

Appendix C | Bicycle Access Guidelines

CALTRAIN BICYCLE ACCESS GUIDELINES

Station approaches

1. Roadways
2. Traffic signals
3. Way-finding
4. Railroad track crossings

Within stations

1. Bicycle circulation
2. Way-finding
3. Crossing tracks between platforms

Caltrain has published Design Criteria and Standard Drawings, which apply to Caltrain facilities. These Caltrain “Bicycle Access Guidelines” cover the critical physical areas to address when accommodating bicycle access to and circulation within stations, and are intended to supplement Caltrain published standards as best practices. Where there are conflicts, Caltrain

standards take precedence over these Guidelines. Design and engineering are important elements needed to improve bike access; however education/information and enforcement are also necessary to complement these efforts.

BICYCLE ACCESS GUIDELINES FIGURES

- C-1: Bicycle-friendly drainage grate
- C-2: Bicycle-sensitive loop detector
- C-3: Bicycle traffic signal head
- C-4: Bicycle destination signs
- C-5/6: Railroad crossing specifications
- C-7/8: Stairway channels
- C-9: Station bicycle sign locations

Designing and operating Caltrain stations requires balancing accommodation of different types of users, including pedestrians, mobility-impaired passengers, automobile drivers, transit users and bicyclists.

Caltrain is committed to maintaining safety for all passengers.



Figure C-1: Bicycle-safe drainage grate

Station approaches

The roadway and bikeway network leading to each station, and the sidewalk, pathway and driveway entrances themselves, are all considered components of station approach. This section addresses bicycle access in the context of these roadways, sidewalks, traffic signals, way-finding signage and railroad crossings.

Roadways

Cyclists should be able to take a safe, direct, well-marked route to all Caltrain stations. Since on-street improvements are the responsibility of local agencies, Caltrain’s role is to support and encourage efforts to make roadways in the vicinity of Caltrain stations more bicycle-friendly. This includes ensuring that planned bikeways have needed bicycle facilities and that streets leading to Caltrain stations that are not designated as bicycle facilities are well-maintained and have good pavement quality.

An important factor to consider when making any roadway safe for cyclists is ensuring that drainage grates are “bicycle safe” (see Figure C-1). Outmoded drainage grates have wide parallel inlets that can allow bicycle wheels to drop through them, which stops the bicycle abruptly, thus throwing the cyclist onto the pavement or into traffic. In such cases, it is recommended that the grate be completely replaced, rather than retrofitting with welded crossbars.



Figure C-2: Bicycle-sensitive loop detector

Sidewalks

The California Vehicle Code allows local jurisdictions to regulate or prohibit sidewalk bicycling in local municipal codes. Some cities prohibit sidewalk-riding completely, while others permit children to ride on sidewalks, or allow the practice only in designated locations.

Bicyclist behavior varies, based on level of experience and confidence, and perception of personal safety. Also, like any other traveler, bicyclists prefer to ride the shortest and most direct routes possible between two points. While some bicyclists operate like a car (as they should), and ride on street with motor traffic, others may decide to ride on sidewalks to be separate from cars, or because it is more convenient and quick.

Nonetheless, bicycling on sidewalks can be unsafe and is a leading cause of bike-car collisions. In areas with high pedestrian traffic, conflicts can occur between bikes and slower-moving pedestrians. Collisions with automobiles are also common where sidewalks intersect driveways and roadways because motorists don’t typically expect fast-moving bicycles at these locations.

Traffic signals

Any traffic signal in the vicinity of a Caltrain station that is actuated by motor vehicle traffic—particularly those adjacent to a station entrance—should also be able to detect cyclists (Figure C-2). Typically, bicycle-sensitive loop detectors are used. Caltrans “Type D” quadruple loop detectors (a.k.a. induction loops) have been shown to be one of the most effective. Caltrans and some California jurisdictions have begun experimenting with video detection at locations with

bicycle lanes and video detection of motor vehicles. Although video detection has relatively high up-front costs, long term costs are lower than loop detectors due to lower maintenance costs.

At locations with high bicycle traffic and where bikeways cross major streets, signals should also be triggered by advanced inductive loop traffic signal detection, which requires installing an additional detection loop approximately 20 feet in advance of the intersection.

All signal timing cycles should be sufficiently long to allow slower-moving bicycles to clear intersections within the green-light interval.

Bicycle-sensitive traffic signal detection will be required at traffic-actuated signals in the near future. In 2007, the California legislature passed Assembly Bill 1581, which says in part:

Upon the first placement of a traffic-actuated signal or replacement of the loop detector of a traffic-actuated signal, the signal would have to be installed and maintained, to the extent feasible and in conformance with professional engineering practices, so as to detect lawful bicycle or motorcycle traffic on the roadway.” However, “Cities and counties would not be required to comply with those requirements until the Department of Transportation has established uniform standards, specifications, and guidelines for the detection of bicycles and motorcycles by traffic-actuated signals and related signal timing.

Caltrans is currently reviewing options for bicycle detection at signals, focused primarily on video

detection and inductive loop detectors. The agency plans to publish the new bicycle detection and signal timing standards in the next California Supplement to the MUTCD, expected in 2010. In the meantime, well-placed loop detectors with a bicycle detection symbol are the accepted standard.

In 2005, the California legislature approved “bikes only” traffic signal heads (Figure C-3). These signals are accepted for use in California at three types of intersections with considerable bicycle traffic volumes and conflicts: T-intersections with major bicycle movement along the top of the “T”; at the confluence of an off-street bike path and a signalized intersection; and where separated bike paths run parallel to arterial streets. At Caltrain stations, this may apply to stations with entrances adjacent to multi-use trails or at entrances that occur at a T-intersection.

Way-finding

Transportation planning practices have historically focused on providing way-finding and other types of signage primarily for motorists. Although cyclists benefit from information targeted at autos, signage that is oriented to cyclists could encourage more passengers to bicycle to Caltrain stations.

Like way-finding signage to each station intended for motorists, bicycle-oriented signs should be posted on bikeways and all major arterials and collectors within one mile of the station. Signage immediately adjacent to the station and at station entrances should direct cyclists to parking and bicycle boarding areas on each platform. Way-finding signage is also needed to direct cyclists leaving each station to nearby bikeways and identify bicycle routes to local destinations.



Figure C-3: Bicycle signal heads

Cyclist-oriented signs typically have the following characteristics:

- Smaller than driver-oriented signs
- Posted lower than driver-oriented signs
- Side-mounted

The most recent California supplement to the Manual on Uniform Traffic Control Devices (MUTCD) includes

the SG45 bicycle route number and destination signs shown in Figure C-4.

Caltrain could create a custom design, consistent with MUTCD specifications that could include the Caltrain logo, station name and directional arrow. Alternately, the agency could develop a unique “Bicycles to Caltrain” sign. Either way, the chosen signs could be distributed to local agencies for all station approaches.

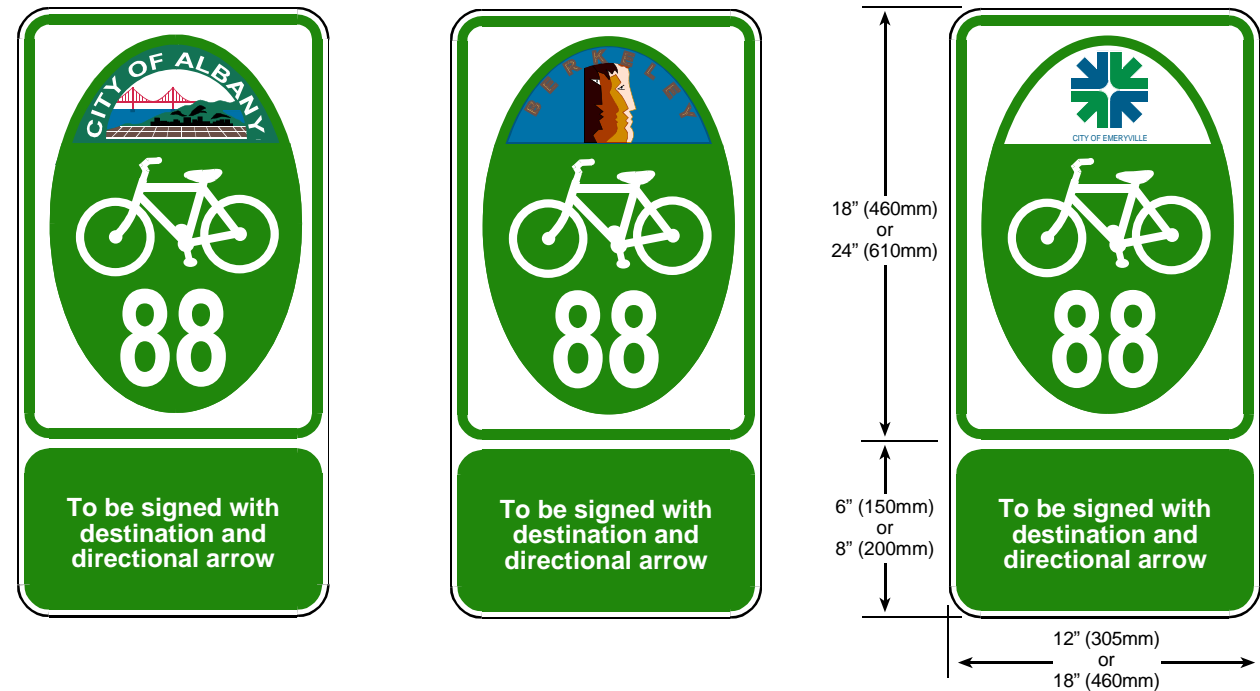


Figure C-4: MUTCD specifications for SG45 bicycle signs

At-grade railroad crossings

Caltrain Design Criteria Chapter 7 Grade Crossings and Standard Drawings SD7001 through SD 7004 delineate the design standards for at-grade crossings of railroad tracks for the Caltrain system. To ensure public safety, crossings are designed to enable motorists, pedestrians and bicyclists to cross tracks at designated locations within clearly defined and delineated ten-foot wide crossing pathways and with adequate crossing warning systems. Where there is a high likelihood of unsafe behavior or where a crossing has a significant skew, channelization is the standard to guide pedestrians and cyclists walking their bikes to cross tracks at a safe and controlled location.

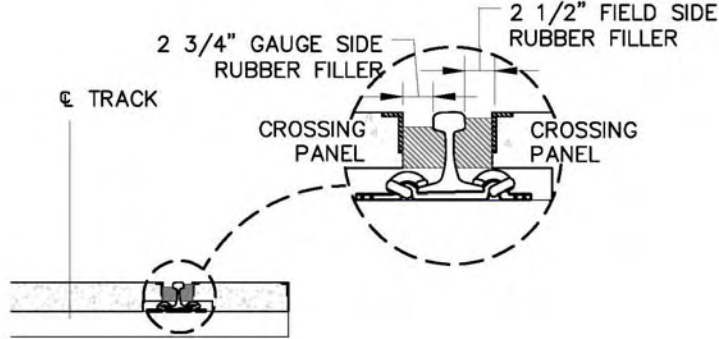


Figure C-5: Rubberized railroad crossing (Caltrain Standard Drawing 2151)

On-street rail tracks should be configured to minimize gaps that could potentially trap bicycle wheels, as shown in Caltrain Standard Drawing 2151 (see Figure C-5).

It is optimal for bicyclists to ride across on-street railroad tracks at a 90 degree angle, in order to avoid bike wheels getting trapped in track rails. Rails laid in asphalt parallel or at a pronounced skew to the pathway of bicycle travel can trap bicycle wheels, which stops the bicycle abruptly and can cause the cyclist to fall onto the tracks or street. The Santa Clara Valley Transportation Authority Bicycle Technical Guidelines provide an example of bicycle-friendly on-street track-crossing design for Class II bike lanes where tracks do not cross the street at a 90 degree angle (see Figure C-6).

