

BICYCLE PARKING GUIDELINES



3rd Edition

A set of recommendations from the Association of Pedestrian and Bicycle Professionals (APBP)



ASSOCIATION OF PEDESTRIAN
& BICYCLE PROFESSIONALS

Expertise for Active Transportation

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Bicycle Parking Guidelines, 3rd Edition

*A set of recommendations from the
Association of Pedestrian and Bicycle Professionals (APBP)*
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1

Introduction & Basics of Bicycle Parking

In the spring of 2002, the Association of Pedestrian and Bicycle Professionals (APBP) released the first edition of the APBP Bicycle Parking Guidelines, a basic guide for the selection and placement of bicycle racks. Since then, the rapid growth of bicycling (particularly in urbanized areas) has led to numerous innovations in the field of bicycle parking. This Third Edition of the APBP Bicycle Parking Guidelines expands on the original guide and is intended as a comprehensive resource for practitioners.

This guide includes:

- General bicycle parking principles
- Definitions of bicycle parking terms
- Elements of effective racks and lockers, including specific performance criteria
- Site design and layout, including guidance by land use type
- Maintenance best practices
- Variety of parking types such as sheltered parking and in-street bicycle corrals
- Sample bicycle parking policies and ordinances



Bike parking storage/wayfinding in Minneapolis, MN
(Photo: John Dempsey)

APBP's 2012 Bicycle Parking Guidelines have been cited and included in many bicycle plans and community policies and ordinances. This new edition of the guidelines is appropriate for local adoption and supports the design, installation, and management of high quality bicycle parking facilities.

About this Guide

These Guidelines have been developed to aid transportation professionals ensure the provision of ample, secure, and convenient bicycle parking. The document provides step-by-step guidance on how public agencies or private parties can plan, install, and evaluate the needs for bicycle parking on public and private property. While each jurisdiction's Planning Code may set the minimum specific requirements for the amounts of bicycle parking necessary in that jurisdiction, this Guide provides best practices and thresholds for determining the need, spacing, materials, specifications, and overall best practices for designing and constructing short- and long-term bicycle parking.

The Guidelines have been organized into five (5) chapters:

Chapter 1 provides an introduction to the document, the importance of the provision of bicycle parking, as well as definitions of core concepts utilized throughout the guide.

Chapter 2 presents a set of early considerations for the implementation of bicycle parking, including associated costs, funding, equity implications, units of measure, and minimum standards.

Chapter 3 includes guidance on site planning, and short-term and long-term parking locations.

Chapter 4 shares information about the bicycle rack selection process and which types of bicycle parking are suitable for different contexts.

Chapter 5 provides guidance on the installation and maintenance of the different types of bicycle parking, and weather considerations.

Why is Bicycle and Micromobility Parking Important?

Bicycle parking, as well as parking for scooters and other forms of micromobility, is a critical component to building a seamless, convenient, and functional bicycle and multimodal transportation network. Bicycle and micromobility parking is an essential element for people who use these modes of transportation to access residential, employment, retail, and other destinations, as well as connecting to public transit and other forms of transportation. It is necessary to provide facilities to securely store bicycles to discourage theft.

Without bicycle parking, people may be relegated to parking their bicycle in an unintended location, such as to a street tree or a signpost, which can be less secure and potentially block pedestrian access. Alternatively, people who bike may be forced to bring their bicycle inside the destination or forgo a trip altogether if suitable bike parking locations are not provided. Additionally, bicyclists who live in high-density neighborhoods, or employees of high-density commercial areas, must also address the issue of where to store their bicycle while at home or work. Conveniently located and well-designed bicycle parking helps increase peoples' comfort and confidence to leave their bicycle unattended, which can help increase the number of people who choose to bike and use micromobility devices for their traveling needs.

Bicycle parking has additional benefits for non-bicyclists:

- *Bicycle parking is good for business.*
 - Bicycle racks provide additional parking spaces that customers can use to patronize local businesses.
 - Bicycle parking requires less space than motor vehicle parking; businesses can leverage less square footage to provide more parking and more spaces for potential customers than motor vehicle parking.
 - Bicycle racks not only invite bicyclists in, but also announce to potential bicyclist and non-bicyclist customers alike that the business supports

sustainability and equity, which are increasingly important factors for many consumers.

- *Designated, well-designed bicycle parking promotes a more orderly streetscape and preserves pedestrian accessibility by:*
 - Presenting a more orderly appearance for buildings.
 - Preventing damage to trees and street furniture.
 - Providing traffic calming elements to the street.
 - Keeping bicycles from falling over.
 - Encouraging bicyclists to park in locations that do not encroach on the pedestrian walkway.
- *Bicycle parking helps legitimize bicycling as a transportation mode.*
 - Bicycle parking provided at all destinations normalizes the use of bicycles.
 - Conveniently located bicycle parking increases the visibility of bicycling as an everyday transportation mode, encouraging people to try bicycling.
 - Consistently provided bicycle parking indicates

While this guide refers to "bicycle" parking, people who use micromobility devices such as scooters and skateboards also benefit from parking facilities and should be considered when planning and building bicycle parking. In some instances, bicycle parking facilities can also be used for a variety of micromobility modes, but others like skateboards and small kick-scooters require different types of racks to properly secure these devices.



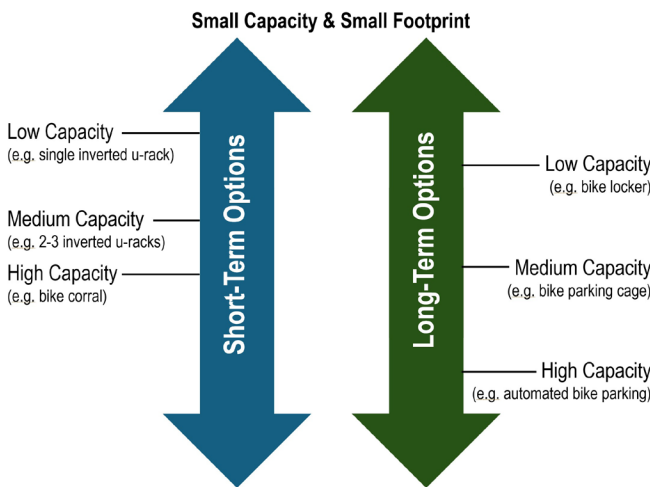
Core Concepts

Bicycle parking facilities can be divided into two overarching categories: short-term and long-term parking. The following table describes the differences between the two:

TABLE 1.1 Criteria for Short-Term and Long-Term Bicycle Parking

Criteria	Short-Term	Long-Term
Parking duration	Less than two hours	More than two hours
Fixture types	Simple bicycle racks	Lockers, bike racks in secured areas
Weather protection	Often unsheltered	Sheltered or enclosed
Security	Typically self-lock, passive surveillance (eyes on the street)	Secured, active surveillance
		Unsupervised:
		“Individual-secure” such as bicycle lockers
		“Shared-secure” such as bicycle room or cage
		Supervised:
		Valet bicycle parking
		Paid bike parking area of transit station
Typical Land Uses	Commercial or retail, medical/healthcare, parks and recreation areas, and community centers	Residential, workplace, and transit

FIGURE 1.1 Bike Parking Capacity and Footprint (Toole Design)



The majority of bicycle parking is short-term parking. Even communities with a large amount of bicycle parking mostly have short-term facilities. In some cases, short-term parking can function as long-term, through strategies such as shelters and locating parking in areas with high pedestrian volumes (i.e., eyes on the street or passive surveillance). However, successful long-term parking almost always offers a superior level of security.

Secure long-term parking should always prevent non-users from accessing the bicycle parking area (e.g., lockers, user-restricted or valet parked bicycle rooms or cages) which also prevents access to bicycle accessories (e.g., helmets, lights, panniers) so that a bicyclist does not have to remove them.

FIGURE 1.2 Short vs. Long Term Bike Parking



Bicycle and Micromobility Sizes, Shapes, and Needs

The overall dimensional envelope (height, length, and width) of the modern bicycle (two inline wheels of equal or nearly equal diameter) has not changed much for over a century. The dimensions of common conventional bicycles fall within the range pictured below, and most acceptable bicycle racks and lockers accommodate these dimensions. This guide refers to the top tube, down tube, seat tube, and front and rear wheels in describing recommended bicycle parking practices; these elements of a bicycle frame are shown in the diagram.

Modern bicycle parking fixture designs and site layouts should strive to accommodate other bicycle types such as recumbents, folding bicycles, adult tricycles, trail-a-bike child carriers, bicycle trailers, longtail cargo bikes, and any number of larger racks and baskets, which are more and more common on utility bicycles. There is often a connection between a particular land use and a certain bicycle type (e.g., cargo bikes or trailers at grocery stores or child trailers, cargo bikes, and trail-a-bikes at schools). Additionally, micromobility devices come in a variety of shapes and sizes that may not be suitable for securely locking to bicycle racks, which may require specific racks at places where these devices are prevalent (e.g., kick-scooter and skateboard parking at schools).

