice
Advanced Public Notice of the roadworks should be provided a week before the commencement of works.

8.7 Railway Crossings
Bicycle crossings should be constructed in accordance with MRWA Railway Crossing Control in Western Australia: Policy and Guidelines (2015) Section 14 requirements, which will vary depending on the location of the crossing, and the type and intensity of rail traffic.

Bicycle crossings are best provided as a “Level 5” straight-through type with electronic gates for pedestrian/cyclist safety. This minimises the hazard created by the railway crossing ‘maze’ and ensures maximum use of the crossing provided.
- Crossing layouts are detailed in AS1742.7.

Bicycle Dismount signage is not a requirement where the approach is part of a Shared Path (AS1742.7 Clause 6.5.4).

8.8 Parking Wheel Stops
Parking wheel stops may be required to limit vehicle overhang into the adjacent path, where this overhang may be inconvenient or hazardous for pedestrians and cyclists.

Where a wheel stop is installed, a 620mm offset from the shared path to wheel stop for a vehicle parking with their front into the kerb, and a 900mm offset for rear-in parking.

Wheel stops should be avoided where they may be in the path of pedestrians moving to or from parked vehicles.
9. Regional Infrastructure

Many cycling and pedestrian routes in regional areas are characterised by long intervals between intersections and an absence of existing pedestrian infrastructure.

In these cases, provision of traditional shared paths may be cost prohibitive. An alternative is to incorporate shared path infrastructure into the roadway seal and provide this as a sealed shoulder extension.

To separate traffic from pedestrians and cyclists, delineation and vertical visual elements are required, considering also the requirements for emergency stopping and run-off-road safety.

While coloured asphalt is recommended to improve differentiation, a black asphalt layer is acceptable. Due to the reduced load experienced by the shared path, a smaller aggregate size is permitted, resulting in a smoother surface for cyclists.

9.1 Low Speed/Volume Roads

Where speeds or traffic volumes are considered to be low (i.e. 60km/hr or 300 vehicles per day), vertical elements are recommended to reduce the overall road width and reinforce lane discipline.

The decision to use particular types of separation should relate to the function of the road and its geometry, summarised as follows:

- Concrete kerbing or armadillos: Slow speed, straight alignment, reinforced by guard rail and warning signage at the outside of bends. Minimum kerb width 500mm. Refer to Figure 7 and Figure 8.
- “Bicycle Kerb”: higher volume or ‘winding’ roads. Consider guard rail protection at critical locations.
9.2 Higher Speed / Volume Roads

- A clear zone of minimum 1.5m should be maintained between the edge of the path and the traffic lane.
- Flexible Bollards: The additional separation width and flexible bollards allows for better delineation at speed, while protecting vehicle passengers during high-speed run-off events.
- Audio-tactile paint: Audio-tactile paint at the road edge assists in maintaining lane compliance, however it may be hazardous to cyclists when wet. Adequate shoulder width is essential to ensure that cyclists do not need to travel along the painted edge.

9.3 Guard Rails

Guard rails are an essential element of the design when bends may increase the risk to path users and vehicles alike.

Guard rails should be installed in accordance with the findings of a Road Safety Audit of the path alignment in the design phase or retro-fitted as required.
AASHTO (2015), Guideline Chapter 14 (Shared Use Path design), USA, Colorado.
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Standards Australia (2001), Tactile Ground Surface Indicators, AS 1428.4:2001, Standards Australia.

Standards Australia (2009), Design for access and mobility – General requirements for access – New building work, AS 1428.1:2009, Standards Australia.


Standards Australia (2005), Lighting for Roads and Public Spaces, AS 1158.3.1:2005, Standards Australia
Policy and Design Context: Australia

Cycling facilities in Western Australia (WA) are designed primarily using the following documents:

- Australian Road Rules 2014
- WA Road Traffic Code (RTC) 2000
- Austroads Guidelines.
- Main Roads WA Policy and Standards.

These advisory documents provide a guide to land-use and cycling planning for local road authorities and for practitioners. Other secondary guidelines include:

- Australian Standards.
- Department of Transport.

Australian Road Rules

The Road Rules 2014 under the Road Transport Act 2013, outlines the rules associated with traffic across all of Australia.

WA Road Rules (WA Road Traffic Code 2000)

As a state, Western Australia currently follows the WA Road Traffic Code 2000. The Code acts as a regulation detailing the design and rules of on-road and off-road (including PSPs and RSPs) traffic.

Austroads Guidelines

Austroads Guidelines are intended as a guide for engineers, planners and designers involved in the planning, design, construction, maintenance and management of cycling facilities.

