APPENDIX A: BIKEWAY PLANNING AND DESIGN

This chapter provides basic bikeway planning and design requirements and recommendations for use in developing the Fremont bikeway system and support facilities.

INTRODUCTION

The bikeway design guidelines presented in this section are a combination of the minimum standards outlined in the Caltrans *Highway Design Manual* (HDM) Chapter 1000 and the 2003 Manual of Uniform Traffic Control Devices (MUTCD) and 2003 MUTCD California Supplement, recommended standards prescribed by the American Association of State Highway and Transportation Officials (AASHTO) *Guide for the Development of Bicycle Facilities*, as well as design solutions tailored to Fremont's unique bicycle facility needs. Some treatments draw upon creative solutions in use in other locations in California and other states, are conceptual at this stage, and must be reviewed further before being applied to actual situations.

This document does not attempt to replace material covered within the HDM or MUTCD, but rather, to clarify local treatments of bicycle facility design. Caltrans HDM Chapter 1000 and the 2003 Manual of Uniform Traffic Control Devices and MUTCD 2003 California Supplement should be referenced and the use of this document should be supplemental. Having a toolbox of strong and innovative design guidelines such as those presented here will allow the City of Fremont to improve the quality of the bicycle network by applying the highest standard of bicycle safety, comfort, and convenience.

Note that the City of Fremont would need to adopt new City Standard Details and Specifications in order to implement bikeway designs not in the MUTCD, MUTCD 2003 California Supplement, or Caltrans Highway Design Manual.

CLARIFICATIONS ON TERMINOLOGY

"SHALL" or "MUST" All language that is explicitly stated as such, is referenced within Caltran's HDM, MUTCD and 2003 California Supplement, or other traffic engineering manuals. Fremont's Bikeway Design Guidelines conform to these overriding documents.

"SHOULD" All language that is suggestively stated as such, represents a "best practices" guideline that should be followed, but is still open for interpretation depending on a multiple of local factors including; topography, lane widths, vehicle speeds, collision history, etc. Suggestive guidelines can not conflict with these explicit standards.

"MAY" All language that is conditionally stated as such, represents a guideline that could be followed in Fremont. Conditional guidelines are dependant on multiple variables. Often times they should be coupled with a "before and after" study to determine their effectiveness. They can not conflict with explicit standards set forth in the HDM or MUTCD.

BIKEWAY CLASSIFICATION DESCRIPTIONS

According to Caltrans, the term "bikeway" encompasses all facilities that provide primarily for bicycle travel. Caltrans has defined three types of bikeways in Chapter 1000 of the Highway Design Manual: Class I, Class II, and Class III. Class I Bike Paths provide a completely separated right-of-way for exclusive use of bicyclists and pedestrians. Class II Bike Lanes provide a striped lane for one-way travel on a street or highway. Class III Bike Routes provide for shared use of the vehicular travel lane, typically on lower volume roadways. **Figure A-1** provides an illustration of the three types of bicycle facilities.

As this Bicycle Master Plan is primarily focused on bicycle transportation, and most of the recommended network facilities are on-street bikeways, design guidelines for the Class II and III facilities are presented first, followed by Class I bike paths at the end of the chapter.

ON-STREET BIKEWAYS: CLASS II BIKE LANES

Often referred to as a "bike lane," a Class II bikeway provides a striped and stenciled lane for one-way travel on either side of a street or highway. **Figure A-2** shows a typical Class II cross-section. To provide bike lanes along corridors where insufficient space is currently available, extra room can be provided by removing a traffic lane, narrowing traffic lanes, or prohibiting parking. The width of the bike lanes vary according to parking and street conditions:

CALTRANS MINIMUM DESIGN GUIDELINES:

- 4' (1.2 m) minimum if no gutter exists, measured from edge of pavement
- 5' (1.5 m) minimum with normal gutter, measured from face of curb; or 3' (0.9 m) measured from the gutter pan seam
- 5' (1.5 m) minimum when parking stalls are marked
- 11' (3.3 m) minimum for a shared bike/parking lane where parking is permitted but not marked on streets without curbs; or 12' (3.6 m) for a shared lane adjacent to a curb face

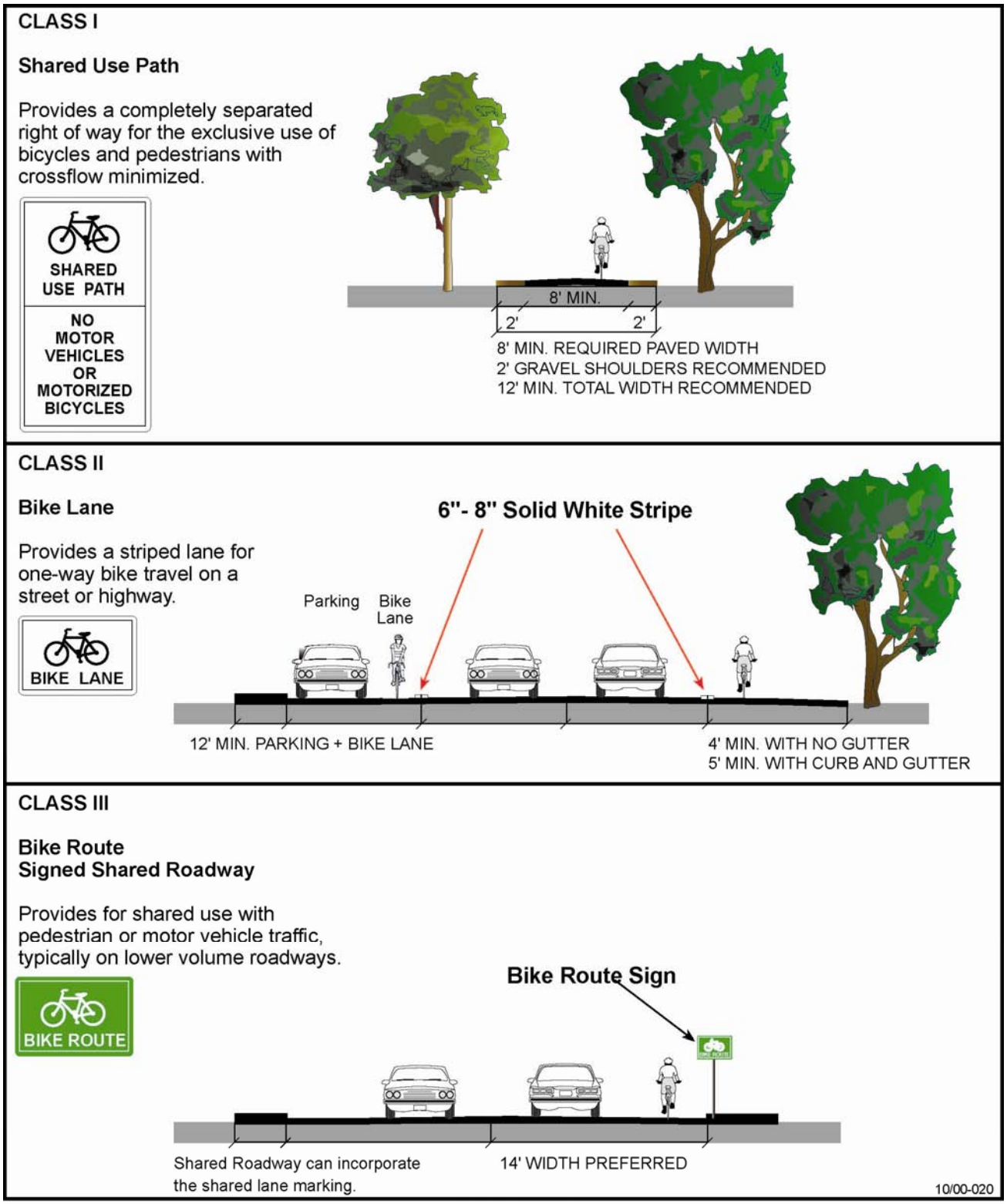


FIGURE A-1 Caltrans Bikeway Classifications

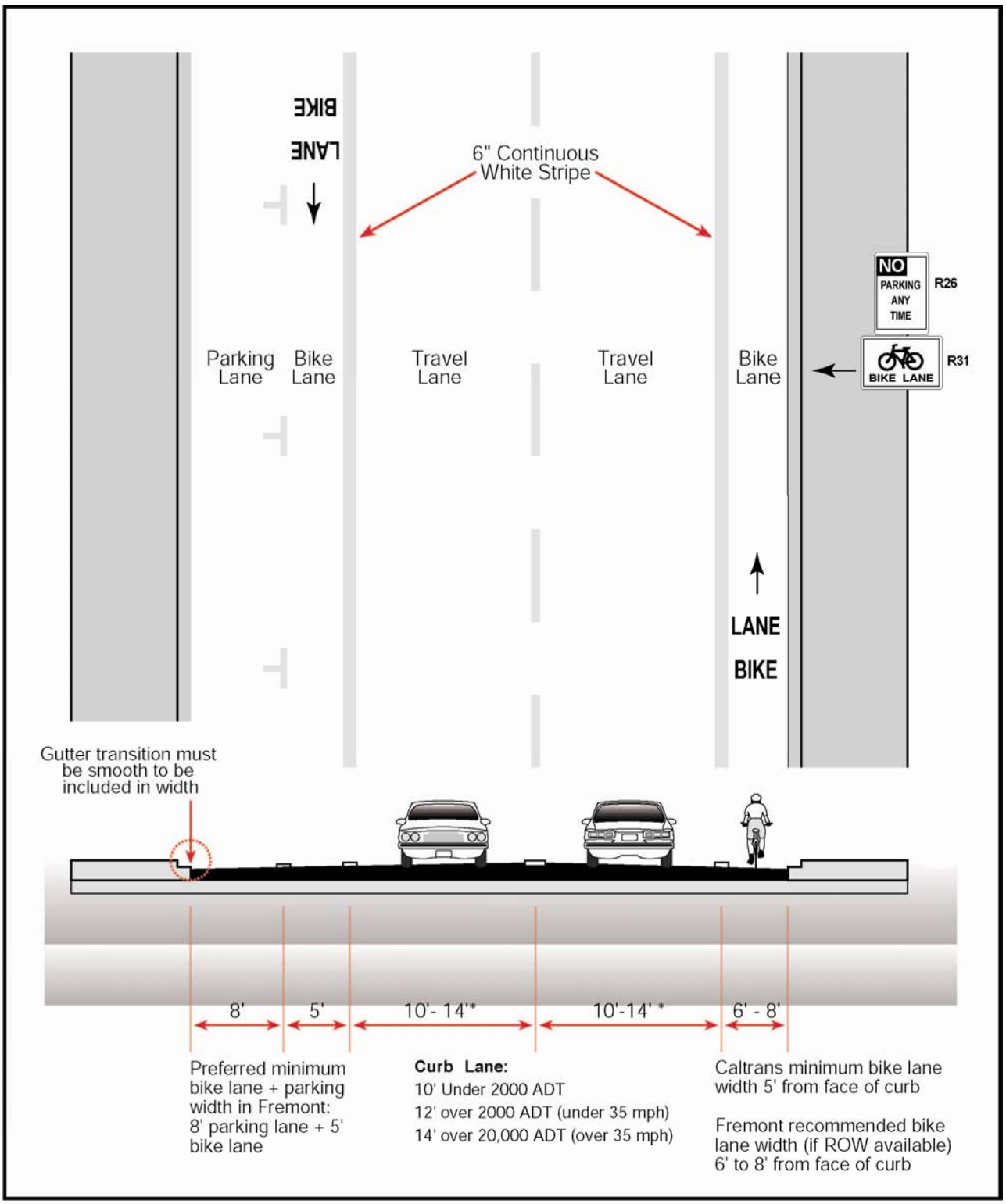


FIGURE A-2 Class II Facility Cross-Section

ADDITIONAL CLASS II DESIGN RECOMMENDATIONS:

1. Whenever possible, the Engineering Division should recommend that wider bike lanes beyond the minimum standard be installed. For Fremont the preferred bike lane width is 6' to 8' from face of curb. 8' is the maximum bike lane width, due to the fact that wider bike lanes may appear to motorists to be a vehicle travel lane.
2. 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.
3. Signal loop detectors, which sense bicycles, should be considered for all arterial/arterial, arterial/collector, and collector/collector intersections. A stencil of a bicycle and the words "Bicycle Loop" should identify the location of the detectors (see discussion of loop detectors, below).
4. When loop detectors are installed, traffic signalization should be set to accommodate bicycle speeds.
5. Bicycle-sensitive loop detectors are preferred over a signalized button specifically designed for bicyclists (see discussion of loop detectors, below).
6. 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.
7. Where bottlenecks preclude continuous bike lanes, they should be linked with Class III route treatments.
8. A bike lane should be delineated from motor vehicle travel lanes with a solid 6" white line, per MUTCD.
9. Bicycle lane signage should be installed per MUTCD California Supplement.
10. Word and symbol pavement stencils should be used to identify bicycle lanes, as per Caltrans and MUTCD specifications.

Installing bike lanes may require more attention to continuous maintenance issues. Bike lanes tend to collect debris as vehicles disperse gravel, trash, and glass fragments from traffic lanes to the edges of the roadway. Striping and stenciling will need periodic replacing.

ON-STREET BIKEWAYS: CLASS III BIKE ROUTES

Generally referred to as a "bike route," a Class III bikeway provides routes through areas not served by Class I or II facilities or to connect discontinuous segments of a bikeway. Class III facilities are shared with motorists on roadways and identified only by signing. There are no recommended minimum widths for Class III facilities, but when encouraging bicyclists to travel along selected routes, traffic speed and volume, parking, traffic control devices, and surface quality should be acceptable for bicycle travel. A wide outside traffic lane (15') is preferable to enable cars to safely pass bicyclists without crossing the centerline.

SHARED LANE MARKINGS

Recently, "shared lane marking" stencils, an additional treatment for Class III facilities, have been introduced on city roadways. The stencil can serve a number of purposes, such as making motorists aware of bicycles potentially in their lane, showing bicyclists the direction of travel, and, with proper placement, reminding bicyclists to bike further from parked cars to prevent "dooring" collisions. The City of Denver has effectively used the "bike-in-house" shared marking treatment (shown in photo on previous page) for several years, and San Francisco recently tested two designs of the shared lane marking stencil for use on Class III facilities where lanes are too narrow for sharing. Based on the results of the San Francisco study, the California Traffic Control Devices Committee (CTCDC) recommended in August 2004 that the "Chevron Bicycle Symbol" design of the Shared Lane Marking be adopted by Caltrans as a standard traffic control device in California.

Guidance language recommended by the CTCDC for use of the Shared Lane Marking is as follows:

Support:
The Shared Lane Marking is intended to improve the positioning of bicyclists on roadways with significant bicycle usage and parked vehicles where the curb lanes are too narrow for motorists and bicyclists to travel side by side within the lane.

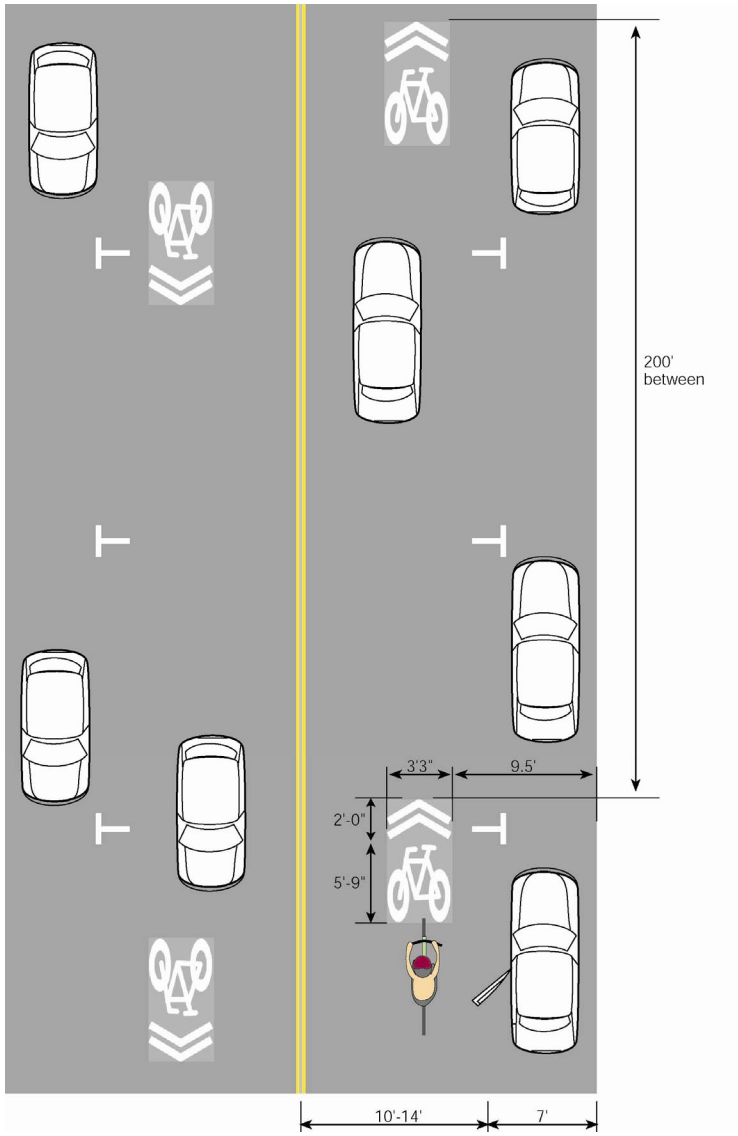
Option:
The Shared Lane Marking may be used in shared lanes to improve bicyclists' positioning on roadways, encourages cycling in the correct direction, discourage cycling on sidewalks, and to decrease motor vehicle/bicycle conflicts by informing motorists where to expect cyclists, especially on urban and suburban roadways with narrow curb lanes.

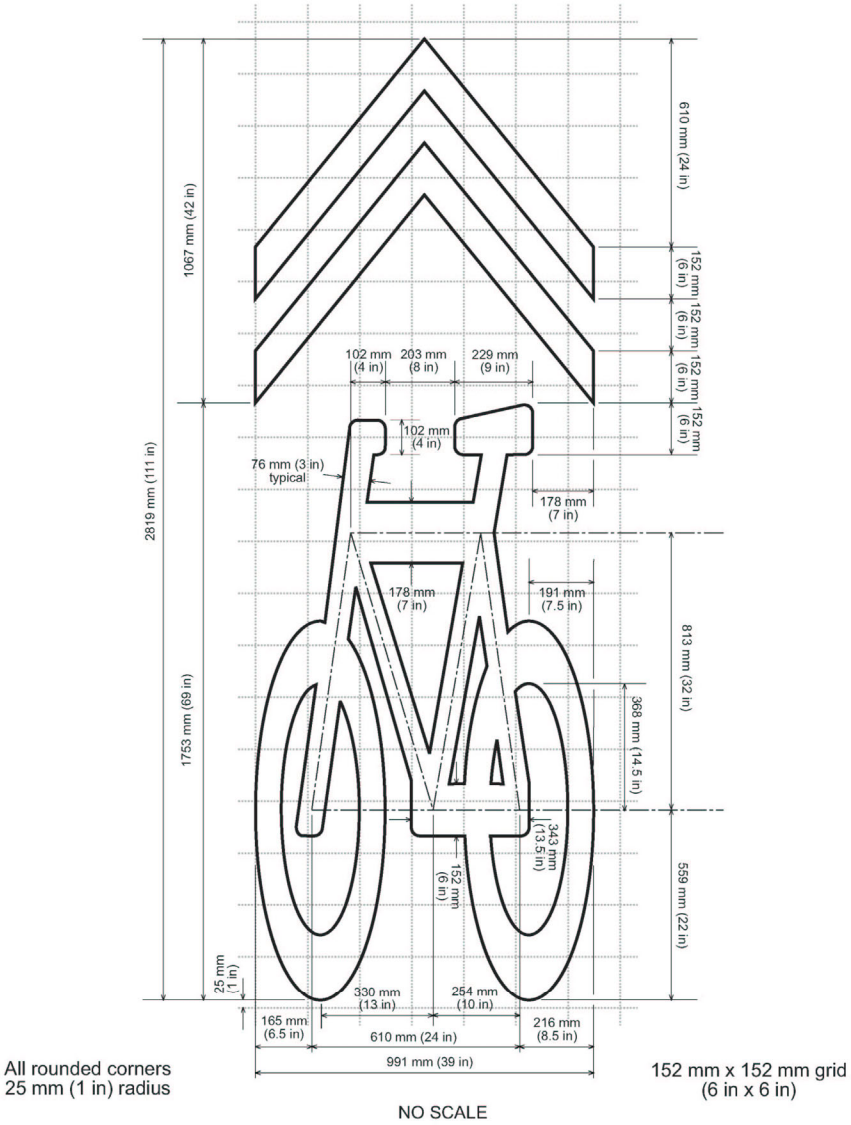
Standard:
If used, the Shared Lane Marking shall be placed so that its center is a minimum of 3.4 meters (11 feet) from the curb face with on-street parking.