FIGURE 1.3 Common Bicycle Elements

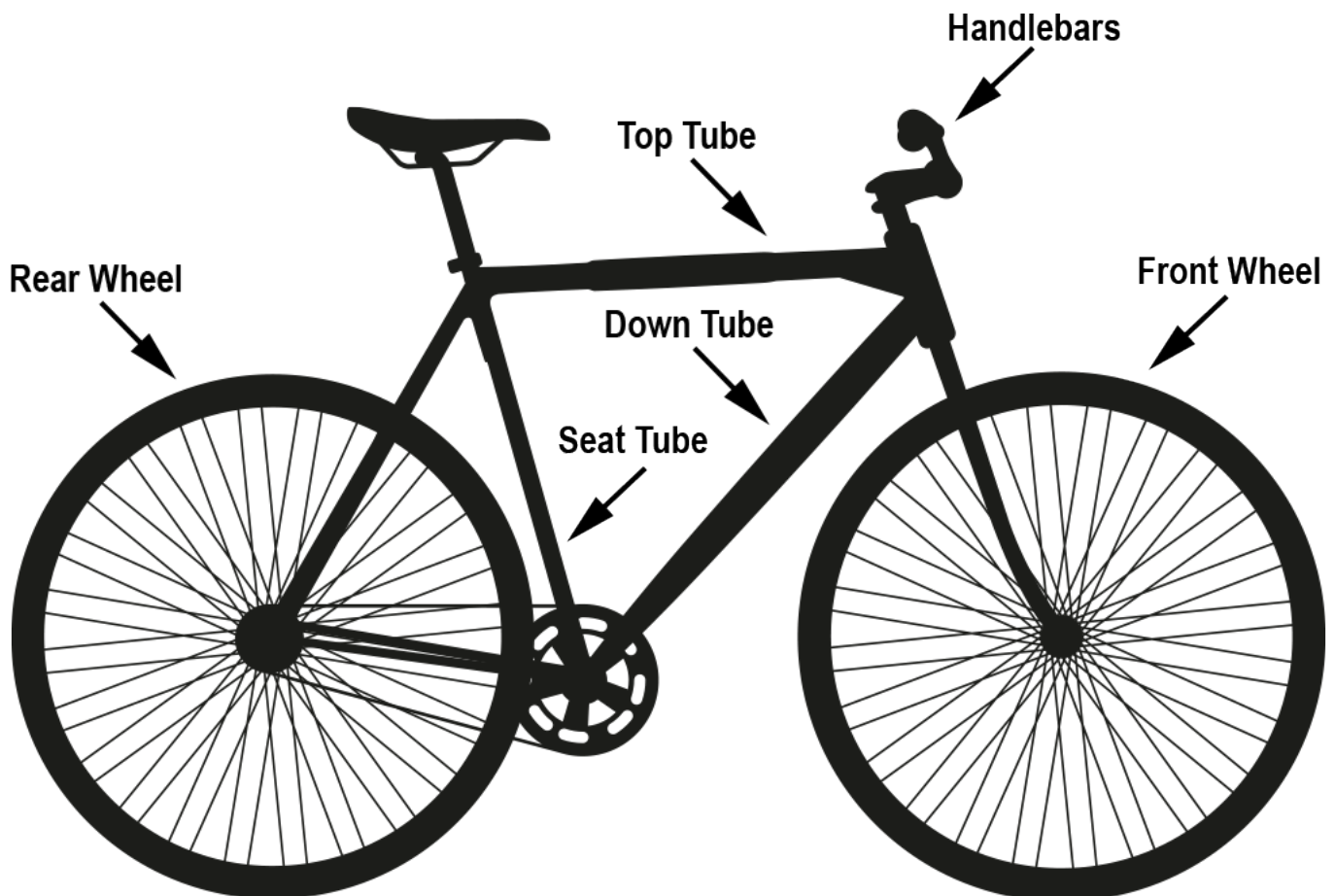
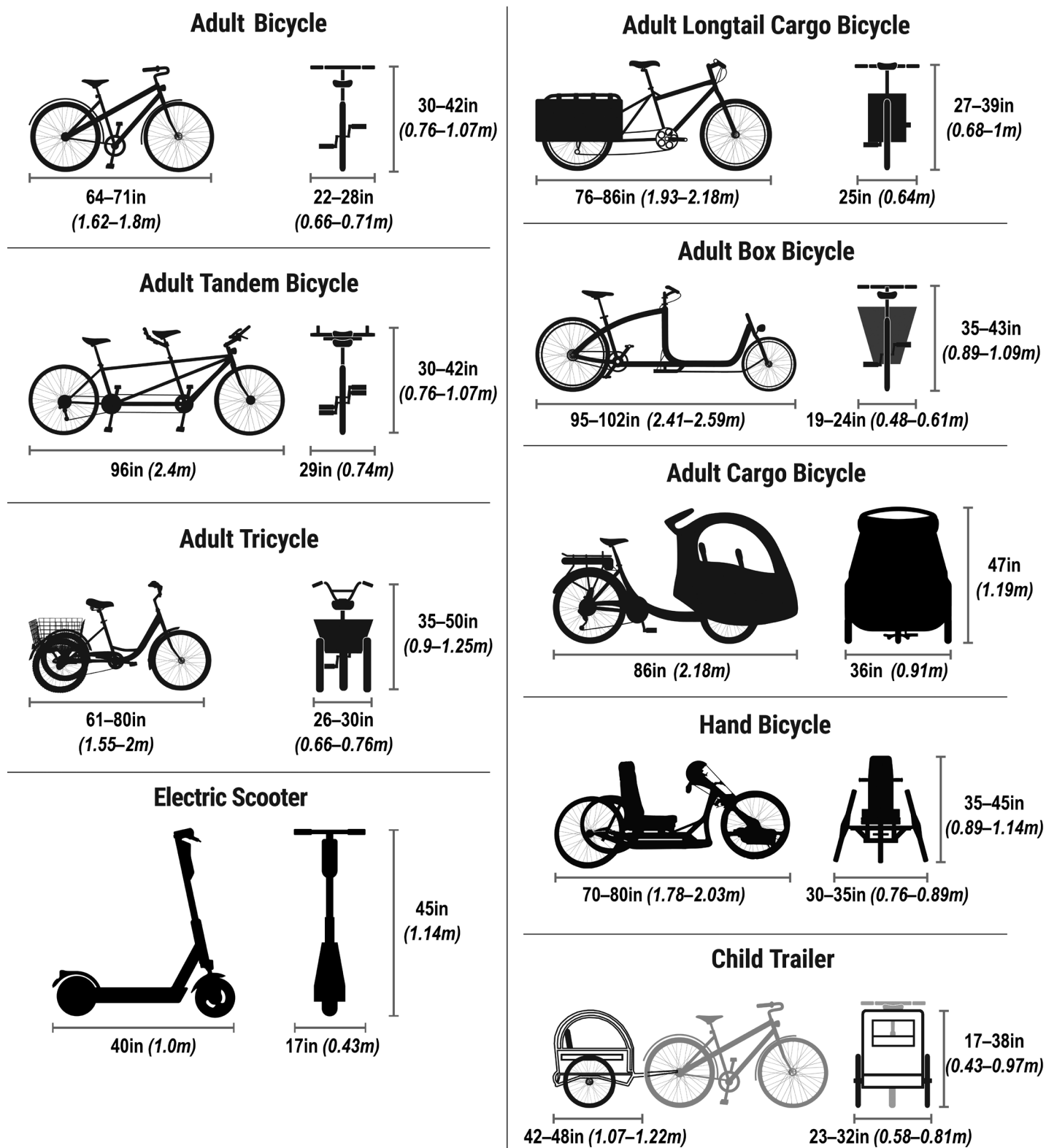


FIGURE 1.4 Common Bicycle Types and Dimensions (Toole Design)



Definitions

Code: Collection of laws [Webster's Dictionary]. As with other development requirements, codes governing bicycle parking are usually legislated by the local body of elected officials from a city, town, or county. Codes contain regulations which are applied generally to enforce policy. Codes are typically mandatory and must be complied with.

Policy: A specific statement of principle or of guiding actions that implies clear commitment but is not mandatory; a general direction that a governmental agency sets to follow in order to meet its goals and objectives before undertaking an action program [Source: A Glossary of Zoning, Development, and Planning Terms, American Planning Association, Planning Advisory Service Report Number 491/492]. Policies are the core principles which requirements, regulations and codes are designed to enforce. Policies are typically advisory in nature to provide guidance.

Regulation: A rule or order prescribed for managing government [Source: A Glossary of Zoning, Development, and Planning Terms, American Planning Association, Planning Advisory Service Report Number 491/492]. Regulations are specific, legislated elements of a code, utilized to enforce policy. Regulations are typically mandatory and must be complied with.

Requirement: Something needed or necessary; a demand [Webster's Dictionary]. While some general requirements may be advisory in nature, they can be used more specifically by local agencies to enforce policy with regard to a particular project. In this case they would become mandatory.

Shared Micromobility: Shared-use fleets of small, fully or partially human-powered devices such as bikes, e-bikes, and e-scooters used for short point-to-point trips or used to link to other modes of transportation such as public transit. These devices are generally rented through a mobile app, key fob, or kiosk, and are picked up and dropped off in the public right-of-way. They may be checked out or returned to a docking station, locked to a bike rack, or free-standing and unlocked.