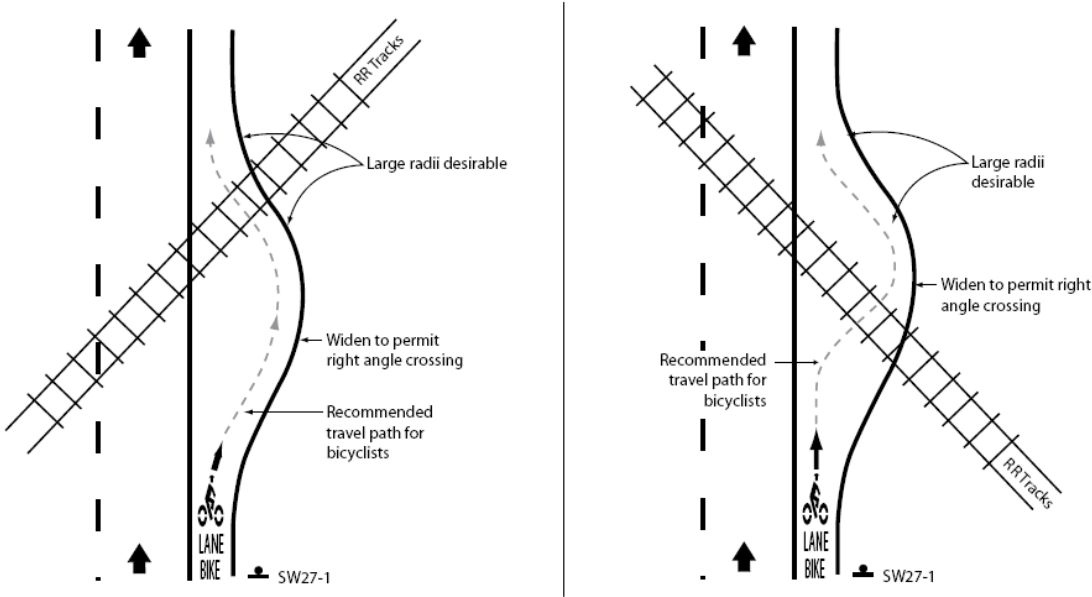


Figure C-6: VTA track-crossing guidelines

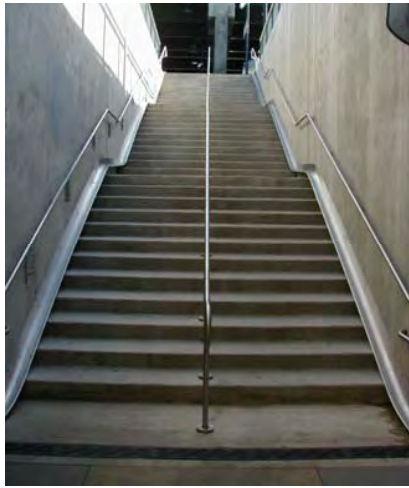


Figure C-7: Lawrence Caltrain station stairway channels

For all new stairways, and stairs without complementary ADA ramps, Caltrain will install stair channels.

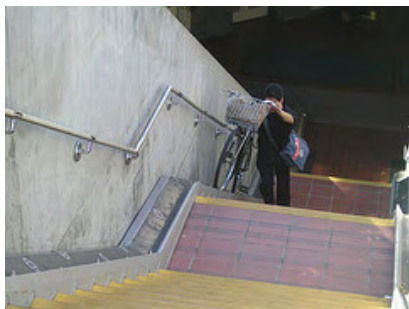


Figure C-8: 16th Street BART station stairway channels

Within stations

Bicycle access to Caltrain continues from the surrounding roadway network into the station itself, via driveways, pathways and sidewalks. This section discusses aspects of the stations proper that influence bicycle access.

Bicycle circulation

Caltrain allows bicycles to be ridden wherever automobiles may travel, such as on station roadways and in parking lots. To minimize conflicts and maintain safety for all passengers, Caltrain policies prohibit bicycles from being ridden on platforms, ramps and sidewalks within stations. Cyclists are required to dismount and walk their bikes on all platforms, sidewalks, and ramps even if there is no posted sign.

It is Caltrain's goal to make access to all types of bicycle parking as convenient and direct as possible, while minimizing the distance needed to walk one's bike and maintaining safe access for all other passengers. To facilitate cyclists' travel from the roadway and parking lot to bicycle parking and the station platform, Caltrain should:

- Add way-finding signage clearly directing cyclists to all types of available bicycle parking
- Stencil "Walk Your Bike" on all station curb cuts and ramps, and
- Where appropriate, install curb cuts adjacent to bicycle parking.

To encourage bicyclists to dismount when they arrive at the areas of the station shared with pedestrians,

Caltrain should consider piloting the concept of a "Bicycle Greeting Zone" at a station with high bicycle access and crowded sidewalks, such as San Francisco. The zone would provide a space for cyclists to safely dismount and would remind them to dismount and walk their bicycles.

Changes in grade

Access to platforms sometimes requires a change in grade. Caltrain has implemented many ADA-mandated facilities at stations to provide access to wheelchair users, such as curb cuts and ramps. These facilities also benefit bicyclists by enabling bikes to roll, instead of having to be lifted onto sidewalks and stairs. However, due to ADA slope graduation requirements, ramps can be quite long, forcing cyclists who use ramps to travel longer distances than they may prefer. Most ramps also have handrails on both sides, which preclude short-cutting across corners and turns. As a result, some passengers prefer to carry their bicycles up and down stairways.

Stairway channels make it easier for bicyclists to navigate stairways, particularly when they are crowded (see Figures C-7 and C-8). The design must be wide enough to accommodate all bicycles, including those carrying racks and bags; cannot interfere with drainage or litter cleanup; and be designed to be understood by visually impaired passengers. Consideration must be given to the width of the channel relative to the width of the stairway and the possible impact on other pedestrians' comfort and circulation. Signage directing bicyclists to stairs equipped with channels should be posted as appropriate.

Elevators

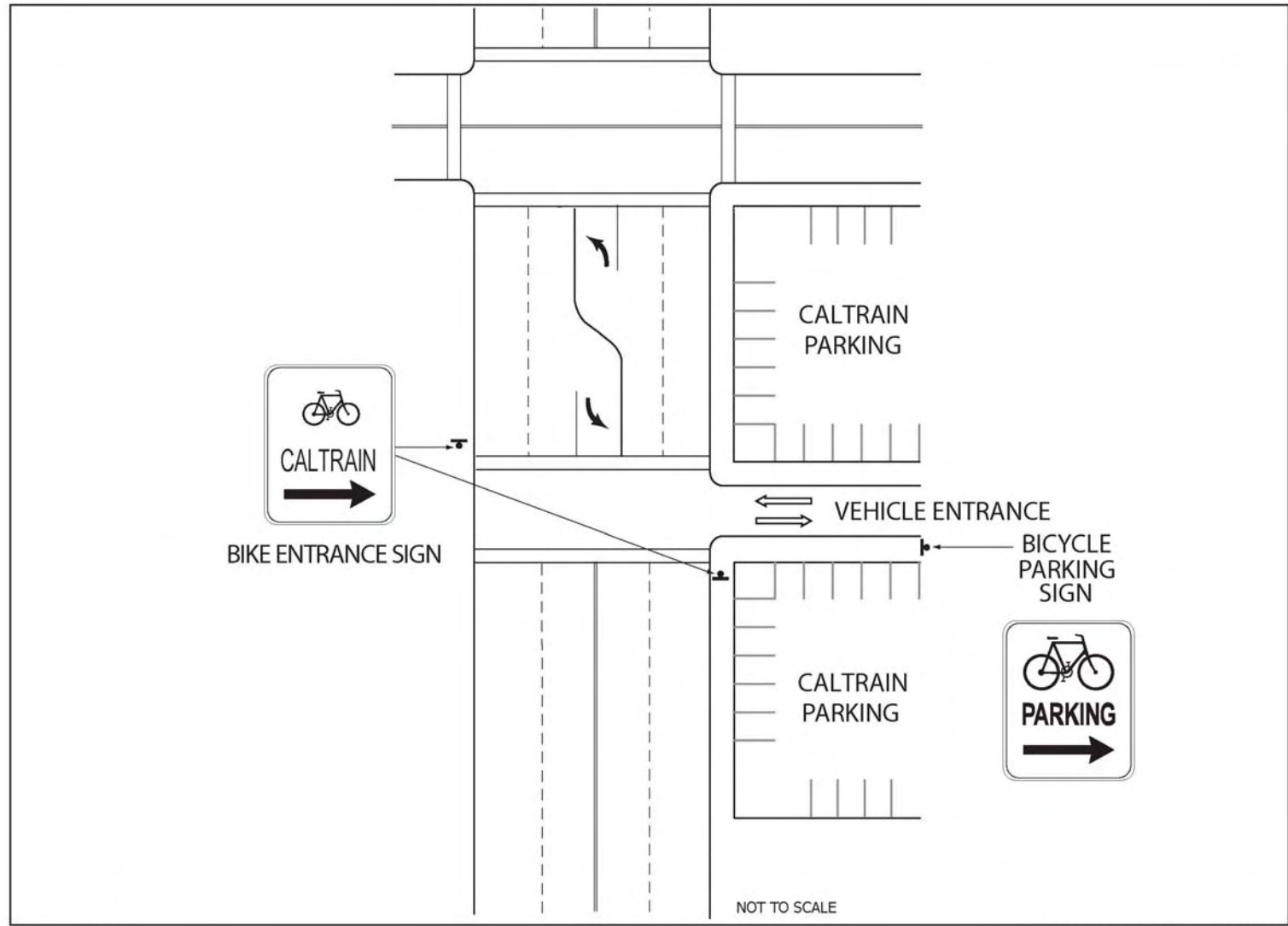
At stations that provide elevator platform access, elevator locations should be clearly marked and indicate destinations. New elevators, at new or existing stations, should accommodate several bicycles and preferably have two doors for entry and exit on opposite sides, wherever this design makes sense given station geometrics and available resources. With the exception of folded bicycles, bikes are not permitted on escalators.

Way-finding signage and other communication

The previous section, “Station Approaches,” describes way-finding signage applications in the vicinity of Caltrain stations. Way-finding within stations is an equally important strategy to encourage bicycle access to Caltrain stations, and should include:

- Maps with locations of all types of bicycle parking, stairway channels and ramps/elevators, relative to all station entrances and the platform
- Directions on where to board the bicycle car of trains on all platforms, and
- Routes to nearby destinations.

Figure C-9 illustrates the proper location of way-finding signs for cyclists at parking lot entrances to stations. In the context of their *Transit Connectivity Plan*, the Metropolitan Transportation Commission is currently creating a signage program at five Caltrain stations (see “Background” chapter 2). The outcome of this effort may guide future way-finding standards for other stations.



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Caltrain Bicycle Access Guidelines

BICYCLE SIGNAGE AT CALTRAIN STATIONS

FIGURE C-9

Appendix D | Bicycle Parking Guidelines

One of the key goals of the *Caltrain Bicycle Access and Parking Plan* is to encourage more people to pedal and park their bicycles at Caltrain stations. This appendix describes five key topics related to bicycle parking: type, quantity, location, maintenance and abandoned bicycles. Following these discussions is an overview of recommended bicycle rack and locker types.

Types of bicycle parking

All bicycle parking at Caltrain stations should be conveniently located, plentiful, intuitive, secure for long-term use, well-maintained and inexpensive. This section provides a brief overview of five types of bicycle parking with respect to security, access and cost. See later sections of these “Bicycle Parking Guidelines” for a more in-depth discussion of each parking type.

BICYCLE PARKING GUIDELINES

- Type
- Quantity
- Location
- Maintenance
- Abandoned bicycles
- Types of bicycle racks

Racks

Racks are free of charge, and can be used by anyone at any time on a first come, first served basis. The level of security provided by a rack is, to a great degree, dependent on location. Racks installed in areas with frequent pedestrian traffic provide more security, and are more likely to be used than those installed in hidden locations. The quality of lock used and the way in which the lock is applied also affect the security of bicycles parked at racks. Regardless of location, bicycle racks do not protect bicycle wheels, saddle or other

components and, unless installed under cover, leave bicycles exposed to the elements.

Typical rack-users include occasional bicyclists who have not procured a key or smart card for a bike locker or cyclists with inexpensive bicycles and passengers with bumped bicycles.