On streets with no on-street parking, the marking should be placed so that it directs cyclists away from conditions alongside the curb face edge that compromise cyclists' safety, such as drain grates and longitudinal gutter joints. If used, the Shared Lane Marking generally should be spaced at 75 meter (250 foot) intervals.

Option:
The spacing may be increased or decreased based on judgment. On streets with downgrades, higher speeds, or wide parked vehicles, the distance from the curb lane may be increased beyond 3.4 meters (11 feet).

SHARED LANE MARKING, CONTINUED





BICYCLE BOULEVARD

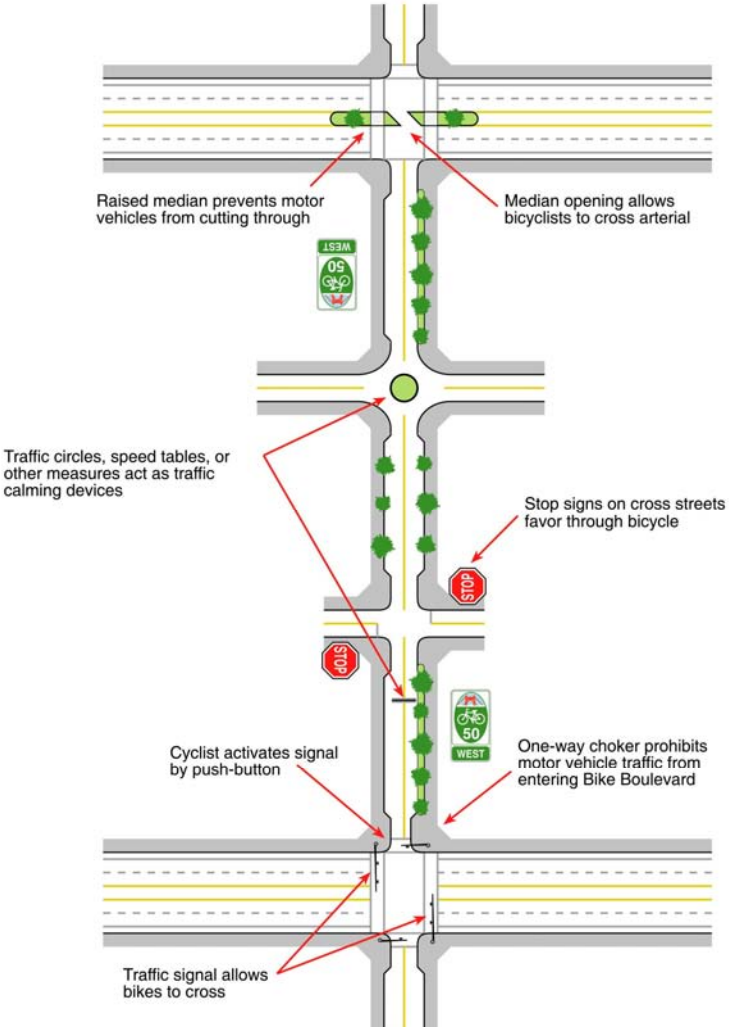
The bicycle boulevard treatment is typically a lower volume street with traffic calming treatments that parallels a higher volume arterial. Traffic calming typically includes a set of improvements to slow traffic and prevent cut-through traffic such as: traffic circles, chokers, and medians. In addition, stop signs favor bicyclists by stopping perpendicular traffic. Sensor loops activate traffic signals to allow safe crossings of higher volume roadways

Application

- Low volume streets
- Calming traffic on streets within 1/4 mile of parallel arterials
- Allows access to key destinations
- Provides safe arterial street crossing

Notes

20 mph speed limits should be considered.



BIKEWAYS AND ON-STREET PARALLEL PARKING

Vehicular parking movements (pulling in and out of parallel parking spaces), as well as the opening of vehicle doors on the driver-side, present hazards to bicyclists.

MINIMUM STANDARD:

According to Caltrans Chapter 1000, the minimum standard for parking lane width is 7'. The minimum standard width for a bike lane next to a parking lane is 5'.

RECOMMENDED GUIDELINE:

In order to provide additional width for bicyclists to ride adjacent to on-street parking, the recommended minimum width of a parking lane + bike lane in Fremont should be an 8' parking lane plus 5' bike lane. Additional bike lane width should be considered if ROW is available. Widened bike lanes/parking lanes are particularly desirable under the following situations:

- Parking turnover is high (metered parking, commercial areas)
- Higher concentration of wide vehicles in parking lane (trucks, buses, etc)
- It is preferable to narrow travel lanes to encourage slower speed
- Widening the parking lane moves the bike lane away from the curb and keeps motorists near the middle of the road, increasing sight distances for traffic on cross-streets

STRIPING

An inside stripe installed on bike lanes adjacent to parallel parking may help to encourage parked vehicles to park as close to the curb as possible and not encroach into the bike lane width.

BIKE LANES ADJACENT TO BACK-IN DIAGONAL PARKING

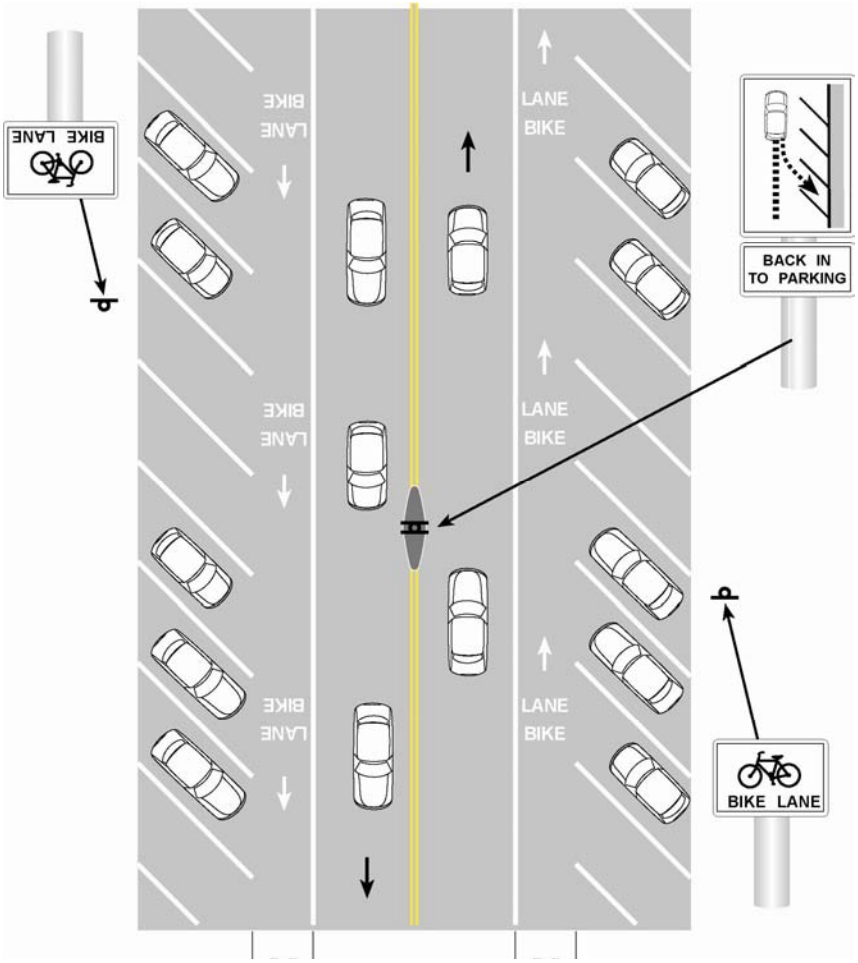
Diagonal parking movements present additional hazards to bicyclists, as motorists views are restricted as they back out of spaces. For this reason, it is recommended to avoid diagonal parking configurations adjacent to bike routes. At locations where diagonal parking is absolutely necessary, back-in parking is recommended. This requires drivers to pull in front of a vacant space and reverse into the parking space. This forces the drivers to look behind them before crossing the path of oncoming bicyclists, and improves motorists' sightlines of oncoming bicycle and motor traffic while exiting.

Application

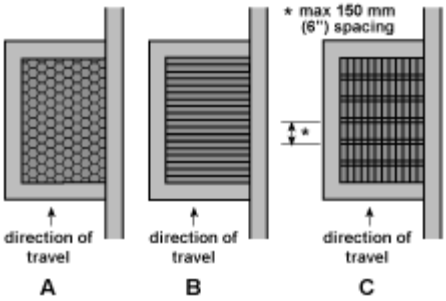
Use where diagonal parking is necessary. Note that City of Fremont parking design standards would need to be amended to allow for back-in diagonal parking.

Notes

Specific language for signage associated with this treatment will be evaluated as a part of implementation design. Language used by Pottstown, Pennsylvania reads "BACK IN ANGLE PARKING ONLY" behind every third stall. Parking stall widths wider than normal may be needed to accommodate drivers unfamiliar with back in parking. A City ordinance change may be required to specify back in angle parking to create a legal basis for this configuration.



DRAINAGE GRATES AND UTILITY COVERS



Examples of bicycle friendly drainage grates.

Poorly designed or placed drainage grates or utility covers can be hazardous to bicyclists. Drainage grates can catch bicycle tires and cause bicyclists to lose control. Because of this, cyclists may veer into travel lanes to avoid grates and utility covers. Grates must feature crossbars or a grid which prevents bicycle tires from catching or slipping through. However, even with proper crossbars, cyclists will generally want to avoid riding over grates due to the potentially slippery metal surface and the lip between the asphalt and the concrete pan around the drain. As such, where drainage grates encroach into the bicycle lane, sufficient usable width (minimum 3 feet) should be maintained so that bicyclists can stay within the bike lane striping while passing the grate. Regular maintenance of drainage grates is also important, especially during the rainy season, as water may pool around drainage grates if they become clogged, flooding the bike lane and forcing bicyclists out into the travel lane.

All utility covers or temporary metal construction plates along the bicycle network should have a non-slip coating.

INTERSECTION CONSIDERATIONS

Intersections represent one of the primary collision points for bicyclists. Generally, the larger the intersection, the more difficult it is for bicyclists to cross. Oncoming vehicles from multiple directions and increased turning movements make it difficult for motorists to see non-motorized travelers.

Most intersections do not provide a designated place for bicyclists. Bike lanes and pavement markings often end before intersections, causing confusion for bicyclists. Loop and other detectors, such as video, often do not detect bicycles.

Bicyclists wanting to make left turns can face quite a challenge. Bicyclists must either choose to behave like motorists by crossing travel lanes and seeking refuge in a left-turn lane, or they act as pedestrians and dismount their bikes, push the pedestrian walk button located on the sidewalk, and then cross the street in the crosswalk. Bicyclists traveling straight also have difficulty maneuvering from the far right lane, across a right turn lane, to a through lane of travel. Furthermore, motorists often do not know which bicyclist movement to expect.

Changing how intersections operate also can help make them more "friendly" to bicyclists. Improved signal timings for bicyclists, bicycle-activated loop detectors, and camera detection make it easier and safer for cyclists to cross intersections. **Figure A-3** is an example of an intersection that provides bike lanes at critical locations at intersections.

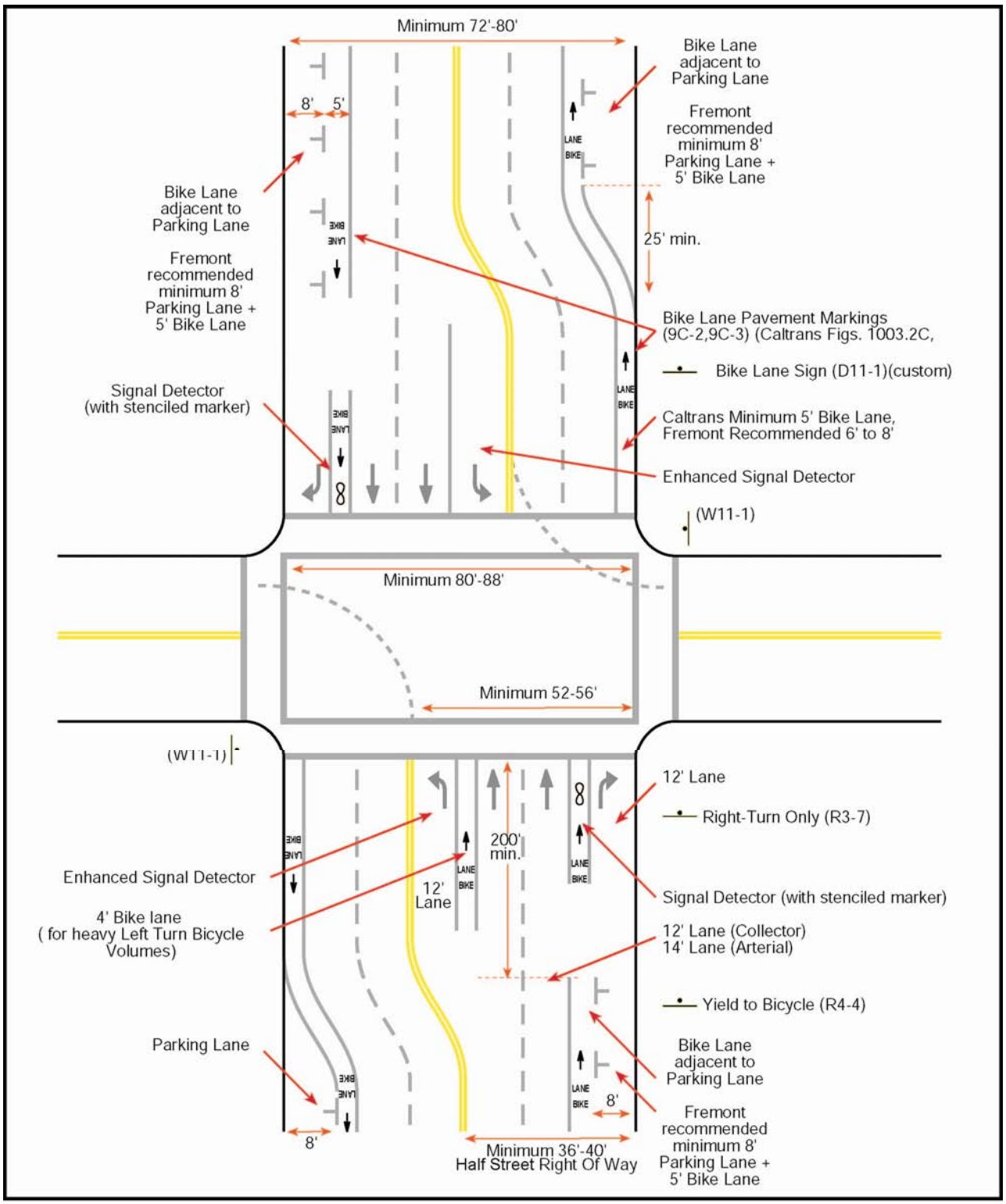


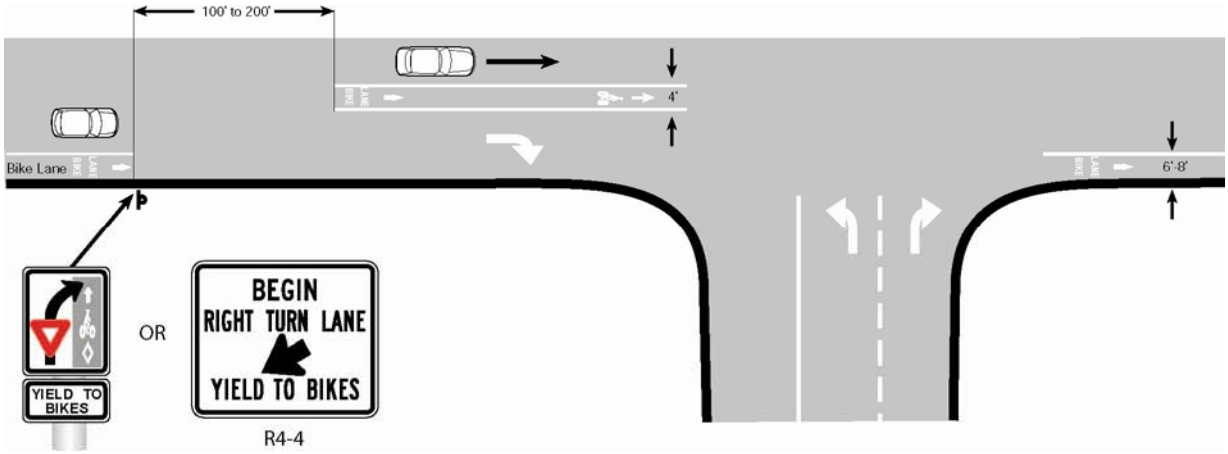
FIGURE A-3 Bike Lanes at Intersection

BIKE LANE ADJACENT TO RIGHT-TURN ONLY LANE

Right-turn only lanes present challenges for through-cyclists who must merge to the left to position themselves in the through travel lane. Jurisdictions will sometimes stripe bike lanes on the right-side of right-turn only lanes, which places the through-cyclist in direct conflict with a right-turning vehicle. The appropriate treatment for right-turn only lanes is to either drop the bike lane entirely approaching the right-turn lane, or to place a bike lane pocket between the right-turn lane and the right-most through lane. The design below illustrates a bike lane pocket, with signage indicating that motorists should yield to bicyclists through the merge area.

Application

Right-turn only lanes at intersections, driveways into shopping centers, or freeway on-ramps.



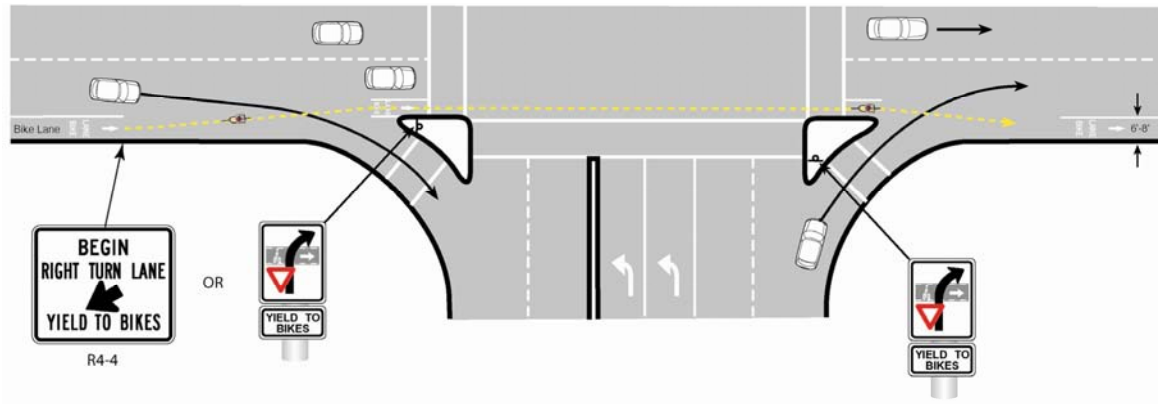
BIKE LANE THROUGH RIGHT TURN ISLAND INTERSECTION WITH FREE RIGHT-TURN LANES

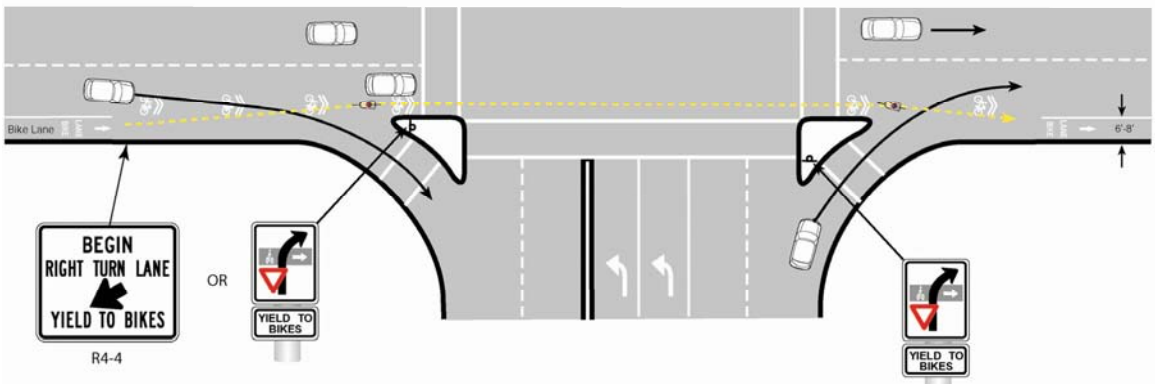
Many of Fremont's arterial intersections are designed with free right-turn lanes at each corner, separated from the through lanes by triangular right turn islands. The free right turn lanes are typically Yield controlled. While the right turn configuration can provide a pedestrian refuge area, they can present some difficulties for bicyclists. The bike lane striping is typically dropped approaching the right-turn lane. Bicyclists traveling straight need to merge left across the right-turn lane in order to position themselves in the through lane. Some bicyclists may wait until too late to merge, which can cause conflicts because of the wider turn radius and relatively higher turning speeds afforded by the free right configuration. A vehicle in the free right lane would not be anticipating a bicyclist along the curb to suddenly merge over near the island to continue straight. In addition, the right turn island configuration provides no dedicated space for bicyclists waiting to proceed straight, as the concrete island cuts off the normally available shoulder width.

