Darwin Shared Path & Bicycle Lane Technical Notes

7. Horizontal and Vertical Geometry of Paths

Objective

The objective of the *Darwin Shared Path & Bicycle Lane Technical Notes* is to provide direction and guidance for the planning and delivery of cycling facilities within the City of Darwin area. These technical notes are also intended to provide information for other stakeholders including the NT Government, cycling groups and the community.

References

Throughout this document, references have been made to the following technical standards and guidelines:

- AS 1428.1-2009 *Design for Access and Mobility Part 1: General Requirements for Access – New Building Work*
- Austroads *Guide to Road Design Part 6A: Pedestrian and Cyclist Paths* (2009)

The technical note should be read in conjunction to these documents.

Introduction

This technical note provides direction and guidance on the vertical and horizontal geometry requirements. The information is compiled from multiple sources detailing good design practices and generally accepted standards adopted throughout Australia.

The importance of geometric design of cycling paths is critical and needs to be designs in accordance to specific guidelines and standards. Failure to do so may result in cycling paths being deemed inadequate for use or potentially hazardous to cyclists and may cause serious harm.

Horizontal alignment

Austroads *Guide to Road Design Part 6A: Pedestrian and Cyclist Paths* stated that "*Where a path location or alignment is not constrained by topography or other physical features, a generous alignment consisting of straights and large radius curves is desirable. Such an alignment will provide good sight lines that are essential for safety as well as a pleasant riding experience for cyclists.*"

In regards to curved path section, Austroads *Guide to Road Design Part 6A: Pedestrian and Cyclist Paths* provides the minimum radii of horizontal curved paths for flat and graded surfaces which have been summarised in the tables below.

Curve radii shown in these tables may be reduced to approximately 3m on the approach to an intersection – e.g. where a path turns 90 degrees to cross a road. Where site constraints prevent a minimum 3m curve radius from being achieved, the designer shall use the maximum radii which is feasible in the location. Further guidance on path alignments at and approaching intersection crossings is provided in the '5. *Crossing Treatments and Alignments for Shared Paths at Road and Driveway Intersections*' Technical Note.

Minimum radii of horizontal curves without superelevation

Design speed (km/h)	Minimum radius (m)
20	10
30	25
40	50
50	94

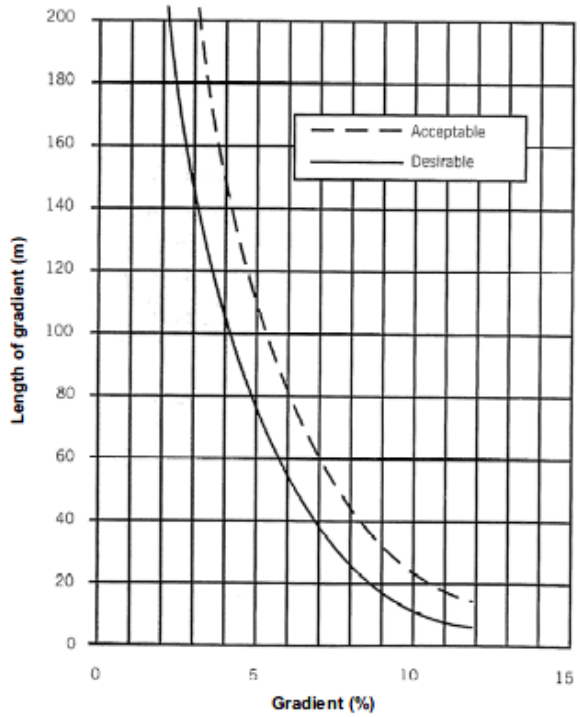
Minimum radii of horizontal curves that have superelevation

	Superelevation (%)				
	2	3	4	5	6
Speed (km/h)	Minimum radius (m)				
20	10	9	9	9	9
30	24	23	22	21	21
40	47	45	43	42	41
50	86	82	79	76	73

Vertical alignment

Austroads *Guide to Road Design Part 6A: Pedestrian and Cyclist Paths* stated that "as a general principle longitudinal gradients on cycling paths should be as flat as possible. The potential hazard for cyclists due to high speeds on steep downgrades and the difficulty of riding up the grade need to be considered when design the maximum gradients on two-way paths."