PARKING GUIDELINES FIGURES

- D-1: Inverted-U bicycle rack
- D-2: Multiple inverted-U racks
- D-3: "Wheel-bender" bicycle rack
- D-4: "Coat-hanger" bicycle rack
- D-5: Multiple rack diagram
- D-6: Racks installed in auto parking space
- D-7: Bicycle rack installation options
- D-8: Sheltered racks
- D-9: Sheltered racks
- D-10: Conventional bicycle locker
- D-11: Electronic bike locker smart card reader
- D-12: Electronic bike locker
- D-13: BikeLid bicycle lockers
- D-14: Locker dimensions

Conventional lockers

Unlike racks, bicycle lockers protect not only the bicycle, including both wheels and components, but helmets, lights, and other accessories.

Caltrain and other agencies provide over 1,000 conventional keyed bicycle lockers at stations

throughout the system (see Appendix F). These lockers, also known as "dedicated lockers" or "subscription lockers," protect bicycles from the elements and provide a higher degree of security than do bicycle racks. Keyed lockers are designed for frequent bicycle parkers who need a safe, guaranteed place to park and are willing to pay for it. A locker-renter always knows where her/his bicycle parking space is and is assured that it is available to her/him at any time. One barrier to conventional lockers is the effort cyclists must make to register for the locker and obtain the key.

The shortcomings of lockers from the operator's perspective are that they are inefficient (because each one sits empty when not in use by the renting cyclist); they occupy more space per bicycle than a bicycle rack; and are cumbersome to administer. A list of users must be maintained and turnover of the lockers managed, including collecting keys and changing locks. When this administration lapses, conventional lockers lose their appeal to cyclists. As Caltrain replaces and acquires new bicycle lockers, a move away from conventional keyed lockers towards electronic lockers should be considered.

Shared use parking

There are many types of "shared use parking" at Caltrain stations:

Day-use electronic lockers

Electronic lockers are similar to conventional key lockers in that they completely enclose the bicycle and require an initial registration. (While renters of conventional lockers need to register to obtain a key,

electronic locker customers register in order to obtain a smart card or to be able to make reservations via cell-phone.) Electronic lockers can be networked such that cyclists with a registered account or smart card can rent any unoccupied electronic locker at any station in the system (see Figures D-11 and D-12). This arrangement allows different cyclists to use the same locker at different times, thereby making better use of this resource than conventional lockers, which sometimes sit empty for extended periods. By replacing the need to track keys and semi-annual locker rent with a systemwide smart card system, electronic lockers reduce administrative overhead as well.

Pricing, typically a few cents per hour, can be structured to encourage high turnover in parking and discourage use for storing items other than those used for bicycle commuting. Tracking the use of electronic lockers will be critical to determine how much (if at all) bicyclists are willing to pay for this type of bicycle parking. As demand rises, an electronic locker network can be administered through an on-line reservation system.

Electronic lockers have been installed in several locations in the Bay Area, including Palo Alto and Sunnyvale. BART is implementing a large-scale installation of electronic lockers at several BART stations. Because this technology is relatively new, Caltrain should monitor the performance, operation and management of existing electronic lockers, as well as advances in electronic locker technology, before full adoption.

Day-use (bring-your-own-lock) lockers

An earlier version of day-use lockers allowed cyclists to use their own locks to secure the locker doors. These lockers were often abused by non-cyclists to store other items and by cyclists who left their locks in place even when not storing their bike, thereby precluding other cyclists from using the locker. Therefore, bring-your-own-lock day-use lockers are not recommended.

Bicycle sheds/unstaffed bicycle stations

Bicycle sheds (also known as bike shelters) and unstaffed bicycle stations are shared-access storage areas in which registered cyclists lock their own bicycles. Cyclists gain access to these facilities by registering for a key or key code. Bicycle sheds are considered less secure than lockers, since anyone who registers has access to the shed. Some bike sheds include small lockers for cyclists to store their accessories using their own padlocks. Bike sheds provide more bicycle parking capacity in a smaller footprint than lockers, so they should be considered at stations where parking demand is high, but space is limited. Security can be bolstered with surveillance cameras, human monitoring, visual transparency (such as wrought iron fencing), and by locating them in areas with plenty of pedestrian activity. (Note: cameras are only recommended in conjunction with human monitoring and action; otherwise, they do not appear to deter vandalism or theft.) Bicycle sheds, such as at the Mountain View station, charge a refundable key deposit but are otherwise free of charge, while others, such as the Palo Alto station's Bikestation, charge a per-use, monthly or annual fee.

Staffed bicycle parking facilities

Also known as valet bicycle parking, staffed bicycle parking facilities offer a high level of security and often provide repair and retail services to generate revenue to offset staffing costs and to provide additional services for users. Bikes parked in staffed facilities are typically not locked if they are checked in and out by the staff person. Staffing costs make such facilities more expensive to operate than other types of parking, so hours of operation can be limited. Cyclists who need to retrieve a parked bicycle after hours must make prior arrangements with the staff operator.

Other services or amenities sometimes offered at attended bicycle parking facilities include:

- Bicycle repairs
- Bicycle and electric car sharing
- Bicycle rental
- Bicycle maintenance classes
- Restroom, locker room and shower
- Tools and repair stands for customer use
- Bike tours
- Café/drinks/snacks

Staffed bicycle parking facilities that are subsidized typically offer free parking. These facilities have typically struggled to mature into self-sustainable operations. In the absence of subsidies, such facilities should consider charging for parking for revenue to help offset operating costs.

Bicycle station annual operating costs range from \$25,000 for a fully-automated, unstaffed facility to \$120,000-\$150,000 per year for a fully-staffed, full

service facility. Capital costs range from \$25,000 for a secure room or cage to over \$3 million for a more extensive facility.⁶

Shared parking: options and trade-offs

Determining the best type of bicycle parking to augment lower-security bicycle racks requires consideration of a number of factors:

Cyclists' usage patterns and potential demand

Considerations include how many spaces are needed, the duration and frequency of parking, and the average value of parked bicycles.

Available space or facilities

Is there enough space to install bicycle lockers or would a bike shed or bicycle station, which provide the same amount of parking in a smaller footprint, suffice? Is there an existing structure that could be used to house the shared bike parking?

Resources for parking administration

Who will manage the bicycle parking on a day-to-day basis? Who will respond to customer issues?

Available funding for capital/operating costs

Outside capital funding to construct bicycle parking facilities is much easier to come by than securing ongoing operations funding. Therefore, available

⁶ www.bikestation.org.

operations funding is a key determinant in the feasibility of staffed facilities (see Chapter 6).

Quantity of bicycle parking

Two key questions are at play when considering how much bicycle parking to provide. First, how many bicycles should each station accommodate? Second, what proportion of total bike parking should be bicycle racks, conventional lockers, and shared parking?

The total number of bicycle parking spaces at each station should be sufficient to meet current demand plus 50 percent of average bicycle boardings during the morning peak period

The goal of attracting 50 percent of current “bike-on-boarders” may be ambitious in the short-term, but some of this new capacity will be used by passengers who currently drive to and park motor vehicles at Caltrain stations. Adding enough bicycle parking to accommodate all current morning peak period bicycle boardings would be excessive in the short run; although demand at some stations may eventually reach this level.

The recommended breakdown by parking type is:

- Racks: 5-to-15% of total bicycle parking at each station
- Conventional keyed lockers: 5 –to-15 % of total bicycle parking at each station
- Shared parking: 70-to-90% of total bicycle parking at each station. (Includes electronic lockers, bicycle sheds, and staffed and unstaffed bicycle stations)

These proportions differ significantly from existing systemwide proportions (21% racks; 62% conventional lockers, and 16% shared parking) and represent a move away from conventional lockers toward various types of shared parking. See Table D-1 for current parking figures at each station. Table D-2 provides recommended levels.

Electronic lockers and attended facilities have recently been added to the stock of bicycle parking options at Caltrain stations. It will be critical to track usage of these resources. In fact, periodic surveying of the level of use of all types of bicycle parking offered at each Caltrain station should be conducted annually. If demand rises, more bicycle parking should be installed. If it falls, the amount should stay the same, but never be reduced. A bicycle parking survey should be conducted in tandem with regular monitoring and removal of abandoned bicycles in bike racks.

Location of bicycle parking

In general, bicycle parking should be located within view of the largest concentration of passers-by and as close as possible to platform access points.

There are two types of bicyclists to consider when selecting a location for bicycle parking: primarily, there are those bicyclists who intend to park at the station prior to boarding the train (“planned parkers”). There is also a small minority of bicyclists who plan to take their bicycles onboard, but quickly decide to park their bikes at the station if they are about to get “bumped.”

The total number of bicycle parking spaces at each station should be sufficient to meet current demand plus 50 percent of average bicycle boardings during the morning peak period.

Table D-1: Existing bicycle parking capacity¹

Station	Capacity				Occupancy	Boardings
	Total racks	Total keyed lockers	Other bike parking ²	Total parking spaces	Total occupancy ³	50% of AM bike boardings
San Francisco	22	180	130	332	215	93
22 nd Street	12	0	0	12	10	30
Millbrae	28	53	0	81	32	13
San Mateo	6	24	0	30	26	23
Hillsdale	12	22	0	34	14	25
Redwood City	20	52	0	72	54	34
Palo Alto	61	96	96	253	155	32
Mountain View	25	116	52	193	156	43
Sunnyvale	15	75	4	94	41	25
San Jose Diridon	18	48	0	66	40	31
Totals	219	666	282	1,167	743	348

1. Covers ten stations profiled in Chapter 4 only.

2. Includes attended and automated bicycle parking facilities and electronic lockers.

3. Includes bicycles parked at fixtures not designed for bicycle parking, such as signposts and railings.

Table D-2: Recommended bicycle parking

Station	Rec'md total spaces ¹	Min add'l parking spaces ²	Recommended range of new pkg ³						Strategies to attain totals				
			Low 5%		High 15%		Low 70%		High 90%		Upgrade key to e-lockers ⁵	Add'l e-lockers ⁶	Rack relocation for bumped bikes ⁷
			Total rack range		Total key locker range		Total shared parking range ⁴						
San Francisco	308	0	15	46	15	46	216	277	134	0	0		
22 nd Street	40	28	2	6	2	6	28	36	0	36	0		
Millbrae	45	0	2	7	2	7	32	41	41	0	2		
San Mateo	49	19	2	7	2	7	34	44	18	18	2		
Hillsdale	39	5	2	6	2	6	27	35	16	12	4		
Redwood City	88	16	4	13	4	13	62	79	40	24	0		
Palo Alto	187	0	9	28	9	28	131	168	68	0	2		
Mountain View	199	6	10	30	10	30	139	179	86	6	2		
Sunnyvale	66	0	3	10	3	10	46	59	65	0	2		
San Jose Diridon	71	5	4	11	4	11	50	64	38	12	0		
Totals	1,092	78	55	164	55	164	763	981	506	108	16		

1. Includes all types of bicycle parking and is based on Appendix C recommendation of current demand plus 50 percent of AM peak bicycle boardings
2. Difference between number of recommended spaces and existing total parking. No recommendation to remove parking if difference is less than zero.
3. Recommended bicycle parking breakdown based on calculations summarized above and in Appendix C.
4. Shared parking includes attended and automated bicycle parking facilities and electronic lockers.
5. Calculations based on providing at least low end of recommended quantities of key lockers and retrofit remaining existing key lockers (if any) to e-lockers.
6. New e-locker amounts are the difference between Appendix C recommended shared parking amounts and upgraded e-locker amounts (see note #5.)
7. See page 116 for bumped bike parking notes (amounts are a portion of "New rack range" numbers):

Table D-2 (continued)

Bicycle parking for bumped bicycles notes:

- SF: No racks; center board
- 22nd: No NB racks b/c no bumps
- Millbrae: 2 on NB platform
- San Mateo: Both on SB platform; need paving; no width for NB platform
- Hillsdale: 2 NB, 2 adjacent to SB
- Redwood City: 2 adjacent to NB platform
- Palo Alto: 2 NB in ped area between ADA ramp and Alma Street in new platform reconfiguration
- Mountain View: In ped area adjacent to SB platform
- Sunnyvale: 2 NB; no SB bumps
- San Jose: No racks; center board

For planned parkers

Bicycle parking should be located no further from platform access points than the closest motor vehicle parking space, thereby maximizing legal biking distance and minimizing the distance needed to walk one's bike. Bicycle parking need not be close to the bike-car end of the platform, because cyclists who have parked their bikes may board any car of the train, like any general passenger.

