

Long Beach Bicycle Master Plan Design & Maintenance

This chapter provides details on the recommended design and operating standards for the Long Beach Bikeway System.

Existing Design Standards and Classifications

National design standards for bikeways have been developed by the American Association of Highway and Transportation Officials (AASHTO) and the California Department of Transportation (Caltrans). The Caltrans Highway Design Manual, Chapter 1000: Bikeway Planning and Design, serves as the official design standard for all bicycle facilities in California. Design standards in Chapter 1000 fall into two categories, mandatory and advisory. Caltrans advises that all standards in Chapter 1000 be followed, which also provides a measure of design immunity to the City. Not all possible design options are shown in Chapter 1000. For example, intersections, ramp entrances, rural roads, and a variety of pathway locations are not specified in the Caltrans Highway Design Manual.

The following section summarizes key operating and design definitions:

- Bicycle: A device upon which any person may ride, propelled exclusively by human power through a belt, chain, or gears, and having either two or three wheels in tandem or tricycle arrangement.
- Class I Bikeway: Variously called a bike path or multi-use trail. Provides for bicycle travel on a paved right of way completely separated from any street or highway.

- Class II Bikeway: Referred to as a bike lane. Provides a striped lane for one-way travel on a street or highway.
- Class III Bikeway: Referred to as a bike route. Provides for shared use with pedestrian or motor vehicle traffic.

Graphic descriptions of Class I, II, and III bikeways are shown in Figure 1.

Class I, II and III Bikeway Design Guidelines

The following guidelines present the recommended minimum design standards and other recommended ancillary support items for Class I bike paths (also referred to as multi-use trails), Class II bike lanes, and Class III bike routes. All bikeways should meet minimum Caltrans standards as spelled out in the California Highway Design Manual, Chapter 1000. Where possible, it may be desirable to exceed the minimum standards for bike paths or bike lane widths, signage, lighting and traffic signal detectors.

Recommendation 1:

Design Recommendations

Class I Guidelines.

1. All Class I bike paths should generally conform to the design recommendation by Caltrans.
2. Multi-use trails and unpaved facilities that serve primarily a recreation rather than a transportation function and will not be funded with federal transportation dollars may not need to be designed to Caltrans standards.
3. Class I bike path crossings of roadways require preliminary design review. A prototype design is presented in Figure 27. Generally speaking, bike paths that cross roadways with Average Daily Trips (ADTs) over 20,000 vehicles will require signalization or grade separation. No multi-use trails are proposed to cross a major arterial at an unprotected

**Class I Guidelines,
continued**

- location with ADTs over 20,000 vehicles in Long Beach.
4. Landscaping should generally be low water consuming native vegetation and should have the least amount of debris.
 5. Lighting should be provided where the bike path will be used by commuters in the evenings.
 6. Barriers at pathway entrances should be clearly marked with reflectors and ADA accessible (minimum five feet clearance).
 7. Bike path construction should take into account impacts of maintenance and emergency vehicles on shoulders and vertical requirements.
 8. Provide two feet wide unpaved shoulders for pedestrians/runners, or a separate tread way where feasible. Direct pedestrians to right side of pathway with signing and/or stenciling.
 9. Provide adequate trailhead parking and other facilities such as restrooms, drinking fountains at appropriate locations.
 10. Consider modifying design of horizontal bar, which requires bicyclists to lift bicycles, at path entrances in Long Beach. Recommendation would need to be made to the County of Los Angeles since it is in their jurisdiction.

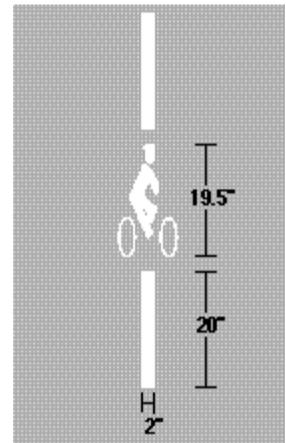
Recommendation 2:

Design Recommendations

Class II Guidelines

1. All Class II bike lanes should generally conform to the minimum design recommendations in Figure 23.
2. Whenever possible the Department of Public works should recommend that wider bike lanes, beyond the minimum standard are installed.
3. Intersection and interchange treatment. Caltrans provides recommended intersection treatments in Chapter 1000 including bike lane 'pockets' and signal loop detectors. The Department of Public Works should develop a protocol for the application of these recommendations, so that improvements can be funded and made as part of regular improvement projects. Figure 23 Class II Bike Lane Crossing at Intersections, figure 24 Bicycle Lane Intersection Design and Figure 25 Recommended Right Turn Channelization provides details for recommended intersection treatments.

4. Signal loop detectors which sense bicycles should be considered for all arterial/arterial, arterial/collector, and collector/collector intersections. The location of the detectors should be identified by a stencil of a bicycle and the words 'Bicycle Detector'.



5. When loop detectors are installed, traffic signalization should be set to accommodate bicycle speeds.
6. For safety reasons, bicycle-sensitive loop detectors are preferred over a signalized button specifically designed for bicyclists.

***Class II Guidelines,
continued***

7. Bike lane pockets (min. 4' wide) between right turn lanes and through lanes should be provided wherever available width allows, and right turn volumes exceed 150 motor vehicles/hour.
8. Where bottlenecks preclude continuous bike lanes, they should be linked with Class III route treatments.

Recommendation 3:***Class III Design.***

Class III bike routes are typically simply signed routes and don't provide much advantage for bicyclists. With proper selection, signage and other treatments they can add significant visibility, direction and advantages. Class III routes can become more useful when coupled with such techniques as:

- route, directional and distance signage
- wide curb lanes
- accelerated pavement maintenance schedules
- new stencils marking the bike routes
- traffic signals timed for cyclists
- traffic calming

Recommendation 4:***Other Guidelines to
Consider******Signing***

In addition to those identified by Caltrans, there are a variety of improvements which will enhance the safety and attraction of streets for bicyclists.

All bikeway signing in Long Beach should conform to the signing identified in the Caltrans Traffic Manual and/or the Manual on Uniform Traffic Control Devices (MUTCD). These documents give specific information on the type and location of signing for the primary bike system. A list of bikeway signs from Caltrans and the MUTCD are shown in Table 8 (Bikeway Signing and Marking Standards). A typical bike route sign is shown in Figure 26, while an example of a customized logo sign for Long Beach is shown as Figure 10.

Long Beach should also provide standard signing at signalized and unsignalized intersections on bikeways, as shown in Figures

Striping

29 and 30. Additional warning signs and other signs are shown in Figure 31.

Stencils

In addition to the signing, striping and stencils should be considered according to Caltrans standards. This includes striping along bicycle lanes which differentiate the space between the bicyclist and the automobile. Striping, and other treatments such as colored pavement (Figure 27), double stripes, and new technologies should be considered for Long Beach.

