

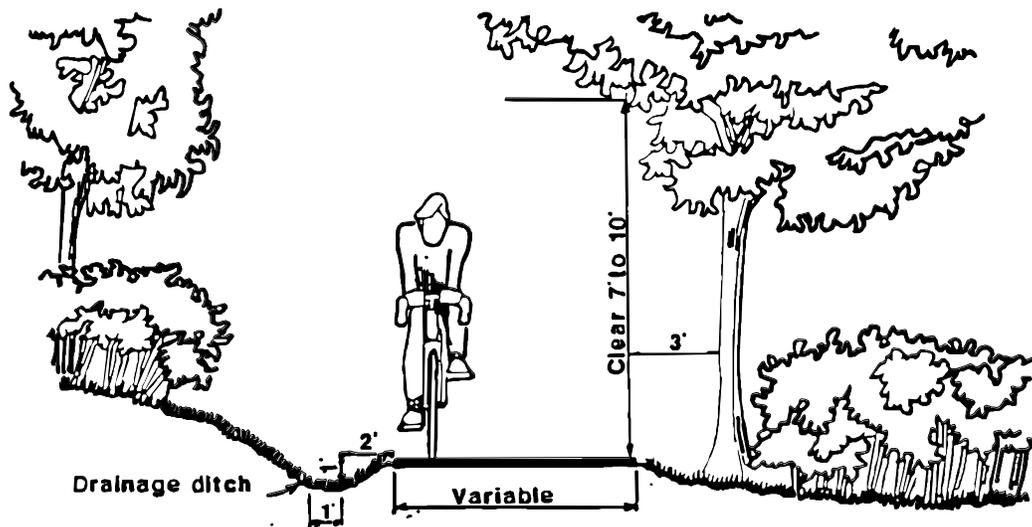
Chapter 3.65

DESIGN STANDARDS FOR HIKER BIKER TRAILS

The Department of Parks and Recreation is assigned responsibility for administration of these design standards.

Section 1. CLEARING

Any vegetation, except grasses, should be cleared a minimum of 3 feet from the edge of the bike route surfacing. Overhead clearance should be maintained for a 10-foot minimum. All dead branches and trunks should be removed from above the trail. All vegetation, including roots, on the subgrade should be removed down to bare earth.



Typical Section Showing Clearing & Drainage

Section 2. DRAINAGE

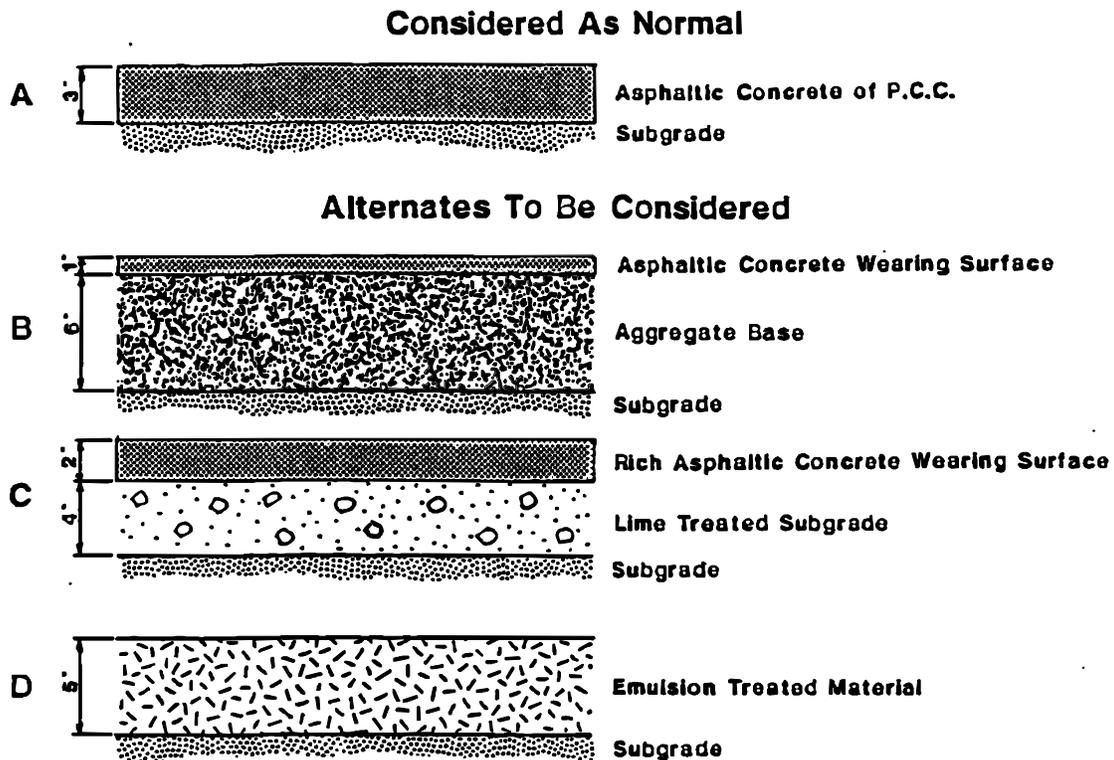
Drainage should be properly handled to prevent washouts, and to avoid ground saturation beneath the trail. The trail should be sloped to provide runoff, and ditches should be provided where necessary. Underdrains may be necessary in very wet places to prevent frost action with resultant heaving.