Where space permits, bicycle parking should be split between the sides of the tracks in proportion to the number of parking cyclist-passengers boarding in each direction in the morning. For example, if three-quarters of those who park their bicycles at a given station in the morning board northbound trains, then three-quarters of the bicycle parking should be located on the northbound platform side of the tracks.

For bumped bicycles

Beyond providing ample bicycle parking for Caltrain passengers who plan to park their bicycles, one or two bicycle rack spaces are recommended at stations with frequent bumpings. These spaces need to be as close to the bicycle car as possible without hindering operations or creating an obstacle to other passengers. Racks for this purpose should be designated as "Priority for bumped bikes." Caltrain's station design guidelines do not allow bicycle racks to be installed on center-boarding platforms, or on any platforms less than 16 feet wide.

Other considerations when locating bicycle parking include security, relationship to other passengers and shelter from the elements:

Security

All bicycle parking should be located in plain view of frequent pedestrian traffic, particularly bike racks. Cyclists are acutely sensitive to the level of foot-traffic in the vicinity of bike racks. Many cyclists chose not to use isolated racks, and instead lock their bikes to fixtures in plain view of pedestrian traffic to minimize the chances of the bike being stolen. For the safety of cyclists parking and retrieving their bicycles, and to enhance bicycle security, all bicycle parking should be well-lit at night.

Relative to other passengers

While it is important to place bicycle parking in convenient locations for cyclists, it is also critical that their placement not be inconvenient to or obstruct other Caltrain passengers. For instance, racks should be installed parallel to passenger flows to and from the trains.

Shelter

Whenever possible, canopies or awnings should cover bicycle parking. . Constant rain in the winter takes a toll on exposed bicycles, but constant summer sunlight can be worse. Bike lockers' useful lives can be extended as well, if protected from direct weather elements. Cyclists and other passengers can also take refuge under these covers (see Figures D-8 and D-9).

Bicycle parking maintenance

Bicycle parking must be routinely maintained to remain effective and attractive to cyclists. Needed upkeep varies by bicycle parking type:

Bicycle Racks

Properly coated and installed, bicycle racks will last up to 20 years with little or no maintenance other than an occasional sweeping in the vicinity of the racks.

Bicycle Lockers (keyed and electronic)

Lockers require somewhat more effort to maintain than bicycle racks due to their enclosed nature. Dirt, dust, spider webs and litter tend to accumulate inside vacant lockers. All bicycle lockers should be inspected every three-to-six months for the following reasons:

- To ensure that hardware and software are functional and contact information is posted
- To note damaged lockers that have not been otherwise reported, and to repair them. Damaged lockers should be repaired as quickly as possible, to avoid creating the impression that the lockers are neglected, and
- To ascertain that lockers are being used to store bicycles and bicycle-related equipment. If it appears that a conventional locker is being misused, the renter on record should be notified of the potential violation, and be subject to Caltrain canceling the rental agreement and re-keying the locker. Caltrain should remove non-bicycle-related equipment

locked in electronic lockers that is visible through the perforated doors.

Abandoned bicycles

At times, cyclists lock their bicycles to racks at Caltrain stations and never retrieve them. Regardless of the reasons behind abandoned bicycles, it is very important that they be removed in a timely manner. These bicycles take up valuable parking space and convey the message that bikes parked at Caltrain stations are vulnerable. Bicycle racks at all Caltrain stations should be surveyed every three-to-six months, according to the following procedure:

- A notice should be attached to every bicycle locked to a rack or other fixture, regardless of condition, that states that the bicycle will be impounded after 30 days if the notice tag is not removed by then.
- Thirty days after tagging, Caltrain (or other another party delegated by Caltrain) should remove all bicycles that still have tags on them.
- These bicycles can be reclaimed from Caltrain with proof of ownership within 30 days after impoundment.
- After 30 days, bicycles should be auctioned or donated.

Locker and rack maintenance and abandoned bike inspections should be performed during the same station visit. The frequency of inspections may vary; stations with higher volumes of bicycle use should be checked more frequently than stations where fewer bicycles are parked. All station racks and lockers should be surveyed and cleared of abandoned bicycles

at least each spring, before the onset of the summer high-volume bicycle traffic season.

Types of Bicycle Racks

The rack design preferred by Caltrain is the “inverted-U” bicycle rack (Figures D-1 and D-2). Future rack purchases and replacements should comply with the following considerations:

BICYCLE RACK SELECTION AND PLACEMENT CONSIDERATIONS

- Design
- Materials and coatings
- Spatial requirements
- Installation

To protect bicycles and wheels from theft and damage, there are several criteria to consider when selecting a bicycle rack design:

Design

Rack Profile

Bicycle racks should be a minimum of three feet tall to allow bicycles to lean against them without putting pressure on the wheels, and to enable a lock to pass through the frame and at least one wheel. Racks should not be so low that someone could trip over them under low light conditions.

Lockability

The bicycle rack should allow the frame and at least one wheel to be locked with a conventional high-security lock, such as a U-lock.

Stability

The rack should support the bicycle at at least two contact points.

Wheel protection

The bicycle rack must not bind or trap the wheels of the bicycle independent of the frame, or the wheels will bend if the bicycle gets knocked over. When the bicycle is supported in two places, this is less likely to happen.

Types of racks that are not recommended

- **Rack Ills, or any rack with movable parts:** These racks require more maintenance than other models, and can scratch bicycles’ paint.
- **“Wheel-bender” designs:** These racks, which have been around for years, have long rows of vertical bars through which the user slides the front bicycle wheel (Figure D-3). Wheel-benders do not provide two points of contact, nor do they allow a U-lock to capture the frame and one wheel.
- **“Coat-hanger” racks:** These racks do not provide stable support at two points of contact (Figure D-4).
- **Concrete blocks:** Concrete blocks—of the sort used as parking lot wheel-stops—are outfitted with a slot for the bicycle wheel and a metal ring to which the bike can be locked. Like wheel-benders, these racks do not provide two points of contact, nor do they allow a U-lock to secure the bicycle frame and one wheel.



Figure D-1: Inverted U- rack (recommended)



Figure D-2: Multiple inverted U- racks (recommended)



Figure D-3: “Wheelbender” bicycle rack (not recommended)



Figure D-4: “Coat-hanger” rack (not recommended)

Materials and coatings

There are a variety of materials and coatings available for bicycle racks. The appropriate choice depends on available budget and aesthetic preferences. The primary options include the following, listed in order of preference in terms of durability and maintenance:

Stainless steel

Requires no coating and is attractive and virtually maintenance-free, but it is typically the most expensive material.

Vinyl coating

Can be somewhat more expensive than other options, but is one of the best when aesthetics and durability are considered. Vinyl requires minimal maintenance. Vinyl coatings are the most user-friendly of all the options because they will not scratch bicycles the way harder coatings will.

Powder coating

An excellent option because it allows all of the same color options as paint, but is very durable. Powder coating is usually the same cost as galvanized.

Galvanized coatings

Durable and much less expensive than stainless steel, but galvanized racks are not typically considered as attractive as other options.

Paint

Economical, but is not as durable as the other options. This is a major issue in the Bay Area where metal surfaces are subjected to alternating cycles of heavy

rain in the winter months and intense heat in the summer.

Stock

Whenever possible, racks should be constructed from square metal stock, since round stock may be vulnerable to pipe cutters.

Spatial requirements

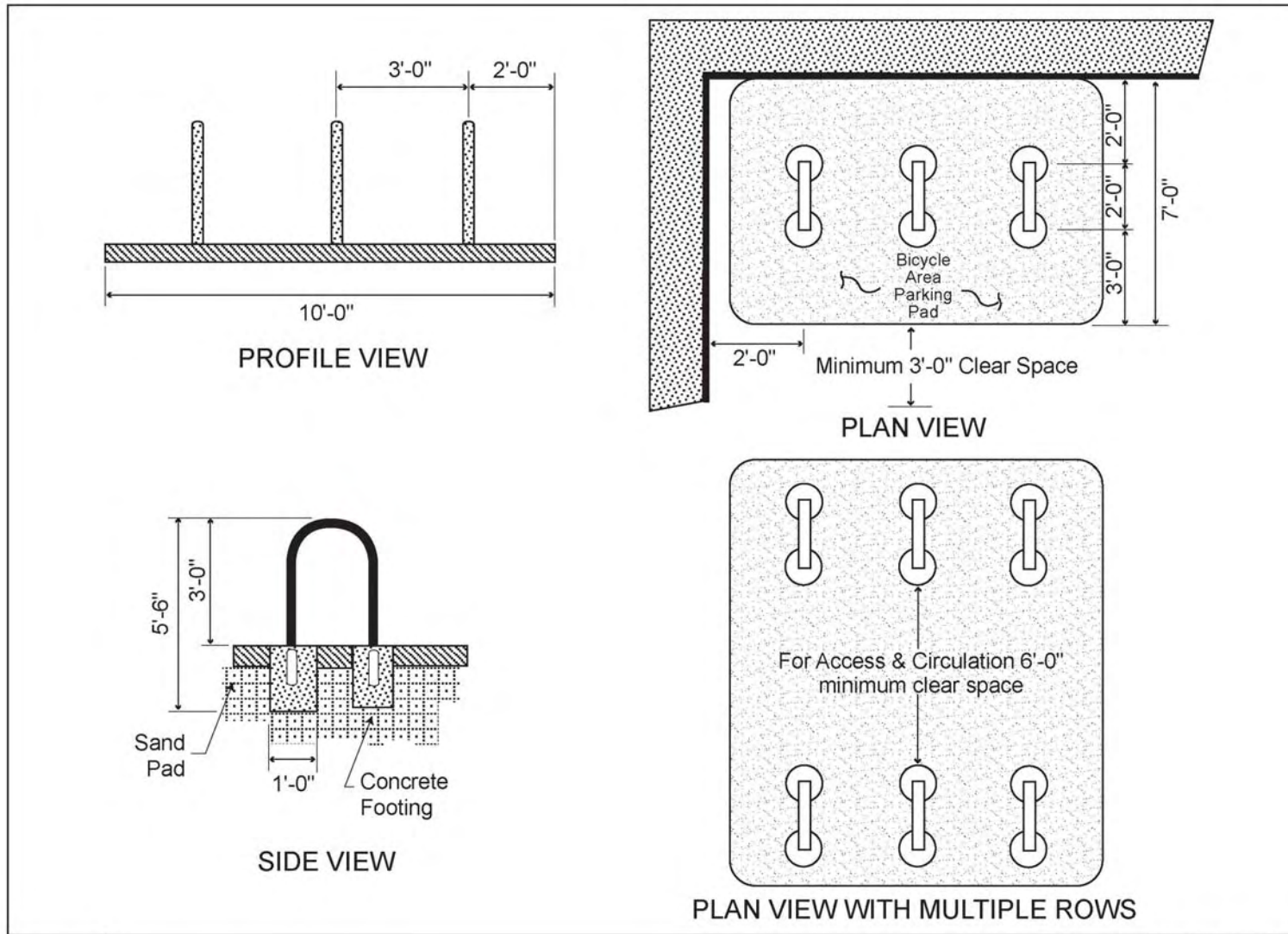
The most common mistake in installing bike racks is placing them too close to a wall or fence, or orienting them the wrong way, rendering the rack unusable. In addition, in order to accommodate a range of bicycle styles and sizes, racks must be installed to allow sufficient space between bicycles and between racks.

Spacing between bicycles

If there are two or more rack spaces (also known as “elements”) in a single rack, there must be a minimum of 30 inches center-to-center between bicycle tires when bicycles are locked side-to-side; otherwise, the handlebars of one bicycle can prevent another bicycle from parking in the adjacent space (see Figure D-5). Figure D-6 shows the proper dimensions if bicycle racks are installed in a vehicle parking space.

Spacing between racks

In addition to optimizing space by situating adjacent bicycles a sufficient distance apart, bicycle racks must be installed to allow sufficient space for bicyclists and their bicycles to move about between racks. In most cases, a standard bicycle footprint is six-foot long. Aisles between rows of racks must be a minimum of 48 inches wide.