Two design options are provided below. One provides a dedicated bike channel along the right side of the through lane. This option would likely require some reduction in the travel lane widths at the intersection in order to provide a 4 foot bike lane channel. The other option would utilize the Shared Use Arrow stencil in order to increase awareness of the bicycle merging area and to indicate to cyclists the proper positioning at the intersection.

Application:

Intersection with free right turn lanes and right turn islands.





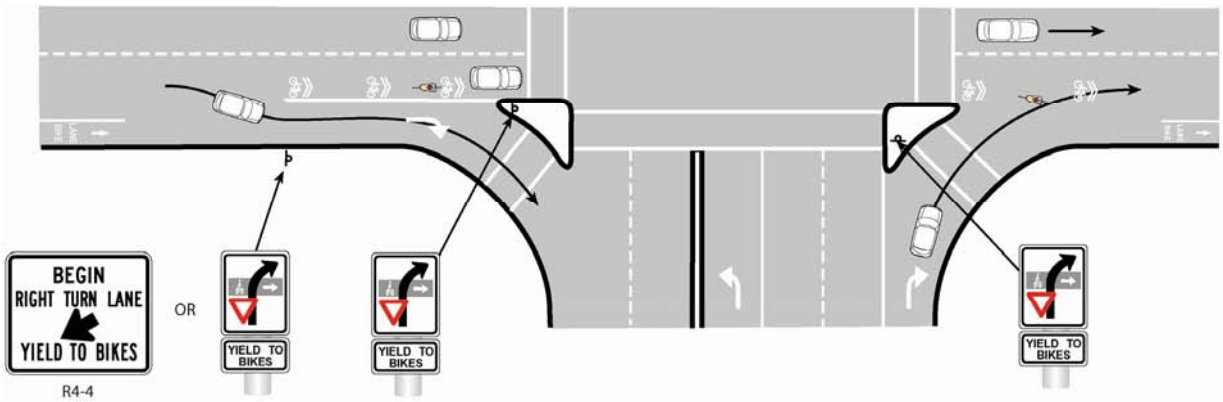
BIKE LANE THROUGH RIGHT TURN ISLAND INTERSECTION WITH EXCLUSIVE RIGHT-TURN LANES

Some of Fremont's arterial intersections are designed with exclusive right-turn lanes that extend from right turn islands at the intersection. In many of these locations, sufficient right-of-way does not exist to maintain the through and right-turn travel lanes, in addition to a bike lane approaching the intersection. The bike lane striping is typically dropped approaching the right-turn lane. Bicyclists traveling straight need to merge left across the right-turn lane in order to position themselves within the through lane. Some bicyclists may wait until too late to merge, which can cause conflicts with right-turning motor vehicles. A vehicle in the free right lane would not be anticipating a bicyclist along the curb to suddenly merge over near the island to continue straight. In addition, the right turn island configuration provides no dedicated space for bicyclists waiting to proceed straight, as the concrete island cuts off the normally available shoulder width.

This design option uses the Shared Use Arrow stencil in order to increase awareness of the bicycle merging area and to indicate to cyclists the proper positioning at the intersection. In addition, signage indicating that right-turning motorists must yield to bicyclists should be installed.

Application:

Intersection with exclusive right-turn lanes and right turn islands.

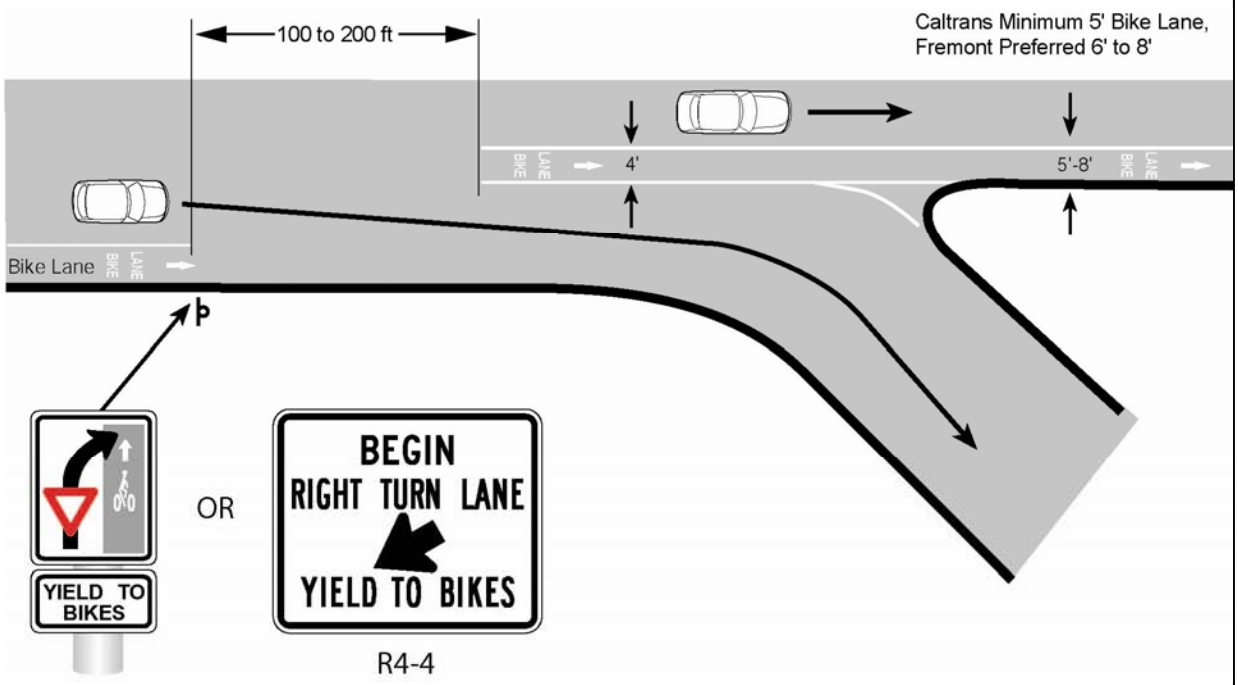


BIKE LANE THROUGH FREEWAY RAMPS

Freeway on- and off-ramp crossings present another potential conflict zone for bicyclists, as bike lanes are typically dropped and cyclists must merge across travel lanes where vehicles are accelerating or decelerating from freeway speeds. As with the free right turn lanes, the appropriate cyclist behavior is to merge left away from the curb so as to be positioned in the through lane well before the mouth of the on-ramp, and to remain out away from the curb until past the off-ramp.

Application:

Freeway ramp crossings



COMBINED BICYCLE/RIGHT TURN LANE

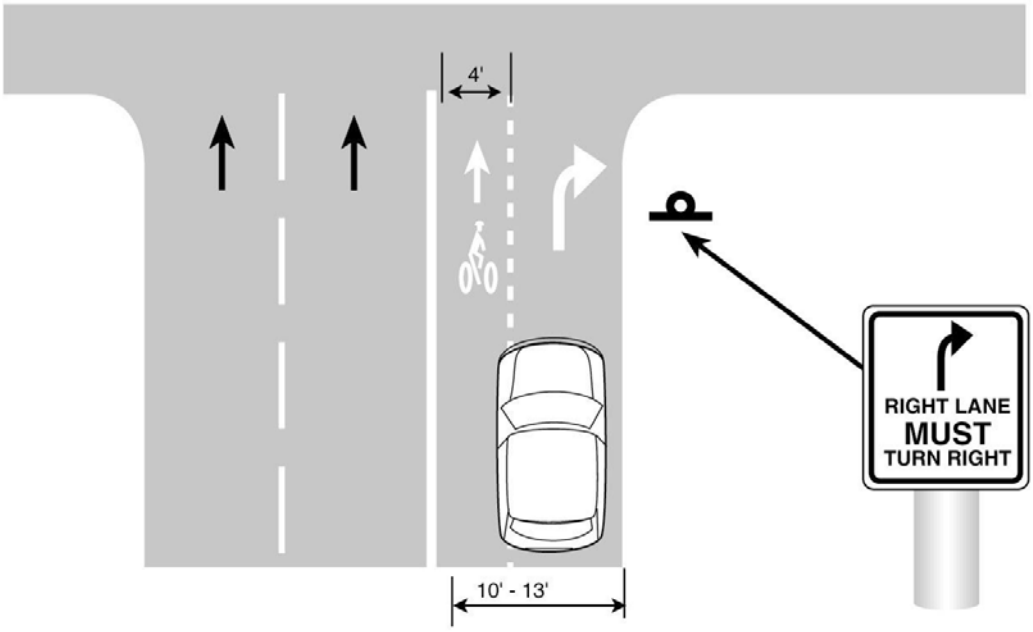
This treatment places a standard-width bicycle lane on the left side of a dedicated right-hand turn lane when there isn't enough room for both. A dashed stripe delineates the space for bicyclists and motorists within the right-hand turn lane. Signs should be installed to instruct bicyclists and motorists of the usage of this facility. This installation should be used on roadways where there is not enough room to provide a standard-width bicycle lane and a standard-width dedicated right-turn lane. These facilities are currently used in Eugene, Oregon.

Application

- Average vehicle speeds < 30 mi/h (48 km/h)
- Install a sign to instruct motorists and bicyclists how to use the facility
- Stripe and sign bicycle lane pavement markings in the turn lane to position and guide bicyclists in the right-turn lane

Notes

Shared-Lane Arrow placed at outside turn lane may prove to be more appropriate marking for this treatment.



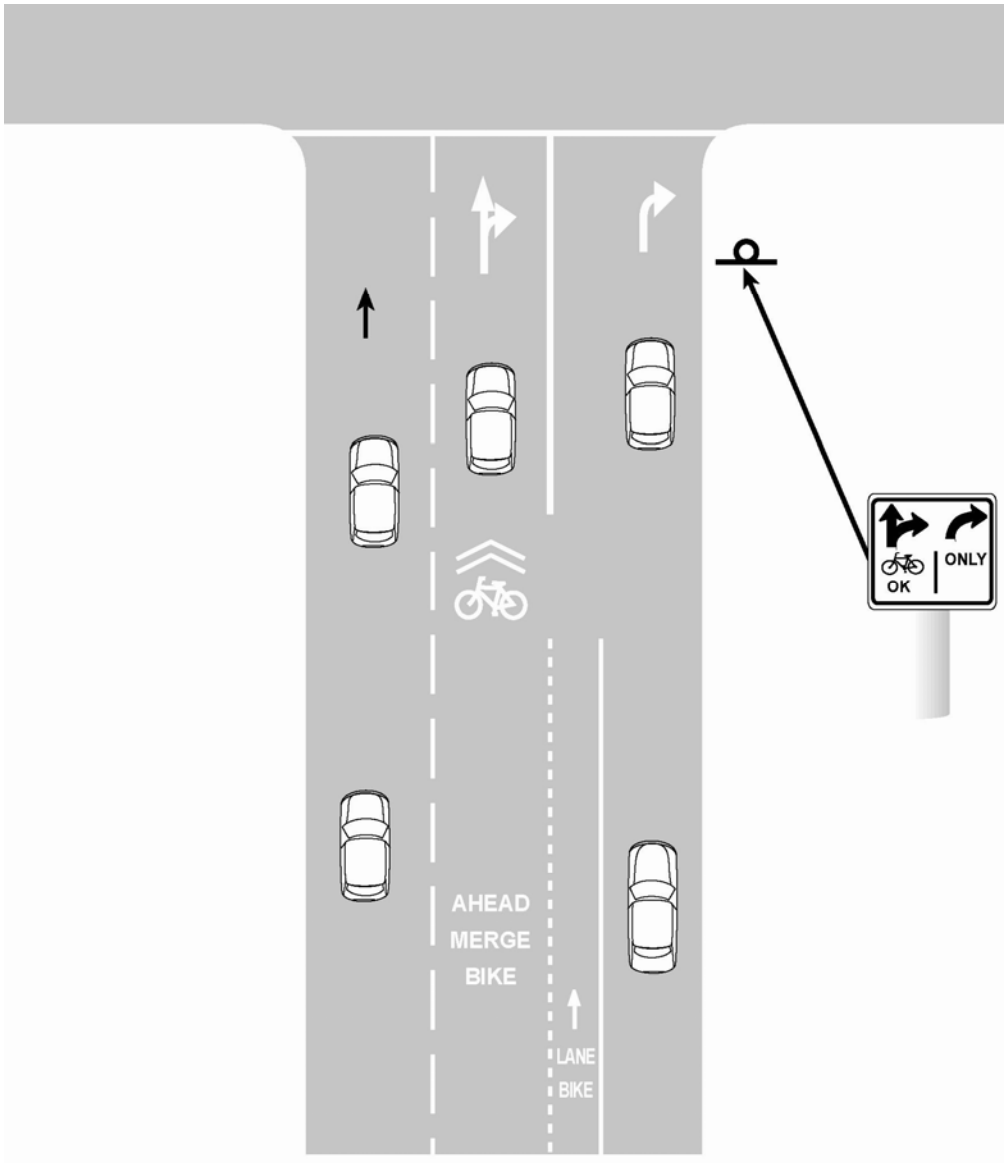
DOUBLE TURN LANES, SHARED LANE

Description

The use of double-turn lanes should be discouraged because of the difficulties they present for pedestrians and bicyclists. Existing double-turn lanes should be studied and converted to single-turn lanes, unless found to be absolutely necessary for traffic operations. In situations where the double-turn lane cannot be avoided, the following design can be used to guide through cyclists. This design uses the shared arrow stencil to indicate that bicyclists and automobiles are to share the through/turn lane. This properly positions through bicyclists and reduces conflicts with right turning vehicles.

Application

In double right turn situations with a right-turn lane and a through/turn lane.



DOUBLE TURN LANES, "GHOST" BIKE LANE

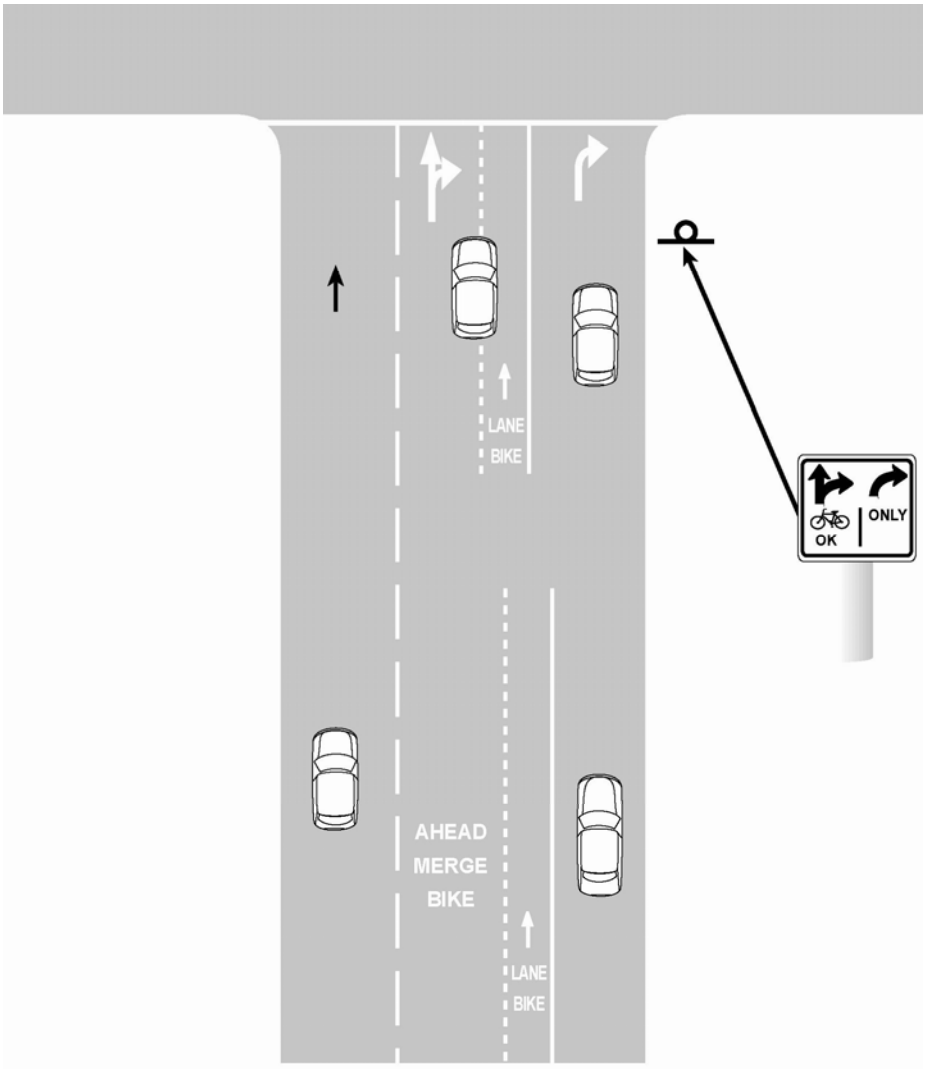
The use of double-turn lanes should be discouraged because of the difficulties they present for pedestrians and bicyclists. Existing double-turn lanes should be studied and converted to single-turn lanes, unless found to be absolutely necessary for traffic operations. In situations where the double-turn lane cannot be avoided, the following design can be used to guide through bicyclists. This design positions bicyclists in the through/turn lane while giving more clear delineation of safe travel path than the "shared lane" approach. The bicyclist therefore "blocks" the motorists in this travel lane.

Application

In double right turn situations with a right-turn lane and a through/turn lane, where a double-right turn is absolutely necessary for traffic operations

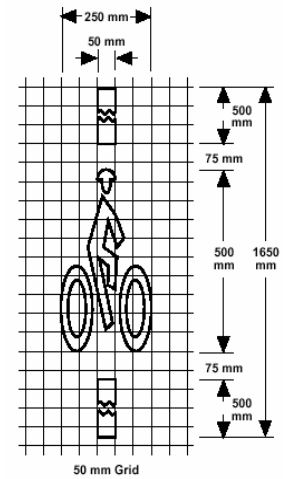
Notes

Shared-Lane Arrow placed at center of through/turn lane may prove to be more appropriate marking for this treatment. Motorist understanding of the shared lane marking requires study. Inclusion of bike box in front of through/turn lane should be considered.



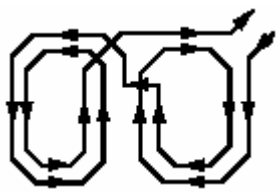
BICYCLE LOOP DETECTORS

The purpose of bicycle loops is to detect bicyclists waiting at intersections, and to give cyclists extra green time (e.g. five seconds) before the light turns yellow to make it through the light. Current and future bicycle detection loops should use the Caltrans Standard Plan A24C bicycle detection stencil to indicate to cyclists where to position themselves over the loop. The City of Fremont uses two loop detector types for bicycle detection, Type "C" (quadrupole) and Type "D" (diagonal slashed), which are shown in **Figure A-4** below. Type "A" loops (6' square) are not bike-sensitive in their center and should not be used for bicycle detection.