In special instances, catch basins and drains may be needed.

C. BASES

Bases and subbases need to be adequately prepared to protect the surface. Removal of topsoil, stumps and roots and compaction of subgrade will normally be adequate. In wet or otherwise poor conditions, crushed stone or slag may be necessary for stability. General specifications for sidewalks, light-duty roads or driveways will generally be applicable.

TYPICAL SECTIONS - BASE DESIGN



A good quality sterilient will be placed directly upon the subgrade.

Section 4. SIGHT DISTANCES

The sight distance to any hazard or potential hazard must be a minimum of 50 feet at 10 m.p.h. that allows four seconds to react to any obstacle or hazard. If this sight distance cannot be provided, warning signs must be posted.

Section 5. GRADE

Bike paths shall not exceed a 5% grade (except for very short distances). If difficult grade problems cannot be overcome, measures should include the provision of rest stops or lower grade "switchbacks". Table 1 shows some suggested relationships between grade and grade-lengths.

TABLE 1
GRADE AND GRADE LENGTH CRITERIA

<i>Bikeway Gradient</i>	<i>Desirable</i>	<i>Normal Length</i>	<i>Maximum Length</i>
10.0 %	Not Recommended	33' (10 meters)	66' (20 meters)
5.0	Not Recommended	131' (40 m)	262' (80 m)
4.5	82' (25 meters)	167' (51 m)	334' (102 m)
4.0	102' (31 m)	203' (62 m)	410' (125 m)
3.5	148' (45 m)	295' (90 m)	590' (180 m)
3.3	148' (45 m)	295' (90 m)	590' (180 m)
2.9	200' (61 m)	400' (122 m)	800' (244 m)
2.5	262' (80 m)	525' (160 m)	1,050' (320 m)
1.7	590' (180 m)	1,180' (360 m)	-----
1.5	-----	2,100' (640 m)	-----

