

Minimising Pedestrian-Cyclist Conflict on Paths



Information Note No 1

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Is the path the problem?

Conflicts may arise as a result of either (or both) path design or user behaviour issues. This note provides information to support the identification of situations in which problems are likely to arise from path planning and design (especially capacity) being inappropriate for the type and level of usage.

Conflict on paths most often causes inconvenience and anxiety, rather than crashes or injury, and may result in people avoiding the path. The real level of conflict may be very different from users' perceptions.

Where the conflicts are real, the solutions may lie in user behaviour or the facility itself.

It is important to be able to identify where there are current or emerging conflict issues, especially since conflict at one location can affect usage of larger parts of the path network in which that location is a link. Local issues should be addressed on a case by case basis (see Information Notes 5, *Infrastructure design*, and 6, *Path construction and maintenance*)

This Information Note outlines how Level of Service can be estimated and interpreted for shared paths, as a basis for identifying where engineering measures, such as increased path width, rather than behavioural measures alone are likely to be effective.

Shared path or separated path?

Shared paths are the most common off-road provision for cyclists in Australia and New Zealand. In principle, shared paths are suitable for most kinds of users, provided they are properly designed, constructed and maintained. However, they are generally not satisfactory in high usage areas and may require the provision of separated pedestrian and cyclist facilities.

Table 1 shows the pros and cons for shared and separated paths.

Path width

The width of paths has a significant impact on the level of convenience and conflict between users.

Recommended widths for shared paths are shown in Table 2.

Table 1 Pros and cons for shared and separated paths

Type of path	Pros	Cons
Shared	Suitable for most users	Not satisfactory in high usage areas – may discourage walking amongst the young, seniors and people with disabilities.
	Lower construction cost than separated paths.	May be ineffective if thorough planning (consultation, observation and demand estimation) has not been carried out.
	Require less road reserve space	
Separated	Eliminates conflicts occurring between different user types.	Ineffective if pedestrian movement along or across the bicycle path is not minimised.
	Will allow the bicycle path to operate at a higher speed than in case of shared paths, which may make it more desirable for commuter cyclists.	Ineffective if both paths are not of a comparable standard relative to the requirements of each type of user.

Table 2 Shared use path widths (Austroads 1999, p 83)

	Path width (metres)		
	Local access path	Commuter path	Recreational path
Desirable	2.5	3.0	3.5
Acceptable	2.0 – 2.5	2.0 – 3.5	3.0 – 4.0

Austroads (1995) recommends the following widths for 'shared footways':

- 2.0 m minimum where cyclists passing in opposite directions are rare
- 2.5 m minimum where two-way cyclists are common with minimal pedestrians
- 3.0 m minimum where two-way cyclists and pedestrians are common.

The criteria for these widths are expressed differently from those in Table 2. If there is any conflict between them (e.g. a commuter path with two-way cyclists at the same time), the higher minimum should be used.

For footpaths, recommended widths are lower, but may be up to 2.4 metres (or greater, depending on demand) where pedestrian volumes are high (Austroads 1995, p18). Where footpath cycling is common (e.g. in the vicinity of primary schools), it may be more appropriate to treat the path as a shared path for the purpose of determining the appropriate width.

Level of Service

What Is Level of Service?

Level of Service (LoS) is a qualitative measure describing operational conditions within a traffic stream. It is generally described in terms of such service measures as speed and travel time, freedom to manoeuvre, traffic interruptions and comfort and convenience. There are six levels of service, designated A (best – free flow) to F (worst – breakdown in flow). See Austroads (1988, pp. 2-3) for more information on Level of Service.

The LoS concept has only recently been applied to paths (TRB 2000, Ch 11). For both pedestrians and cyclists, the factors affecting level of service are less rigorously measurable than for road vehicle traffic, primarily as a consequence of:

- the wide range of abilities and capabilities of users, both within and between groups
- the importance of non-travel aspects of both walking and cycling.

Whilst there is no specific LoS at which intervention can be mandated, the lower the LoS the more likely it is that physical path improvements are an appropriate response to conflict between users. Even so, path improvements should always be considered in conjunction with other initiatives to reduce conflicts.

Assessing Level of Service

A major factor in determining LoS is the path capacity, which is in turn a function of width (and a number of other design parameters – see Information Note 5, *Infrastructure Design*).