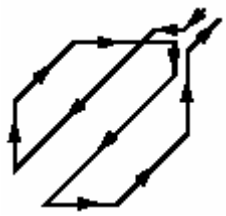


Caltrans Standard Plan A24C bicycle detection

Figure A-4
Bicycle-Sensitive Loop Detector Types Used in Fremont



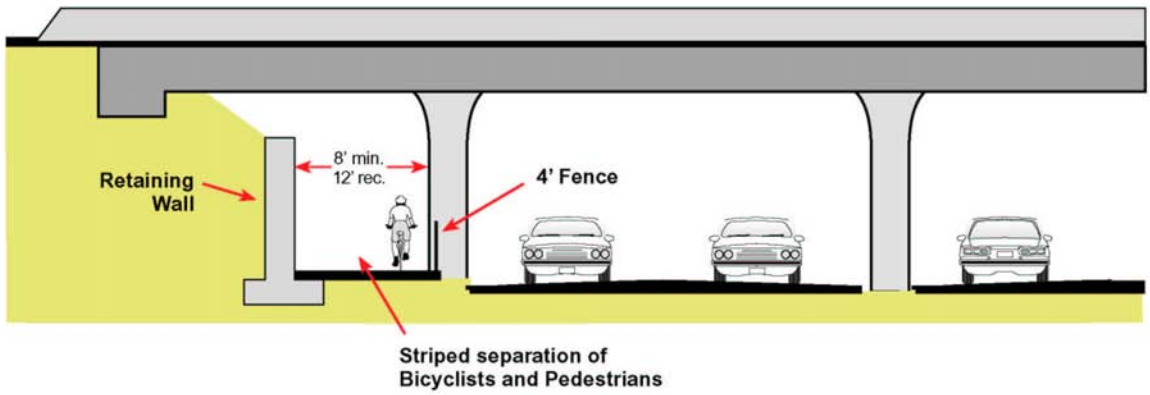
Quadrupole Loop – Type "C"
Detects most strongly in center
Sharp cut-off sensitivity
Used in bike lanes



Diagonal Quadrupole Loop – Type "D"
Sensitive over whole area
Sharp cut-off sensitivity
Used in shared lanes

UNDERCROSSINGS

Undercrossings are an important component of bikeway design. **Figure A-5** illustrates basic design standards for undercrossings.



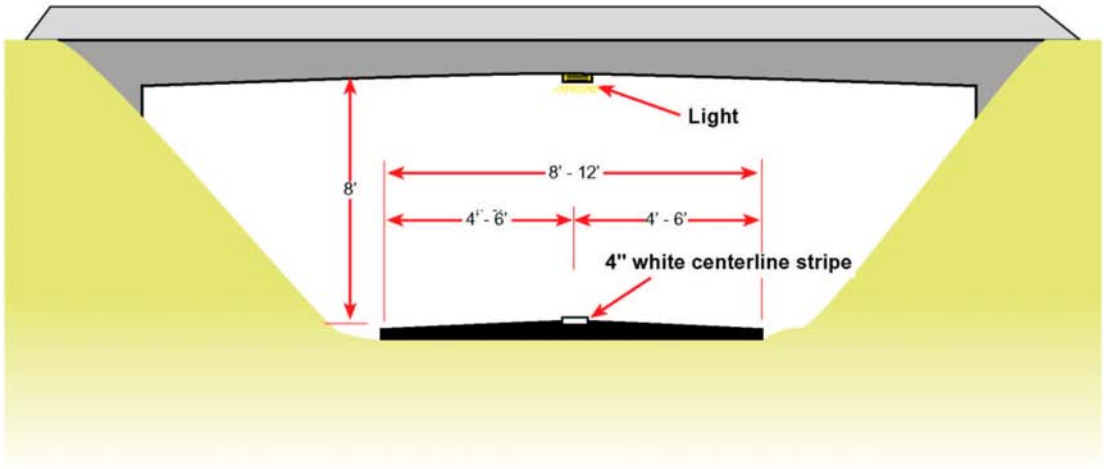


FIGURE A-5 Undercrossing Design Guidelines

Some design considerations with undercrossings:

- Must have adequate lighting and sight distance for safety
- Must have adequate over-head clearance of at least 3.1 m (10 ft)
- Tunnels should be a minimum 4.3 m (14 ft) for several users to pass one another safely; a 3.0 m x 6.0 m (10 ft x 20 ft) arch is the recommended standard
- "Channeling" with fences and walls into the tunnel should be avoided for safety reasons
- May require drainage if the sag point is lower than the surrounding terrain

This undercrossing provides ample vertical and horizontal clearance and a clear sight line through the structure, improving the feeling of safety.

SIGNAGE

Implementing a well-planned and attractive system of signing can greatly enhance bikeway facilities by signaling their presence and location to both motorists and existing and potential bicycle users. By leading people to city bikeways and the safe and efficient transportation they offer to local residents and visitors to the county, effective signage can encourage more people to bicycle.

STANDARD SIGNAGE

All bikeway signing should conform to the signing identified in the Manual on Uniform Traffic Control Devices (MUTCD) and MUTCD California Supplement. These documents give specific information on the type and location of signing for the primary bike system. A list of bikeway signs from the MUTCD is shown in **Table A-1**.

Figures A-6, A-7, A-8, and A-9 illustrate a number of examples of bikeway signage.

In general, the sizes of signs used on bicycle paths are smaller than those used on roadways. Table 9B-1 of the MUTCD lists minimum sign sizes for both path and roadway bicycle facilities. If the sign applies to drivers and bicyclists, then the larger size used for conventional roads shall apply.

Table A-1
Recommended Signing and Marking

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

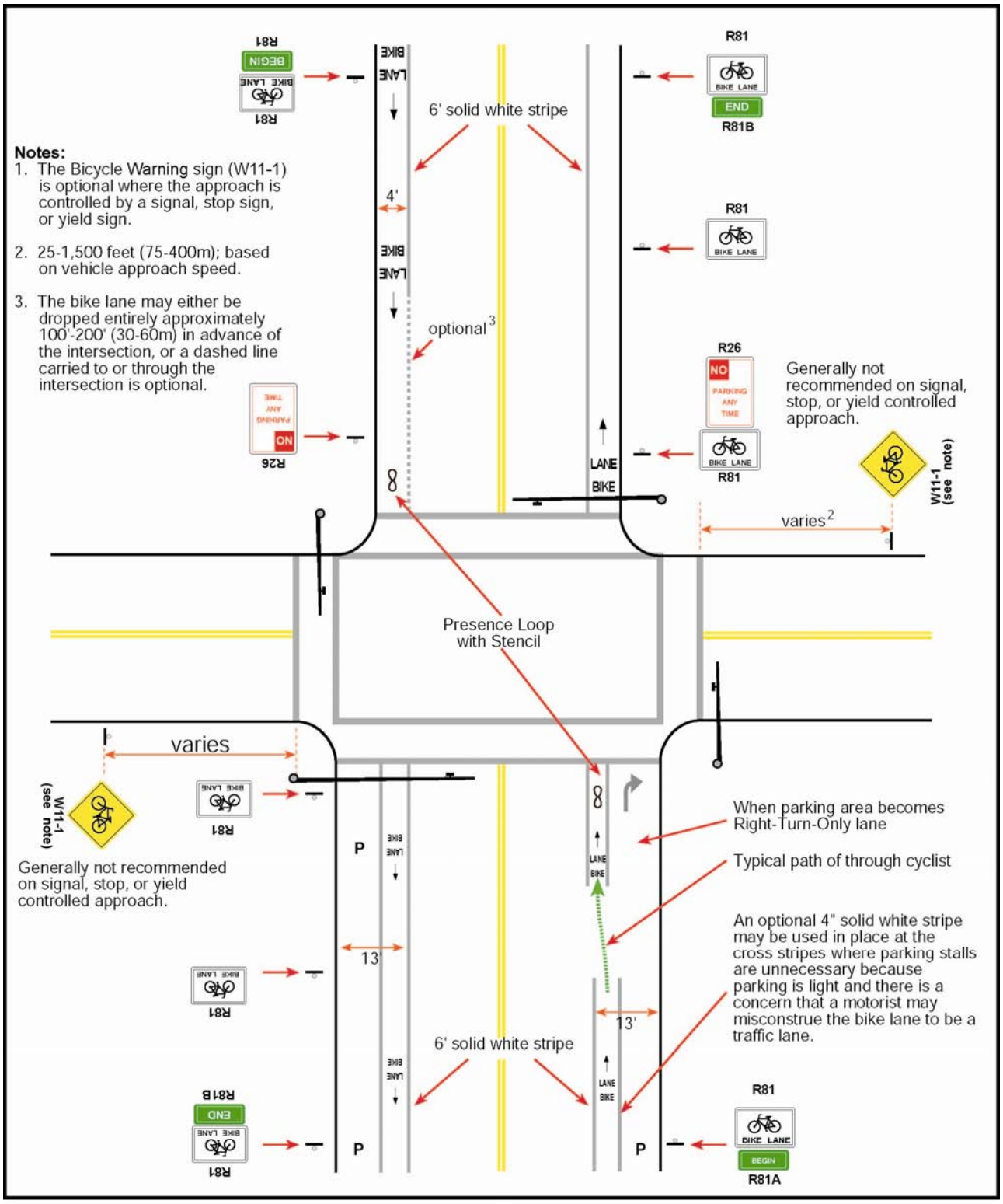
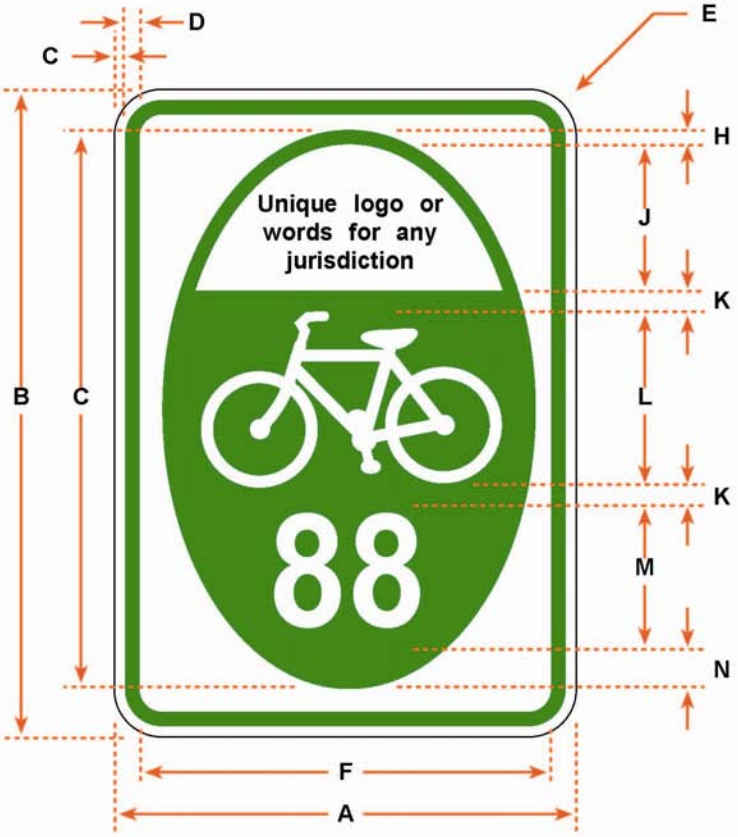


FIGURE A-6 Typical Signing at a Signalized Intersection

MUTCD 2003 California Supplement
Code : SG45



Sign	Dimensions (inches)												
	A	B	C	D	E	F	G	H	I	J	K	L	M
12 x 18	12	18	1/4	1/4	1-1/2	10	16	1/4	4	3/4	4-1/2	4D	1-3/4
18 x 24	18	24	3/8	1/2	1-1/2	15	21	1/2	5	1	6	5D	2-1/2

Colors
Border and Legend - Green (Reflective)
Background - White (Reflective)

FIGURE A-7 **Bicycle Route Signage**

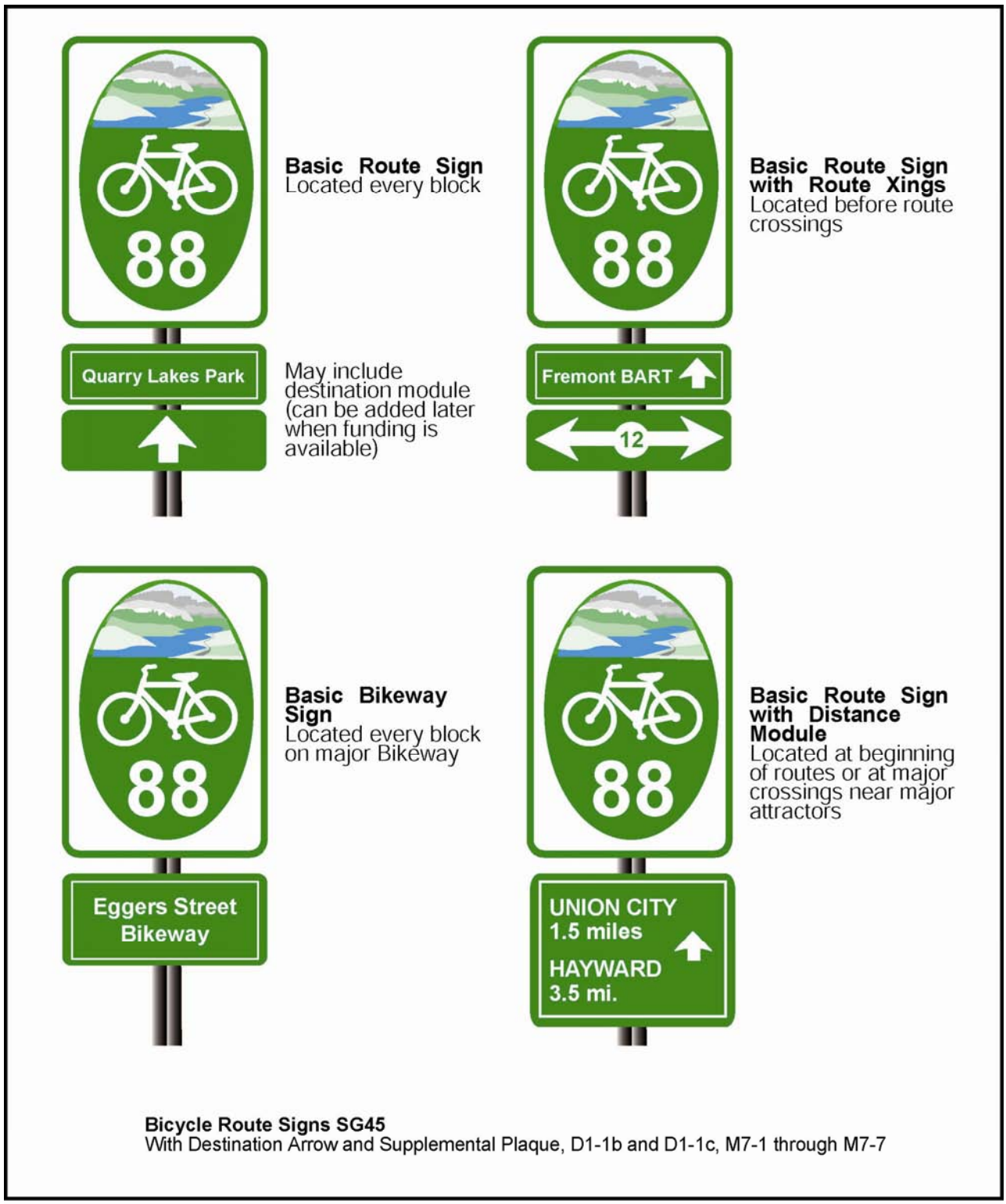


FIGURE A-8

Bicycle Route Signs With Destination Arrow and Plaque

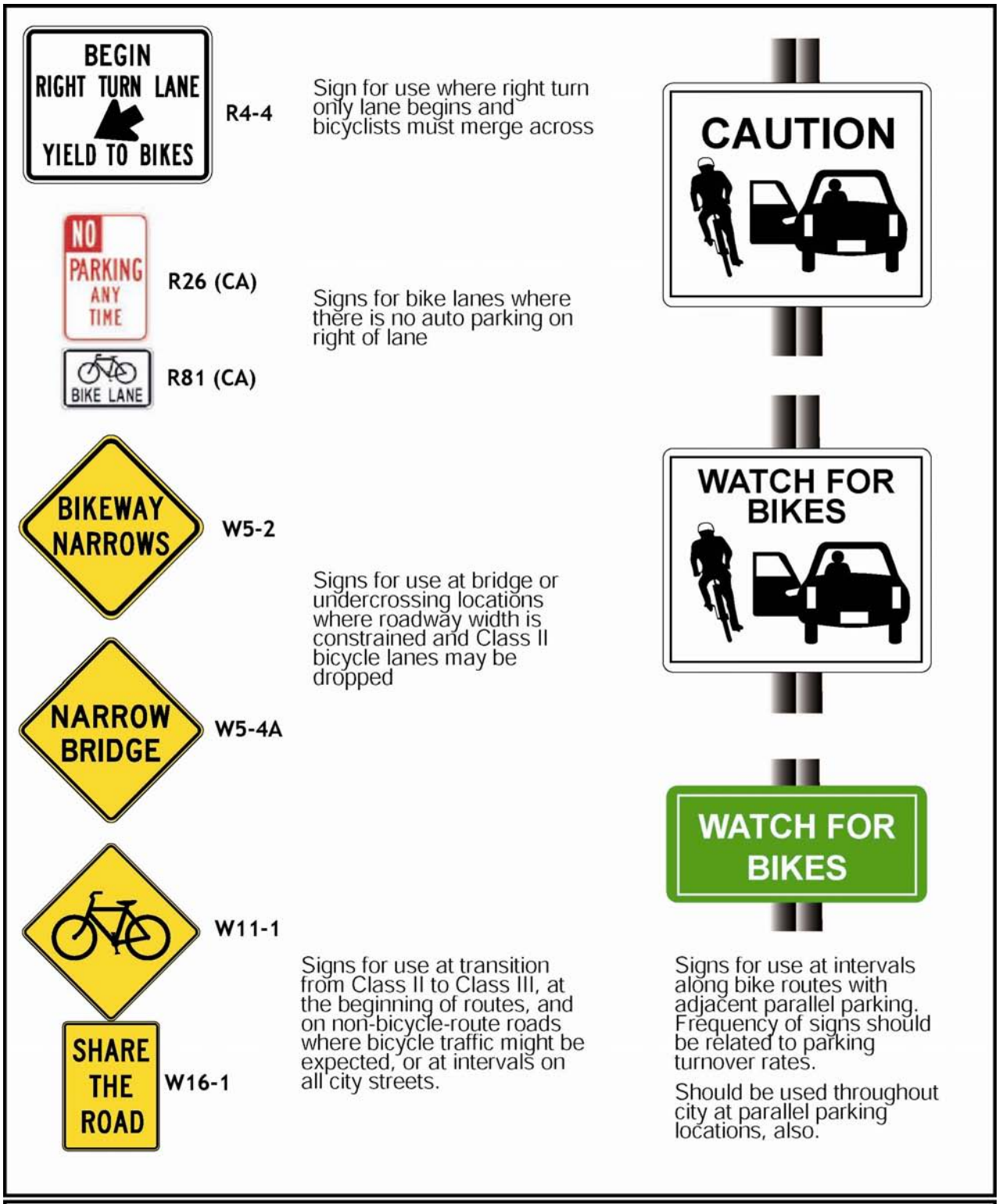


FIGURE A-9

Various On-Street Bikeway Warning Signs

OTHER SIGNAGE

Innovative signing is often developed to increase bicycle awareness and improve visibility. Signs to be installed on public roadways in California must be approved by Caltrans' California Traffic Control Devices Committee. New designs can be utilized on an experimental basis with Caltrans approval.

San Francisco was the first city in California to use the approved customized bike route logo sign. Jurisdictions may choose a graphic of their choice for the upper third portion of the sign and a numbering system, similar to the highway numbering system, can be used in the lower third. Some considerations for the use of directional signage:

- Use signs sparingly, primarily at intersections and junctions with other bicycle routes
- A consistent and recognizable logo, arrows and a destination should be on the sign to clearly direct bicyclists
- Bicycle route signs should be accompanied with destination and direction plaques

The new "Share the Road" sign, adopted by the California Traffic Control Devices Committee in 1999, is designed to advise motorists that bicyclists need to share narrow roadways with motor vehicles. This sign has been installed throughout Marin County.