Section 6. RADIUS OF CURVATURE

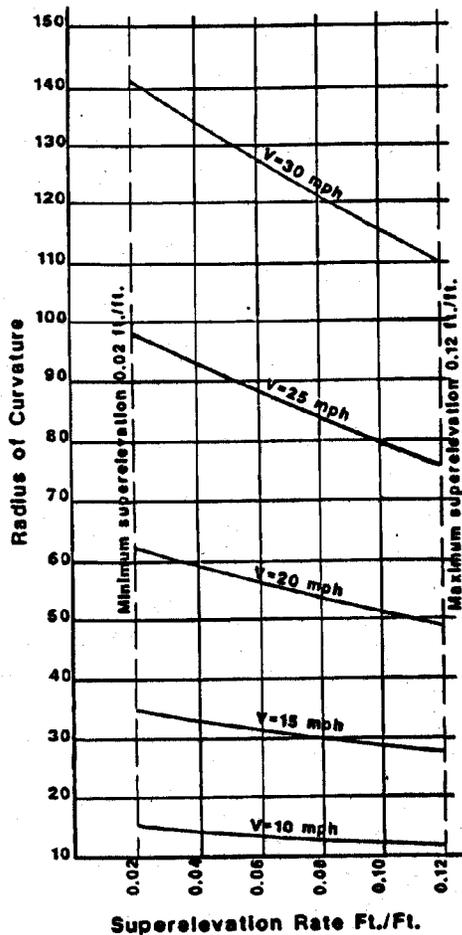
In these standards, a design speed of 20 m.p.h. is recommended for Bike Paths. The following simple linear equation which related curve radius to design speed at the relatively low speeds bicycles normally travel will be used to arrive at radius of curvature.

$$R = 1.25 v + 1.4$$

Where V = speed in m.p.h.

R = curve radius in feet

This equation allows for a minimum R of 58' at a V of 20 m.p.h. Since Biker Paths in the Parks are used for both pedestrians and bicycles, a maximum of .06 foot per foot superlevation will be used. Figure 1 below (Standard Superlevation for Bikeways, Source: State of Oregon) will be used to determine superlevation up to the maximum allowable.



$$\text{Plot of } \frac{V}{qR} = \frac{\tan \theta + f}{1 \pm \tan \theta}$$

where V = velocity, ft/sec

q = acceleration due to gravity, ft/sec

R = radius of curvature, ft

f = coefficient of friction on dry pavement = 0.4

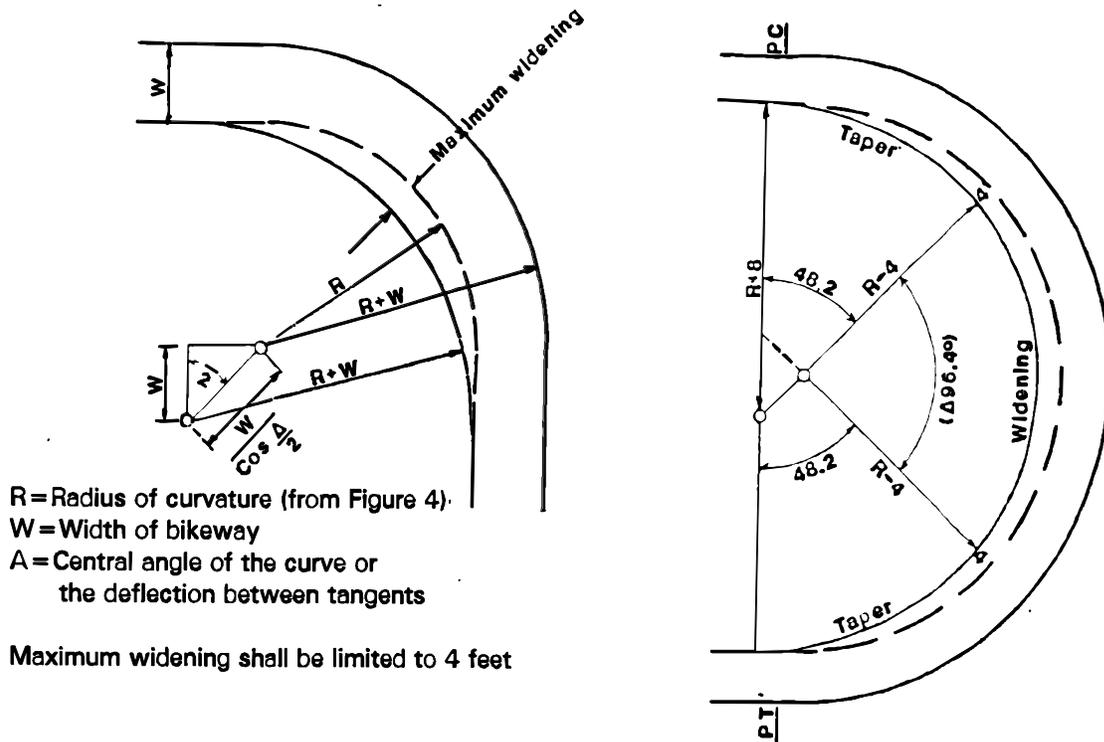
$\tan \theta$ = superlevation rate, ft/ft