Equity Considerations

The 2026 edition of the APBP Bike Parking Guidelines is the first to acknowledge what equity in bike parking means and how to incorporate equity into a bike parking program. As this document is intended to serve a wide variety of users, the goal of the Equity Considerations section in Chapter 2 is to provide awareness and guidance regarding common disparities in bike parking and not to provide a prescriptive equity checklist. The five considerations call attention to common gaps in service, outline the overarching issues, and provide opportunities for the reader to consider.

Economic Access

Bicycling tends to be a more affordable option than driving and can greatly impact a person's access to resources. Ensuring an equitable geographic distribution of bike racks as well as updating bike parking policies for older buildings can increase access to desired destinations. Integrating bike racks with transit stations of all sizes encourages multimodal use and increases access to low-cost transportation options. On a wider neighborhood or community scale, bicycle parking is more space-efficient and can be a low-cost parking option compared to motor vehicle parking.

Accessibility

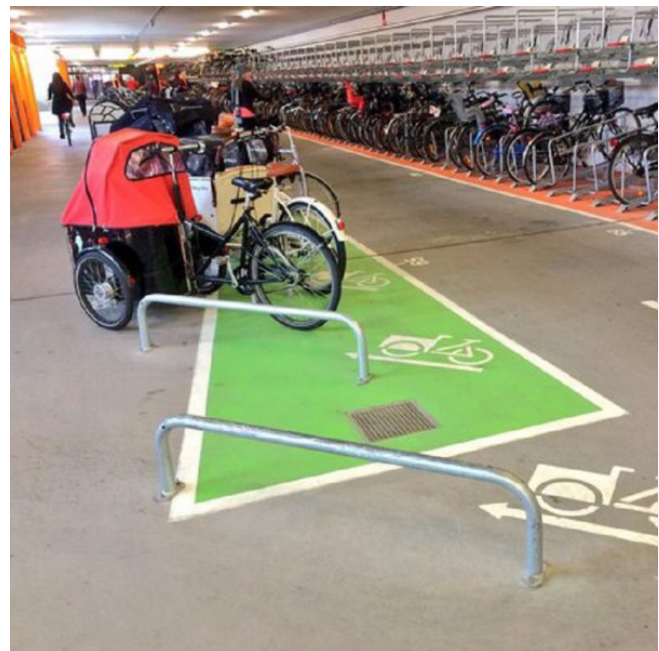
While it is important for bicycle parking to be accessible to bicyclists, consideration also needs to be given to the impact bicycle parking will have on accessibility for pedestrians with disabilities. Bike racks and bicycles locked to them should not encroach upon pedestrian facilities such as sidewalks, curb ramps, and walkways. Depending on the configuration, if implemented improperly, a bike parking facility could present a tripping hazard or barrier for pedestrians. Permanent bicycle parking, including bicycle lockers and cages, can also create blind spots and block sightlines, which must be considered and mitigated as part of the siting process.

Improvements to accessibility for bicyclists with disabilities can be made by providing parking facilities for non-traditional bicycles at a ground-level location or offering step-free access, for example a shallow ramp or large accessible lift. These locations should also strive to allow bicyclists to ride into and out of these locations without needing to reverse or lift the bicycle.

Bicycle stairway channels (sometimes referred to as bike runnels) can make it easier to navigate stairs with a bike, but because they require pushing one's bike up and down and are only suitable for traditional bicycles, they are not accessible for everyone. Alternative ramps or elevators that are accessible to all bicyclists are preferable, and wayfinding signage to alternative routing may be necessary, keeping in mind that people with low vision may require additional wayfinding to locate bicycle parking.



Cargo Bike Parking Sign (Photo: Heath Maddox)



Cargo Bike Racks in Malmo, Sweden (Photo: Infravelo)



Bike stair ramp to access parking garage bike lock-up in London, Ontario (Photo: Allison Miller)



Accessible elevator for cargo bikes at El Cerrito del Norte BART Station. El Cerrito, CA (Photo: Heath Maddox)





Policies, Requirements, and Codes



Equity Considerations

This edition of the APBP Bike Parking Guide provides considerations about equity and its relationship to secure bike parking. In the context of bicycle parking, equity refers to the inclusion of underserved communities and geographies. An equitable bicycle parking program works with traditionally underserved communities in the planning, installation, and maintenance of secure bike parking. This may mean the identification of gaps in service and the use of local resources to ensure these communities have access to high-quality bike parking.

In cities across North America, codified bike parking requirements and standards have been instrumental to increasing the availability of secure bike parking. As a result, more businesses and residential areas have been equipped to support bicycling and encourage more people to choose biking for their transportation needs. However, not all communities have benefited from these improvements and gaps in service may still remain. This section highlights these gaps and provides a list of considerations for jurisdictions and agencies that are involved in the provision of bike parking.

Consideration #1

Are there older residential buildings that need bike parking?



These older apartments offer naturally occurring affordable housing in central Austin, TX but lack basic bike amenities. Without elevators or ground-floor bike parking, and with no incentives for landlords to provide secure, covered e-biking charging, residents are left with few options. (Photo: Sophia Benner)

Issue:

- **Older buildings, including apartments, townhouses and other multi-family housing, tend to lack both short- and long-term bike parking.** Smaller living spaces, the potential absence of elevators, and multiple sets of stairs can make storing a bicycle indoors difficult. The lack of high quality short- and long-term bike parking can disproportionately affect lower income residents who may rely on bicycles as their primary mode of transportation.

Opportunities:

- **Incentivize the installation of secure bike parking for property owners.** This may include providing the secure bike parking equipment for free, installing the bike parking for free, and giving special recognition to the property owner, such as a Bicycle Friendly Business designation.
- **Work with public housing authorities and low income housing developers to install high-quality bike parking to serve residents.** It is essential for low-income residents who may rely on a bicycle as their primary mode of transportation to have a secure and comfortable place to store their bike.
- **Maintain a bike parking request form.** Partner with local groups, including nonprofits and advocacy groups, to promote the bike parking program and request form. Make sure it is available in the most commonly spoken languages.
- **Unlock the ability to install on private property.** Every jurisdiction has a different comfort level with the liability associated with installing bike parking on private property. Work with your organization's legal team to create a liability release form to enable the installation of secure bike parking on private property.
- **Provide free high-quality bike parking.** When providing free bike parking, consider the siting, installation, and maintenance that accompanies the bike parking. Partnerships with non-profit organizations may be a good way for jurisdictions with limited funds to help provide high quality bike parking.
- **Evaluate options for installing secure bike parking in the nearest available right-of-way.** While the best location to install bike parking may be located on private property, the only feasible location may be within the right-of-way.

Consideration #2

Are there older commercial buildings that need bike parking?



Businesses along Skillman St in Dallas, TX. Older commercial buildings can be ideal for small businesses and local retailers, but they often lack adequate bike parking or the space to easily add it. (Photo: Sophia Benner)

Issue:

- **Many older businesses and shopping centers lack secure bike parking.** Ranging from restaurants to convenient stores to thrift shops, businesses located in older commercial buildings are often serving middle to lower income people who may be more likely to arrive by bike.
- **A lack of short-term bike parking can be more than a minor inconvenience,** it can mean a missed economic benefit for the business owner.

Opportunities:

- **Assist the tenant.** Many businesses that need secure bike parking don't own their property and may not have the support of their landlord. Incentivizing bike parking for property owners can help serve tenants' and their customers' needs.
- **Incentivize the installation of secure bike parking for property owners.** This may include providing the bike parking equipment for free, installing the bike parking for free, and recognizing the business as a Bicycle Friendly Business.

- **Partner with business assistance organizations.** Some organizations, such as an Economic Development Corporation or a Business Improvement District, may be better suited for communicating with businesses and installing bike parking on their private property.
- **Maintain a bike parking request form.** Partner with local groups including non-profit organizations and advocacy groups to promote the bike parking program and request form. Make sure it is available in the most commonly spoken languages.
- **Unlock the ability to install on private property.** Every jurisdiction has a different comfort level with the liability associated with installing bike parking on private property. Work with your organization's legal team to create a liability release form that streamlines the installation of bike parking on private property.
- **Evaluate options for installing bike parking in the nearest available right-of-way.** While the best location to install bike parking may be located on private property the only feasible location may be within the right-of-way.

Consideration #3

Improve bike parking availability at smaller transit stops



Covered bike parking can serve transit users and nearby businesses (Photo: Phil Goff)



Accommodations for bicycles on buses is a great way to support people who bike to and from bus stops (Photo: Lola Torney)

Issue:

- **While major transit stops (e.g. Transfer points, mobility hubs) are often equipped with bicycle parking and amenities, small transit stops may be lacking in basic amenities.** Since these stops likely have less traffic, improving their amenities may not be a high priority for transit operators. These smaller transit stops, particularly those in underserved parts of town, also serve residents who rely on a bicycle to access transit.