Stencils can also be included on Class I and Class II bicycle facilities, to help cyclists and motorists more easily identify the bike lane or route. Stencils approved by Caltrans for Class III should also be used once they are approved (Figure 28).

Action***Parking***

A bicycle signing program is recommended as a high priority project for Long Beach. In addition new technologies and strategies for bicycle striping and stencils should be considered for bicycle lanes and routes where deemed appropriate.

Bicycle Parking is not standardized by any codes. However, there are preferable types of secure bicycle furnishing available on the market. When bicycle parking is being considered the types of bicycle lockers and racks in Figures 32 and 33 are recommended. More specific guidelines to determine bicycle parking capacity and location are suggested in Table 9.

Action***Sidewalks***

A bicycle parking program is recommended as a high priority project for Long Beach. Specific bicycle parking guidelines should be developed to help city staff, developers and commercial districts determine the types of furnishings and location of bicycle parking.

The use of sidewalks as bicycle facilities is not encouraged by Caltrans, even as a Class III bike route. There are exceptions to this rule. The California Vehicle Code states: 'Local

Sidewalks, continued

authorities may adopt rules and regulations by ordinance or resolution regarding the (...) operation of bicycles (...) on the public sidewalks.' (CA VC 21100, Subdiv. H). Caltrans adds in Chapter 1000: 'In residential areas, sidewalk riding by young children too inexperienced to ride in the street is common. With lower bicycle speeds and lower auto speeds, potential conflicts are somewhat lessened, but still exist. But it is inappropriate to sign these facilities as bikeways. Bicyclists should not be encouraged (through signing) to ride facilities that are not designed to accommodate bicycle travel.'

Long Beach Municipal Code section 10.48.070 entitled Riding on Sidewalks, specifically states that 'no person shall ride a bicycle upon a sidewalk within any business district; upon the sidewalks of bridges; in pedestrian underpasses; on pedestrian overpasses; upon sidewalks adjacent to any school building, church, recreation center, playground, or senior citizens' development; within the area south of Ocean Boulevard between the Long Beach Museum of Art on the west and Bluff Park on the east; on the northerly side of the Downtown Marina mole which directly abuts said marina, between Gangway A and Gangway B.' Section 10.48.110 also prohibits riding a bicycle, other than law enforcement officers, within the Civic Center Plaza or within Lincoln Park. The Traffic Engineer shall also have the authority to post signs noticing the prohibition of bicycles on sidewalks as stated in section 10.48.100.

Action

Long Beach has a number of existing sidewalks that are currently designated as bicycle facilities, but new sidewalks should be considered only when there are no other options.

Traffic Calming

Traffic calming includes any effort to moderate or reduce vehicle speeds and/or volumes on streets where that traffic has a negative impact on bicycle or pedestrian movement. Because these efforts may impact traffic outside the immediate corridor, study of traffic impacts is typically required. For example, the City of Berkeley instituted traffic calming techniques by blocking access into residential streets. The impact was less traffic on local streets, and more traffic on arterials and collectors. Other techniques include installing

***Traffic Calming,
continued***

traffic circles, intersection islands, partial street closings, 'bulb-out' curbs, pavement treatments, lower speed , signal timing, and narrowing travel lanes.

The City of Long Beach already has a relatively continuous street grid system with little filtering of through traffic into residential neighborhoods. Traffic circles, roundabouts, and other measures may be considered for residential collector streets where there is a desire to control travel speeds and traffic volumes but not to install numerous stop signs or traffic signals.

Action

Traffic calming alternatives should be considered where traffic speeds are exceedingly high, and when safety is an issue.

Bicycle Boulevards

Palo Alto pioneered the concept of a bicycle boulevard, which in that city is a street directly parallel to a major commercial corridor that was designed to promote bicycle movement and discourage through vehicle movement. This was achieved by partial street closures and lack of coordinated signals. In addition, wider curb lanes and frequent signing as a 'Bicycle Boulevard' helps increase the motorists' awareness.

Action:

The bicycle boulevard may be considered as an option if the City of Long Beach decides it can be feasible.