The Guide to Road Design – Part 6A: Pedestrian and Cyclist Paths provides guidance for road designers and other practitioners on the design of paths for safe and efficient walking and cycling. This document is recommended as part of the cycle planning phase, to determine the appropriate type of infrastructure for the application.

Austroads has also developed a summary document entitled Cycling Aspects of Austroads Guides. This provides a comprehensive guide for the determination and provision of cycling infrastructure across many different applications.

Main Roads WA Policy and Standards

Main Roads WA has developed the Policy for Cycling Infrastructure 2000 which is a guidance document for the provision of shared paths. It outlines details regarding on-road cycling requirements, off-road cycling requirements, maintenance of cycling facilities, and roadworks which can affect cycling facilities.

Department of Transport WA guideline Planning and designing for pedestrians: guidelines provides a comprehensive guidance document including information regarding design standards for paths and focuses on the safety of pedestrians.

The Guidelines on the provisions for all path users at roadwork sites in built-up areas acts as a guideline to provide for persons engaged in roadworks in built-up areas.

Main Roads WA also has a library of standard drawings which can assist in construction guidelines.

Australian Standards

Australian Standards are a range of supporting documents including handbooks and technical reports and their role is to provide guidance and assistance on implementing standards. Relevant standards for the construction and design of shared paths include:

Department of Transport
Planning and Designing for Pedestrians Guidelines has been developed by the Department of Transport (DoT) to describe the range of standards and guidelines which are relevant for pedestrian infrastructure. This guideline also takes into account, local road traffic management relating to pedestrian activities.

It is fundamental that shared paths are provided for pedestrians as well as cyclists, and should cater for all users, including those with disabilities.

Policy and Design Context: International

Some International guidelines for the provision of shared paths are listed below. A sample of these has been referenced as having significant merit for consideration of infrastructure geometry, as follows:

- AASHTO Guideline (USA) Chapter 14 (Shared Use Path Design).
- NACTO Urban Bikeway Design Guide (USA).
- New York City Street Design Manual (USA) 2013.
- Collection of Cycle Concepts 2012 (Denmark).

AASHTO Guideline (USA) Chapter 14 (Shared Use Path Design)

AASHTO Guidelines provide planners, designers, and transportation engineers with a better understanding of how sidewalks and trails should be developed to promote pedestrian access for all users, including people with disabilities.

NACTO Urban Bikeway Design Guide (USA)

The purpose of the NACTO Urban Bikeway Design Guide (part of the ‘Cities for cycling initiative’) is to provide cities with best practice solutions that can help create complete streets that are safe and enjoyable for bicyclists. The guide is based on the experience of the best cycling cities in the world. The designs in this document were developed by cities for cities, since unique urban streets require innovative solutions.

New York City Street Design Manual (USA) 2013

The Street Design Manual is New York City’s comprehensive resource on street design guidelines, policies, and processes. It aggregates a broad range of resources from nationally recognized engineering and design guidelines and standards to federal, state, and local laws, rules, and regulations to provide information on treatments that are allowed and encouraged on New York City streets.

Cycle Infrastructure Design Guide (UK) 2008

Cycle Infrastructure Design Guide brings together and updates guidance previously available in a number of draft local transport notes and other documents. Although its focus is the design of cycle infrastructure, parts of its advice are equally appropriate to improving conditions for pedestrians.

Collection of Cycle Concepts 2012 (Denmark)

The Collection of Cycle Concepts 2012 presents a number of ideas to help generate more bicycle traffic and reduce the accident rate among cyclists. Its aim is to provide inspiration and motivation for creating more and safer bicycle traffic – in Denmark as well as the rest of the world.
Appendix B

Figures/Tables
Determining Path Usage Type

Figure 6A-1 Transport and Main Roads accepted process for determining the appropriate path type

Step 1
Determine the “design hour” for the path.
The design hour for the path is the hour during which it is most desirable to minimise delays for cyclists. The design hour may be the weekday AM peak hour for commuter paths, it may be sometime on a weekend for recreational paths or it may be the hour when most people are using the path. It is up to the designer or the path manager to determine the design hour. If possible future usage should always be factored into these calculations.

Step 2
Count the numbers of pedestrians and cyclists using the path in the design hour and their direction of travel.
Counting may be done manually or by automatic counting methods such as sensors. For more information on counting methodology for pedestrians and cyclists refer to the Austroads (2013) Guide to Traffic Management – Part 3 Traffic Studies and Analysis.

Step 3
Determine the directional split of the path users.
“Directional split” indicates the proportion of path users going in each direction. The split can be calculated by dividing the numbers of path users going in each direction by the total number of path users. Expressed as a percentage.