Interest has been generated over the "Bikes Allowed Use of Full Lane" sign. These words, taken directly from the California Vehicle Code (CVC 21202), remind motorists of the rights of bicyclists on the roadway, Cities may consider using this sign as an experiment as it has not yet been approved by the California Traffic Control Devices Committee.

BICYCLE PARKING

As more bikeways are constructed and bicycle usage grows, the need for bike parking will climb. Long-term bicycle parking at transit stations and work sites, as well as short-term parking at shopping centers and similar sites, can both support bicycling. Bicyclists have a significant need for secure long-term parking because bicycles parked for longer periods are more exposed to weather and theft. Long term parking is very popular and the demand for this service often outpaces the supply.

BICYCLE RACKS

The City of Fremont utilizes the Association of Pedestrian and Bicycle Professionals' *Bicycle Parking Guidelines* for guidance on rack designs and placement. Among the recommendations of the APBP guidelines are:

- The rack element (part of the rack that supports the bike) should keep the bike upright by supporting the frame in two places. For a standard inverted "U" rack, the rack should be

oriented so the bicycle is parked parallel to the rack, with the frame resting against both vertical elements of the "U." The rack should allow one or both wheels to be secured as well as the frame.

- Position racks so there is enough room between adjacent parked bicycles. If it becomes too difficult for a bicyclist to easily lock their bicycle, they may park it elsewhere and the bicycle capacity is lowered. A row of inverted "U" racks should be situated on 30" minimum centers, oriented in the parallel direction.
- Empty racks should not pose a tripping hazard for visually impaired pedestrians. Position racks out of the walkway's clear zone.
- When possible, racks should be in a lighted, high visibility, covered area protected from the elements. Long-term parking should always be protected.

It should be noted that the APBP *Bicycle Parking Guidelines* do not recommend use of the wave-style rack, for the reasons that bicycles parked perpendicular to wave racks are only supported on one place and more likely to fall over, and as a result a bicyclist will commonly use a wave rack as if it were a single inverted "U," limiting its capacity.

Table A-2 provides basic guidelines on the ideal locations for parking at several key activity centers as well as an optimum number of parking spaces.

Sample bicycle parking ordinance language is provided in **Appendix E** of this Plan, which outlines minimum bicycle parking standards for various land uses. This language can serve as a template for the City of Fremont in creating a bicycle parking ordinance for inclusion in the zoning code.

Table A-2
Recommended Guidelines for Bicycle Parking Locations and Quantities

Land Use or Location	Physical Location	Bicycle Capacity
City Park	Adjacent to restrooms, picnic areas, fields, and other attractions	8 bicycles per acre
City Schools	Near school buildings, in area with good visibility	8 bicycles per 40 students
Public Facilities (city hall, libraries, community centers)	Near main entrance with good visibility	8 bicycles per location
Commercial, retail and industrial developments over 10,000 gross square feet	Near main entrance with good visibility	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	8 bicycles per 10,000 gross square feet
Commercial Districts	Near main entrance with good visibility; not to obstruct auto or pedestrian movement	2 bicycles every 200 feet
Transit Stations	Near platform or security guard	1 bicycle per 30 parking spaces

ATTENDED BICYCLE PARKING FACILITIES

Attended bike parking is analogous to a coat check – your bike is securely stored until you need it in a supervised location. An organization called The Bikestation® Coalition is promoting enhanced attended parking at transit stations.

The Bikestation® concept is now in use in Palo Alto and Berkeley in the Bay Area. Bikestations® offer secured valet bicycle parking near transit centers. What makes Bikestations® distinctive are the other amenities that may be offered at the location – bicycle repair, cafes, showers and changing facilities, bicycle rentals, licensing, etc. Bikestations® become a virtual one-stop-shop for bicycle commuters.

Attended bicycle parking can be offered at some special events. For example, the Marin County Bicycle Coalition sponsors valet parking at many festivals in the county, the Sonoma County Bicycle Coalition sponsors valley parking at the downtown Santa Rosa Farmer's Market, and secured bicycle parking is offered at SBC Park in San Francisco.

OFF-STREET BIKEWAYS: CLASS I BIKE PATHS

Typically called a "bike path" or "shared use path," a Class I bikeway provides bicycle travel on a paved right-of-way completely separated from any street or highway. The recommended width of a shared use path is dependent upon anticipated usage.

CALTRANS MINIMUM DESIGN GUIDELINES:

- 8' (2.4 m) is the minimum width for Class I facilities
- 8' (2.4 m) may be used for short neighborhood connector paths (generally less than one mile in length) due to low anticipated volumes of use
- 10' (3.0 m) is the preferred minimum width for a Class I bicycle path in Fremont
- 12' (3.6 m) is the preferred width if more than 300 users per peak hour are anticipated, and/or if there is heavy mixed bicycle and pedestrian use

A minimum 2' (0.6 m) wide graded area must be provided adjacent to the path to provide clearance from trees, poles, walls, guardrails, etc. On facilities with expected heavy use, a yellow centerline stripe is recommended to separate travel in opposite directions. **Figure A-10** illustrates a typical cross-section of a Class I multi-use path.

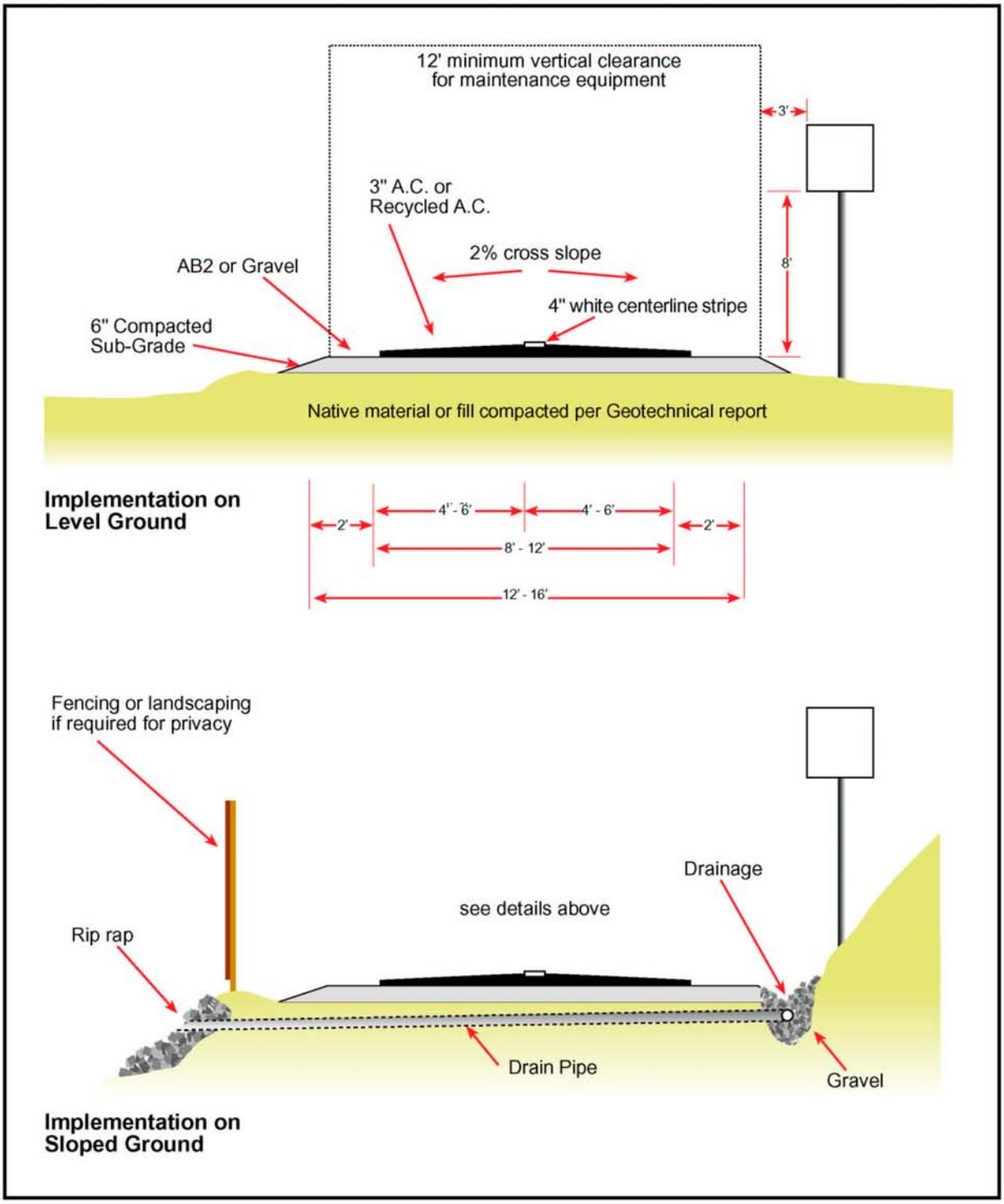


FIGURE A-10 Class I Facility Cross-Section

ADDITIONAL CLASS I DESIGN RECOMMENDATIONS:

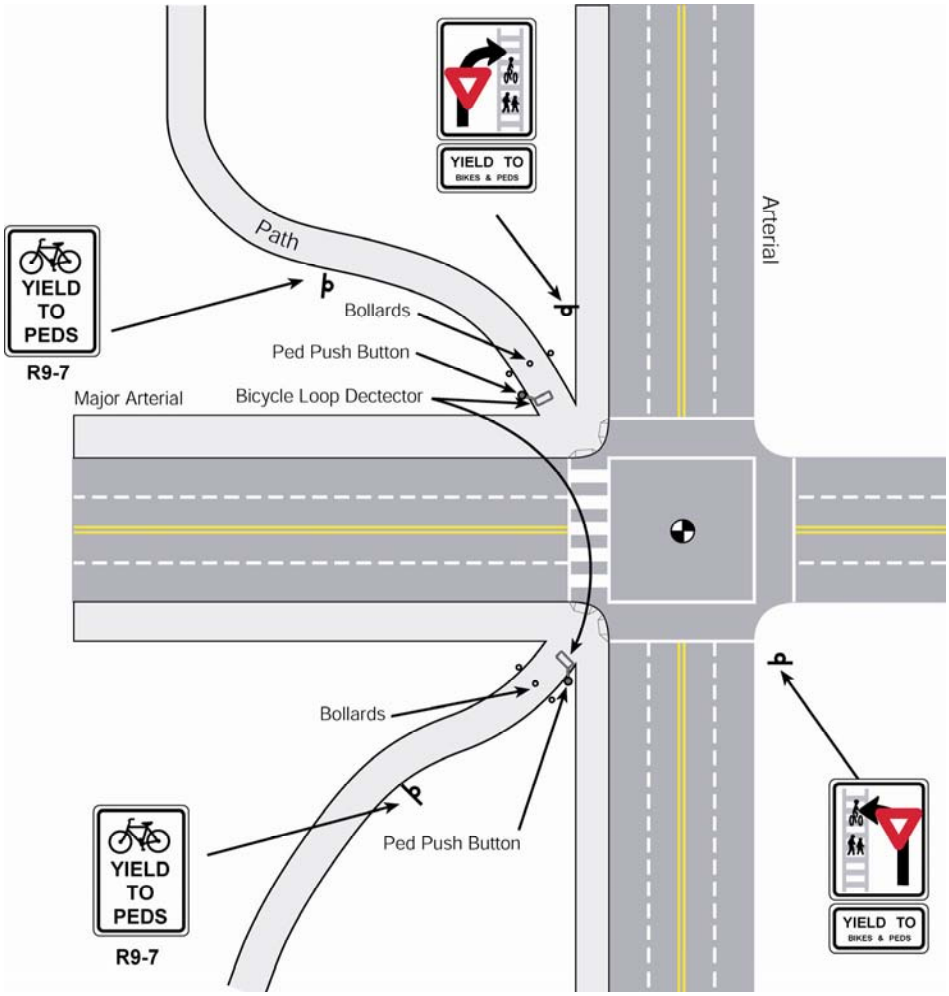
1. Shared use trails and unpaved facilities that serve primarily a recreation rather than a transportation function and will not be funded with federal transportation dollars may not need to be designed to Caltrans standards. However, state and national guidelines have been created with user safety in mind and should be followed as appropriate. Wherever any trail facility intersects with a street, roadway, or railway, standard traffic controls should always be used.
2. Class I bike path crossings of roadways require preliminary design review. Generally speaking, bike paths that cross roadways with average daily trips (ADTs) over 20,000 vehicles will require signalization or grade separation.
3. Landscaping should generally be low water consuming native vegetation and should have the least amount of debris.
4. Lighting should be provided where commuters will use the bike path in the evenings.
5. Barriers at pathway entrances should be clearly marked with reflectors and be ADA accessible (minimum five feet clearance).
6. Bike path construction should take into account impacts of maintenance and emergency vehicles on shoulders and vertical and structural requirements. Paths should be constructed with adequate sub grade compaction to minimize cracking and sinking.
7. All structures should be designed to accommodate appropriate loadings. The width of structures should be the same as the approaching trail width, plus minimum two-foot wide clear areas.
8. Where feasible, provide two-foot wide unpaved shoulders for pedestrians/runners, or a separate tread way.
9. Direct pedestrians to the right side of pathway with signing and/or stenciling.
10. Provide adequate trailhead parking and other facilities such as restrooms and drinking fountains at appropriate locations.

CLASS I PATH CROSSING OF ROADWAY

This treatment provides a design for locations where Class I off-street paths cross roadways. Bollards and path geometry could be used to slow path users as they approach the intersection, however the use of bollards should only be used with prudence and where motorized vehicles may attempt to drive on paths.

Application

- Intersections of Class I paths and high volume and/or high speed roadways
- Can also be used at a signalized mid-block crossing with median



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APPENDIX B: BIKE PLAN SURVEY FORM AND RESULTS

Fremont
Bicycle User Survey

Fremont is in the process of preparing a Bicycle Master Plan. The Bike Plan will identify ways to enhance and expand the existing network of bike lanes, routes and paths; connect gaps in the system; and provide improvements such as bike parking, signage, and lane markings to encourage people to bike more. The goal of the Bike Plan is to make Fremont a safer and more enjoyable place for you and your children to bicycle to work, to school, or for recreation. This survey will help the city understand what bicycling improvements people want and prefer.

Please return all surveys as soon as possible, but no later than **Wednesday December 1, 2004** to:

Rene Dalton, City of Fremont
39550 Liberty Street
P.O. Box 5006
Fremont, CA 94537-5006
TEL: (510) 494-4535 FAX: (510) 494-4751
Comments can also be emailed to: RDalton@ci.fremont.ca.us

1. How often do you bicycle?
   - ❑ Daily
   - ❑ 1-6 times per week
   - ❑ 1-3 times per month
   - ❑ Rarely
   - ❑ Never

2. Can you describe your typical trip purpose? (Check all that apply)
   - ❑ Work
   - ❑ School
   - ❑ Transit connections/Bus stops
   - ❑ Shopping
   - ❑ Recreation/exercise
   - ❑ Other
   - ❑ Don't Ride

3. How far do you live from work or school?
   - ❑ 0 - 1 mile
   - ❑ 1 - 2 miles
   - ❑ 2 - 6 miles
   - ❑ 6 or more miles
   - ❑ Not applicable

4. Please rank your preference (1 through 3, 1 being highest) for:

   __ Off-street bike paths

   __ On-street bike lanes

   __ Bike routes or boulevards (on local streets)

5. Check the reasons you don't bicycle more often:
   - ❑ Concerns about safety
   - ❑ Lack of bikeways (paths, lanes, routes) to ride on
   - ❑ Too far
   - ❑ Time
   - ❑ Weather / darkness
   - ❑ Lack of bicycle parking/storage
   - ❑ Driving is more convenient
   - ❑ Other

6. On the back of this sheet, please list the routes you ride on a regular basis, including your destinations.

7. Please describe the top priority bicycle projects or programs you would like to see completed or implemented in Fremont. This may include correcting major constraints, such as specific intersections, stretches of road, lack of parking, maintenance issues, etc.; or implementing educational programs or enforcement activities. Please feel free to use the back of this survey if more space is needed.

   1. _____
   2. _____
   3. _____
   4. _____
   5. _____

OPTIONAL INFORMATION:

Name:_____ Address:_____

Email:_____ Date Completed:_____ Circle: Male/Female

Fremont Bicycle Master Plan Survey Results

The bicycle survey conducted as a part of this plan received 30 responses, which are summarized in Table B-1. Most of the respondents (97%) bicycle at least once per week, and 13% bicycle on a daily basis. The most common trip purposes were recreation/exercise, work, and shopping. A majority of respondents (51%) said that they prefer on-street bicycle lanes for bicycling. The most common reason cited for not bicycling more often was weather and darkness (67% of respondents), while time to ride on also received a significant number of responses (50%).

Table B-1
Bicycle Survey Results

1. How often do you bicycle?	Number responded	Percent responded (%)
Daily	4	13.3%
1-6 times per week	20	66.7%
1-3 times per week	5	16.7%
Rarely	1	3.3%
Never	0	0%
2. Can you describe your typical trip purpose?		
Work	12	40.0%
School	0	0%
Transit Connections/Bus stops	3	10.0%
Shopping	9	30.0%
Recreation/exercise	28	93.3%
other	2	7.7%
Don't Ride	0	0%
3. How far do you live from work or school?		
0-1 mile	3	10.0%
1-2 mile	2	6.7%
2-6 mile	6	20.0%
6 or more miles	11	36.7%
Not applicable	8	26.7%
4. Please rank your preference:		
Off-street bike paths	9	30.0%
On-street bike lanes	15	50.0%
Bike routes or boulevards (on local streets)	6	20.0%
5. Check the reasons you don't bicycle more often:		
Concerns about safety	12	40.0%
Lack of bikeways to ride on	9	30.0%
Too far	4	13.3%

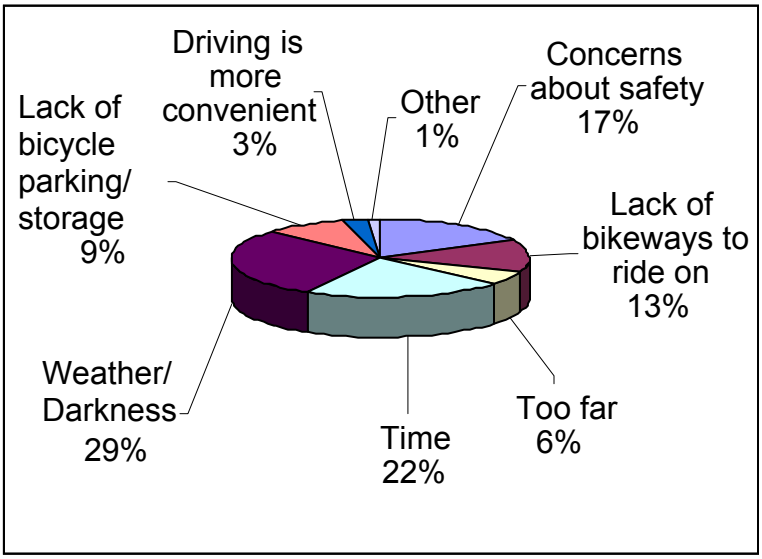
Time	**15**	**50.0%**
Weather/Darkness	**20**	**66.7%**
Lack of bicycle parking/storage	**6**	**20.0%**
Driving is more convenient	**2**	**6.7%**
Other	**1**	**3.3%**