Opportunities:

- **Install short-term bike parking to serve transit users and/or nearby needs.** The right-of-way at transit stops may provide a relatively low-effort, low-cost opportunity to install a bike rack to serve transit riders. Additionally, providing bicycle parking in the right-of-way at a transit stop may be the only feasible place to install secure bike parking to serve a nearby business.

Consideration #4

Equitably support the rise in e-bike ownership



Access to secure bike parking is critical for e-bike users, especially those living in compact or shared housing without storage space
(Photo: Lola Torney)

Issue:

- The increase in e-bike ownership is changing the landscape of bike parking. E-bikes are heavy, their batteries require charging, and the high cost of the bike and of bike maintenance differentiate them from a standard bicycle. While rebate programs that include a customer assistance program for low income residents can make an e-bike purchase more affordable, highly secure, sheltered parking remains a significant barrier.

Opportunities:

- **Partner with energy utilities for the provision of long-term bike parking and complementary facilities.** Incentivize high quality, long-term bike parking such as bike lockers or bike shelters equipped with outlets for battery charging and offer an enhanced incentive for older or underserved businesses or residential buildings.
- **Install long-term bike parking to serve older residential buildings.** Local jurisdictions can partner with private owners to secure a spacing at older private residential buildings.
- **Partner with private businesses and property owners.** Partner with private property owners in underserved areas to sponsor long-term bike parking installations, such as bike lockers or bike shelters equipped with outlets for battery charging on their property.
- **Work with public housing authorities to install high-quality bike parking equipped with outlets for battery charging to serve residents.** It is essential for low-income residents who may rely on a bicycle as their primary mode of transportation to have a secure and comfortable place to store their bike.
- **Partner with non-profit organizations.** Partnering with non-profit organizations and advocacy groups can lead to creative, grassroots solutions to providing high quality, secure bike parking.

STORY HIGHLIGHT

Community Driven Safe Bike Storage, Portland, OR



The Hacienda CDC in Portland, OR, explored innovative solutions for bike parking for their e-bike recipients. (Photo: forthmobility.org)

The conversation began in 2011 when residents, Community Cycling Center (CCC) staff, and property management at Hacienda CDC, an organization that provides affordable housing, conducted an audit of their housing site to assess the existing amenities that promote or inhibit healthy eating and active living. These assessments, along with the advocacy efforts from *Andando en Bicicletas y Caminando* (ABC), a grassroots active transportation advocacy group sponsored by CCC, led to an understanding of the need for secure bike storage. While they were unable to secure funding for secure, long-term bike storage, they were able to form a partnership with two neighboring buildings. The bike storage would be provided in a locked building and each participant was given a key to access the storage space as needed. Additionally, the Portland Bureau of Transportation provided two older bike corrals and bike racks which were bolted to the building's concrete slab. Safe bike storage is a barrier that many affordable housing residents face and affordable housing communities often prohibit residents from storing bikes inside their homes or on porches. Now, residents finally have a safe place to store their bikes in two of Hacienda's buildings.

Read more about this project: The Community Electric Bike Project, <https://forthmobility.org/news/the-community-electric-bike-project> | <https://forthmobility.org/storage/app/media/Documents/201811-CEB-final.pdf>

Learn more about ABC: <https://communitycyclingcenter.org/community/hacienda/>

Consideration #5

Consider bike parking for adaptive bicycles



ADA-compliant access routes and clear space around racks are essential for making bike parking usable for diverse riders
(Photo: Alyson Fletcher)

Issue:

- Adaptive bikes are specially designed to accommodate a variety of disabilities, allowing more people to experience the benefits of cycling. These bikes include tricycles, handcycles, tandem bikes, cargo bikes, and recumbent bikes and each cater to different physical and cognitive needs. Since these bicycles are as diverse as their riders, providing adaptive bike parking will have diverse solutions.

Opportunities:

- Understand your audience. Bicycle parking for adaptive bikes may include wider spacing and using a wider bike rack, but it is important to understand the needs of the users first.
- Wider margins. Adding an additional foot of spacing around a bike rack and using a wider bike rack can significantly increase the access and comfort level for a wide variety of bicycle riders.
- Partner, partner, partner. A variety of organizations, from schools to recreation centers to non-profits, can help identify the specific needs to create a high quality bike parking experience.

Associated Costs and Funding Considerations

Compared with automobile parking, bicycle parking is one of the most cost-effective transportation improvements. The level of expense involved with bicycle parking is directly related to the length of time that people are expected to park. The shortest-term parking, such as unsheltered simple bicycle racks located in the right-of-way, is usually the least expensive. Shelters, bicycle cages, and lockers (longer-duration parking) are more costly, but offer a significant increase in security and user peace of mind. Use a per-bicycle cost to evaluate the level of expense per user when comparing bicycle parking options.

Cost Ranges

The cost of bicycle racks varies greatly based on the type of rack and installation method. *Table 2.1* below outlines typical prices for different types of bicycle parking, potential locations for installation, and level of expertise needed to install for each of the most popular rack types. *Tables 4.1 to 4.5* in Chapter 4 provides even more detail on each rack type.

TABLE 2.1 Bicycle Rack Cost Estimates¹

Type	Price Range	Location	Ease of Installation	Usage Term
Inverted U-Rack	\$100-\$400 (low)	• Along sidewalk • Park strip with concrete piers	Easy	Short-term
Post and Ring Rack	\$200-\$400 (low)	Existing poles/parking meters	Easy	Short-term
Vertical Wall Mounted Racks	\$100-\$500 (low)	• Apartment complexes • Indoor employee parking	Medium	Long-term
Two-Tier (Double-Decker Rack)	\$1,000-\$5,000 (medium-high)	• Parking lots • Apartment complexes	High	Long-term
Locker	\$2,000-\$5,000 (high)	• Parking lots • Apartment complexes	High	Long-term

¹ Averages as of May 2024 in US Dollars

Potential Funding

Several sources of funding can be leveraged for bicycle parking installation programs. While the most common sources of funding include public funds focusing on bicycle and pedestrian infrastructure, a number of cities have diversified their sources by allowing private sources and allowing for advertising as a revenue stream.

In the US, various [federal grants](#) including [Congestion Mitigation and Air Quality Improvement \(CMAQ\)](#), [Transportation Alternatives Program \(TAP\)](#), and [Safe Routes to School \(SRTS\)](#) can provide program-level funding. In local air quality non-attainment zones, air quality management districts may have dedicated funding for bike/ped projects that can be applied to bike parking.

For Canadian communities, the [Federal Public Transit Infrastructure Fund \(PTIF\)](#), the [Investing in Canada Infrastructure Program](#), and the [Federation of Canadian Municipalities Green Municipal Fund](#) provide Federal funding opportunities for activities such as a bike parking program. Additionally, the [Gas Tax Funds](#) and the [Ontario Trillium Foundation](#) are provincial sources that may also be used to support bike parking.

It is advised to apply for several years' worth of funding (2-5 years) to establish the program and better understand associated costs for future grant applications. Revenue from parking meters, micromobility operators, or advertising can also be considered to support a bicycle parking program.

When budgeting for a bicycle parking program, consider any associated costs:

- **Site planning and design**
- **Cost of racks**—see table on previous page
- **Labor to install**—city crews and non-profit advocacy groups can be a less expensive option compared to a construction contractor.
- **Anticipated number of rack installations per year**—how will rack locations be determined? Whether by internal staff analysis, business request, or public request, estimate how many racks will be installed (for reference, Milwaukee, a city of roughly 570,000 people, receives a maximum of 100 requests per year, depending on program promotion).
- **Anticipated number of rack repairs per year**—while this may increase in later program years, keep in mind that racks can be damaged at any point in time due to motor vehicles, weather, vandalism, etc.

Including bike parking in corridor or streetscape projects is a cost effective way to deliver bike parking.

Other Considerations

Requiring bicycle parking through new development is often the most direct approach to provide more parking facilities in a municipality or jurisdiction. Zoning ordinances and development regulations are existing policies that are understood by local officials, a jurisdiction's staff, and the development community. Incorporating new or updating existing regulations in these policies is often more straightforward than developing new policies. However, if this is the only local method of adding bicycle parking it will limit new bicycle parking to locations where new development occurs and may leave other areas of a jurisdiction in need of bicycle parking.

In addition to requiring bicycle parking as part of the development process, local jurisdictions should supplement and augment the amount of bicycle and shared micromobility parking that is available for residents, employees, and visitors. Some additional policy considerations that jurisdictions can incorporate into their planning, capital improvement, and development review programs include:

- Require additional bicycle parking as a condition of approval for projects needing a conditional use permit.
- Permit property developers to reduce required automobile parking in exchange for an increase of bicycle parking.
- Consider developing bicycle parking plans for neighborhood commercial districts to meet parking demand needs in the public right-of-way.
- Review parking rates in conjunction with bicycle master plan updates or at least every five years.
- Encourage bicycle parking through a locally sponsored bicycle rack grant program for commercial and residential uses.
- Update bus shelter and parking space details and standards to provide options for bicycle parking racks.
- Establish bicycle parking as a required component of all future bicycle facilities and shared use path capital projects if adequate bike parking is not provided near those projects.
- Include bicycle parking as a separate capital improvement program budget item.
- Repurpose on-street parking meter posts for bicycle parking.
- Require on-street bicycle parking corrals for bicycles, and e-scooter or dockless shared micromobility programs.