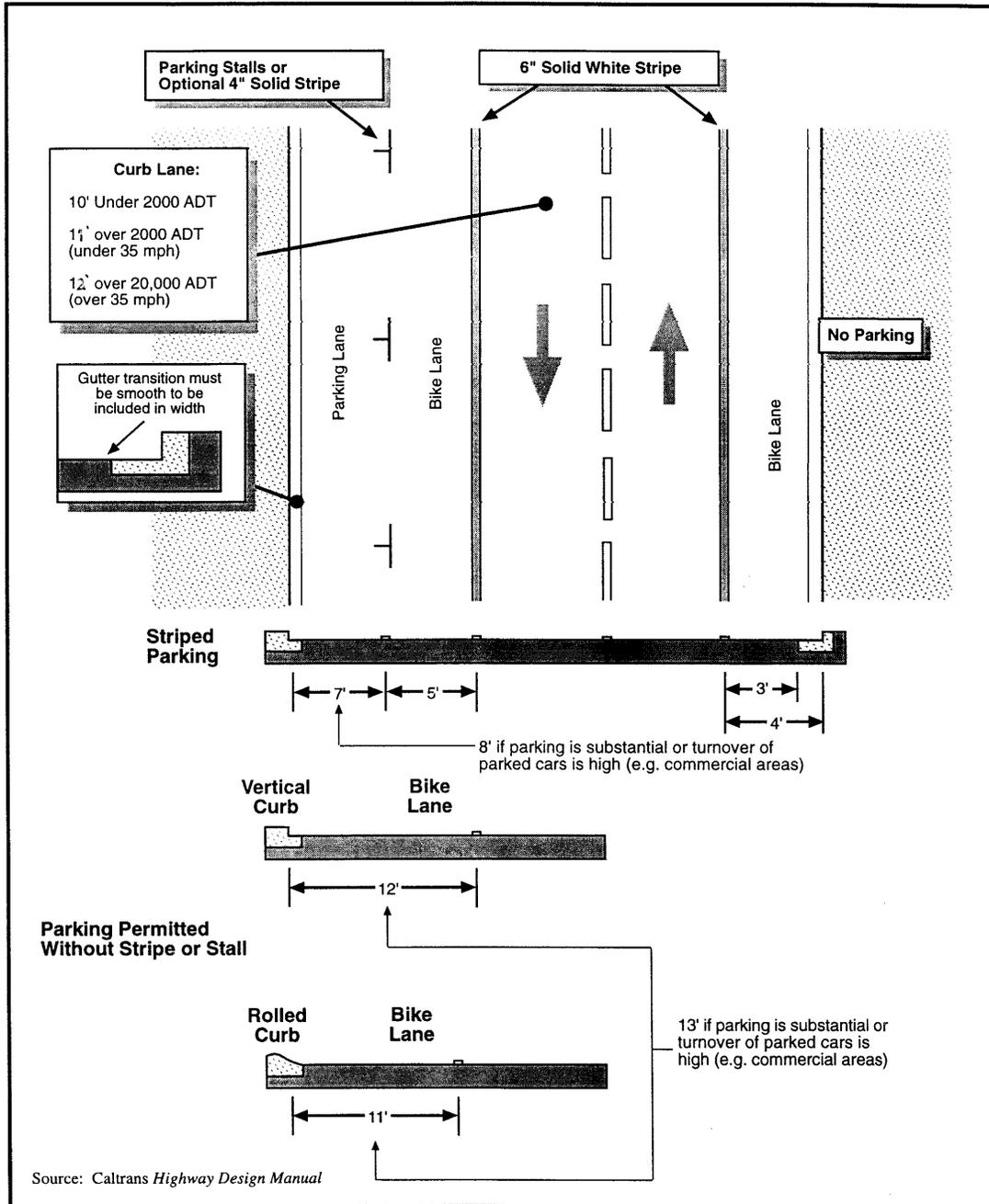


Figure 23: Class II Bike Lane Cross Section

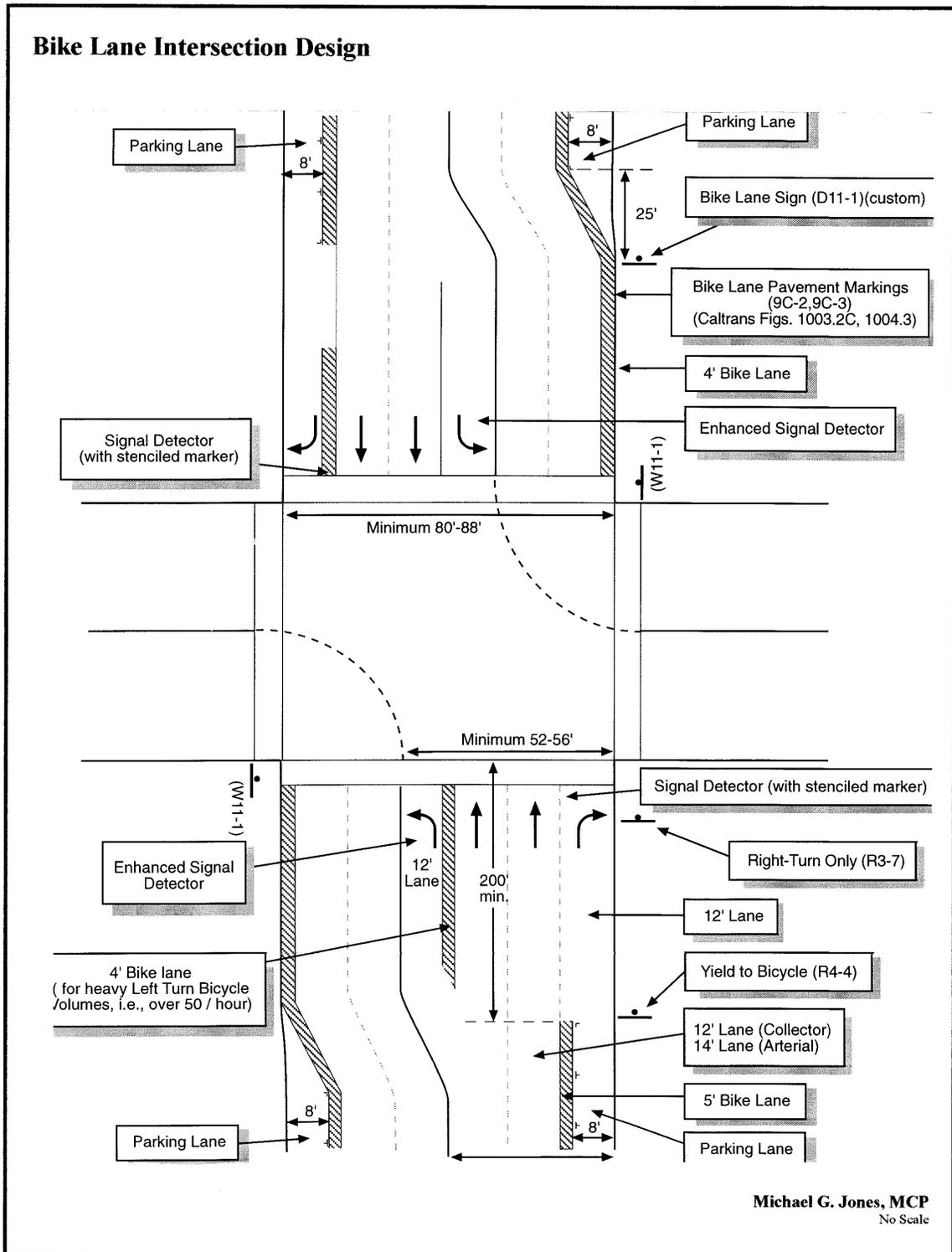


Figure 24: Bike Lane Intersection Design

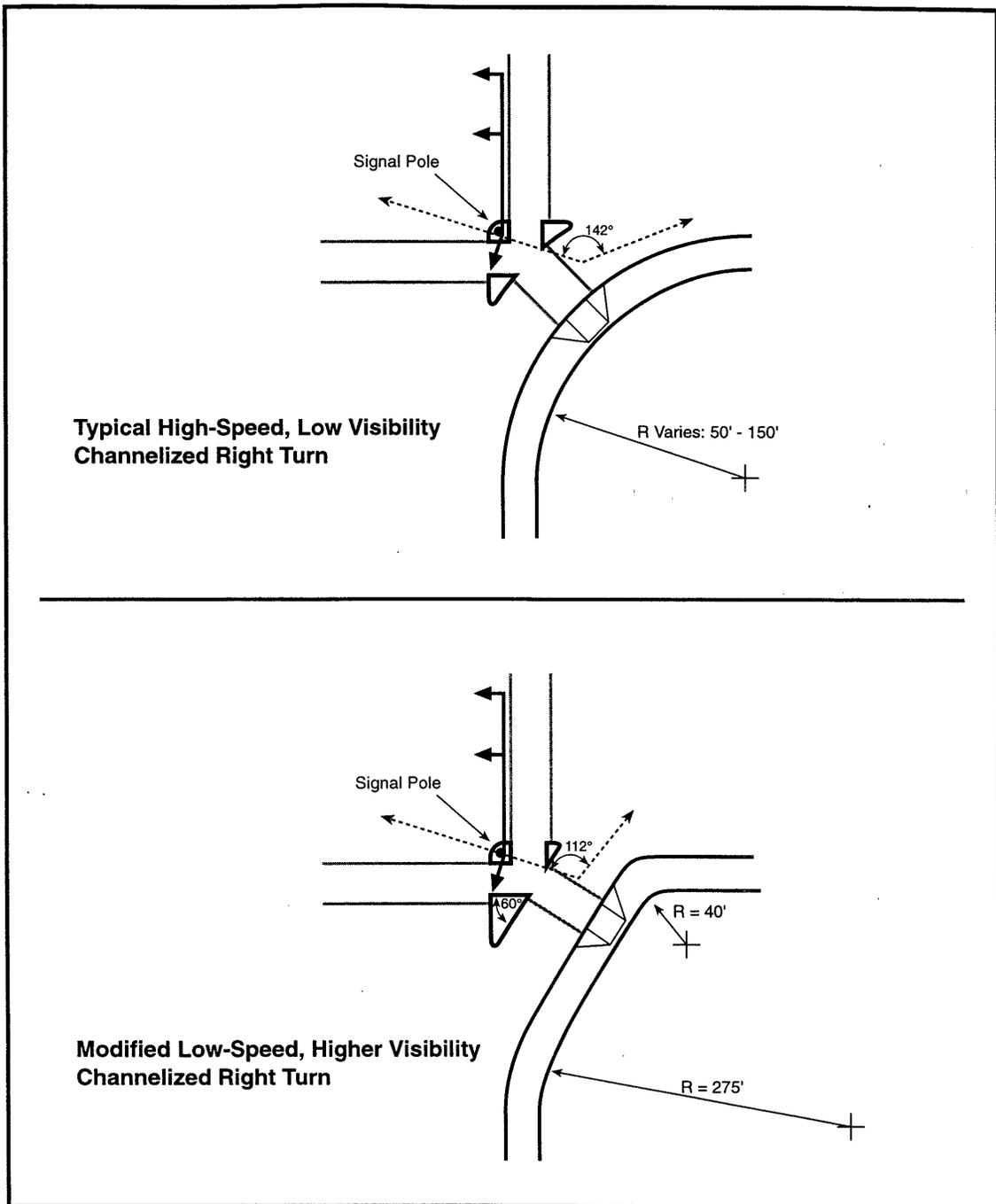


Figure 25: Recommended Right Turn Channelization

Table 8: Recommended Signing and Marking

Item	Location	Color	Caltrans Designation	MUTCD Designation
No Motor Vehicles	Entrances to trail	B on W	R44A	R5-3
Use Ped Signal/Yield to Peds	At crosswalks; where sidewalks are being used	B on W	N/A	R9-5 R9-6
Bike Lane Ahead: Right Lane Bikes Only	At beginning of bike lanes	B on W	N/A	R3-16 R3-17
STOP, YIELD	At trail intersections with roads and Coastal Bikeways	W on R	R1-2	R1-1 R1-2
Bicycle Crossing	For motorists at trail crossings	B on Y	W79	W11-1
Bike Lane	At the far side of all arterial intersections	B on W	R81	D11-1
Hazardous Condition	Slippery or rough pavement	B on Y	W42	W8-10
Turns and Curves	At turns and curves which exceed 20 mph design specifications	B on Y	W1,2,3 W4,5,6,14 W56,57	W1-1,2 W1-4,5 W1-6
Trail Intersections	At trail intersections where no STOP or YIELD required, or sight lines limited	B on Y	W7,8,9	W2-1, W2-2 W2-3, W2-3 W2-4, W2-5
STOP Ahead	Where STOP sign is obscured	B,R on Y	W17	W3-1
Signal Ahead	Where signal is obscured	B,R,G	YW41	W3-3