Table B-2
List of Projects Bicycle Riders Would Like Implemented

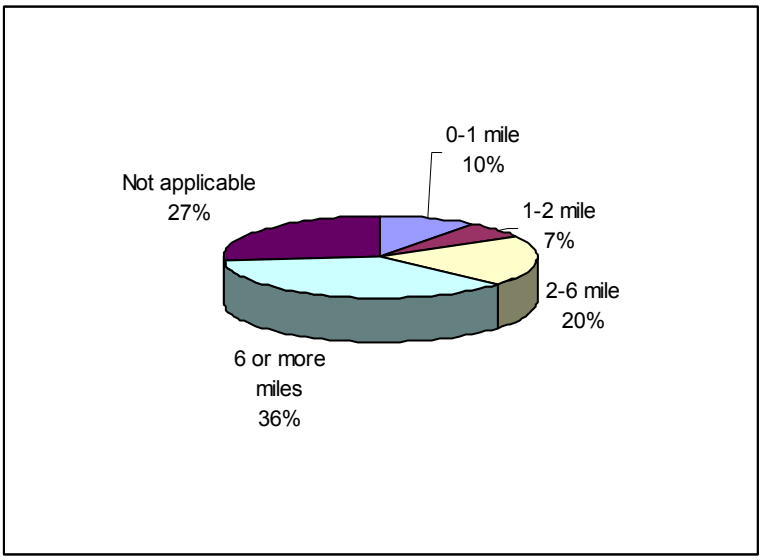
1.	Continuous bike lane in Niles Canyon
2.	A bike path from Alameda Creek Trail to Lake Elizabeth
3.	A complete Bay Trail
4.	Niles Canyon Mission Boulevard Intersection
5.	Making trails longer
6.	More trails to ride on
7.	More off road Bike Paths
8.	More Bike Lanes
9.	A Class II bike lane on Niles Canyon Road
10.	Fixing Fremont traffic lights so that they respond to bicycles
11.	Putting bicycle lanes on major streets
12.	More share the road signs
13.	More bicycle loop detectors
14.	Longer green lights for bicycles
15.	A bike path along Hetch Hetchy in Warm Springs
16.	A safe way to cross 880 near Dixon's Landing at Mission
17.	Fix locations along Mowry, Blacow, and Stevens where tree roots have lifted pavement
18.	Auto Mall needs bikes lanes for safety purposes
19.	The city needs a BMX course for children
20.	Unused rail lines could be made into bicycle and pedestrian paths.
21.	Niles Canyon Road needs to be widened for bikes
22.	Pot holes along Mill Creek Road need to be fixed
23.	Bike lanes in the industrial area around Fremont Boulevard
24.	The Lakeshore to Bayside to Warm Springs route needs to be improved
25.	Bike lanes eastbound on Grimmer
26.	Better street lighting on Grimmer
27.	Better bike parking throughout the city
28.	A bike station at BART
29.	Bike lanes on Paseo Padre between Eggers and Grimmer
30.	Conversion of the UPRR abandoned rail line to Class I trail from Washington Blvd. to Niles Canyon
31.	Proposing a route that connects south Fremont Boulevard to Dixon Landing or McCarthy Ranch
32.	An overall improvement in citywide maintenance
33.	Install push buttons to change lights for bicycles at intersections throughout the city

34.	Fix signals at Paseo Padre and Mission as well as Paseo Padre and Isherwood
35.	Put a bike lane in on Osgood
36.	Access to the west side of I-880
37.	Mission Boulevard RR underpass
38.	Removing parking at Driscoll and Paseo
39.	Fixing signals at Washington, Bay and Fremont

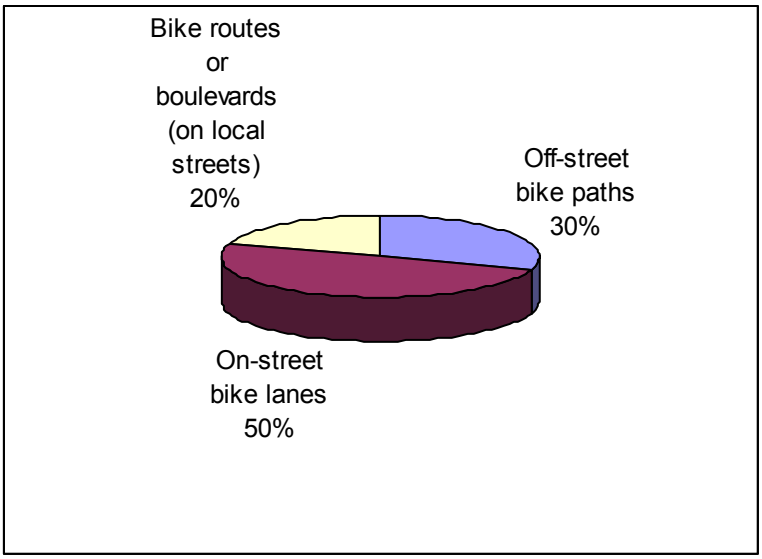
Reasons Cyclists Do Not Ride



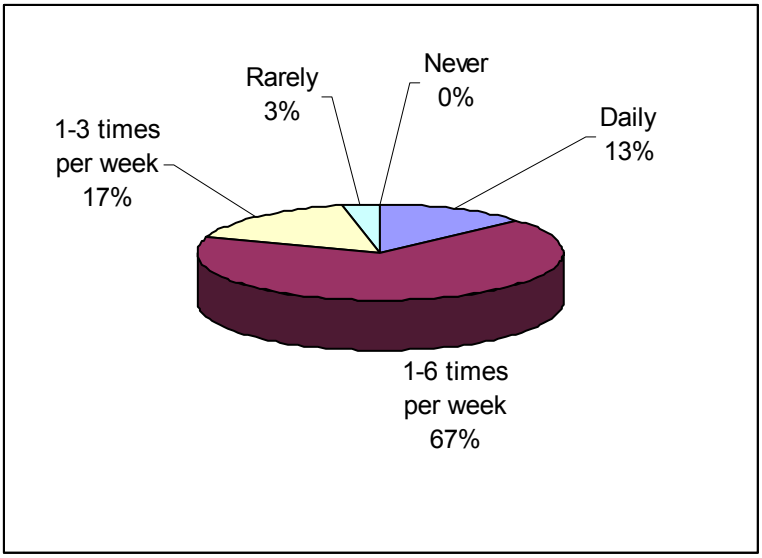
Distance Cyclists Ride



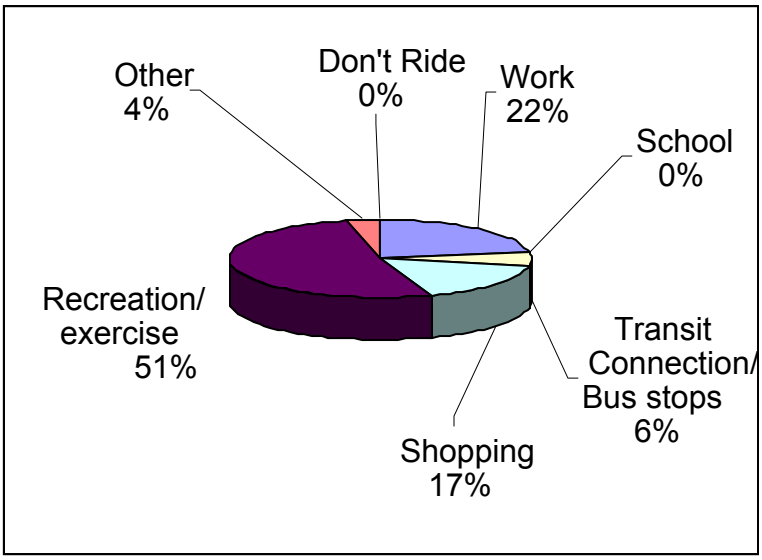
Bicycle Facility Preference



Number of Trips



Typical Trip Purpose



APPENDIX C: BIKE PLAN PUBLIC MEETINGS

FREMONT
BICYCLE MASTER PLAN

PUBLIC WORKSHOP

The City of Fremont is currently preparing a Bicycle Master Plan. The Plan will identify ways to enhance and expand the existing network of bike lanes, routes and paths, connect gaps in the system, and improve problem areas. The Public Workshop will include a presentation on the goals of the Bicycle Plan and an opportunity for residents to ask questions and provide comments on bicycling issues in Fremont.

- Discuss what parts of the existing bicycle network are working, what parts are not working, and what is missing
- Suggest improvements to existing streets, intersections and paths - such as lane markings, signage, or bike parking - that would encourage you and your neighbors to bike more
- Rate the "bikeability" of your neighborhood
- Discuss what the city can do to encourage more employers to provide amenities such as secure bike parking, lockers, and showers to assist bike commuters
- Tell us how to make Fremont a safer place for you and your children to bike to work, to school, and for recreation

Wednesday, October 20, 2004
7:00 p.m. to 9:00 p.m.
Fremont City Offices, 39550 Liberty Street
Niles Room

For more information on this workshop, please contact:

Rene Dalton, City of Fremont
(510) 494-4535
rdalton@ci.fremont.ca.us

CITY OF Fremont

AGENDA
JOINT FREMONT BICYCLE MASTER PLAN PUBLIC MEETING AND BICYCLE PEDESTRIAN TECHNICAL ADVISORY COMMITTEE MEETING
NILES ROOM
39550 LIBERTY STREET
FREMONT, CALIFORNIA 94537
April 13, 2005, 7:00 P.M.

1. **CALL TO ORDER**
2. **ROLL CALL**
3. **APPROVAL OF MINUTES**
4. **ORAL COMMUNICATIONS FROM THE PUBLIC**

5. **AGENDA ITEM**

5.1 Bicycle Master Plan **120 Minutes**

Contact Person: Rene Dalton
Associate Transportation Engineer
Dept.: Development and Environmental Services
Phone: 510-494-4535
E-Mail: rdalton@ci.fremont.ca.us

The City of Fremont is holding its second public meeting regarding the City's Bicycle Master Plan project. This meeting is to present the Draft Bicycle Master Plan to the Community for review and evaluation. The plan can be viewed on the City's website by selecting "2005 Bicycle Master Plan" at the following website address:

http://www.fremont.gov/Community/Traffic/BicycleAndPedestrianProgram.htm

The draft plan includes an update of the City's bicycle network map which shows the existing and planned bikeway network. The plan proposes new trails, bicycle lanes and routes, calls for improvements on existing bicycle facilities, considers a bicycle parking ordinance, introduces a best practices design guidelines, Safe Routes to School Program and more. Comments regarding the plan can be submitted to Rene Dalton at the above contact information or by mail at P.O. Box 5006, Fremont, CA 94537-5006. All comments regarding the Draft Bicycle Master Plan should be submitted to the City by April 29, 2005.

6. **WRITTEN COMMUNICATIONS**
7. **COMMITTEE REFERRALS**
8. **COMMITEE AND STAFF COMMUNICATIONS**
9. **ADJOURNMENT:**

Adjourn to the next Joint Bicycle Master Plan Public Meeting and Bicycle Pedestrian Technical Advisory Committee Meeting of Wednesday, May 18, 2005 at 7:00 p.m., Niles Room, 39550 Liberty Street, Fremont, California.

APPENDIX D: SAMPLE BICYCLE PARKING CODE LANGUAGE

This appendix provides sample bicycle parking code language taken from the City of Palo Alto Municipal Code and the City of San Francisco Planning Code. It is recommended that the City of Fremont pass a bicycle parking ordinance to include similar language in their zoning code. Both Palo Alto and San Francisco provide detailed parking requirements per building square footage, and include provisions such as employee shower requirements.

PALO ALTO MUNICIPAL CODE

BICYCLE PARKING REQUIREMENTS

Section 18.83.050

Table 1. Minimum Off-Street Parking Requirements

Use	Minimum Off-Street Parking Requirement	Minimum Bicycle Parking Requirements	
		Spaces	Class(1)
Accessory employee housing or guest cottage	1 space per unit	None	
Administrative office services:			
(a) In the LM district	1 space for each 27.9 sq. m. (300 sq. ft.) of gross floor area	10% of auto parking	80% - I 20% - II
(b) In all other districts	1 space for each 23.2 sq. m. (250 sq. ft.) of gross floor area	10% of auto parking	80% - I 20% - II
Animal care facilities	1 space for each 32.5 sq. m. (350 sq. ft.) of gross floor area	10% of auto parking or 1 space-whichever is greater	80% - I 20% - III
Automobile service station:			
(a) Except in parking assessment area	1 space for each 32.5 sq. m. (350 sq. ft.) of gross enclosed floor area, plus queue capacity equivalent to the service capacity of gasoline pumps	None	

Table 1. Minimum Off-Street Parking Requirements

Use	Minimum Off-Street Parking Requirement	Minimum Bicycle Parking Requirements	
		Spaces	Class(1)
(b) In the California Ave. parking assessment area	1 space for each 2.82 sq. m. (310 sq. ft.) of gross enclosed floor area, plus queue capacity equivalent to the service capacity of gasoline pumps	None	
Automotive services:			
(a) Enclosed, except in parking assessment areas	1 space for each 32.5 sq. m. (350 sq. ft.) of gross floor area	None	
(b) Open lot, except parking assessment areas	1 space for each 46.5 sq. m. (500 sq. ft.) of exterior sales, display, or storage site area	None	
(c) In the California Ave. parking assessment area	1 space for each 13.9 sq. m. (150) sq. ft.) of gross floor area, display, or storage on site	None	
Business and trade schools	1 space for each 4-person capacity, or 1 space for each 23.2 sq. m. (250 sq. ft.) of gross floor area, whichever is greater	10% of auto parking	40% - I 60% - II - covered
Churches and religious institutions	1 space for each 4 sets or 4- person capacity, based on maximum use of all facilities at the same time	10% of auto parking	20% - I 40% - II 40% - III
Commercial recreation	1 space for each 4 seats or 4-person capacity, or as adjusted by the Zoning Administrator as part of the conditional use permit, not to exceed a 30% reduction	25% of auto parking	20% - I 20% - II 60% - III or as adjusted by the Zoning Administrator as part of the conditional use permit
Community facilities, including swim club, tennis club, golf course, community centers, neighborhood centers, and similar activities	1 space for each 4-person capacity based on maximum use of all facilities, or as adjusted by the Zoning Administrator as part of the conditional use permit, not to exceed a 30% reduction	25% of auto parking	20% - I 20% - II - covered 60% - III

Table 1. Minimum Off-Street Parking Requirements

Use	Minimum Off-Street Parking Requirement	Minimum Bicycle Parking Requirements	
		Spaces	Class(1)
			or as adjusted by the Zoning Administrator as part of the conditional use permit
Convalescent facilities	1 space for each 2.5 patient beds	10% of auto parking	2 spaces - I remainder - III
Day care centers, day care homes, family day care homes, and residential care homes	a. Day care centers: 1 space for each 1.5 employees	25% of auto parking	100% - I
	b. Day care homes: 2 spaces per dwelling unit, of which one space shall be covered	25% of auto parking	100% - II
	c. Family day care homes: 2 spaces per dwelling unit, or which one space shall be covered	None	
	d. Residential day care homes: 2 spaces, or which one space shall be covered, for the resident owners or tenants	None	
	Where such uses are conditional, to be established by use permit conditions		
Downtown University Avenue Parking Assessment Area - all uses	1 space for each 23.2 sq. m. (250 sq. ft.) of gross floor area	10% of auto parking	40% - I 60% - II
Drive-up windows providing services to occupants in vehicles	Queue line for 5 cars, not blocking any parking spaces, in addition to other applicable requirements	None	
Eating and drinking services:			
(a) With drive-in or take out facilities	3 spaces for each 9.3 sq. m. (100 sq. ft.) of gross floor area	25% of auto parking	40% - I 60% - III
(b) All others, except parking assessment areas	1 space for each 60 gross sq. ft. of public service area, plus one space for each 200 gross sq. ft. for all other areas	10% of auto parking	40% - I 30% - II 30% - III
(c) All others, in the California Ave. parking assessment area	1 space for each 14.4 sq. m. (155 sq. ft.) of gross floor area	10% of auto parking	40% - I 60% - II

Table 1. Minimum Off-Street Parking Requirements

Use	Minimum Off-Street Parking Requirement	Minimum Bicycle Parking Requirements	
		Spaces	Class(1)
Financial Services:			
(a) Bank, savings and loan offices with 696.7 sq. m. or less (7,500 sq. ft.) of gross floor area:			
(1) Except in the parking assessment areas	1 space for each 18.6 sq. m. (200 sq. ft.) of gross floor area	10% of auto parking	40% - I 60% - III
(2) In the California Ave. parking assessment area	1 space for each 16.7 sq. m. (180) sq. ft.) of gross floor area	10% of auto parking	40% - I 60% - III
(b) Banks, savings and loan offices with more than 696.7 sq. m. (7,500 sq. ft.) of gross floor area:			
(1)Except in the parking assessment are	1 space for each 23.2 sq. m. (250 sq. ft.) of gross floor area	10% of auto parking	40% - I 60% - III
(2)In the California Ave. parking assessment area	1 space for each 16.7 sq. m. (180) sq. ft.) of gross floor area	10% of auto parking	
(c) Others	1 space for each 23.2 sq. m. (250 sq. ft.) of gross floor area	10% of auto parking	40% - I 60% - III
General business services:			
(a) Enclosed, except in parking assessment areas	1 space for each 3.25 sq. m. (350 sq. ft.) of gross floor area	10% of auto parking	80% - I 20% - II
(b) Enclosed, in the California Ave. parking assessment area	1 space for each 33.4 sq. m. (360 sq. ft.) of gross floor area	10% of auto parking	80% - I 20% - II
(c) Open lot	1 space for each 46.5 sq. m. (500 sq. ft.) of sales, display, or storage site area	10% of auto parking	100% - III
Hospitals	1 space for each 1.5 patient beds	10% of auto parking	60% - I 40% - II

Table 1. Minimum Off-Street Parking Requirements

Use	Minimum Off-Street Parking Requirement	Minimum Bicycle Parking Requirements	
		Spaces	Class(1)
Hotel	1 space per guestroom; plus the applicable requirement for eating and drinking, banquet, assembly, commercial or other as required for such use, less 75 percent of the spaces required for guestrooms	10% of auto parking	40% - I 30% - II 30% - III
Lodging	1 space for each lodging unit in addition to other residential use requirements	1 space per lodging unit	100% - I
Manufacturing:			
(a) In the LM district	1 space for each 27.9 sq. m. (300 sq. ft.) of gross floor area	10% of auto parking	80% - I 20% - II
(b) In all other districts	1 space for each 46.5 sq. m. (500 sq. ft.) of gross floor area	10% of auto parking	80% - I 20% - II
Medical, professional, and general business offices:			
(a) In the LM district	1 space for each 27.9 sq. m. (300 sq. ft.) of gross floor area	10% of auto parking	60% - I 40% - II
(b) In all other districts, except in parking assessment areas	1 space for each 23.2 sq. m. (310 sq. ft.) of gross floor area	10% of auto parking	60% - I 40% - II
(c) In the California Ave. parking assessment area	1 space for each 28.8 sq. m. (310 sq. ft.) of gross floor area	10% of auto parking	60% - I 40% - II
Mortuaries	1 space for each 4 seats or 4-person capacity, plus funeral procession queue capacity of 5 cars	2 spaces	100% - II
Multiple-family residential use	1.25 spaces per studio unit, 1.5 spaces per 1-bedroom unit, and 2 spaces per 2-bedroom or larger unit; of which at least one space per unit must be covered	1 space per unit	100% - I
(a) Guest parking	For projects exceeding 3 units: 1 space plus 10% of total number of units, provided that if more than one space per unit is assigned or secured parking, then guest spaces equal to 33% of all units is required.	1 space for each 10 units	100% - III
Personal services:			

Table 1. Minimum Off-Street Parking Requirements

Use	Minimum Off-Street Parking Requirement	Minimum Bicycle Parking Requirements	
		Spaces	Class(1)
(a) Except in parking assessment areas	1 space for each 18.6 sq. m. (200 sq. ft.) of gross floor area	10% of auto parking	20% - I 40% - II 40% - III
(b) In the California Avenue parking assessment area	1 space for each 4.18 sq. m. (450 sq. ft.) of gross floor area	10% of auto parking	20% - I 40% - II 40% - III
Private clubs, lodges and fraternal organizations	1 space for each 4 seats or 4-person capacity based on maximum use of all space at one time	10% of auto parking	20% - I 40% - II 40% - III
Research and development:			
(a) In the LM district	1 space for each 27.9 sq. m. (300 sq. ft.) of gross floor area	10% of auto parking	80% - I 20% - II
(b) In all other districts	1 space for each 23.2 sq. m. (250 sq. ft.) of gross floor area	10% of auto parking	80% - I 20% - II
Retail:			
(a) Intensive, except in parking assessment areas	1 space for each 18,.6 sq. m. (200 sq. ft.) of gross floor area	10% of auto parking	20% - I 40% - II 40% - III
(b) Intensive in the California Ave. parking assessment area	1 space for each 22.3 sq. m. (240) sq. ft.) of gross floor area	10% of auto parking	20% - I 40% -II 40% - III
(c) Extensive	1 space for each 32.5 sq. m. (350 sq. ft.) of gross floor area	10% of auto parking	20% - I 40% - II 40% - III
(d) Open lot	1 space for each 46.5 sq. m. (500 sq. ft.) of sales, display, or storage site area	10% of auto parking	100% - III
Schools and educational facilities:			
(a) Grades K-8	2 spaces per teaching station	1 space per every 3 students	100% - III enclosed

Table 1. Minimum Off-Street Parking Requirements

Use	Minimum Off-Street Parking Requirement	Minimum Bicycle Parking Requirements	
		Spaces	Class(1)
(b) Grades 9-12	4 spaces per teaching station	1 space per every 3 students	100% - III enclosed
Shopping center	1 space for each 25.6 sq. m. (275 sq. ft.) of gross floor area	10% of auto parking	40% - I 30% - II 30% - III
Single-family residential use: (including second detached single-family dwelling units)			
(a) In the O-S district	For the primary dwelling unit, 4 spaces, of which one space must be covered	None	
	For all additional units, 2 spaces per unit, of which one space must be covered	None	
(b) In all other districts	2 spaces per unit, of which one space must be covered	None	
Two-family residential use	1.5 spaces per unit, of which one space must be covered	1 space per unit	100% - I
Warehousing and distribution:			
(a) In the LM district	1 space for each 27.9 sq. m. (300 sq. ft.) of gross floor area	10% of auto parking	80% - I 20% - II
(b) In all other districts	1 space for each 92.9 sq. m. (1,000 sq. ft.) of gross floor area	10% of auto parking	80% - I 20% - II
Any use not specified	To be determined by the Director of Planning and Community Environment	To be determined by the Director of Planning and Community Environment	

(1) For description of bicycle parking classes, refer to section 18.83.080

DESIGN STANDARDS: BICYCLE PARKING FACILITIES

Section 18.83.080

(a) Classifications of Bicycle Parking Facilities.