Unit of Measure

To identify the rates of bicycle parking, communities can use several different units of measurement, including unit count, building square footage, and building occupancy. Simple policies linking bicycle parking requirements to automobile parking requirements have been reasonably effective to increase the amount of bicycle parking. However, bicycle parking requirements based on auto parking can pose problems as automobile demand and parking rates are not necessarily an indicator of bicycle parking needs. In many instances, increasing automobile parking can detrimentally impact the built environment in ways that also discourage bicycle or other micromobility travel. Moreover, if a community adopts automobile parking maximums or reduces parking requirements in an attempt to encourage other modes of transport, the amount of bicycle parking may also be reduced, which is counterproductive to the goal of promoting other modes, particularly bicycling. Bicycle parking, in combination with a comprehensive bicycle facility network, is often needed to help offset and make up the difference in shifting travel modes. One exception to this is for automobile related uses such as a private parking lot.

Sometimes parking ratios are measured by a non-fixed variable, such as the number of employees for a commercial use, the number of students for a school, the number of patients for a health care use, or the number of seats for a religious use. While it may seem intuitive to link the amount of bicycle parking to the expected amount of people, this can be difficult to calculate before the use is operational and it can change over time—especially if the bicycle network is not fully built-out. It is best to measure the bicycle parking ratio with a fixed variable that is known and easily measured at the time of the development approval. One exception to this is for transportation related uses, such as a train station. In these cases, a percentage of the expected or measured peak ridership should be used.

Rates of bicycle parking based directly on unit count, the proportion of building square footage, and building occupancy are better indicators of potential demand. Additionally, these units of measurement are commonly used during the development application and site plan review and can therefore be easily integrated into the planning and approval process.

Many communities follow an environmental sustainability focused building standard, such as the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) (<https://www.usgbc.org/leed>) certification program, and these programs incentivize the provision of bicycle parking. The following sample standards will contribute to, or meet many of these environmental sustainability focused building standards. However, it is recommended to confirm bicycle parking requirements for environmental building certification in addition to these sample standards.





Sample Rates of Parking

Rates of bicycle parking should meet current demand at a minimum, and should also meet goals for a community's future mode share goals. The recommended rates below provide guidance for local jurisdictions and are based on the following:

1. North American (US and Canadian jurisdictions) best practices
2. Increasing the overall bicycle mode share for commute and non-commute trips
3. U.S. Green Building Council's LEED credit levels for alternative transportation
4. Most recent edition of the AASHTO Bike Guide

The following rates include recommended minimums.

Cities with bicycle commute mode shares above five percent (5%) or jurisdictions that desire more bicycle travel should consider higher rates of parking, provided in the "Urbanized or High Mode Share" tables later in this section. While population density is an important metric to consider in relation to active transportation, it is equally important to consider the nature of how residential land uses impact cycling activity. Many people have the ability to obtain a secured or dedicated place to park their bike at home, but they require one at their destination as well (i.e. work, school, regular errands). Therefore, looking at density of jobs is equally important to understand demand for bicycle parking. It is a good general indicator of "activity," where there are concentrations of jobs there may also be concentrations of visitors. This metric is therefore key to understanding potential demand for bicycle parking.

It is also important for jurisdictions to consider the various land use contexts in their local community when determining minimum bicycle parking rates. Jurisdictions and communities can vary greatly in their land area, population and job densities, geographic features, built environment, roadway networks, and development patterns. These issues can influence the demand for bicycling in a jurisdiction or general area. It is recommended that the local jurisdiction's staff use the rates as a guide and consider their unique contexts before establishing formalized bicycle parking rates.

Sample Basic Parking Requirements

The following bicycle parking requirements are suitable for use in a variety of community sizes in North America with varying levels of bicycle use.

Residential

Type of Activity	Long-term Bicycle Parking Requirement	Short-term Bicycle Parking Requirement
Single Family Dwelling		
Single Family Dwelling	No spaces required	No spaces required
Multi Family Dwelling		
With private garage for each unit	No spaces required	1 space for each 30 dwelling units. Minimum is 4 spaces.
Without private garage for each unit	1 space for each 2 dwelling units. Minimum is 2 spaces.	1 space for each 30 dwelling units. Minimum is 4 spaces.
Senior Housing	1 space for each 2 dwelling units. Minimum is 4 spaces.	1 space for each 40 dwelling units. Minimum is 4 spaces.

Civic: Cultural/Recreational

Type of Activity	Long-term Bicycle Parking Requirement	Short-term Bicycle Parking Requirement
General Cultural/Recreational		
Non-assembly cultural (library, government buildings, etc.)	1 space for each 10,000 sq. ft. (~930 sq. mt.) gross floor area. Minimum is 2 spaces.	1 space for each 3,000 sq. ft. (~278 sq. mt.) of floor area. Minimum is 4 spaces.
Place of worship or other religious use	1 space for each 10,000 sq. ft. (~930 sq. mt.) gross floor area. Minimum is 2 spaces.	1 space for each 10,000 sq. ft. (~929 sq. mt.) gross floor area. Minimum is 4 spaces.
Assembly (theaters, stadiums, parks, beaches, etc.)	1 space for each 10,000 sq. ft. (~930 sq. mt.) gross floor area. Minimum is 2 spaces.	1 space for each 7,500 sq. ft. (~696 sq. mt.) gross floor area. Minimum is 10 spaces.
Hospital	1 space for each 20,000 sq. ft. (~1,858 sq. mt.) gross floor area. Minimum is 2 spaces.	1 space for each 50,000 sq. ft. (~4,645 sq. mt.) gross floor area. Minimum is 4 spaces.
Medical/dental office or other health care	1 space for each 10,000 sq. ft. (~930 sq. mt.) gross floor area. Minimum is 2 spaces.	1 space for each 30,000 sq. ft. (~2,787 sq. mt.) gross floor area. Minimum is 4 spaces.

Type of Activity	Long-term Bicycle Parking Requirement	Short-term Bicycle Parking Requirement
Education		
Public or private day-care centers for 15 or more children	1 space for each 10,000 sq. ft. (~930 sq. mt.) gross floor area. Minimum is 2 spaces.	1 space for each 10,000 sq. ft. (~930 sq. mt.) gross floor area. Minimum is 2 spaces.
Public or private elementary school, and elementary, junior high and high schools	1 space for each 15 classrooms Minimum is 2 spaces.	2 spaces for each classroom Minimum is 10 spaces.
Public or private middle school	1 space for each 15 classrooms Minimum is 2 spaces.	2 spaces for each classroom Minimum is 10 spaces.
Public or private high school	1 space for each 15 classrooms Minimum is 2 spaces.	3 spaces for each 1 classroom Minimum is 10 spaces.
Colleges and universities	1 space for each 2 classrooms Minimum is 4 spaces	2 spaces for each classroom Minimum is 20 spaces.
Transportation		
Rail/bus terminals and stations/airports	Spaces for 5% of projected a.m. peak period daily ridership.	Spaces for 1.5% of a.m. peak period daily ridership.

Commercial

Type of Activity	Long-term Bicycle Parking Requirement	Short-term Bicycle Parking Requirement
Retail		
General food sales or groceries	1 space for each 10,000 sq. ft. (~930 sq. mt.) gross floor area. Minimum is 4 spaces.	1 space for each 2,000 sq. ft. (~186 sq. mt.) gross floor area. Minimum is 6 spaces.
General retail	1 space for each 8,000 sq. ft. (~743 sq. mt.) gross floor area. Minimum is 4 spaces.	1 space for each 4,000 sq. ft. (~372 sq. mt.) gross floor area. Minimum is 4 spaces.
Office		
General office	1 space for each 10,000 sq. ft. (~930 sq. mt.) gross floor area. Minimum is 4 spaces.	1 space for each 20,000 sq. ft. (~1,858 sq. mt.) gross floor area. Minimum is 4 spaces.
Auto Related		
Automotive sales, rental, and delivery Automotive servicing Automotive repair and cleaning	1 space for each 12,000 sq. ft. (~1,115 sq. mt.) gross floor area. Minimum is 2 spaces.	1 space for each 20,000 sq. ft. (~1,858 sq. mt.) gross floor area. Minimum is 2 spaces.
Off-street parking lots and garages available to the general public either without charge or on a fee basis	1 space for each 15 motor vehicle spaces. Minimum is 6 spaces.	1 space for each 15 motor vehicle spaces. Minimum is 6 spaces.

Industrial Manufacturing

Type of Activity	Long-term Bicycle Parking Requirement	Short-term Bicycle Parking Requirement
Manufacturing and Production		
Manufacturing and production	1 space for each 15,000 sq. ft. (~1,394 sq. mt.) gross floor area. Minimum is 4 spaces.	1 space for each 20,000 sq. ft. (~1,858 sq. mt.) gross floor area. Minimum is 4 spaces.

Parking for Alternative Bicycles

The preceding sample parking rates were developed for traditional bicycles. Tandem bicycles, adult tricycles, electric bicycles, cargo bicycles, recumbent bicycles, and bicycle trailers are increasing in popularity and require more physical space for parking than standard bicycles.