The clearest specification of level of service on shared paths is provided by the Highway Capacity Manual (TRB 2000). However, this has limitations relating to path width and the directional composition of use. For 2.4- metre and 3.0-metre wide paths with reasonably equal directional flows, this method will provide a useful guide to LoS.

The LoS decreases with increasing levels of usage and user interaction:

- Pedestrian level of service on a 2-way shared path of 2.4 m width is worse than LoS D where

bicycle use exceeds 105 per hour in each direction (Table 3)

- Cyclist level of service is worse than LoS D:
 - on a 2-way shared path of 2.4 m width where the total number of events exceeds 150 per hour, or
 - on a 2-way shared path of 3.0 m width where the total number of events exceeds 300 per hour (Table 4).

In broad terms, the acceptable cyclist volume for any given level of service doubles with the transition from a 2.4-metre wide path to a 3.0-metre wide one (Table 4).

Table 3 Pedestrian level of service for shared two-way 2.4 m paths (TRB 2000, Exhibit 18-8)

Pedestrian level of service	Number of events ^(a) /hour	Corresponding bicycle service volume per direction ^(b) (bicycles/hour)
A	≤ 38	≤ 28
B	>38 up to 60	>28 up to 44
C	>60 up to 103	>44 up to 75
D	>103 up to 144	>75 up to 105
E	>144 up to 180	>105 up to 131
F	>180	>131

^(a) An 'event' is a bicycle meeting or passing a pedestrian

^(b) Assuming equal direction split of bicycles

Table 4 Cyclist level of service for shared two-way paths (TRB 2000, Exhibit 19-2)

Cyclist level of service	Frequency of events ^(a) /hour 2.4 metre wide paths	Frequency of Events (events/hour) 3.0 metre wide paths
A	≤ 40	≤ 90
B	>40 up to 60	>90 up to 140
C	>60 up to 100	>140 up to 210
D	>100 up to 150	>210 up to 300
E	>150 up to 195	>300 up to 375
F	>195	>375

^(a) An 'event' is a bicycle meeting or passing a pedestrian or cyclist.

The assumption of equal directional flows is a major limitation of this simple method for some paths – for example, those serving primarily a commuting function to a centre of activity, such as a CBD or a tertiary campus.

For paths with unequal directional flows, a more refined approach to estimating bicycle LoS has been derived by Hummer et al. (2004):

*Overall Rating (Scale 1-5) = 5.446 – (0.00809 * wevents) – (52.03 * rwidth) – (0.287 * clin) - DPF*

where:

- *wevents* = meetings per minute + 10* active passings per minute,
- *rwidth* = 1/path width (in metres),
- *clin* = presence of a centreline (0 if no; 1 if yes), and
- *DPF* is a 'delayed passes' adjustment calculated as the number of delayed passes per hour multiplied by 1.5/180, which gives an effective maximum value of 1.5 (Patten et al. 2004, p7).

The value of *wevents* is best established by direct observation using the 'floating vehicle' technique to estimate the experience of users.

The 'overall rating' value (X) converts to bicycle LoS ratings as below:

- $X \geq 4.0$: LoS A
- $3.5 \leq X < 4.0$: LoS B
- $3.0 \leq X < 3.5$: LoS C
- $2.5 \leq X < 3.0$: LoS D
- $2.0 \leq X < 2.5$: LoS E
- $X < 2.0$: LoS F

Adjustments required for low volumes are not likely to affect paths where there is a concern about conflict, except where the path width itself is clearly inadequate.

References

Austrroads 1988, *Guide to traffic Engineering Practice – Part 2: Roadway Capacity*. Austrroads: Sydney, NSW.

Austrroads 1995, *Guide to Traffic Engineering Practice – Part 13: Pedestrians*. Austrroads: Sydney, NSW.

Austrroads 1999, *Guide to Traffic Engineering Practice – Part 14: Bicycles*. Austrroads: Sydney, NSW.

Hummer J E, Roupail N, Hughes R G, Fain S J, Toole J L, Patten S, Schneider R J, Monahan J F and Do A 2004, *User Perceptions of the Quality of Service on Shared Paths*. Paper submitted for Annual Meeting, 2005. Transportation Research Board: Washington DC, USA.

Patten R S, Schneider R J, Toole J L, Hummer J E, Roupail N and Do A 2004, *Shared Use Path Bicycle Level of Service Procedure*. Paper submitted for Annual Meeting, 2005. Transportation Research Board: Washington DC, USA.

TRB 2000, *Highway Capacity Manual 2000*. Transportation Research Board: Washington DC, USA.