Caltrain Bicycle Parking Guidelines

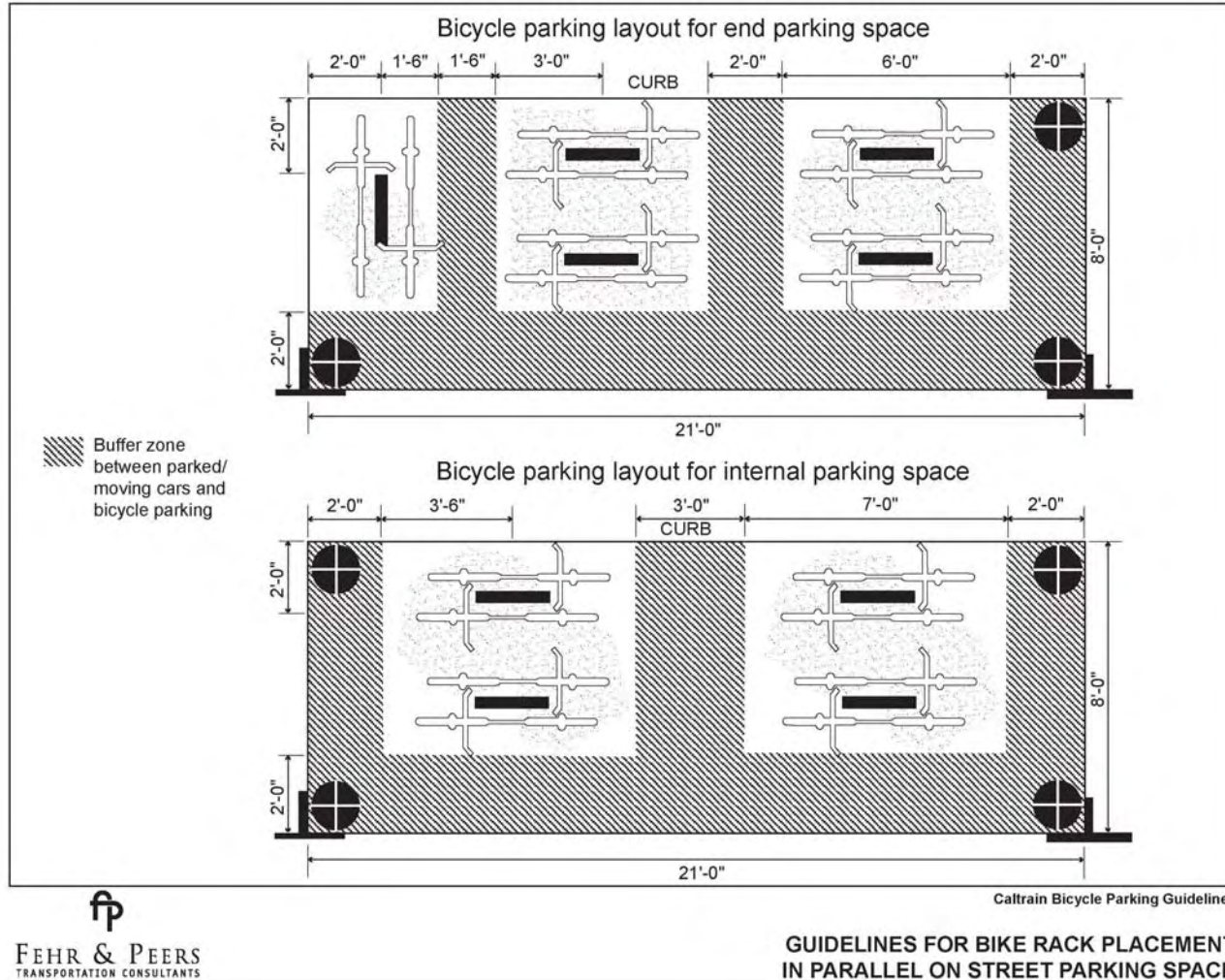


FIGURE D-6

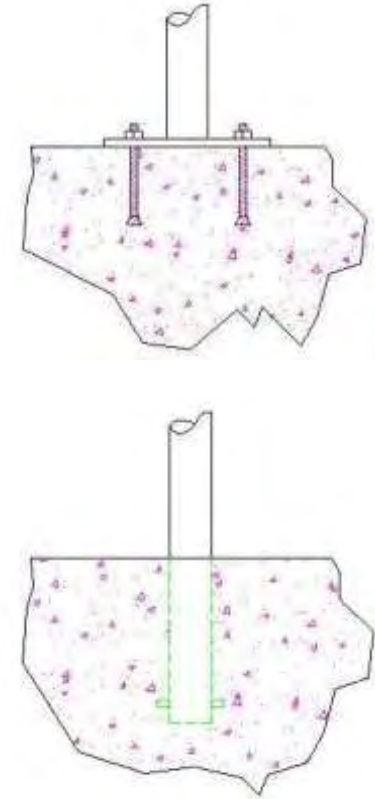


Figure D-7: Surface-mount bike rack (top) and embedded bike rack (bottom)

Non-standard bicycles

Tandem bicycles, recumbent bicycles, bicycles pulling a trailer and other non-standard bicycles all require parking that can accommodate longer and wider bicycles. Many times these spaces can be accommodated at the ends of standard racks, although these spaces are not typically reserved for such bicycles.

Installation

Bicycle racks should always be installed in concrete, rarely in asphalt, and never in soil. There are two primary types of bicycle rack installation: surface mount and cast-in place. Either is acceptable, but for certain rack models, only one installation type will work.

Surface mount

Appropriate where racks are being installed onto an existing concrete slab. Anti-tampering bolts and other hardware should be used to prevent theft of the whole rack. Surface-mounted bicycle racks should only be mounted in concrete; asphalt cannot securely hold the mounting hardware. If an asphalt substrate is all that is available, concrete footings should be poured (Figure D-7).

Embedded or cast-in-place

The best option for security purposes, but may be impossible if the rack installation location already has a slab poured or if the chosen rack type does not provide a cast-in-place option. Cast-in-place installation is appropriate for asphalt or concrete (Figure D-7).

Bicycle Lockers

As described above, there are two distinct types of bicycle lockers: conventional (see figure D-10) and electronic lockers (see Figures D-11 and D-14). Although locking mechanisms and management differ, the spatial requirements and appropriate construction materials of each are the same.

Spatial requirements

Bicycle lockers come in a variety of sizes, but the most common is approximately 40 inches wide by 48 inches high by 72 inches long, and accommodates two bicycles by having a diagonal divider inside the locker (see Figures D-12 and D-14). These lockers open from opposite sides, so they require adequate room on both sides of the locker to comfortably open the door and slide the bicycle in and out, which equates to six feet of clearance from each door (see Figure D-14).

Double-decker lockers

Double-decker bicycle lockers double parking capacity within the same footprint; however, they require cyclists using the upper level lockers to lift their bikes into the locker.

Appropriate materials

Bike lockers should have perforated doors, to enable visual monitoring of contents. Bicycle lockers can be constructed of the following materials:



Figure D-8 (top): Covered bicycle parking (Amtrak)

Figure D-9 (center): Covered bicycle parking

Figure D-10 (bottom): Conventional bicycle locker



Figure D-11: Electronic locker smart card reader



Figure D-12: Electronic bicycle locker

Stainless steel

The best material because it is the strongest and most durable, it reflects sunlight well, and requires the least amount of maintenance because it never needs painting.

Powder coated steel

The second best option. Although not as durable as stainless steel, powder coated steel is available in a broad range of colors (though dark colors should be avoided due to heat absorption in the summer) and will last many years.

Composite materials

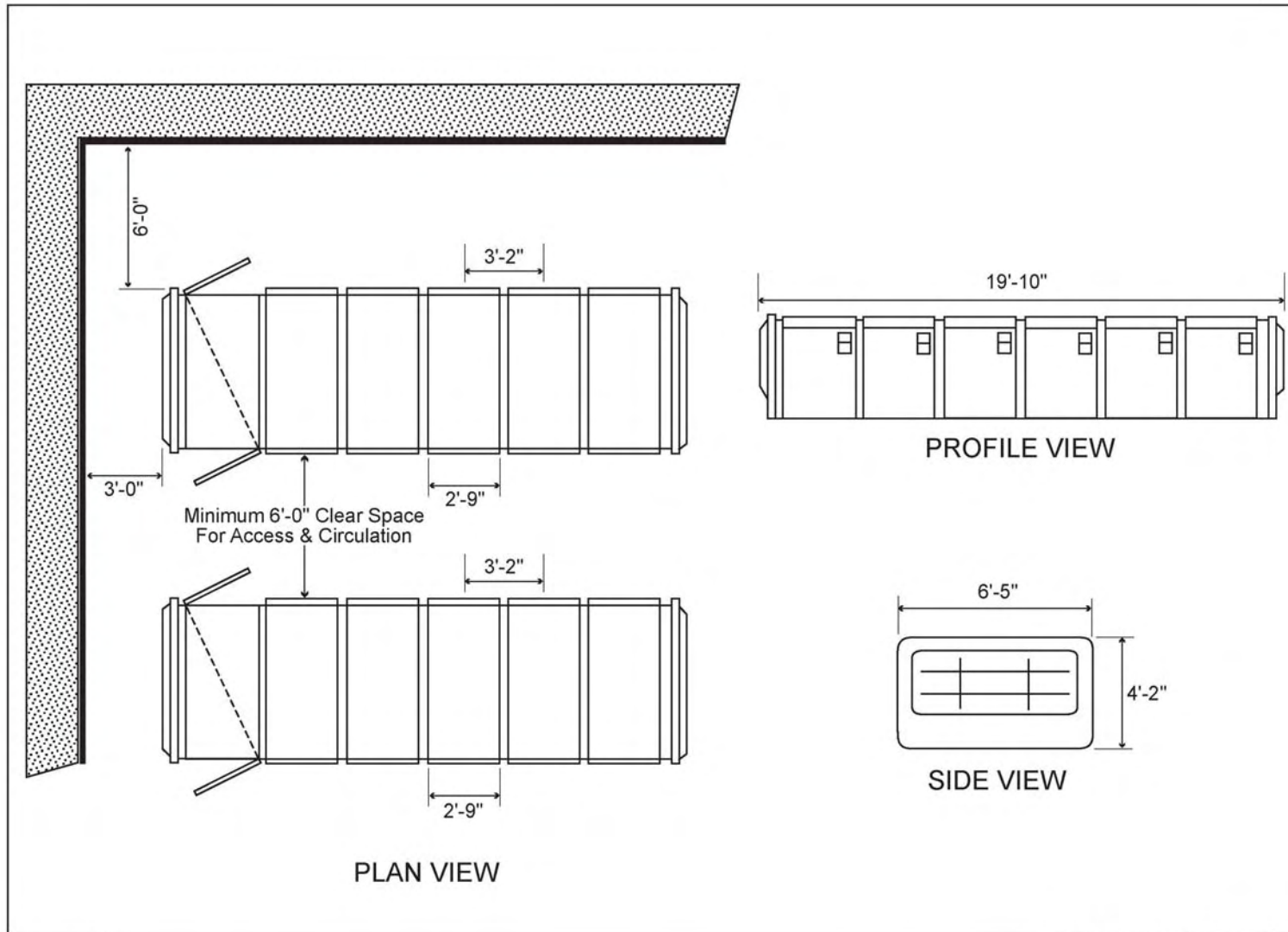
Composite materials such as resin-based materials, chip-board, and particle board should be avoided. These materials photo-oxidize and break down quickly, and are not as secure as steel lockers.

BikeLids

BikeLids are not recommended. These bicycle parking/rack hybrids completely cover a single bicycle and are locked using the cyclist's own U-lock (see Figure D-13). The function as bring-your-own day-use lockers, with the same flaw: cyclists who leave their locks in place to reserve it, even when not parking their bike there.



Figure D-13: BikeLids bicycle lockers (not recommended)



Caltrain Bicycle Parking Guidelines

Appendix E | Onboard Operations

The focus of this plan is on improving station-side accommodation of and facilities for passengers who bicycle to Caltrain stations. This appendix provides background information and context for Caltrain's bicycles-onboard program and rail operations. It addresses areas that fall outside of the plan scope, but which are of concern to the public (namely, onboard capacity, operations protocols, and future operations investments).