The figure below shows the maximum length of uphill gradients acceptable to cyclists. The figure is based on a review of the ease of uphill travel (Andrew O'Brien & Associates 1996).



SOURCE: AUSTROADS GUIDE TO ROAD DESIGN PART 6A: PEDESTRIAN AND CYCLIST PATHS (2006)

Many shared paths will need to comply with the universal (disability) access requirements contained within AS1428.1. This document classifies shared paths as 'ramps' which shall have grades no greater than in 1 in 14 (when disability access is required and where practical) and shall incorporate landings in varying positions depending on the grades. Clarification should be sought from the asset owner as to the requirements for individual paths.

Austroads *Guide to Road Design Part 6A: Pedestrian and Cyclist Paths* recommends that gradients steeper than 5% (1 in 20) should not be provided unless it is unavoidable. It is recommended that steep gradient be avoided in the following cases:

- Fixed objects at the bottom of the hill
- Horizontal curves at the bottom of the hill
- At grade separated facilities such as underpasses
- Intersecting paths and underpass access points
- Any other circumstance that which may result in conflict for cyclists

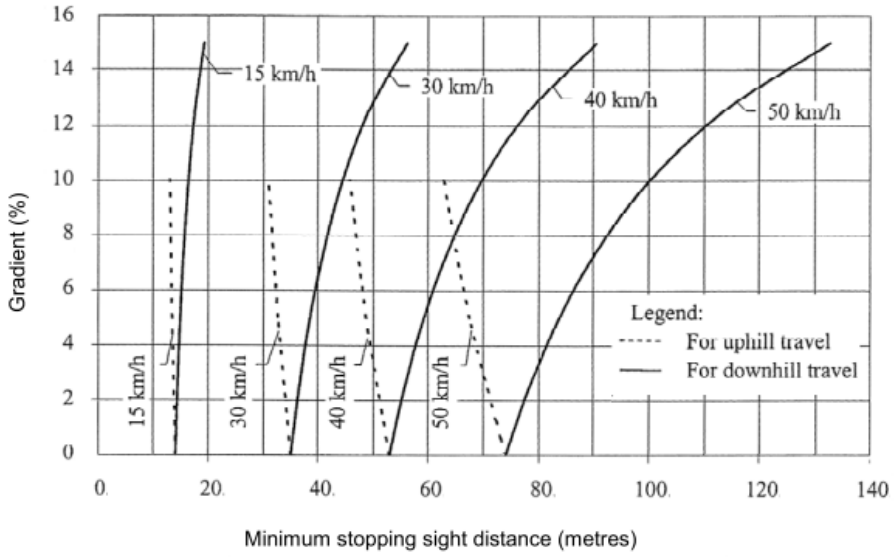
If these cases are unavoidable, additional safety provision should be provided such as:

- Additional path width
- A clear escape route or recovery area
- Ensure adequate sight distances
- Appropriate delineation and warning signs

Sight Distance

Sight distance is an important component of shared path design, particularly in locations away from the edge of a road carriageway.

Austroads *Guide to Road Design Part 6A: Pedestrian and Cyclist Paths* provides the following minimum sight distances for different design speeds. All two-way shared and bicycle paths should meet at least these minimum requirements and desirably meet double the requirements in order to allow for safe overtaking of other cyclists.



SOURCE: AUSTROADS GUIDE TO ROAD DESIGN PART 6A: PEDESTRIAN AND CYCLIST PATHS (2009)

Crossfall and Drainage

Austroads *Guide to Road Design 6A: Pedestrian and Cyclist Paths* recommended a crossfall of 2%-4% should be adequate on sealed surface cycle path to dispose of surface water whereas unsealed surfaces may require 5% to prevent puddles of water from developing. AS 1428.1 specifies that a shared path crossfall should not exceed 2.5% to cater for people who have a disability. However, a crossfall of 2.5% should be adopted in order to ensure that the path will shed water and to avoid ponding.