Curvature shall be based on a normal design speed of 20 m.p.h. Within limits shown, either the radius or the superlevation may be varied to fit individual situations. The dependant variable may be selected from the adjacent chart. Descending grades in excess of 7 percent (7%) will have a design speed of 30 m.p.h. Climbing grades in excess of 3 percent (3%) may use a 15 m.p.h. design speed. The descending grade determines the design speed on two-way bikeways.

Figure 1:
STANDARD SUPERELEVATION
FOR BIKEWAYS
Source: State of Oregon

Curvature shall be based on a normal design speed of 20 m.p.h. Within limits shown, either the radius or the superelevation may be varied to fit individual situations. The dependant variable may be selected from the adjacent chart. Descending grades in excess of 7% will have a design speed of 30 m.p.h. Climbing grades in excess of 3% may use a 15 m.p.h. design speed. The descending grade determines the design speed on two-way bikeways.

Bike Paths with curves of radii of less than 100 feet will be widened in accordance to the attached methodology in Figure 2 as developed by the State of Oregon. Maximum widening is limited to 4 feet.



When widening reaches 4 ft. ($\Delta > 96.4^\circ$), that width shall be carried on a radius of R-4 through the central portion of the curve ($\Delta > 96.4^\circ$) as shown on the right.

Figure 2: CURVE WIDENING
Source: State of Oregon

Section 7. WIDTH OF PATH

Minimum width is six feet, this will allow a cyclist in one direction to meet and pass a cyclist going in the opposite direction.

Section 8. BRIDGES

The width of bridges will need to be the minimum width of the path.

Section 9. BIKE PATH GRAPHICS

9.1 Route Signing

- a. All bikeway signing shall conform to the Manual on Uniform Traffic Control Design.
- b. Adequate signing should be deployed at all decision points along a bikeway. This includes both signs informing the cyclist of directional changes and confirmatory signs to ensure that route changes have been correctly perceived.

9.2. Bike Pedestrian and Roadway Crossing Signs

- a. Warning signs indicating to motorists that bicycles should be anticipated and to cyclists that motor vehicles or pedestrians may be encountered should be installed on the approaches to points of potential conflict and at high activity areas. Included are:
 - (1) Points where a bikeway crosses a roadway or sidewalk.
 - (2) At bikeway starts and terminations or transition areas involving potential conflict movements.
 - (3) At intense activity areas such as the vicinity of parks, schools, recreational facilities and community centers.
- b. Motorist directed warning signs on urban streets should be placed at least a half block in advance of the conflict point, and in all circumstances such signing whether directed to motorists or cyclists should be placed sufficiently in advance of the conflict point to permit appropriate perception and reaction. Additional cyclist directed warning signs may be installed as required to warn cyclists of specific hazardous conditions.

MOTOR VEHICLE DIRECTED AND WARNING SIGNS



Black on Yellow Background
BIKE ROUTE DESIGNATION SIGNS (White on green Background)



Message Plates

To be mounted above the official marker to designate the beginning and ending of the bike route, and to trailblaze that bikeway.



Directional Plates

To be mounted below the official marker to guide cyclists along the bikeway and to trailblaze the bikeway.

TYPICAL BIKEWAY SIGNING

CYCLIST DIRECTED WARNING SIGNS
(Black on yellow background)



TYPICAL BIKEWAY SIGNING