Class I Facilities. Intended for long-term parking; protects against theft of entire bicycle and of its components and accessories. The facility must also protect the bicycle from inclement weather, including wind-driven rain. Three design alternatives for Class I facilities are as follows:

Bicycle Locker. A fully enclosed space accessible only by the owner or operator of the bicycle.

Bicycle lockers may be pre-manufactured or designed for individual sites. All bicycle lockers must be fitted with key locking mechanisms.
In multiple-family developments, the Class I bicycle parking and required storage area for each dwelling unit may be combined into one locked mullet-use storage facility provided that the total space requirement shall be the sum of the requirements for each use computed separately.

The preferred Class I facility is a bicycle locker. Restricted access facilities and enclosed cages may be considered as alternatives to bicycle lockers as indicated below. Class I facilities other than lockers, restricted access rooms, or enclosed cages, but providing the same level of security, may be approved by the Director of Planning and Community Environment.

Restricted Access. Class II bicycle parking facilities located within a locked room or locked enclosure accessible only to the owners or operators of the bicycles parked within. The maximum capacity of each restricted room or enclosure shall be ten (10) bicycles. An additional locked room or enclosure is required for each maximum increment of ten additional bicycles. The doors of such restricted access enclosures must be fitted with key locking mechanisms.
In multiple-family residential developments, a common locked garage area with Class II bicycle parking facilities shall be deemed restricted access provided the garage is accessible only to the residents of the units for whom the garage is provided.

Enclosed Cages. A fully enclosed chain link enclosure for individual bicycles, where contents are visible from the outside, and which can be locked by a user-provided lock. The locking mechanism must accept a 3/8" diameter padlock. This type of facility is only to be used for retail and service uses and multiple family developments.

Class II Facilities. Intended for short term parking. A stationary object to which the user can lock the frame and both wheels with only a lock furnished by the user. The facility shall be designed so that the lock is protected from physical assault. A Class II rack must accept padlocks and high security U-shaped locks.

Class III Facilities. Intended for short term parking. A stationary object to which the user can lock the frame and both wheels with a user-provided cable or chain (6 foot) and lock.

All Class III facilities must be located at street floor level.

(b) The following general design standards shall be observed:

- Class II and Class III facilities shall provide at least a twenty-four inch clearance from the centerline of each adjacent bicycle, and at least eighteen inches from walls or other obstructions.

- An aisle or other space shall be provided to bicycles to enter and leave the facility. This aisle shall have a width of at least five feet (1.5 meters) to the front or the rear of a standard six-foot (1.8 meters) bicycle parked in the facility.

- Parking facilities shall support bicycles in a stable position without damage to wheels, frame, or components. Facilities designed for hanging or vertical storage of bicycles shall not satisfy the requirements of this chapter.

- Bicycle parking should be situated at least as conveniently as the most convenient vehicle parking area. Bicycle and vehicle parking areas shall be separated by a physical barrier or sufficient distance to protect parked bicycles from damage by vehicles.

    - Class I facilities at employment sites shall be located near the building entrances used by employees.

    - Class II or Class III facilities intended for customers or visitors shall be located near the main building entrances used by the public.

  Paving of bicycle parking areas is required.

- Convenient access to bicycle parking facilities shall be provided. Where access is via a sidewalk or pathway, curb ramps shall be installed where appropriate.

- Signage of Bicycle Parking Facilities.

    - Where bicycle parking areas are not clearly visible to approaching bicyclists, signs shall be posted to direct cyclists to the facilities.

    - All bicycle parking areas shall be identified by a sign of a minimum of 12" X 12" in size to identify the area for bicycle parking and to give the name, phone number of location of the person in charge of the facility.

    - Where Class I parking required by this chapter is provided by restricted access parking, the sign shall state that the bicycle enclosure shall be kept locked at all times.

- Lighting shall be provided in all bicycle parking areas. In both exterior and interior locations, lighting of not less than one footcandle of illumination at ground level shall be provided.

- The director of planning and community environment shall have the authority to review the design of all bicycle parking facilities required by this chapter with respect to safety, security, and convenience.

EMPLOYEE SHOWER FACILITY REQUIREMENTS

Section 18.49.040

(e) Requirement for Showers. Employee shower facilities shall be provided for any new building constructed or for any addition to or enlargement of any existing building in compliance with the following table:

Use	Gross Floor Area of New Construction	Number of Showers Required
Medical, professional, general business offices, financial services, business and trade schools and general business services.	0-9,999 sq. ft. 10,000-19,999 sq. ft. 20,000-49,999 sq. ft. 50,000 sq. ft. and up	No requirement 1 2 4
Retail, personal and eating and drinking services.	0-24,999 sq. ft 25,000-49,999 sq. ft. 50,000-99,999 sq. ft. 100,000 sq. ft. and up	No requirement 1 2 4

SAN FRANCISCO PLANNING CODE

BICYCLE PARKING AND SHOWER REQUIREMENTS

Excerpts from the San Francisco Planning Code, Sections 155.1-4.
See: http://sfgov.org/planning/index.htm

SEC. 155.1. BICYCLE PARKING REQUIREMENTS FOR CITY-OWNED AND LEASED BUILDINGS.

In all City-owned and leased buildings, regardless of whether off-street parking is available, the responsible city official, as defined in Section 155.1(a)(11) below, shall provide bicycle parking according to the schedule in Section 155.1(c) below, except as otherwise provided in Section 155.2. The provisions of this Section shall not apply in any case where the City occupies property as a tenant under a lease the term of which does not exceed six months. In the event that a privately owned garage, as defined in Section 155.2, is in a building in which the City leases space, Section 155.2 and not this Section shall apply. All required bicycle parking shall conform to the requirements of Sections 155.1(b) (Location of Facilities) and 155.1(c) (Number of Spaces) set forth below:

(a) **Definitions.**

(1) **Locker.** A fully enclosed, secure and burglar-proof bicycle parking space accessible only to the owner or operator of the bicycle.

(2) **Check-In Facility.** A location in which the bicycle is delivered to and left with an attendant with provisions for identifying the bicycle's owner. The stored bicycle is accessible only to the attendant.

(3) **Monitored Parking.** A location where Class 2 parking spaces are provided within an area under constant surveillance by an attendant or security guard or by a monitored camera.

(4) **Restricted Access Parking.** A location that provides Class 2 parking spaces within a locked room or locked enclosure accessible only to the owners of bicycles parked within.

(5) **Personal Storage.** Storage within the view of the bicycle owner in either the operator's office or a location within the building.

(6) **Class 1 Bicycle Parking Space(s).** Facilities which protect the entire bicycle, its components and accessories against theft and against inclement weather, including wind-driven rain. Examples of this type of facility include (1) lockers, (2) check-in facilities, (3) monitored parking, (4) restricted access parking, and (5) personal storage.

(7) **Class 2 Bicycle Parking Space(s).** Bicycle racks which permit the locking of the bicycle frame and one wheel to the rack and, which support the bicycle in a stable position without damage to wheels, frame or components.

(8) **Director.** Director of the Department of City Planning.

(9) **Landlord.** Any person who leases space in a building to the City. The term "landlord" does not include the City.

(10) **Employees.** Individuals employed by the City and County of San Francisco.

(11) **Responsible City Official.** The highest ranking City official of an agency or department which has authority over a City-owned building or parking facility or of an agency or department for which the City is leasing space.

(12) **Person.** Any individual, proprietorship, partnership, joint venture, corporation, limited liability company, trust, association, or other entity that may enter into leases.

(b) **Location of Facilities.**

(1) At locations where the majority of parking spaces will be long-term (e.g., occupied by building employees for eight hours or more), at least ½ of the required bicycle parking spaces shall be Class 1 spaces. The remaining spaces may be Class 2 spaces. The Director may approve alternative types of parking spaces that provide an equivalent measure of security.

(2) **Alternative Locations.** In the event that compliance with Section 155.1(b)(1) may not be feasible because of demonstrable hardship, the responsible city official may apply to the Director for approval of an alternative storage location. In acting upon such applications, the Director shall be guided by the following criteria: Such alternative facilities shall be well-lighted and secure. The entrance shall be no more than 50 feet from the entrance of the building, unless there are no feasible locations within a 50 foot zone that can be provided without impeding sidewalk or pedestrian traffic. However, in no event shall an alternative location be approved that is farther from the entrance of the building than the closest automobile parking space.

(3) **Exemptions.** If no feasible alternative parking facility exists nearby which can be approved pursuant to Section 155.1(b)(1) or (2) or, securing an alternative location would be unduly costly and pose a demonstrable hardship on the landlord, or on the City, where the City owns the building, the Director may issue an exemption. In order to obtain an exemption, the responsible City official shall certify to the Director in writing that the landlord, or the City, where the City owns the building, will not prohibit bicycle operators from storing bicycles within their office space, provided that they are stored in such a way that the Fire Code is not violated and that the normal business of the building is not disrupted.

(c) **Required Number of Bicycle Parking Spaces.**

(1) **Class 1 Bicycle Parking Spaces.** The following standards shall govern the number of Class 1, long-term, bicycle parking spaces a responsible City official must provide:

(A) In buildings with one to 20 employees, at least two bicycle parking spaces shall be provided.

(B) In buildings with 21 to 50 employees, at least four bicycle parking spaces shall be provided.

(C) In buildings with 51 to 300 employees, the number of bicycle parking spaces provided shall be equal to at least five percent of the number of employees at that building, but in no event shall fewer than five bicycle spaces be provided.

(D) In buildings with more than 300 employees, the number of bicycle parking spaces provided shall be equal to at least three percent of the number of employees at that building but in no event shall fewer than 16 bicycle parking spaces be provided.

(2) In addition to the Class 1 bicycle parking spaces required above, a responsible City official shall also provide Class 2 bicycle parking spaces according to the below enumerated schedule:

(A) In buildings with one to 40 employees, at least two bicycle parking spaces shall be provided.

(B) In buildings with 41 to 50 employees, at least four bicycle parking spaces shall be provided.

(C) In buildings with 51 to 100 employees, at least six bicycle parking spaces shall be provided.

(D) In buildings with more than 100 employees, at least eight bicycle parking spaces shall be provided. Wherever a responsible City official is required to provide eight or more Class 2 bicycle parking spaces, at least 50 percent of those parking spaces shall be covered.

(3) In public buildings where the City provides a public service to members of the public who are patrons or users of the buildings, such as libraries, museums, and sports facilities, the responsible City official shall provide the number of bicycle parking spaces as set out in Section 155.1(c)(1) and (2), except that the average patron load in a building during peak use hours as determined by the Director, rather than the number of employees, shall determine the number of spaces required. This Section shall not apply where a public building has a "garage" (as such term is defined in Section 155.2(a)) that is open to the general public, in which case Section 155.2 shall apply.

(4) The Director shall annually survey the amount, location, and usage of provided bicycle parking spaces in all buildings subject to the requirements of this Section in order to ascertain whether current requirements are adequate to meet demand for such parking spaces. If current requirements are inadequate, the Director shall draft and submit to the Board of Supervisors proposed legislation that would remedy the deficiency.

(5) **Reductions.** The Director may grant a reduction from the number of bicycle parking spaces required by this Section where the applicant shows based upon the type of patronage, clientele, or employees using the building that there is no reason to expect a sufficient number of bicycle-riding patrons, clientele or employees to justify the number of spaces otherwise required by the Section.

(d) **Layout of Spaces.** Class 1 and Class 2 bicycle parking spaces or alternative spaces approved by the Director shall be laid out according to the following:

(1) An aisle or other space to enter and leave the facility shall be provided. The aisle shall provide a width of five feet to the front or rear of a standard six-foot bicycle parked in the facility.

(2) Each bicycle parking space shall provide an area at least two feet wide by six feet deep. Vertical clearance shall be at least 78 inches.

(3) Bicycle parking shall be at least as conveniently located as the most convenient nondisabled car parking. Safe and convenient means of ingress and egress to bicycle parking facilities shall be provided. Safe and convenient means include, but are not limited to stairways, elevators and escalators.

(4) Bicycle parking and automobile parking shall be separated by a physical barrier or sufficient distance to protect parking bicycles from damage.

(5) Class 2 bicycle racks shall be located in highly visible areas to minimize theft and vandalism.

(6) Where Class 2 bicycle parking areas are not clearly visible to approaching bicyclists, signs shall indicate the locations of the facilities.

(7) The surface of bicycle parking spaces need not be paved, but shall be finished to avoid mud and dust.

(8) All bicycle racks and lockers shall be securely anchored to the ground or building structure.

(9) Bicycle parking spaces may not interfere with pedestrian circulation.

(g) **Miscellaneous Requirements.**

(4) Buildings with existing traditional-type racks which support only one wheel shall have two years from the effective date of this Section to replace them with conforming racks.

SEC. 155.3. SHOWER FACILITIES AND LOCKERS REQUIRED IN NEW COMMERCIAL AND INDUSTRIAL BUILDINGS AND EXISTING BUILDINGS UNDERGOING MAJOR RENOVATIONS.

(a) **Definitions.**

(1) **New Building.** A commercial or industrial building for which a building permit is issued at least six months after the effective date of this legislation.

(2) **Major Renovations.** Any construction or renovation project (i) for which a building permit is issued commencing at least six months after the date of enactment of this legislation (ii) which involves an enlargement of an existing public or privately owned commercial or industrial building, and (iii) which has an estimated cost of at least $1,000,000.00. For purposes of this Section, the term "enlargement" shall mean an increase in the square footage of the ground story of a building.

(3) The term "commercial building" shall include, but is not limited to, public or privately owned buildings containing employees working for City government agencies or departments.

(b) **Requirements for New Buildings and Buildings With Major Renovations.** New buildings and buildings with major renovations shall provide shower and clothes locker facilities for short-term use of the tenants or employees in that building in accordance with this Section. Where a building undergoes major renovations, its total square footage after the renovation is the square footage that shall be used in calculating how many, if any, showers and clothes lockers are required.

(c) For new buildings and buildings with major renovations whose primary use consists of medical or other professional services, general business offices, financial services, City government agencies and departments, general business services, business and trade schools, colleges and universities, research and development or manufacturing, the following schedule of required shower and locker facilities applies:

(1) Where the gross square footage of the floor area exceeds 10,000 square feet but is no greater than 20,000 square feet, one shower and two clothes lockers are required.

(2) Where the gross square footage of the floor area exceeds 20,000 square feet but is no greater than 50,000 square feet, two showers and four clothes lockers are required.

(3) Where the gross square footage of the floor area exceeds 50,000 square feet, four showers and eight clothes lockers are required.

(d) For new buildings and buildings with major renovations whose primary use consists of retail, eating and drinking or personal services, the following table of shower and locker facilities applies:

(1) Where the gross square footage of the floor area exceeds 25,000 square feet but is no greater than 50,000 square feet, one shower and two clothes lockers are required.

(2) Where the gross square footage of the floor area exceeds 50,000 square feet but is no greater than 100,000 square feet, two showers and four clothes lockers are required.

(3) Where the gross square footage of the floor area exceeds 100,000 square feet, four showers and eight clothes lockers are required.

(e) **Exemptions.** An owner of an existing building subject to the requirements of this Section shall be exempt from Subsections (c) and (d) upon submitting proof to the Director of the Department of City Planning that the owner has made arrangements with a health club or other facility, located within a four-block radius of the building, to provide showers and lockers at no cost to the employees who work in the owner's building.

(f) **Exclusion for Hotels, Residential Buildings and Live/Work Units.** This Section shall not apply to buildings used primarily as hotels or residential buildings. In addition, this Section shall not apply to "live/work units" as defined in Section 102.13 of the San Francisco Planning Code.

(g) **Owners of Existing Buildings Encouraged to Provide Shower and Clothes Locker Facilities.** The City encourages private building owners whose buildings are not subject to this Section to provide safe and secure shower and clothes locker facilities for employees working in such buildings.

(h) The Department of City Planning may establish more definitive requirements for shower and locker facilities in accordance with this Section. (Added by Ord. 343-98, App. 11/19/98)

SEC. 155.4. BICYCLE PARKING REQUIRED IN NEW AND RENOVATED COMMERCIAL BUILDINGS.

(a) **Definitions.**

(1) All definitions set forth in Section 155.1(a) and Section 155.3(a) are incorporated into this Section.

(2) **New Commercial Building.** A commercial or industrial building for which a building permit is issued on or at least six months after the effective date of this Section.

(3) **Major Renovation.** Any construction or renovation project (i) for which a building permit is issued commencing on or at least six months after the effective date of this Section (ii) which involves an enlargement of an existing commercial building and (iii) which has an estimated construction cost of at least $1,000,000.00.

(b) **Requirements for New Commercial Buildings and Commercial Buildings with Major Renovations.** New commercial buildings and commercial buildings with major renovations, as a condition of approval, shall provide bicycle parking in that building in accordance with this Section. Where a building undergoes major renovations, its total square footage after the renovation shall be used in calculating how many, if any, bicycle parking spaces are required.

(c) **Types of Bicycle Parking.** New commercial buildings and commercial buildings with major renovations shall offer either Class 1 bicycle parking, as defined in Section 155.1(a)(6), or Class 2 bicycle parking, as defined in Section 155.1(a)(7), or a combination of Class 1 and Class 2 bicycle parking.

(d) **Bicycle Parking Spaces - Professional Services.** For new commercial buildings and commercial buildings with major renovations whose primary use consists of medical or other professional services, general business offices, financial services, general business services, business and trade schools, colleges and universities, research and development or manufacturing, the following schedule of required bicycle parking applies:

(1) Where the gross square footage of the floor area exceeds 10,000 square feet but is no greater than 20,000 feet, 3 bicycle spaces are required.

(2) Where the gross square footage of the floor area exceeds 20,000 square feet but is no greater than 50,000 feet, 6 bicycle spaces are required.

(3) Where the gross square footage of the floor area exceeds 50,000 square feet, 12 bicycle spaces are required.

(4) Bicycle Parking Spaces—Retail. For new commercial buildings and commercial buildings with major renovations whose primary use consists of retail, eating and drinking or personal service, the following schedule of required bicycle parking applies:

(1) Where the gross square footage of the floor area exceeds 25,000 square feet but is no greater than 50,000 feet, 3 bicycle spaces are required.

(2) Where the gross square footage of the floor area exceeds 50,000 square feet but is no greater than 100,000 feet, 6 bicycle spaces are required.

(3) Where the gross square footage of the floor area exceeds 100,000 square feet, 12 bicycle spaces are required.