Bikeway Narrows	Where bikeway width narrows or is below 8'	B on Y	W15	W5-4
Downgrade	Where sustained bikeway gradient is above 5%	B on Y	W29	W7-5
Pedestrian Crossing	Where pedestrian walkway crosses trail	B on Y	W54	W11A-2
Restricted Vertical Clearance	Where vertical clearance is less than 8' 6"	B on Y	W47	W11A-2
Railroad Crossing	Where trail crosses railway tracks at grade	B on Y	W47	W10-1
Directional Signs (i.e. Cal State LB, Downtown, Train Station, etc.)	At intersections where access to major destinations is available	W on G	G7 G8	D1-1b(r/l) D1-1c
Right Lane Must Turn Right; Begin Right Turn Here, Yield to Bikes	Where bike lanes end before intersection	B on W	R18	R3-7 R4-4
Trail Regulations	All trail entrances	B on W	n/a	n/a

Multi-purpose Trail: Bikes Yield to Pedestrians	All trail entrances	n/a	n/a	n/a
Bikes Reduce Speed & Call Out Before Passing	Every 2,000 feet	B on W	n/a	n/a
Please Stay On Trail	In environmentally-sensitive areas	n/a	n/a	n/a
Caution: Storm Damaged Trail	Storm damaged locations	B on Y	n/a	n/a
Trail Closed: No Entry Until Made Accessible & Safe for Public Use	Where trail or access points closed due to hazardous conditions	n/a	n/a	n/a
Speed Limit Signs	Near trail entrances: where speed limits should be reduced from 20 mph	B on W	n/a	n/a
Trail Curfew 10PM - 5AM	Based on local ordinance	R on W	n/a	n/a