Regardless of the land use, jurisdictions with large bike parking facilities or corrals should consider providing at least 10% of provided bicycle parking spaces to accommodate alternative bicycles. Jurisdictions may also want to consider adding signage or pavement markings designating specific bicycle parking spaces for alternative bicycles. This may help distinguish the different bicycle parking available.







3

Placement

The placement of bicycle racks provides convenience, promotes usage, and helps ensure safety for both bicyclists and other people. Most bicycle racks throughout a city should follow careful, consistent site planning. Some placements are more unique or occasional. The sections below discuss site planning for a variety of situations.

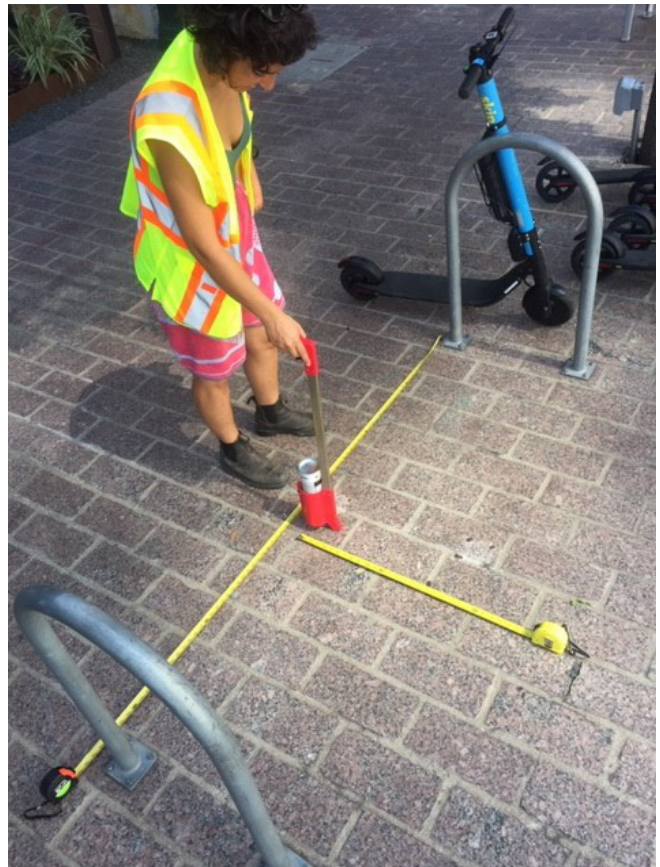
Short- and Long-Term Parking

Site planning requirements for bicycle parking differ based on whether the use is to be short-term or long-term. Aside from the intrinsic difference between short-term and long-term site planning, the kinds of fixtures typically associated with these parking types also have unique site design requirements. Dimensions for specific rack and locker layouts are provided later in this section.

Short-Term Site Planning

Because short-term parking usually consists of simple bicycle racks located on the sidewalk in front of a building or destination, the site planning focus is on convenience, utility, and the attempt to improve security at the bicycle rack. Short-term parking racks should be:

- Convenient to the bicyclist destination.
- Placed no more than 50' from the door, otherwise users may lock to other street furniture or trees.
- Visible from the destination to reassure users about the security of the rack.
- Prominent within the streetscape to encourage and normalize its use.
- Located in a high-traffic area with passive surveillance or eyes on the street.
- Located along the “desire line” from adjacent bikeways; the path that bicyclists are most likely to travel.



Bike rack installation layout in Austin, TX (Photo: Sophia Benner)

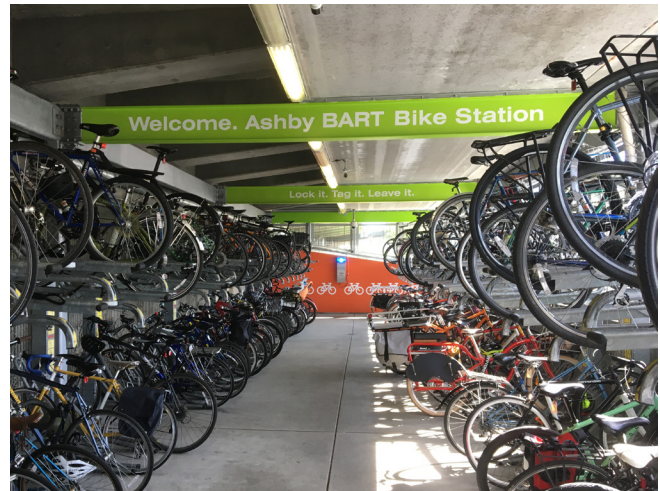


Bike Corral Installation in Austin TX. (Photo: Sophia Benner)

Long-Term Site Planning

Long-term parking consists of a wider variety of fixture types and site plan layouts, including racks in cages, bicycle rooms, or lockers that may be located indoors and outdoors. Because long-term parking areas are frequently located in low pedestrian traffic areas and may be in out-of-the-way locations, site design focus is on ensuring the safety of users while maintaining exclusive access to these areas. Long-term parking should consider:

- Easy access via effective wayfinding signage.
- Charging infrastructure for electric bicycles.
- Controlled access:
 - Long-term rental (keyed, smartcard, or app-controlled) lockers
 - On-demand (smartcard or app-controlled) lockers
 - Keycard/code or app-controlled access garage cage or bicycle room
- Safeguards for users such as effective lighting and visible surveillance cameras or security guards.
- Weather protection:
 - Free-standing shelter
 - Indoor cage or room
- Lockers and showers for longer commutes or hot or inclement weather.
- Outreach to users to educate them about the presence of the facilities.
- 24-hour customer service and responsive maintenance.



Ashby BART Station Bike Parking in Berkeley, CA
(Photo: Health Maddox)



Long-term bike parking in Boulder, CO (Photo: Mauricio Hernandez)



Bike station wayfinding sign at Berryessa station in San Jose, CA.
(Photo: Heath Maddox)

Short- and Long-Term Site Diagrams

FIGURE 3.1 Example Transit Station Area Bike Parking Locations (Mauricio Hernandez)

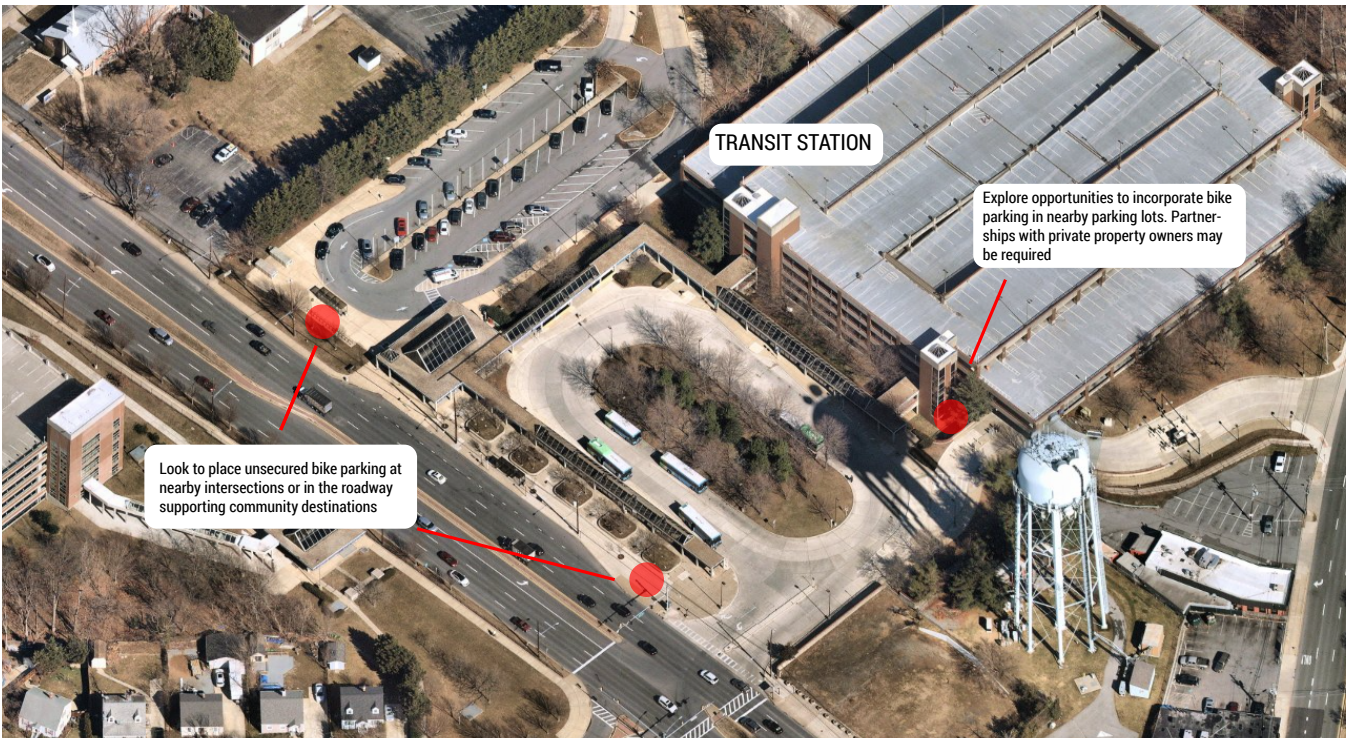


FIGURE 3.2 Example Urban Core Area Bike Parking Locations (Mauricio Hernandez)