Step 4
Determine the appropriate path width for the number of pedestrians and cyclists using the path and the directional split.
To determine the appropriate path width:
(a) select the appropriate graph to use – Figure 6A.2 for paths with a 75/25 directional split or Figure 6A.3 for paths with a 50/50 directional split,
(b) locate the number of pedestrians on the left side or “y” axis of the appropriate graph and draw a horizontal line across the graph from this point, and
(c) locate the number of cyclists along the bottom or “x” axis of the graph and draw a vertical line. The zone within which these two lines intersect indicates the recommended path width.

Source 1: Road Planning & Design Manual - Edition 2: Volume 3, Transport and Main Roads, June 2015 Figure 6A.1
**Figure 6A-2**  Path capacity and recommended widths, directional split 75/25

Notes: This figure is not to be used for pedestrian only paths
1.5 m footpath width is the low use minimum only and is not appropriate at higher pedestrian volumes
A 75/25 directional split is typical for most commuter paths which are subject to high peak direction volumes.

Source 3: Road Planning & Design Manual - Edition 2: Volume 3, Transport and Main Roads, June 2015 Figure 6A.3

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**Figure 6A-3**  Path capacity and recommended widths, directional split 50/50

Notes: This figure is not to be used for pedestrian only paths
1.5 m footpath width is the low use minimum only and is not appropriate at higher pedestrian volumes
A 50/50 directional split is typical for most recreational paths which are subject to high use in both directions.

Source 2: Road Planning & Design Manual - Edition 2: Volume 3, Transport and Main Roads, June 2015 Figure 6A.2
Hazards and Mitigation

Source 4: AS 2890.1:2004 Off-Street Car Parking Figure 3.3
Source 5: Public Transport Bus Stop Layout Guidelines Figure 3A (Public Transport Authority of Western Australia)
Signage and Linemarking

Source 7: AS1742.9 Figure 3.1

Source 9: AS1742.9 Figure 3.1

Source 8: AS1742.9 Table 3.1

### TABLE 3.1

<table>
<thead>
<tr>
<th>Sign</th>
<th>Sign Number</th>
<th>Size, mm</th>
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<tbody>
<tr>
<td>GIVE WAY</td>
<td>E1-2 (Special)</td>
<td>375 x 750</td>
</tr>
<tr>
<td>No Bicycles</td>
<td>E6-10-3A</td>
<td>450 x 450</td>
</tr>
<tr>
<td></td>
<td>E6-10-3B</td>
<td>600 x 600</td>
</tr>
<tr>
<td></td>
<td>E6-10-3C</td>
<td>750 x 750</td>
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<tr>
<td>END</td>
<td>E7-4A</td>
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<tr>
<td></td>
<td>E7-4B</td>
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<tr>
<td></td>
<td>E7-4C</td>
<td>600 x 200</td>
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<tr>
<td></td>
<td>E7-4D</td>
<td>900 x 300</td>
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<tr>
<td>Bicycle Path ONLY</td>
<td>E8-1A</td>
<td>300 x 400</td>
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<td></td>
<td>E8-1B</td>
<td>450 x 600</td>
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<tr>
<td></td>
<td>E8-1C</td>
<td>600 x 800</td>
</tr>
<tr>
<td>Shared Path</td>
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</tr>
<tr>
<td></td>
<td>E8-2B</td>
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<tr>
<td></td>
<td>E8-2C</td>
<td>600 x 800</td>
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<td>Separated Path</td>
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<tr>
<td></td>
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</tr>
<tr>
<td></td>
<td>E8-3C (L or R)</td>
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<td></td>
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<td>W6-8B</td>
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<td></td>
<td>W6-9B</td>
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<td></td>
<td>W8-23B</td>
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<tr>
<td>ROUGH SURFACE</td>
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</tr>
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Source 11: Main Roads WA Standard Drawing 200531-0009
Typical Kerb Ramp and Grab Rail Details

Source 12: Main Roads WA Standard Drawing 9831-5649
Source 13: Main Roads WA Standard Drawing 200931-0089
TYPICAL CUT THROUGH DETAIL
Source 15: Main Roads WA Standard Drawing 200931-0091

NARROW MEDIAN GAP DETAIL
MEDIAN WIDTH < 2900
REFER TO NOTE 2

WIDE MEDIAN GAP DETAIL
MEDIAN WIDTH > 2900

NOTES

2. THE NARROW MEDIAN GAP DETAIL SHOULD NOT BE USED AT SIGNALISED INTERSECTIONS IAT LEAST WHERE A PARALLEL WALK PHASE EXISTS.

3. TSS'S CAN BE EITHER 300 x 300mm OR 400 x 400mm IN SIZE. 600 x 600mm TILES SHOWN.
Rumble Strip Details
Source 19: Main Roads WA Standard Drawing 9748-1098
Crossover Design Details

Crossover - Plan Layout