Figure 26: Bike Route Sign

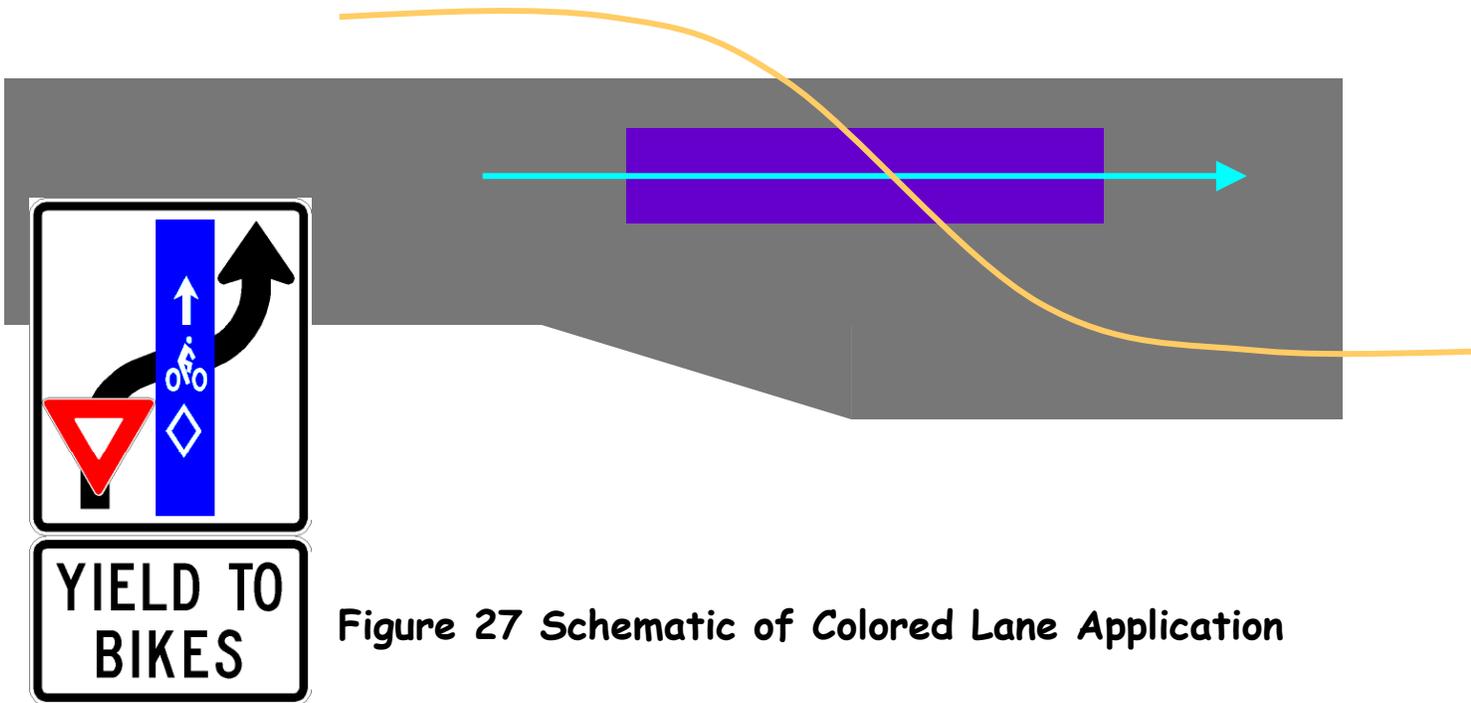


Figure 27 Schematic of Colored Lane Application

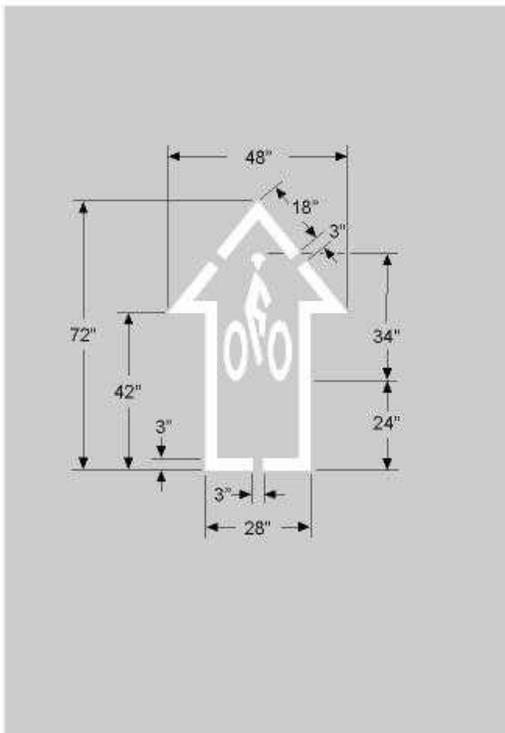


Figure 28
Schematic of Pavement Stencil
in use in San Francisco and
Denver

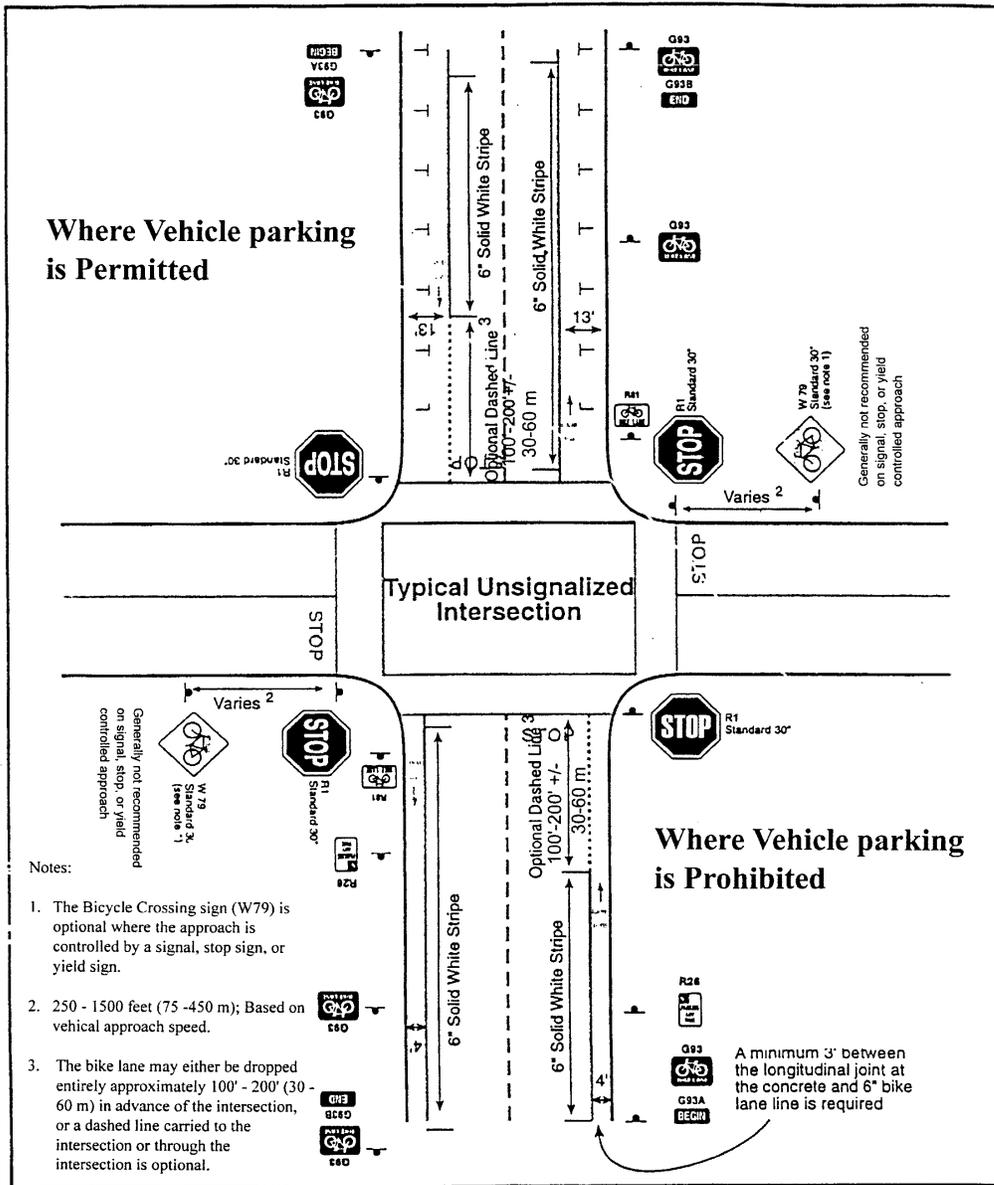


Figure 29: Signing at Unsignalized Intersections

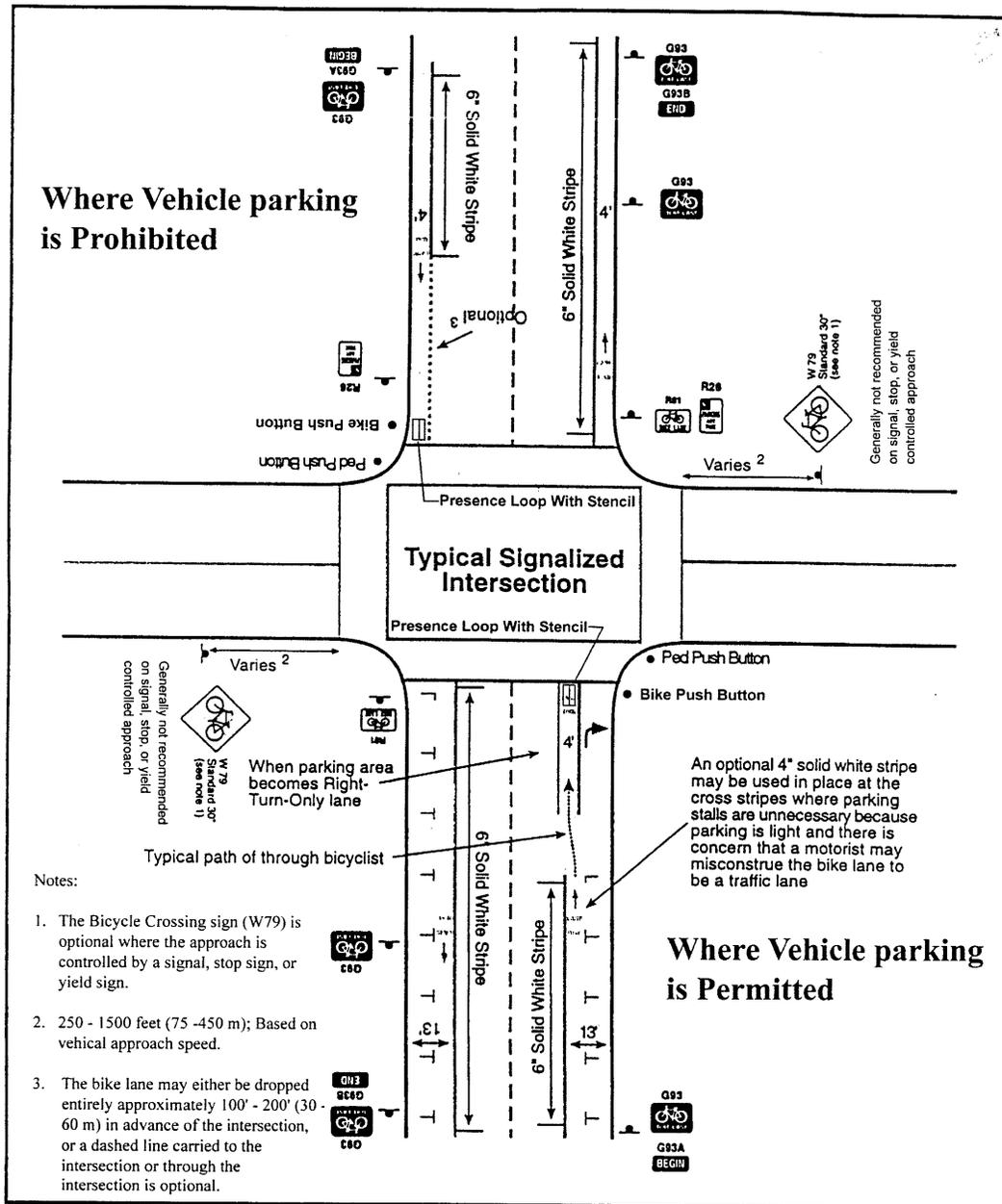


Figure 30: Signing at Signalized Intersections

WARNING SIGNS

	<p>Signs for locations on path near auto access points</p>	
	<p>Signs for bike lanes where there is no auto parking on right of lane</p>	
	<p>Signs for occasional use on Class 2 & 3 routes and Bicycle Boulevards. Can be interspersed with "Share the Road" signs. Possible sticker?</p>	
	<p>Signs for use at transition from Class 2 to Class 3; at the beginning of routes; and on non-bicycle-route roads where bicycle traffic might be expected or at intervals on all city streets. Possible sticker?