Popularity of the onboard bicycle program

Caltrain has one of the most generous onboard bicycle programs of all U.S. commuter rail operators. There are no peak hour or direction restrictions. Additional fees or permits are not required for bringing a bicycle onboard. Every train has a guaranteed 16- or 32 -bike space capacity: Bombardier bicycle cars carry 16 bikes; Gallery bicycle cars carry 32. Conventional bikes are permitted onboard in designated bike-cars only. Folding bicycles (that are folded) are allowed on any

car of the train. For safety reasons, passengers must walk their bicycles on all platforms.

A number of factors influence Caltrain passengers' decisions to bring their bicycles onboard the train:

Last mile connections

The "last-mile" link between the train station and home, or train station and ultimate destination may be underserved by transit, shuttles, or too far to walk. Automobile parking can be scarce and costly. Riding a bicycle overcomes many of these disadvantages. Situations in which the last-mile connection is poor for both ends of the train trip provide a strong incentive for passengers to bring their bicycles onboard the train.

Open-jaw trips

Open-jaw trips are those in which the passenger returns from a station other than the one at which he or she arrived, or in which the final destination is not the same as the original departure location. For instance, a

commuting cyclist who disembarks at the station closest to his/her work, but boards at a different station in the afternoon or a cyclist who disembarks at a station in the afternoon other than the one they boarded that morning, are making open jaw trips. Explanations for this pattern include needing to run an errand near a different station or the desire to get exercise.

Caltrain passengers with bicycles make a significant number of open jaw trips each day. Based on responses to the 2007 online survey, eight percent of respondents who bring their bicycles onboard regularly varied the station at which they board in the afternoon. An additional nine percent varied the station end in the morning, of which the most significant were 45 passengers with bicycles who regularly board at San Francisco in the morning, but disembark at 22nd Street in the evening. (See “Bicycle space availability” section, below, for an explanation of this behavior.) The ability to bring one’s bicycle onboard allows cycling passengers the flexibility of open jaw trips. Several factors account for open jaw bicycle trips on Caltrain, including:

Irregular train schedules and staggered stops

San Francisco and San Jose Diridon are the only stops that all Baby Bullet and limited express trains serve during peak periods. Between these termini, Baby Bullet trains stagger stops with great variation. For instance, some northbound Baby Bullets stop at Mountain View, while others stop at Sunnyvale. With a bicycle, passengers can board and alight at the station that best suits their schedule. In the example above, if a cyclist had parked his/her bicycle at the Mountain

View station in the morning, their afternoon train options would be limited to those that serve Mountain View, instead of having the flexibility to take a train to nearby Sunnyvale that might be faster.

Flexible schedules

Passengers who do not have fixed work schedules or otherwise have flexibility, can catch whichever train is scheduled to come first to whichever of two stations are within bicycling distance of their ultimate destination.

Bicycle space availability

Some passengers with bicycles board at a station upstream of their origin station to improve their chances of securing an onboard spot for their bicycle. The online survey revealed that, many cyclists who live near the 22nd Street station board at San Francisco station in the morning for this reason.

Variation in trips

Some people commute to different work sites on different days; make trips between home, school, errands and work; or have plans after work near a different Caltrain station than they used in the morning. Bringing a bicycle onboard allows this sort of variation in boarding and alighting locations in the course of one day’s activities.

Exercise

Some Caltrain passengers rely on the ability to bring their bicycle onboard Caltrain for their complete trip in one direction, and then cycle home or to a different Caltrain station for the return trip. The online survey showed that, among passengers with bicycles, exercise

was cited as the reason for almost 30 percent of open-jaw trips.

Weather and darkness

Cyclists who bicycle all the way to their destination in the morning may choose to take the train home when it is raining or darkness has fallen.

Barriers to bicycle parking

There are a number of factors that dissuade cyclists from parking their bicycles at Caltrain stations. These include fear of theft or vandalism, the cost of secure parking, lack of on-demand bicycle lockers (i.e., those that don't have to be rented ahead of time), and difficulties renting a bicycle locker (see "Locker rental" discussion in Chapter 3). For these reasons, cyclists sometimes find it more attractive to take their bicycles onboard, even if it is not needed at both ends of the trip.

No peak-hour restrictions

Unlike other rail operators, which typically have peak hour and direction restrictions against bringing bicycles onboard, Caltrain has no restrictions and provides space for at least 16 bicycles on every train. Caltrain's onboard bicycle capacity and the lack of peak period/direction restrictions has raised the expectations of many passengers with bicycles that there will usually be an onboard space for their bike; however, demand for peak hour onboard bicycle capacity is increasingly exceeding supply.

Onboard bicycle capacity

As noted above, Caltrain offers a generous onboard bicycle program and passengers with bicycles are appreciative of this effort. The onboard bicycle program is so popular and well-used that, even with relatively high capacity, a number of peak period passengers with bikes are unable to board due to capacity constraints, an occurrence known as "bumping." Passengers with bumped bicycles can still board the train, but must leave their bike at the station. Bumping happens mainly in peak periods; at stations with very high bicycle traffic volumes; and at the "earlier" stations of a peak direction run (because some passengers with bikes will have alighted by the time the train reaches later stations).⁷

Passengers with bumped bicycles either wait for the next train with the prospect that there may be space for their bike; park their bicycle so they can board the train without it; or bicycle to the next station in an attempt to board a limited stop run that serves that station. (Appendix D provides guidelines and recommendations for bicycle parking designed to accommodate bumped bicycles.)

⁷ A one-time survey, conducted in the morning and evening peak in September 2007, found 51 instances of bicycles unable to board due to capacity constraints ("bumping"). The survey also found that there were no instances of bumping when there were two bicycle cars of either type: Bombardier or Gallery; and only two instances of this occurring on a one-bicycle car Gallery train set.

Bumping is the primary source of frustration among passengers with bikes, due to the unpredictability and uncertainty of being bumped. Twenty-five percent of online survey respondents who formerly used bicycles in conjunction with their Caltrain trips quit doing so due to bumping concerns.

Adaptations

Passengers who regularly board with their bicycles at stations with high demand have developed adaptations to reduce their risk of being bumped, including:

- Arriving earlier at the station and waiting longer on the platform, to ensure being closer to the head of the bicycle-car queue.
- Riding an earlier or later train, i.e. during the shoulder of the peak period, or on a slower train, when there is less demand for onboard bicycle space.
- Boarding the train at a station that is farther from their destination than the desired station. This occurs most frequently in San Francisco: many cycling passengers live closer to the 22nd Street station, but cycle to and board at Fourth/Townsend in the morning to increase their odds of securing an onboard space for their bicycle.
- Using a folding bike, since there are no limitations on bringing folded bikes onboard.
- Using mobile device applications such as Twitter, to communicate with one another the bicycle car capacity of a given train on a particular day.
- Twenty-seven percent of users of the Warm Planet Bikes valet bicycle facility at San Francisco station

report that they used to bring a bicycle onboard the train, but no longer do.

Another option for passengers who need a bicycle on both ends of their Caltrain trip is to park one at either trip-end station. Although it requires owning two bicycles, this arrangement avoids the bumping issue altogether because neither bicycle is carried onboard. Less than 0.1 percent of online survey respondents (13 respondents) reported parking one bike at each of two stations.

Operational factors

A variety of operational factors affect the number of bicycles each Caltrain train can accommodate, including operations practice, rolling stock and fleet makeup. Safety and regulatory requirements are a consideration in all categories. Most of these factors fall outside the scope of this plan, but are noted here for information.

Operations' practice

A number of Caltrain policies and practices impact the bicycle capacity of each train, including efforts to reduce dwell time and conductor discretion. Dwell time is the number of minutes between the time a train comes to a stop in a station and the time it leaves that station. Dwell times are built into rail timetables and, together with travel time, determine how long a particular scheduled run will be. Dwell times have increased significantly with Caltrain's growing ridership.

Minimizing dwell time is essential for the efficient operation of Caltrain because it helps minimize travel time. The resulting shorter trips are valued by all Caltrain passengers, and provide a reliable and competitive alternative to the automobile. The success of the Baby Bullet service has reinforced these passenger priorities.

The current practice is for passengers with bicycles to board after passengers not carrying a bike, even when boarding the bicycle car, which can add to bicycle-related dwell time. It has been suggested by the public, and the Board of Directors has requested that in the near term, Caltrain examine the feasibility of a protocol to encourage passengers not carrying a bicycle onboard to avoid boarding and disembarking through the bike car doors. The public has also suggested reserving seats with views of the bicycle racks for passengers with bikes to help minimize opportunities for bicycle theft and vandalism.

It has also been suggested that spreading bicycle racks among various cars could reduce the number of bikes boarding one car at a particular time, thereby reducing their dwell time impact. This may be the case on transit systems in which train interiors are visible from the platform; however, Caltrain staff have investigated this arrangement and have found that it has the potential to, in fact, increase dwell time due to uncertainties of which car or cars have excess bicycle capacity, causing cyclists at times to approach multiple cars before finding one with spare capacity.

Conductors play an important role in the onboard bicycle program because they observe onboard bicycle occupancy and ensure that bicycle car capacity is not

exceeded. Conductors usually announce if there is a second bicycle car on the train. While they are responsible for enforcing the operating policies set by Caltrain, conductors also have discretion in addressing passenger issues on the spot. Some conductors may permit more bicycles onboard than the rated capacity, which may give passengers with bikes the misperception that onboard bike capacity is flexible.

Rolling stock

Caltrain operates two distinct types of rolling stock, which are not interchangeable: Gallery and Bombardier. Each train set comprises cars of one type or the other.

Gallery cars

These bi-level cars have a single center door, with three high steps leading to a vestibule. There are two seating areas, one on each side of the vestibule. Each lower seating area has double seats and stairs leading to the upper level. There is one row of single-file seats on each side of the upper level, with a center open-space in-between through which the lower level can be seen. This space is the “gallery.” Openings at each end of Gallery cars allow passengers to walk between train cars.

Caltrain’s Gallery fleet includes 27 bicycle cars, each with 32 bicycle parking slots in the lower level of the northern half of the car. Four one-sided bicycle racks sit along each of the two sides of the car, each of which has bungee cords for securing up to four bikes. The Gallery car bicycle racks were designed and retrofitted in the 1990s. The rack design was “grandfathered in”

to be compliant with FRA (Federal Rail Administration) regulations.

Thirty-two seats were removed from each Gallery bicycle car to create an arrangement that allows every cycling passenger a seat with a view of his/her bike in order to protect against theft and vandalism. Bicycle owners can also monitor their bikes from Gallery upper level seats.

Bombardier

Bombardier cars were put into service in 2002. Like Gallery cars, they are bi-level, but have a mezzanine at each end. Bombardiers have two entry doors and low floor boarding designed to facilitate access by disabled passengers, but which ease bicycle boarding as well.

The Bombardier fleet includes seven bicycle cars, the lower levels of which are equipped with three-sided “crib” racks, one along each car wall adjacent to each of the four doors. Eleven seats per car were removed for this configuration. Each crib has four bungee cords for securing bikes. Nineteen seats in the vicinity of the cribs allow each bicycle owner a view of his/her bike. Bombardier bike cribs were retrofitted after Caltrain took delivery of the rolling stock from the previous operator. This rack design also complies with FRA regulations.

Onboard bicycle storage

According to (FRA) regulations, bicycle racks on all rolling stock must conform to certain attachment

strength requirements⁸. In addition, Caltrain has the following requirements to ensure that the racks do not interfere with other aspects of rail operations:

- **Access to control panels:** Bicycle racks cannot block access to a car’s electrical, mechanical or other functional systems that are needed for the car’s operation and maintenance.
- **Safety:** The racks, including parked bicycles, cannot block doors, stairs or emergency access.
- **Ratio of bike spaces to seats within-view of racks:** In order to allow each passenger a seat within view of their bicycle, the number of seats within view of the bicycle racks should be equal to at least the total capacity of the racks.
- **Rack operation:** Racks must allow for quick and efficient storing and retrieval of bikes.