(f) **Notice of Bicycle Parking.** New commercial buildings and commercial buildings with major renovations subject to this Section must provide adequate signs or notices to advertise the availability of bicycle parking.

(g) **Layout of Spaces.** Owners of new commercial buildings and commercial buildings with major renovations subject to this Section are encouraged to follow the requirements set forth in Section 155.1(d) (Layout of Spaces) in installing Class 1 and Class 2 bicycle parking.

(h) **Owners of Existing Buildings Encouraged to Provide Bicycle Parking Spaces.** The City encourages building owners whose buildings are not subject to this Section to provide bicycle parking spaces in such buildings.

(i) **Exemption.** Where a new commercial building or building with major renovations includes residential uses, the building's total non-residential square footage shall be used in calculating how many, if any, bicycle parking spaces are required.

(j) This Section shall not be interpreted to interfere with the Department of Planning's authority to require more than the minimum bicycle parking spaces required by this Section as a condition of approval of a project, where appropriate.

(k) For the purposes of this Section, commercial shall mean commercial and industrial. (Added by Ord. 193-01, File No. 010488, App. 9/7/2001)

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APPENDIX E: CONSTRUCTION ZONE TREATMENTS

Construction zones are difficult environments in which to manage traffic. Priorities exist to maintain vehicular traffic flow, to maintain transit service at an acceptable level, to maintain pedestrian access to businesses and the street, and to maintain bicycle traffic flow to minimize inconveniences to riders. Oftentimes, issues related to bicycles are overlooked in construction zones. Some of these issues are discussed here. They include the following.

- Lane Closures
- Signage
- Pavement Smoothness and Compaction
- Enforcement of Guidelines and Inspection
- Trenching and Plate Use
- Gutter-to-Pavement Transition
- Drainage Grate Guidelines

The purpose of this is to provide planning level guidance for the accommodation of bicycles in construction zones. This guidance is based on national and state sources. Actual treatments for treating bicycles in construction zones is dealt with in traffic management plans submitted by contractors to the City. Contractors and the City can use this document to assist them with specific traffic control measures in each construction zone.

LANE CLOSURES

The needs of bicyclists are often neglected when roadway lanes are closed for construction activities. Guidelines should consider the needs of bicyclists and motorists since both are roadway users. Accommodating bicycle space during a lane closure is typically considered only when a bikeway facility (such as a bicycle lane) is affected by construction activities. Wherever bicycles are allowed, measures should be taken to provide for the continuity of a bicyclist's trip through a lane closure. The most important consideration is to maintain adequate width of travel lanes to accommodate bicycle travel. Where bike lanes exist, it may be possible to carry the bike lane through the construction zone. A second option is to provide a wide outside lane through the construction zone for shared use by motor vehicles and bicycles. When necessary, bicycles share a standard travel lane (12 feet) with motor vehicles through a construction zone. Only in rare cases would bicycles be detoured to another street when travel lanes remain open on the street under construction.

A complete road closure affects bicyclists in a similar manner as motorists. If an entire roadway segment is closed for construction activities, a sufficient detour route should be provided for all

modes of travel. The implementation of these detour routes, however, should take into consideration attributes of alternative routes as they pertain to bicycles versus motor vehicles. The same detour route may not be suitable for both modes. For example, a motorist detour may traverse several hills on a major thoroughfare. A bicycle detour might be provided on another set of streets that minimizes changes in elevation that impact bicyclists more than motorists. Maintaining a direct route should be a primary goal when bicycles are detoured.

GUIDELINES

In order to accommodate bicyclists through various lane closures and detours, the following guidelines are recommended. These are based on sources including, the Manual for Uniform Traffic Control Devices (MUTCD), the Caltrans Traffic Control Manual, the Caltrans Highway Design Manual, and the Guide for the Development of Bicycle Facilities published by the American Association of State Highway and Transportation Officials (AASHTO).

- Continuing a bike lane through a construction zone

  Efforts shall be made to re-create the bike lane to the left of the construction zone if enough space exists to do so. The standard width of a bike lane is five feet.

  Standard construction zone signs (see MUTCD) are part of the recommended design, including:

W21-4A	Road Work Ahead
W20-5	Right Lane Closed
W4-2	Lane Shift, Left Sign
W11-1	Bicycle Warning Sign
W16-1	Share The Road

  The bicycle warning sign is recommended in combination with W4-2 and again in combination with W16-1. This effectively warns motorists of the presence of bicycles at the lane drop and again where the work zone begins.

  Construction barrels equipped with flashers delineate the edge of the construction zone and also indicate the outer edge of the bike lane.

- Transitioning a bike lane to a wide travel lane in a construction zone

  Where there is insufficient space to carry a bike lane through a construction zone, a wide travel lane adjacent to the construction zone should be considered. The travel lane width should be 14 to 15 feet. Bicycles share the travel lane with motor vehicles.

  Standard construction zone signs (see MUTCD) are part of the recommended design, including:

W21-4A	Road Work Ahead
W20-5	Right Lane Closed
W4-2	Lane Shift, Left Sign

W11-1	Bicycle Warning Sign
W16-1	Share The Road

The bicycle warning sign is recommended in combination with W4-2 and again in combination with W16-1. This effectively warns motorists of the presence of bicycles at the lane drop and again where the work zone begins.

Construction barrels equipped with flashers delineate the edge of the construction zone and also indicate the outer edge of the bike lane. The barrels delineating the outer bike lane edge do not carry through the work zone.

- Transitioning a bike lane to a standard travel lane in a construction zone

  Where there is insufficient space to provide a wide travel lane adjacent to the construction zone, then a standard 12-foot wide travel lane should be provided. Bicycles share the travel lane with motor vehicles. The rules of overtaking and passing apply in this case as in similar situations where only one travel lane is provided in one direction.

  Standard construction zone signs (see MUTCD) are part of the recommended design, including:

W21-4A	Road Work Ahead
W20-5	Right Lane Closed
W4-2	Lane Shift, Left Sign
W11-1	Bicycle Warning Sign
W16-1	Share The Road

  The bicycle warning sign is recommended in combination with W4-2 and again in combination with W16-1. This effectively warns motorists of the presence of bicycles at the lane drop and again where the work zone begins.

  Construction barrels equipped with flashers delineate the edge of the construction zone and also indicate the outer edge of the bike lane. The barrels delineating the outer bike lane edge do not carry through the work zone.

- For a complete roadway closure

  A sufficient detour route shall be outlined with adequate signage similar to that provided for motor vehicle traffic.

  Consideration should be given to alternative detour routes that minimize vertical transitions and situations where bicyclist safety may be an issue.

  A bicycle detour route different from the one outlined for motor vehicle traffic may be appropriate in cases where significant grades or levels of traffic and/or traffic speeds make the route less than desirable for the average bicyclist.

Signage specific to bicyclists shall be installed on the detour route to ensure proper guidance through the roadway closure.

SIGNAGE

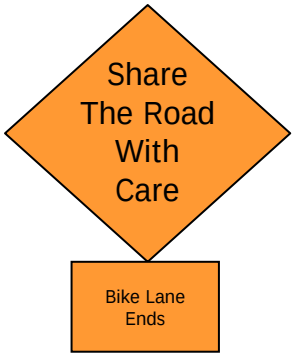
Signage is a critical component of construction activities. Due to the temporary nature of roadway work, information regarding temporary detours and reduced capacity do not appear on conventional maps. Aside from public notification through various media, roadside signage and signals are the only methods a public agency has to notify road users of construction activities. Therefore, signage is crucial in order to successfully manage traffic flow for motorists, pedestrians, and bicyclists.

Signage alerting roadway users of construction activities can provide for motorists and bicyclists alike. However, signage specific for bicyclists should be employed if the circumstances warrant it. Such circumstances may include a detour route that is different for bicyclists and motorists, loss of a bike lane, or reductions in the travel way width that require bicyclists to share a travel lane with motor vehicles.

Another issue with signage is its placement along a roadway. It is often the case that typical orange construction signs, which are large compared to the size of a bicycle, are placed either squarely in a bike lane or in the riding area of a wide curb lane. Sign placement should be made with bicyclists and pedestrians in mind. Because many sidewalks are directly adjacent to the roadway, placing signage on sidewalks would obstruct the pedestrian pathway and may not be visible to motorists. Sign placement can be a tricky issue when construction activities take place.

GUIDELINES

- The City shall place signage related to construction activities in a location that does not obstruct the path of bicycles or pedestrians, including bicycle lanes, wide curb lanes, or sidewalks.
- Signage related to bicycle travel shall be included on all bikeways where construction activities occur. Signage shall also be provided on all other roadways where bicycle travel is likely to occur.
- Signage that increases motorist awareness of bicyclists through construction zones shall be used wherever possible on bikeways and other roadways on which bicyclists travel.
- Recommended signage to be used include the following signage now being used in the City of Denver, Colorado and the County of Clark, Nevada, respectively. These signs are not found in MUTCD or Caltrans manuals:



Among others, signs that may be used in coordination with construction activities include those found on the following page. These include standard signage from the Caltrans Traffic Control Manual, and the Manual of Uniform Traffic Control Devices. Some of these signs may be used in conjunction with one another in order to enhance the visibility of and provide enhanced guidance to bicyclists through construction zones and detours.

ROADWAY SMOOTHNESS AND COMPACTION

Roadway surface is a critical issue for bicyclists. As mentioned previously, bicycles are much more sensitive to subtle changes in roadway surface than are motor vehicles. Various pavement materials are used to pave roadways, and some are smoother than others. Compaction is also an important issue after trenches and other construction holes are filled. Uneven settlement after trenching can affect the roadway space nearest the curb where bicycles travel. Sometimes compaction is not achieved to a satisfactory level, and an uneven pavement surface can result due to settling over the course of days or weeks.

GUIDELINES

- On new construction, the finished surface of bikeways should not vary more than 6 mm from the lower edge of a 2.4 m long straight edge when laid on the surface in any direction.
- The surface of a roadway open to bicycle travel should be smooth, free of potholes, and the pavement edge uniform.
- Pavement shall be maintained so ridge buildup does not occur at the gutter-to-pavement transition or adjacent to railway crossings.
- City officials should inspect the pavement two to four months after trenching construction activities are completed to ensure that excessive settlement did not occur.

ENFORCEMENT OF GUIDELINES AND INSPECTION

Regulations and policies are only as good as the enforcement that accompanies them. Sometimes inspections do not occur during construction and/or after construction is completed. Insufficient resources can affect the ability of a municipality to conduct proper inspections. In order to ensure that proper construction procedures are followed, it is imperative that inspectors are used to field inspect construction sites while construction activities are occurring and again once they have been completed. When roadway surfaces are not inspected, the surface may be left in an unacceptable condition, such as in an uneven or concave fashion, for months or years. Because these conditions are more likely to occur in the portion of the roadway where bicyclists travel, it is a critical issue for bicyclists.

One of the most important issues related to construction activities is enforcement. Often it is difficult to manage a team of contractors and subcontractors on a given project. The contractor is

responsible for the subcontractors' work, and the public agency has very little interaction with subcontractors. The only way for an agency to ensure that procedures and guidelines are being followed is through periodic inspection. Some contractors neglect to draft a traffic control plan and/or implement one as required. Enforcement is certainly a key issue to ensure that proper regulations are followed during construction activities.

GUIDELINES

- A traffic control plan that adequately addresses the needs of bicycle traffic through a construction zone shall be made and approved by the City Traffic Engineering Division prior to the start of construction.
- Inspection shall be made at all sites during construction activities on bikeways and on city streets to ensure that the traffic control plan is being followed.
- Inspection shall be made of the construction site immediately after construction is completed.
- If settling is likely to occur once construction is ended, such as with trenching activities, the City shall inspect the pavement surface quality two to four months after construction activities cease in order to ensure that excessive settlement did not occur.
- The City should ensure adequate staff and budget for inspection and monitoring of construction activities as they affect bicycle traffic on bikeways and all other roadways where bicycle travel is permitted.

TRENCHING AND PLATE USE

Recent years have seen the installation of fiber-optic cable under many city streets. The primary method used to perform this type of work is trenching, which involves cutting a one- to two-foot wide trench. This activity often takes place near the curb of roadways in order to minimize the disruption to automobile traffic. However, the common practice maximizes disruptions to bicycle traffic since bicycle travel predominantly takes place near the curb. Bike lane facilities can also be disrupted because they are located near the curb and away from vehicle travel lanes.

When plates are used to cover open trenches, they are typically not flush with the pavement and have a one- to two-inch vertical transition on the edges. This can puncture a hole in a narrow bicycle tire and can cause the bicyclists to lose control due to the shock of the vertical transition. Also, coordination among different trenching entities is a significant problem. Trenching performed by different City departments, utility companies, telecommunication companies, and others sometimes creates a situation where a street segment may be trenched several times over the course of a year. Coordination to prevent the duplication of trenching activities is a problem, especially for bicyclists whose riding space is often interrupted during trenching activities.

When activities such as this take place, bicycle travel is negatively affected, but no noticeable difference has occurred to motorists. Bicyclists often are left to their own devices to merge with vehicles in the adjacent travel lane. The interim condition of the trenches during non-construction

hours is also of concern because of the impact on bicyclist travel. Although the common practice is to use steel plates during non-construction hours, these plates can be slippery, especially when wet. Slippage can be a significant problem for bicyclists riding over steel plates in any weather.

GUIDELINES

- Steel plates used as a temporary measure during construction activities shall not have a vertical edge greater than 10 mm without a temporary asphalt lip to accommodate bicyclists riding over them.
- The City should consider using non-skid steel plates with no raised steel bar on top.
- Wherever possible, the City should use in-laid steel plates that are flush with the surrounding pavement surface in order to minimize or eliminate the vertical transition between plates and the pavement for bicyclists.
- Steel plates shall be used only as a temporary measure during construction and shall not be used for extended periods of time.

GUTTER-TO-PAVEMENT TRANSITION

As mentioned earlier in this document, the path of travel for bicyclists is most often near the curb of a given roadway. On streets with concrete curb and gutter, one to two feet of this curbside area is typically devoted to the gutter pan, where water collects and drains into catch basins. On many streets, the path of the bicyclist is near the transition between the gutter pan and the edge of pavement. It is at this location that water can erode the transition, creating potholes and a rough surface for travel.

Many streets' pavements do not meet flush with the gutter, creating a vertical transition between these two segments of the roadway. This area can buckle over time and create a hazardous environment to ride in for bicyclists. Since it is the most likely place for bicyclists to ride on the roadway, this issue is significant for bicycle travel.

GUIDELINES

- Gutter-to-pavement transitions should have no more than a 10 mm vertical transition.
- Pavement transitions should be examined during every roadway project for new construction, maintenance activities, and construction project activities that occur in streets.

DRAINAGE GRATES

Drainage grates are encountered in the gutter area near the curb of a roadway. This area is where most bicycle travel occurs. Drainage grates typically have some kind of slots through which water drains into the municipal wastewater system. Many grates are designed with linear parallel bars spread wide enough for a tire to become caught in so that if a bicycle were to ride on them, the front

tire would become caught and fall through the slot. This would cause the rider of the bicycle to tumble over the handlebars and sustain potentially serious injuries. Drainage grates are often wider than the gutter making avoiding them difficult and sometimes dangerous pushing bicyclists out into the vehicle traffic lane.

GUIDELINES

- The City shall require that all new drainage grates be bicycle-friendly. These include grates that have horizontal slats on them so that bicycle tires do not fall through the vertical slats.
- A program to inventory all existing drainage grates should be implemented. Grates that are not bicycle-friendly should be replaced or reset citywide.

APPENDIX F: BICYCLE COMMUTE AND AIR QUALITY CALCULATIONS

Table 1

Estimate of Existing Bicycle Transportation Usage

2000

Employed Adults, 16 Years and Older		*Input*	*Calculated Totals*
a. 2000 Population /1		203,413	
b. 2000 Employed Persons /1		100,215	
c. 2000 Bicycle Commute Share /1		0.55%	
d. Travel Time Less Than 9 Minutes /1		7,562	
e. 2000 est. Bicycle Commuters /1			556
School Children			
f. 2000 Population, Ages 6-14 /1 (K-8)		26,876	
g. 1990 Bicycle Commute Share /2		3%	
h. 2000 est. Bicycle School Commuters /3			672
College			
i. 2000 College Population /1		15,467	
j. 1990 Bicycle Commute Share /4		2%	
k. 2000 est. Bicycle College Commuters /5			309
Bike-Transit Users			
l. average daily transit/rail exits /6		5,867	
m. average bike-transit boarding percentage /7		0.7%	
n. bike-transit boardings in Fremont /8			39
Utilitarian (non work or school) Trips			
m. percent of work/school bicycle trips /9		174%	
n. estimated bicycle utility riders /10			1,573
l. Total Estimated Daily Bicycle Ridership (excl. recreation)			3,149
m. Average Two-Way Travel Length (Miles)			
r1. Adults/College Students /11		8	
r2. School Children /12		1	
n. Replaced Vehicle Trips	n1. Adults /13	73%	
	n2. Students /	53%	
o. Reduced Vehicle Trips /15			4,329
p. Reduced Vehicle Miles /16			14,823
Reduced Annual Vehicle Miles			400,196

Notes and Sources:

/1 2000 U.S. Census and estimates utilizing 1990 percentages.

/2 Lamorinda School Commute Study (Fehr & Peers Associates, 1995) and San Diego County School Commute Study (1990).

/3 Estimated school children who commute by bicycle, as of 1990.

/4 National Bicycling & Walking Study, FHWA, Case Study No. 1, 1995. Review of bicycle commute share in seven unversity communities (5%) -- Reduced based on Community College

/5 Estimated college students who commute by bicycle, as of 1990.

/6 American Public Transportation Assn. Statistics, first quarter 2002

/7 Bikemap.com survey of Bike-Transit ridership on Caltrain system, 6% of riders bike boardings

/8 ibid

/9 National Bicycling & Walking Study, Case Study No. 1, p. 16.

/10 total work, college, and transit bicycle users times 174 percent.

/11 Based on survey results from 10 California cities conducted by Alta between 1990 and 1999, L.A. Countywide Policy Document survey (1995), and National Bicycling & Walking Study, FHWA, 1995.

/12 Ibid.

/13 Ibid.

/14 Ibid.

/15 Calculated reduced vehicle trips based on assumptions and sources stated above.

/16 Calculated reduced vehicle miles based on assumptions and sources stated above.

Table 2

Estimate of System Completion and User Increases

(No Input Required)

Studies of Other Cities:

Study Cities:	v. Corridor Increases	x. System Completion	y. Adjusted Increase
City of Portland /17	137%	50%	274%
City of San Francisco /18	61%	20%	305%
City of Seattle /19	90%	35%	257%
Average			279%

Projected Increases in Your Community

	Current (2000)	*Buildout*	*Increment*	
q. Bicycle Commute Mode Share /20	0.55%	1.53%	0.98%	
r. Total Daily Bicycle Commuters /21	3,149	8,777	5,628	Calculation
s. Total Daily Bicycle Trips /22	6,298	17,554	11,256	
t. Reduced Daily Vehicle Trips /23	4,329	12,065	7,736	(1/x) x v
u. Reduced Daily Vehicle Miles /24	14,823	41,313	26,490	(1/x) x v

Notes and Sources:

/17 Before and after bicycle counts conducted by the City of Portland.

/18 Before and after bicycle counts conducted by the City of San Francisco.

/19 Based on preference survey study conducted by Stuart Goldsmith for the City of Seattle.

/17-19 Corridor increases refers to the average increase in bicycling in the corridors in each city, before and after bikeways were installed. System completion refers to the percent completion of the bikeway network in each city. Adjusted increase reflects the projected amount of bicycling that will occur when the system is completed, based on studies of communities with completed or nearly completed bikeway systems (National Bicycling & Walking Study, Study No. 1, 1995). This translates into an average 279% increase upon system completion.

/20 Current bicycle commute mode share from U.S. census for LA County (.63%), adjusted to potential mode share when system is 100% complete (1.76%), and the increment (1.13%).

/21 Same as above except that it shows total bicycle commuters (school and college students).

/22 Total commuters from previous line times 2 (each commuter makes 2 trips)

/23 Total reduced trips by category (adult employed, students), times 279% increase (see notes10-14).

/24 Total reduced vehicle miles by category (adult employed, students), times 279% increase (see notes 10-14)