</p>	<p>Signs used at intervals along bike routes with adjacent parallel parking. Frequency of signs should be related to parking turnover rates.</p>
	<p>Signs for use at transition from Class 2 to Class 3; at the beginning of routes; and on non-bicycle-route roads where bicycle traffic might be expected or at intervals on all city streets. Possible sticker?</p>	<p>Should be used throughout City at parallel parking locations, also.</p>
	<p>Signs for use at transition from Class 2 to Class 3; at the beginning of routes; and on non-bicycle-route roads where bicycle traffic might be expected or at intervals on all city streets. Possible sticker?</p>	

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Figure 31: Signs

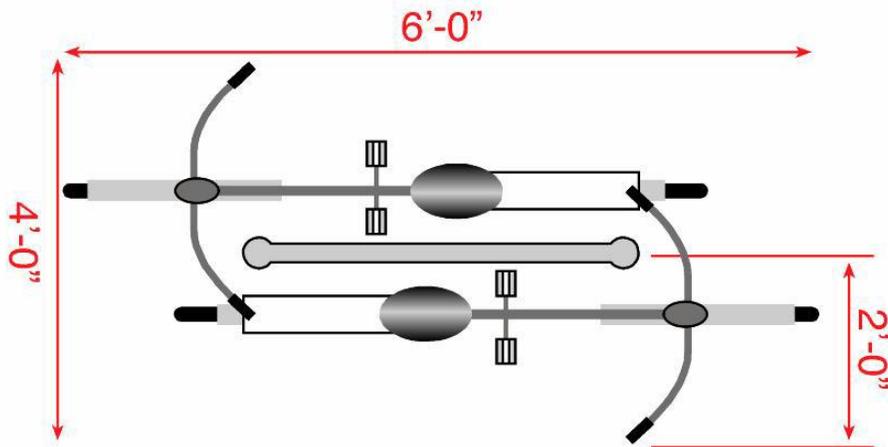
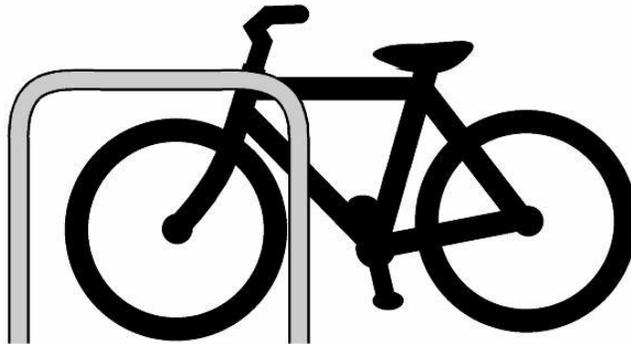
Table 9: Recommended Guidelines for Bicycle Parking Locations and Quantities