Within these constraints, Caltrain bicycle cars are configured to maximize bicycle capacity, while implementing Caltrain’s practice of providing a seat for every cyclist. Nearly 1,000 seats have been removed⁹ (the equivalent of eight cars) to make way for bicycle racks.

⁸ CFR 49 Section 238.233: Code of Federal Regulations Title 49 Section 238.233 requires that “interior fittings within a passenger car shall be attached to the car body with sufficient strength to withstand the following individually applied accelerations acting on the mass of the fitting: (1) Longitudinal: 8g; (2) Vertical: 4g; and (3) Lateral: 4g.”

⁹ 32 seats removed from each of 27 Gallery cars and 16 seats removed from each of 7 Bombardiers.

Removing more seats to accommodate increasing demand from passengers with bicycles has been suggested, but is an issue which falls outside the scope of this plan. However, to provide additional context some discussion is included here.

The original retrofits left one seat per bicycle space in each bicycle car. If additional seats are removed to accommodate more bicycles, then under crowded conditions some cyclists will need to stand in the bike car in order to have their bike in view, an arrangement some cyclists have said they would be willing to accept in exchange for increased bicycle capacity. Previously, seat removal was found to be infeasible because seats that are replaced by bicycle racks can no longer be used by other passengers when the bicycle racks are not used to capacity. The combination of additional bicycles and standing passengers crowded into the bike car would also interfere with conductors' ability to adequately move among train cars.

Another suggestion to increase physical bicycle capacity is external bicycle racks, similar to those common on public buses. This option has been considered and rejected in the context of CPUC rail safety regulations.

Fleet makeup

Caltrain operates 98 runs each weekday, with three types of service: Baby Bullet, limited stop and local. Relative to the amount of service provided, Caltrain's fleet is very small, with 20 train sets and a spare car ratio of ten percent. Eight additional Bombardier cars were procured in 2008, two of which are bicycle cars. Train sets are assembled and scheduled for their runs

the night before service, but cars are sometimes switched out immediately before the start of a run for unanticipated repairs or maintenance.

Each train set (also known as a consist) makes an average of four runs per day. During the course of those runs, a given consist may have excess passenger capacity in one direction, but be full on the return trip. Both Bombardier and Gallery train sets typically consist of five vehicles, assembled as follows, from north to south, irrespective of travel direction:

- Cab / bicycle car
- Trailer / ADA access car
- Trailer / luggage car
- Trailer or cab/bicycle car (depending on fleet availability: this is a filler car to complete a full five-car train-set)
- Locomotive (southern end)

The bicycle, ADA and luggage cars are configured for their respective specific purposes and are distinguished by decals next to the doors on the car exteriors.

Train-sets sometimes include two bicycle cars: the standard northern-end bicycle car and a filler car to make up a full train-set. When this occurs, the functional onboard bike capacity of the train is doubled, to 64 on a Gallery train or 32 on a Bombardier. Each consist makes an average of five trips per day and, given that there can be both planned and unplanned maintenance needs, it is difficult to consistently dedicate trains with higher bicycle capacity to runs with higher bicycle demand; however Caltrain makes every attempt to do so.

It has been suggested that boarding certainty would be increased and dwell time reduced if Caltrain communicated the presence of a second bicycle car in advance of a given train's arrival. At this time, this information cannot accurately be communicated until the train goes into service because train set assembly and run schedules are programmed the night before service and cars are sometimes switched out immediately before the start of a run.

Next Steps

The *Caltrain Bicycle Access and Parking Plan* is a vital step towards creating the first master bicycle plan for the Peninsula Joint Powers Board (JPB). The key recommendations of this plan include parking, access and customer service improvements. Beyond that are additional efforts to be pursued by the JPB to address the immediate concern of peak commute hour onboard bicycle capacity, outlined in this appendix. Additional studies focused on bicyclists who want or need to bring their bikes on the train will be pursued by the JPB. These studies – which will provide another step towards creating a bicycle master plan – will accomplish the following:

- Identify potential operational solutions, such as providing timely bicycle capacity information and boarding and alighting protocols for bicycles
- Conduct feasibility studies related to the innovative ideas identified in Chapter 5, such as bicycle sharing, a folding bike subsidy program, and bike capacity real time information
- Continue to pursue long term investments, such as the *Caltrain 2015* program, which provides the

ultimate solutions for increasing capacity for all riders by increasing frequency of service.

The recommendations resulting from these efforts will be considered in the context of a systemwide access policy to address the needs of all Caltrain riders and will guide investment decisions.

Access policy

The development of a comprehensive access policy will enable the Board of Directors to balance its mission to accommodate more passengers while providing access to the system via multiple modes, such as bicycling and transit. With guidance from the Board, future planning efforts to develop a comprehensive access policy that addresses these tradeoffs, provides investment guidance and considers the benefits and impacts of these decisions from a system-wide perspective is recommended.

Long-term operations investments

Caltrain's program to electrify the current Caltrain right-of-way and convert diesel trains to electric motive power and the *Caltrain 2015* program, a vision for rapid rail in the corridor, will affect Caltrain's onboard bicycle capacity in the following ways:

Increasing train/stop frequencies

One way that onboard bicycle capacity may be increased in the long run is through increased frequency from Caltrain electrification. By 2015, Caltrain plans to increase to six trains in the peak period, which will provide more opportunities for

trains to stop at high demand stations, thereby increasing bicycle capacity through increased frequency.

Future rolling stock

Caltrain electrification and *Caltrain 2025* call for ordering electric multiple units (EMUs) as part of the next phase of major service replacement and expansion, pending FRA approval. The interior design and capacity of the EMU bicycle cars is *yet to be determined*. The development of procurement specifications will begin in 2009. EMU rolling stock is expected to be delivered and in revenue service by 2015.

The procurement specifications process, which has not yet been developed, could consider various designs of onboard bicycle storage that are used on other rail systems, such as vertical storage and fold-up seats and could seek to maximize under-seat height to accommodate the widest possible range of folding bicycles.

A committee of bicyclists has already developed preliminary bicycle-car recommendations, which will be considered during the specification process.

It is anticipated that six Gallery bicycle cars and five-to-seven current Bombardier bicycle cars will remain in revenue service post-electrification.

Conclusion

A balanced approach to meeting the wide range of needs identified by and for the bicycling community is

needed. The first step will be to seek funds and implement the recommendations identified in the *Caltrain Bicycle Access and Parking Plan*, while pursuing other efforts to address the needs of bicyclists who want or need to bring their bikes onboard Caltrain.

Appendix F | Data Used to Inform Plan

The data obtained from several Caltrain surveys and an inventory of parked bicycles and bicycle parking provided the statistics on which the analyses and recommendations in the *Caltrain Bicycle Access and Parking Plan* were based. This appendix describes the results of these surveys and inventory.

Annual Passenger Count (February 2007)

Caltrain conducts this comprehensive survey each February, which counts each Caltrain passenger on every scheduled train once over the course of the month. Surveyors do not ask questions of passengers; rather, the number of passengers and bicycles are passively counted on each train when the doors close at each station. Although February's typically rainy weather and short daylight hours may limit the proportion of passengers who bicycle to Caltrain, this survey is conducted at this time of year in order to produce systemwide data that is comparable to the years of data sets from previous February counts.

The data presented in this plan is from the 2007 Annual Passenger Counts. It reflects the weekday morning peak period, which runs northbound from Train #101, which leaves the San Jose Diridon station at 4:30 am to #135, which arrives in San Francisco at 10:41 am; and southbound from Train #102, which leaves San Francisco at 4:55 am to #332, which arrives at Diridon at 9:58 am.

The Annual Passenger Count is an extremely rich source of data about where Caltrain passengers who bring a bicycle onboard trains board, relative to other, non-cycling passengers. For the 2007 Count, 924 cyclists with bikes—seven percent of all Caltrain passengers—boarded between 4:30 am and 10:41: am, 500 heading northbound and 424 southbound (see Table F-1).

Table F-1 Caltrain bicycle boardings (morning peak period)

Station	Passenger with bike boardings				Total passenger boardings				
	North-bound	South-bound	Total	% system bike boardings	North-bound	South-bound	Total pax boardings	% system total boardings	% total pax boardings w/ bike
San Francisco	0	186	186	20%	0	1,641	1,641	12%	11%
22nd St	0	59	59	6%	4	728	732	5%	8%
Millbrae	11	15	26	3%	308	643	951	7%	3%
San Mateo	20	26	46	5%	327	362	689	5%	7%
Hillsdale	36	14	50	5%	745	300	1,045	8%	5%
Redwood City	45	23	68	7%	545	235	780	6%	9%
Palo Alto	42	22	64	7%	656	166	822	6%	8%
Mountain View	75	10	85	9%	1,109	105	1,214	9%	7%
Sunnyvale	48	1	49	5%	1,104	36	1,140	9%	4%
San Jose	62	0	62	7%	1,128	1	1,129	8%	5%
Subtotal	339	356	695	75%	5,926	4,217	10,143	76%	7%
Remaining 23 stations	161	68	229	25%	2,250	970	3,220	24%	7%
Total all 33 stations	500	424	924	100%	8,176	5,187	13,363	100%	7%

Source: Annual Passenger Count (2007)

COMPARISON OF ANNUAL PASSENGER COUNT AND ONLINE BICYCLE SURVEY

The methodologies of the Annual Passenger Count and the Online Bicycle Survey are different. While the Count counted each Caltrain passenger on every train surveyed, the Online Survey asked a self-selected sample of passengers to report their behavior on a typical day. Although conducted just three months apart, the Passenger Count took place in February, when rain is common and darkness falls early. The Online Survey was conducted in late May, during a period of better weather and longer days.

Despite these differences, in the morning peak at the ten stations profiled in this plan, the two surveys found fairly consistent results. While 695 passengers with bicycles were observed during the Annual Passenger Count at the ten stations profiled in this plan, 699 current passengers responded to the Online Survey. However, when one looks at the station-specific data, the numbers diverge. For instance the Count saw 186 and 62 passengers with bikes board at the San Francisco and San Jose Diridon stations respectively, while the Survey showed 270 and 39 at the same stations. Although it is impossible to say exactly what factors caused these similarities and discrepancies, it is clear that the Annual Passenger Count provides a more reliable accounting of the patterns of Caltrain passengers who bring a bicycle onboard, while the Online Bicycle Survey provides important information about the habits and motivations of these passengers.

Online Bicycle Survey (May 2007)

Caltrain conducted an online survey of passengers who access Caltrain stations by bicycle, including those who park their bikes at the station and those who bring their bikes onboard. The survey was conducted over a twelve-day period in May 2007, when daylight hours are longer and the weather drier than the period in which the Annual Passenger Count was conducted (see previous discussion).

The Online Bicycle Survey was publicized via “Take One” cards distributed on trains; station bulletin boards; conductor announcements; postcards mailed to bike locker renters and Mountain View Bike Shed users; and notices attached to bikes parked at racks and

fixtures at all but four stations. (A high number of the mailed postcards were returned by the postal service, so locker renters may have been under-represented in survey results.) Announcements were also emailed to Caltrain’s Bicycle Access and Parking Plan Technical Advisory Group, local bicycle coalitions, and Palo Alto Bikestation users. (The San Francisco bicycle parking facility was not yet open at the time.) The 1,509 respondents were self-selected.

The online survey included 131 questions divided into sections for current cyclists, former cyclists and potential cyclists. Only responses of current cyclists are reported in this plan. The survey focused on revealing patterns of passengers who bicycle to

Caltrain stations in terms of: frequency; boarding and alighting locations; parking bikes versus bringing them onboard; and the reasons for bringing bicycles onboard.

All questions were asked about respondents' "regular" trips, rather than surveying on a particular day, like the Annual Passenger Count. The survey was not intended to be a scientific sample of Caltrain passengers who bicycle to access the train; rather, it was a tool for Caltrain staff to gain a greater understanding of the habits and motivations of cycling passengers in order to encourage more people to bicycle to Caltrain (and fewer to drive or bring their bikes onboard) and design bicycle parking that is responsive to and accommodates more bicyclists.

The data from this survey is primarily qualitative. Because the Online Bicycle Survey neither counted every passenger, nor surveyed for a particular day, the boarding location analysis in this plan relies more heavily on the Annual Passenger Count, and the bike parking analysis on the various parking surveys.