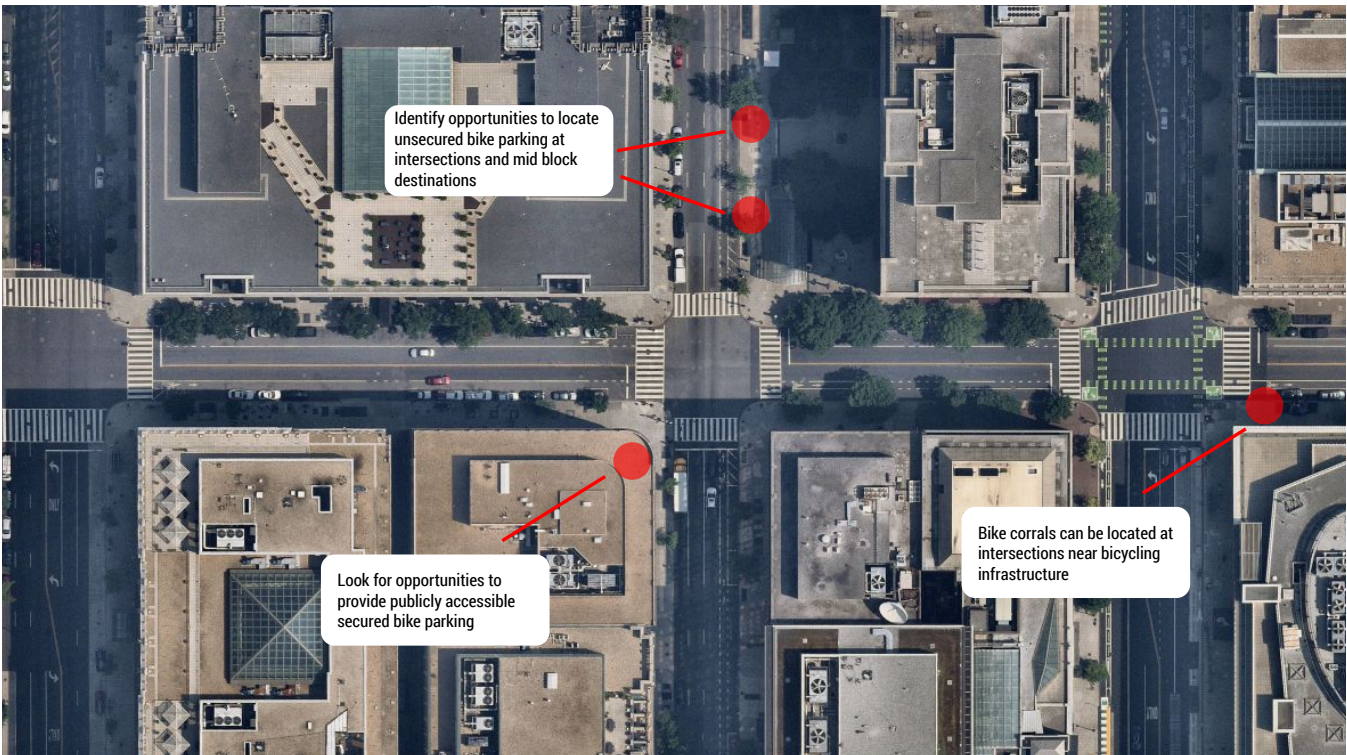


FIGURE 3.3 Example Mixed-Use/Residential Area Bike Parking Locations (Mauricio Hernandez)



Site Layout

The layout of a bicycle parking area is critical to its ease of use. Bicycle racks, lockers, and other elements (discussed in more detail below) each have their own considerations for safe and convenient placement.



Bike Corral installation in Austin, TX (Photo: Sophia Benner)

Bicycle Rack Site Layout

Bicycle racks that are placed too close together or too close to nearby objects, such as walls or trees, may be completely unusable or reduce the capacity of the provided parking. Some key principles of bicycle rack site design:

- Ensure that racks are placed to prevent encroachment into pedestrian access routes to maintain pedestrian accessibility.
- Avoid handlebar/rack/basket conflicts; this can be accomplished through proper rack spacing or vertical staggering of bicycle racks.
- Allow at least two feet (0.6 meters) of clearance around the rack for users to be able to access and securely lock bicycles from the side.
- Ensure adequate end and side clearance for users to maneuver their bicycles around the parking area.
- Ensure adequate clearance from walls and other fixed objects to allow parking of bicycles; too close to a wall and the racks will be unusable.
- Aisle spacing should be at least six feet (1.8 meters) wide to:
 - Allow for simultaneous users.
 - Consider entry and exit flow.
 - Accommodate lifting of bicycles where two-tiered racks are used.
- Consider access from all sides so that all parking spaces can be used.
- Consider how and where longer or wider bicycles (e.g., tandem, cargo, bikes with trailers) will be accommodated.
- Recognize that not everyone will use racks as intended; thoughtful site design should anticipate and accommodate some incorrect use while minimizing the impact of this incorrect parking. For example, consider including additional space between racks or extra clearance between racks and adjacent obstructions.



Bike rack site layout at the Walnut Creek BART station

Bicycle Locker Site Layout

To a greater degree than with simple bicycle racks, the layout of a bicycle locker area is critical to its operation. Lockers that are placed too close together or too close to nearby objects, such as walls or trees, may result in doors that cannot be opened or insufficient space to maneuver a bicycle into and out of the locker. Some key principles of bicycle locker site design:

- Ensure adequate end and side clearance for users to maneuver their bicycles around the parking area, given the increased size and obstruction of larger bicycle lockers.
- Aisle spacing should be at least six feet (1.8 meters) wide to:
 - Allow for simultaneous users.
 - Consider entry and exit flow.
 - Take into account door swing from opening lockers, both to allow the door to open and to maneuver the bicycle into and out of the locker.
 - Accommodate lifting of bicycles where stacked lockers are used.
- Consider access from both sides where two-sided lockers are used.
- Accommodate special requirements of types such as wedge lockers which can be arranged in circles rather than rows.
- Consider how placement of the locker(s) may provide cover for unwanted activities unrelated to bike parking.

Considerations:

Security

Provide employee/resident bike parking behind locked doors, with access limited to authorized users (e.g. building employees, residents, and other regular occupants). Options for access control include keys, fobs, and smart cards. Install motion-activated security lights in tamper-proof cases and, whenever possible, ensure that the entire area is visible from the entry door and video surveillance cameras.

Signage

Where employee/resident bike parking is not visible from the public right-of-way, install directional signage. Such signage must be visible from all adjacent on-street bike facilities. In building directories, describe the location of bike parking wherever you describe the location of car parking.

Pricing

All employee/resident bike parking should be provided at no cost to building employees, residents, and other regular building occupants.

Electric Bike and Micromobility Charging

As adoption of e-bikes and e-scooters continues to rise, building and facility owners may wish to provide opportunities for customers to charge their devices. To accommodate electric bikes with charging cords, install standard 120V electric outlets with timers within 4' of the center of bike parking spaces. There are however important safety and security considerations:*

- Charging a bike or a scooter is more akin to charging a laptop than an EV in that owners must bring their own charging cord and power converter. The cords themselves are valuable and are not locked to the device during charging, so outside of a secure bike room, lockers may be the best option, although some manufacturers offer dedicated charging racks with enclosures for personal charge cords built in.
- The most critical fire safety feature for providing bike parking with charging is to prevent over-charging. To do this, it is recommended that all outlets include timers that do not exceed 4-6 hours. In addition to timers on outlets, charging rules or user agreements should include the following points:
 - Only officially rated, undamaged batteries and chargers may be charged—only use equipment that has a reputable testing agency mark, such as UL.
 - Use the charger that was made specifically for the specific e-bike/micromobility device.
 - Always follow manufacturer's charging and battery care instructions.
 - Battery charger must be directly connected to an outlet. Extension cords and power strips should not be used.
 - Any repairs to devices charged here must have been performed by a qualified professional.

More info, including an e-bike and e-scooter charging safety tip sheet, can be found on the website of the National Fire Prevention Association: <https://www.nfpa.org/education-and-research/electrical/ebikes>

Showers and Changing Facilities

Showers and changing facilities allow employees, residents, and other regular building occupants to bike year-round without sacrificing personal hygiene. Ensure that these facilities are conveniently located for people using the employee/resident bike parking areas and that they follow all accessibility requirements.

Covered Parking

Sheltered bicycle parking on sidewalks has been installed in a number of North American cities as a win-win solution benefiting both bicyclists and pedestrians. Such parking is typically installed on a curb extension, often at an intersection corner. Curb extensions function as traffic calming by narrowing the roadway, shortening crossing distances and increasing pedestrian visibility. Locating bike parking on bulbouts has the benefit of moving the bicycle racks out of the pedestrian path of travel. Kiosk shelters can provide information and resources, such as bicycle route maps, and can also generate revenue through placement of bus shelter-type advertising.