Land Use or Location	Physical Location	Type of Parking (existing & recommended)	Bicycle Capacity
City Park	Adjacent to restrooms, picnic areas, fields, and other attractions	A Frame, Staple, etc	8 bicycles per acre
City Schools	Near office entrance with good visibility	A Frame, Free Standing racks in fenced area, etc	8 bicycles per 40 students
Public Facilities (City Hall, libraries, community centers)	Near main entrance with good visibility	Staple or Free Standing racks, etc	8 bicycles per location
Commercial, Retail and Industrial Developments over 10,000 gross square feet	Near main entrance with good visibility	Staple or new technologies	1 bicycle per 15 employees or 8 bicycles per 10,000 gross square feet
Shopping Centers over 10,000 gross square feet	Near main entrance with good visibility	Staple or new technologies	8 bicycles per 10,000 gross square feet
Commercial Districts	Near main entrance with good visibility Not to obstruct auto or pedestrian movement	Staple or new technologies	2 bicycles every 200 feet
Transit Stations	Near platform or security guard	Enclosed Lockers	1 bicycle per 30 parking spaces

Recommended Locations

Prohibited Locations	4 Feet Minimum Distance From	5 Feet Minimum Distance From
Red zones, blue zones, bus zones, white zones, corners	Parking meters, newspaper boxes, trees, sign posts, light poles and public telephones.	Wheelchair ramps, driveways, fire hydrants, fire escapes, and doorways.

Hitching Post or Staple Racks



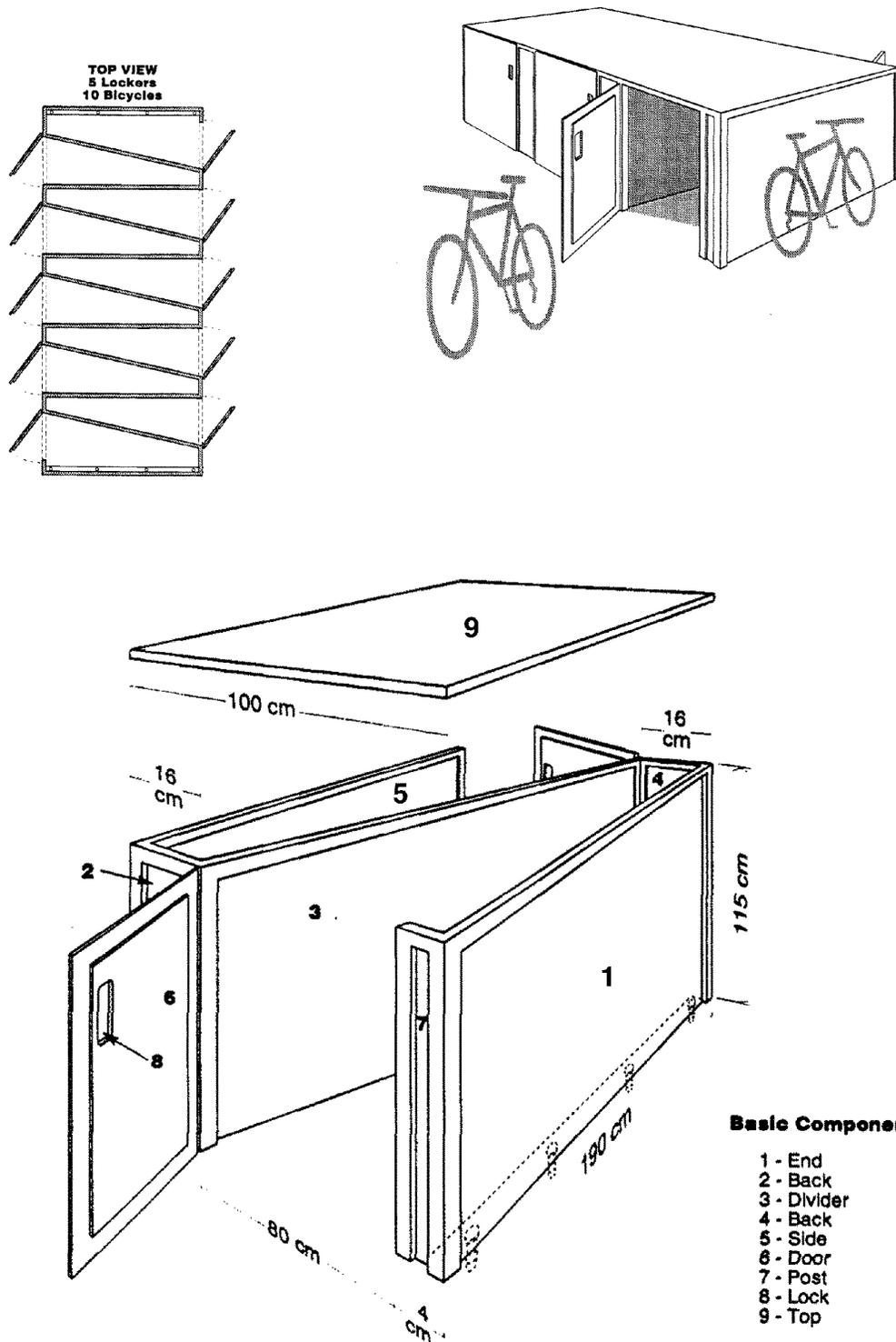
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**DIMENSIONS FOR
COMMONLY USED RACKS**



Figure 32 Bicycle Racks

Figure 33: Bicycle Lockers



Maintenance

The total annual maintenance cost of the primary bikeway system is estimated to be about \$133,500 annually once it is fully implemented (see Table 6). Most of the maintenance costs are associated with the proposed off-road bike paths, as bike lanes and routes are assumed to be maintained as part of routine roadway maintenance. However, as bicycle lanes do require occasional restriping and other maintenance, a cost of \$2000 per mile annually is used based on experience in other cities. This includes costs like sweeping, replacing signs and markings, and street repair. Class I bike path maintenance costs are based on \$8,500 per mile, which covers labor, supplies, and amortized equipment costs for weekly trash removal, monthly sweeping, and bi-annual resurfacing and repair patrols.