Bicycle parking (various dates)

There were three distinct surveys of bicycle parking data:

Bicycle rack and occupancy survey (May-June 2007)

Caltrain staff visited each station and recorded the number of bicycle rack parking spaces and the number of bicycles parked at racks and attached to other fixtures, such as signposts and railings.

Bicycle locker report (May 2008)

In May 2008, Caltrain's locker administrator, Amtrak, reported how many operable and inoperable lockers were at each station and the number of rented lockers. The City of San Mateo, which administers lockers at the San Mateo and Hillsdale stations, provided data in February 2008.

Bicycle facility reports (February 2008)

The three shared bicycle parking facilities at Caltrain stations—San Francisco's Bicycle Station, Palo Alto's Bikestation and Mountain View's Bike Shed—reported bicycle capacity and occupancy in February 2008.

Bump survey (September 2007)

In September 2007, Caltrain conducted a one-time bump survey of 48 trains (split evenly between northbound and southbound) in the morning and afternoon/evening peak periods. Surveyors counted the number of bikes onboard each train after the doors closed at each station, as well as the number of bikes, if any, left on the platform. (Passengers with bikes left on the platform were not considered to be "bumped" if there was still capacity in the bike car. In these cases, these passengers were presumed to be waiting for another train since various trains serve different stations.) Table F-4 provides the bump survey results.

When evaluating the bump data, it is important to look at the context. The bicycle capacity of a particular train depends on the train set configuration that day. For instance, a particular train may operate with a two-bike car Gallery trainset on one day, and a one-bike car Bombardier train-set on the next day. A train's onboard bike capacity can vary between 16 bicycles

(one Bombardier bicycle car) and 64 (two Gallery cars). In fact, no bumps occurred on trains with two Bombardier cars or two Gallery bicycle cars.

According to the survey report, the median number of bicycles on all trains surveyed was 15, near the limit of a Bombardier train set with one bicycle car. Fifteen of the 48 surveyed trains experienced bike volumes of 32 or more bikes (the capacity of a single Gallery bike car or two Bombardier bike cars). As with all survey information, the Bump Survey is a very limited data set, which represents a snapshot in time.

Table F-2: Bicycle parking inventory¹

Station	Racks ²		Fixtures ²	Abandoned ³	Lockers ⁴			Other bicycle facilities ⁵		
	Capacity	Occupancy			Capacity	Rented out	Inoperable	Capacity	Occupancy	Registered users
San Francisco	22	9	9	-	180	136	2	130	54	-
22nd St	12	3	7	1	-	-	-	-	-	-
Millbrae	28	17	-	1	53	16	-	-	-	-
San Mateo	6	3	8	-	24	15	6	-	-	-
Hillsdale	12	3	-	-	22	11	4	-	-	-
Redwood City	20	20	-	2	52	52	0	-	-	-
Palo Alto	61	55	12	27	96	92	2	96	11	63
Mountain View	25	29	2	5	116	91	2	52	25	80
Sunnyvale	15	14	1	1	75	41	-	4	-	-
San Jose	18	7	-	1	48	43	-	-	-	-
Subtotal	219	160	39	38	666	497	16	282	90	143
Remaining 23 stations	190	57	10	2	461	187	8	80	12	224
Systemwide	409	217	49	40	1,127	684	24	362	90	367

1. Occupancy and rented figures vary from day-to-day.
2. Based on counts in May-June 2007. Fixtures are fences, sign posts, light poles, benches and other items that are not intended for use as bike parking.
3. Based on counts in May-June 2007. Abandoned bike count based on appearances.
4. Based on May 2008 report (San Mateo and Hillsdale station data provided in February 2008.)
5. Based on February-April 2008 data from operators. Includes bike sheds, staffed bicycle stations and electronic lockers at Sunnyvale station.

Table F-3: Bicycle parking analysis

Station	Total spaces ¹	Total parked bikes ²	Percent parking occupied	Number of bikes parked at fixtures	% bikes parked system-wide	% system-wide bike parking capacity
San Francisco	332	218	66%	9	21%	17%
22 nd Street	12	3	25%	7	~0%	1%
Millbrae	81	33	41%	0	3%	4%
San Mateo	30	18	60%	8	2%	2%
Hillsdale	34	14	41%	0	1%	2%
Redwood City	72	72	100%	0	7%	4%
Palo Alto	253	158	62%	12	16%	13%
Mountain View	193	145	75%	2	14%	10%
Sunnyvale	94	55	58%	1	5%	5%
San Jose Diridon	66	50	75%	0%	5%	3%
Subtotal	1,167	766	61%	39	74%	61%
Remaining 23 stns	731	278	38%	10	26%	39%
Systemwide	1,898	1,044	55%	49	100%	100%

1. See Table F-2 for breakdown among various parking types.
2. Includes only bicycles locked to bicycle racks; excludes bicycles locked to other fixtures.

Table F-4: Bumped bicycle counts

Station	Train direction	Time of day	Total bumps	Percent total bumps	Total # of trains where bumps occurred	Number and type of bike car ¹
San Francisco	SB	AM	16	31%	2	1-B, 1-B
22 nd Street	SB	AM	12	24%	2	1-G, 1-B
Millbrae	SB	AM	3	6%	2	1-G, 1-B
San Mateo	SB	AM	3	6%	1	1-G
Hillsdale	NB	PM	3	6%	1	1-G
Redwood City	NB	PM	5	10%	1	1-B
Palo Alto	NB	PM	8	16%	2	1-G, 1-B
Mountain View	NB	PM	1	2%	1	1-G
Totals			51	100%	12	

1. B – Bombardier; G - Gallery

Appendix G | Estimated Costs

Item / Description	Cost*	Notes
Signs		
Double sided standard sign	\$300	E.g., bike parking locations; way-finding; bikes-on-board rules
Double sided custom sign	\$550	
Relocate sign	\$250	
Remove sign	\$150	
Install sign	\$350	
Install mast arm mounted sign	\$300	
Striping		
Install painted pavement legend (SF)	\$3	E.g., location where bike car stops, where cyclists should queue, etc.
Install themorplastic pavement legend (SF)	\$6	
Remove pavement legend (SF)	\$1	
Install painted stripe (LF)	\$1	

Appendix G

Item / Description	Cost*	Notes
Install thermoplastic stripe (LF)	\$1	
Remove stripe (LF)	\$2	
Bicycle parking		
Bicycle lockers	\$1,000	\$/bicycle; most lockers accommodate two bikes.
Electronic lockers	\$2,500	\$/bicycle; lockers accommodate one bicycle at a time, but their technology allows them to be used by multiple users each month, unlike conventional lockers. Cost based on recent BART purchase of 198 electronic bicycle lockers.
Retrofit mechanical lockers to electronic lockers	\$1,200	Cost based on recent City of Santa Cruz retrofit.
Bicycle rack - single inverted "U" rack	\$120-250	Assumes surface-mounted, hot-dipped galvanized rack. Add 10% for square racks. Unit price depends on size of order.
Multiple "U" racks	\$60	\$/bicycle; assumes surface-mounted, hot-dipped galvanized rack. Add 10% for square racks
Remove bicycle rack	\$200	Assumes a surface-mounted rack in concrete or asphalt
Relocate bicycle rack	\$250	Assumes a surface-mounted rack in concrete or asphalt
Sidewalks, ramps and stairway channels		
6" curb & gutter (LF)	\$32	
Sidewalk (SF)	\$8	Estimate can also be used for concrete pads.
Sidewalk removal (SF)	\$1	
Pedestrian ramp (Wheelchair)	\$3,750	
Bicycle Stair Channel	\$100,000	Cost assumes purchase and installation in a stand-alone project. Based on recent stair channel projects at Downtown Berkeley BART station.

Pavement	
A.C. overlay 1.5" Avg. (SF)	\$2
A.C. pavement removal (SF)	\$90
Lighting and signals	
Light pole w/foundation	\$2,300
200/250w HPS luminaire	\$550
New pedestrian signal	\$180,000
Rolling stock	
Bombardier car	\$2.65 million

Source: Fehr & Peers

Appendix H | Bicycle Issues at Other Stations

Beyond the ten Caltrain stations with the highest bicycle volumes profiled in this chapter are a number of other stations with bicycle-related issues raised by cyclists and/or proposed bicycle improvements in locally-adopted plans. Descriptions of these issues and plans follow.

Bayshore

The Bayshore station was renovated in 2004, with a new pedestrian/bicycle/ADA accessible overcrossing. There are no plans in the near future for additional bicycle access or parking or any other capital improvements at the Bayshore station.

South San Francisco Station

South San Francisco station is undergoing a major relocation project over the term of this plan horizon. The project proposes to move the South San Francisco

station 600 feet south of the current station location, to the intersection of Grand Avenue and Airport Boulevard, with direct access from West Grand Avenue and Airport Boulevard. A new, grade separated pedestrian/bicycle/ADA accessible underpass at the station will replace the existing at-grade crossing. In addition to providing access to the new center platform, the underpass will serve as a connection between the industries east of the station and the downtown area west of the station.

Burlingame

The *City of Burlingame Bicycle Plan* (2004) includes the following “high priority” project: Explore the possibility of a local bicycle path between the Broadway and Burlingame Commercial Areas and train stations using existing right-of-way along the Caltrain tracks, where there may be excess right-of-way

on either side of the tracks sufficient to install a Class I bicycle path.

This right-of-way belongs to either the Joint Powers Board which operates Caltrain, or the City and County of San Francisco (adjacent to California Drive). This project would have to be a joint effort in cooperation with these agencies and is a long range project. If the project is determined to be feasible, the *Burlingame Bicycle Plan* specifies that the path should be a joint use trail, with separate clearly designated areas for bicycles and for pedestrians. It is also recommended that a landscaped buffer be included between the railroad tracks and the pathway.

Menlo Park

Menlo Park Station is one mile north of Palo Alto station, so it is a convenient station for passengers with bikes to use instead of Palo Alto, depending on train schedules. There is a large bike shelter and a small bike shelter, both of which are key-operated. There is no contact information posted for the bike shelter. The City of Menlo Park is seeking upgrade the key/door lock with an electronic system using developer fees, as well as taking over administration of the shed(s) from Caltrain. In 2003, the City conducted a feasibility study of roadway undercrossings of the Caltrain tracks at Ravenswood and Oak Grove avenues. If one or both of these options are pursued, bicycle access should be included, or provided on nearby alternate routes. As this plan went to press, the City was proposing to develop a bicycle/pedestrian rail undercrossing at a location to be determined between Ravenswood Avenue and San Francisquito Creek

California Avenue

There is a need for improved bicycle parking at the California Avenue station. There is an existing bicycle/pedestrian undercrossing under Alma Street and the rail tracks, from Bowden Park to the California Avenue turn-around by the Caltrain station. The undercrossing is dark and narrow and is not ADA-compliant. Replacement and upgrade of the California Avenue undercrossing is included in the *City of Palo Alto Bicycle Plan* and in the draft 2008 *Santa Clara Countywide Bicycle Plan: Bicycle Expenditure Program*. The California Avenue station is being upgraded in 2008 to provide outside boarding platforms and a pedestrian undercrossing between the platforms.

San Antonio

Access to San Antonio station from north of Central Expressway is challenging. Potential redevelopment of the Mayfield site at the north-east corner of Central Expressway and San Antonio Road may lead to developer improvements in bike (and pedestrian) access to the station, based on the Mayfield Precise Plan adopted by the City in 2006. The City is conducting a feasibility study for a bicycle/pedestrian tunnel under Central Expressway to create a safer and more convenient crossing to the San Antonio Caltrain station. If found to be feasible, the tunnel will be a requirement of the Mayfield redevelopment project.

Santa Clara

Santa Clara Caltrain station is slated to be the terminus for the BART to San José extension and will therefore need a higher level of bicycle parking facilities, once revenue service begins. Currently, there are plans for

platform improvements, as well as an undercrossing between the Caltrain platforms. In addition to the two Caltrain tracks, there are four UP tracks at the station vicinity. PUC regulations prohibit an at-grade crossing at this location. As this plan was written, Caltrain and VTA were working on the design of an undercrossing. A chain link fence at the end of Brokaw Road has been installed to deter trespassers from crossing the six tracks from the station.