Maintenance access on the Class I bike path will be achieved using standard City pick-up trucks on the pathway itself. Sections with narrow widths or other clearance restrictions should be clearly marked. Class I bike path maintenance includes cleaning, resurfacing and restriping the asphalt path, repairs to crossings, cleaning drainage systems, trash removal, and landscaping. Underbrush and weed abatement should be performed once in the late spring and again in mid-summer. In addition, these same maintenance treatments should be performed on Class II and Class III facilities. These facilities should be prioritized to include an accelerated maintenance plan, that is already a part of the City's ongoing street maintenance. A maintenance schedule and checklist is provided in Table 10.

Action

Identify a reliable source of funding to cover all new Class I, II and III bike facility maintenance. All proposed designs should be closely examined to minimize future maintenance costs. In particular, maintenance on Class II and III facilities should be accelerated.

Table 10
Bikeway Maintenance Check List and Schedule

Item	Frequency
Sign Replacement/Repair	1 - 3 years
Pavement Marking Replacement	1 - 3 years
Tree, Shrub & grass trimming	5 months - 1 year
Pavement sealing/potholes	5 - 15 years ¹
Clean drainage system	1 year
Pavement sweeping	Weekly-Monthly/As needed
Shoulder and grass mowing	Weekly/As needed
Trash disposal	Weekly/As needed
Lighting Replacement/Repair	1 year
Graffiti removal	Weekly-Monthly/As needed
Maintain Furniture	1 year
Fountain/restroom cleaning/repair	Weekly-Monthly/As needed
Pruning	1 - 4 years
Bridge/Tunnel Inspection	1 year
Remove fallen trees	As needed
Weed control	Monthly/As needed
Remove snow and ice	Weekly/As needed
Maintain emergency telephones, CCTV	1 year
Maintain irrigation lines	1 year
Irrigate/water plants	Weekly-Monthly/As needed

Security

Security may be an issue along portions of the Class I bike paths. The following actions are recommended to address these concerns.

Action

Enforcement of applicable laws on the bike path will be performed by the City of Long Beach Police Department, using both bicycles and vehicles. Enforcement of vehicle statutes relating to bicycle operation will be enforced on Class II and Class III bikeways as part of the department's normal operations. No additional manpower or equipment is anticipated for Class II or III segments.

Liability

Liability is a major concern for all local governments. Liability for local agencies implementing and operating new bikeways and pedestrian facilities should be no different than the liability for new roads, parks, or schools. Local agencies should adhere to the following guidelines to minimize their liability.

1. Use of Design standards.

The designers, builders, and inspectors of a facility should adhere to widely accepted standards governing the design and construction of the trail. A standard of conduct includes adherence to published documents such as safety codes, standards, or guidelines which are sponsored or issued by government agencies or voluntary associations, even though such documents lack the force and effect of law. Provisions of state laws related to transportation facilities, if mandatory, may provide the basis for a finding of negligence per se.

Applicable California standards include the Uniform Building Code, and Caltrans Design Manual for Class I and II Bikeways. Other available design standards include AASHTO's Guide for the Development of Bicycle Facilities; Florida Department of

Transportations Trail Intersection Design Guidelines, Island Press's "Greenways: A Guide to Planning, Design, and Development," Americans with Disabilities Act (ADA), and the Rail-to-Trails Conservancy's Trails for the 21st Century: A

Liability, continuedPlanning, Design, and Management Manual for Multi-Use Trails.

Note that Caltrans requirements and guidelines are legally binding for all bikeways in California: deviations to these standards must go through the design exception process. Careful compliance with applicable laws, regulations, route selection criteria, and design standards should greatly reduce the risk of injury to bicyclists using the bikeway, and also provide strong evidence that the agency used reasonable care. A detailed Project Feasibility Report is specifically designed to address existing standards.

2. Traffic signals and warning devices.

CalTrans has adopted a Traffic Design Manual, which defines the circumstances under which traffic signals and warning devices are required. While California law limits the liability of public entities for failure to install regulatory traffic signals, signage and markings, non-regulatory warning signs must be installed where necessary to warn of dangerous condition, such as an intersection. All signals and warning devices must be adequately maintained, so as not to invite reliance on a defective warning device.

3. Usage of Professionals.

Facilities that have been reviewed and approved by unregistered or unlicensed professionals may increase liability exposure.

4. Adhere to Maintenance Standards.

Maintenance practice should be consistent along the entire facility, and conform to recognized maintenance practices. The responsible maintenance agency(ies) should have a written procedure to follow to maintain all portions of the facility, including pre-existing conditions such as drain grates.

5. Monitor Conditions.

The responsible agency(ies) should have an internal mechanism to monitor and respond to actual operating conditions on the

Liability, continued

facility. This is typically done through the maintenance procedures, a record of field observations and public comments, and an annual accident analysis. Accidents should be reviewed to determine if physical conditions on the bikeway were a contributing cause.

6. Keep Written Records.

Written records of all maintenance activities and procedures, responses to reports of safety hazards, and other regular through numerous jurisdictions, it may make sense to have one contact persons/department responsible for the entire facility, rather than risk confusion by incidents being reported to the wrong jurisdiction. Mileposts on the route may also help maintenance and enforcement personnel respond to problems.

7. Correct Hazards.

Trail managers should correct all hazards known by public officials in a timely fashion.

8. Warn of Known Hazards.

Trail users should be warned that the trail is adjacent to an active railroad corridor and to use caution when crossing the tracks or at intersections with roadways.

9. Insurance.

Proper insurance coverage or budgeting for self-insurance to cover potential liability will do much to alleviate concerns.

10. Be Careful With the Word 'Safe'.

Do not make any verbal or written comments that the facility is safe or safer than a non-designated route. For example, a Project Feasibility Report should not make any blanket claims that the facility is safe or safer than comparable routes.

11. Do Not Rush to Settle.

Fear that juries will award a plaintiff large sums for damages

Liability, continued

has made many attorneys eager to settle cases before they come to court. Lawsuits related to bikeways and walkways may be settled more quickly than other types of lawsuits due to the misconception that walking or bicycling are inherently unsafe activities.

Attorneys may feel that a local government has an extra responsibility on designated bikeways or walkways—more than it does for motor vehicles on roadways for example—to prevent incidents. In fact, there is no evidence that bicycling or walking is inherently more or less safe than other transportation modes such as driving, flying, or other recreational activities such as swimming or playing soccer. This misconception is probably shared by the same public, who must be educated about the facts of bicycling and walking. The same exceptions for user responsibility and facility condition that apply to driving should apply to bicycling or walking. Since by law bicyclists and pedestrians are allowed on all roadways except where expressly prohibited, and roadway conditions vary widely, a public agency incurs no additional liability by identifying the route on a map or a plan. The net effect or prematurely settling a case is to incrementally reduce the types of improvements that can be offered by local government. In other cases, settling cases prematurely may simply encourage legal actions by others.