Covered bicycle parking facilities are attractive options for bicyclists, particularly those in rainy climates. Unfortunately, the cost and space requirements to install covered facilities have made them rarities in the urban landscape. Guidelines for identifying locations for covered parking follow the same rules of thumb as other sections in this chapter, but the addition of a roof requires additional considerations, such as roof span, setbacks and clearances, local and federal guidelines and standards, sight distances and sight lines, and lighting and signage.

Roof Span

The shelter should be deep enough to provide sufficient cover for the length of the bicycles, ideally a minimum of eight feet (2.5 meters). This suggestion will vary depending on the height of the roof. The footings to support a roof generally require a purpose-built curb extension. Some vendors have introduced prefabricated shelters that store bicycles vertically and thus require a much smaller footprint, but these will generally be incompatible with heavier e-bikes and cargo bikes as well as longer bicycle types.

Setbacks and Clearances

Local setback requirements will vary by city. Locating a shelter will require considering the setback from the curbline, ensuring adequate pedestrian throughway clearance, overhead clearances, and visibility clearances at intersections. Designs must account for any visibility conflicts with adjacent stop signs in the facility design.

Local and Federal Guidelines & Standards

The installation of any shelter in the public right-of-way will need to comply with local building code requirements, require a detailed review by city structural engineers, compliance with pedestrian accessibility standards & guidelines, and possibly, take into consideration stormwater impacts.

Lighting and Signage

Inadequate lighting of a shelter may be a safety concern, particularly at night. Some designs have installed glass roofs to allow overhead street lighting to illuminate the parking area. Many shelter designs take advantage of side or back panels to display local information, such as bicycle or pedestrian maps. If graffiti is a problem in the vicinity, the design should minimize broad, flat surfaces which could be a target.



Covered parking, University of Minnesota (Photo: Andy Lageson)

Bike Room or Bike Station Layout

The layout of bike rooms, cages or self-park bike stations involves a number of variables, including the amount and shape of the space available, internal circulation, access and egress to the facility, and the racks themselves. A mix of rack types is usually the best approach to efficiently use a given space and provide as many options as possible for those parking their bikes:

- Standard U racks for heavy and large bikes
- Double-decker stacking racks to maximize density
- Vertical hanging racks where floor space is limited.

For stacking racks, lift trays are desirable and require aisles sufficiently wide to deploy the tray (4'-6'). U-racks should be spaced further apart than they otherwise might be (4'-5' on center depending upon the angle) to provide clearance for cargo bikes. Consideration for the extra length of cargo bikes should be given as well and how different types of cargo bikes will orient relative to racks and the adjacent aisles. Longtails are longer in back, whereas box bikes have greater length up front. Signs, floor markings and decals on racks can be used to indicate that the U racks are for larger, non-standard bikes. Rack manufacturers will often provide layout services free of charge to help designers figure out what will work best.

FIGURE 3.5 Example Signage for Cargo Bike Racks
(Heath Maddox)



FIGURE 3.6 MacArthur BART Bike Station, Oakland, CA
(Heath Maddox)



FIGURE 3.4 Site Layout and Clearances for On-Street Bike Parking (Toole Design)

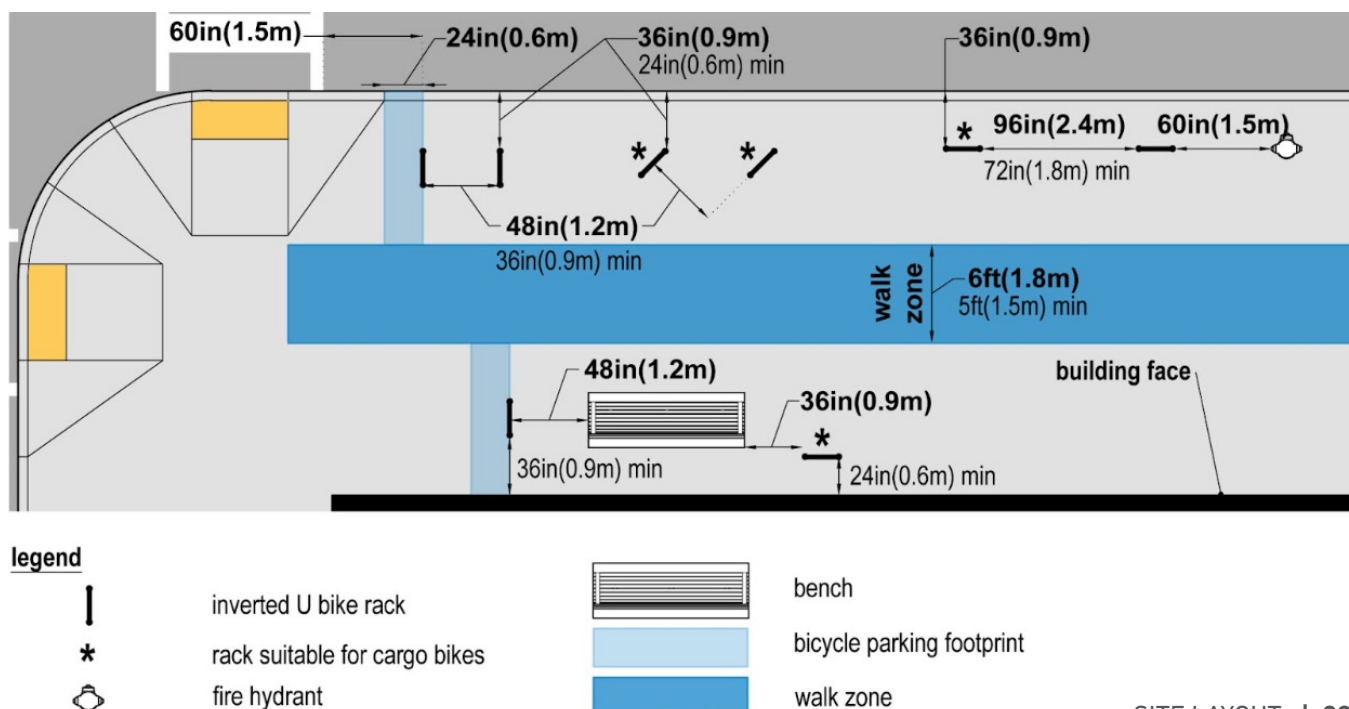


FIGURE 3.7 Bike Parking Footprint (Toole Design)

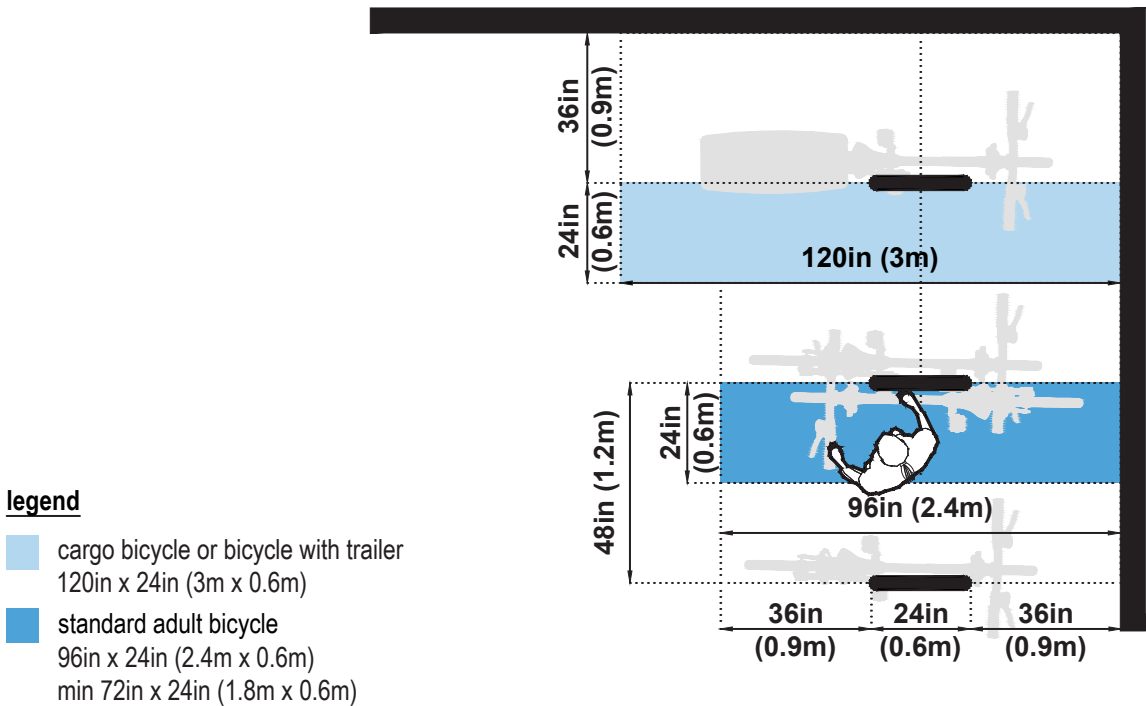
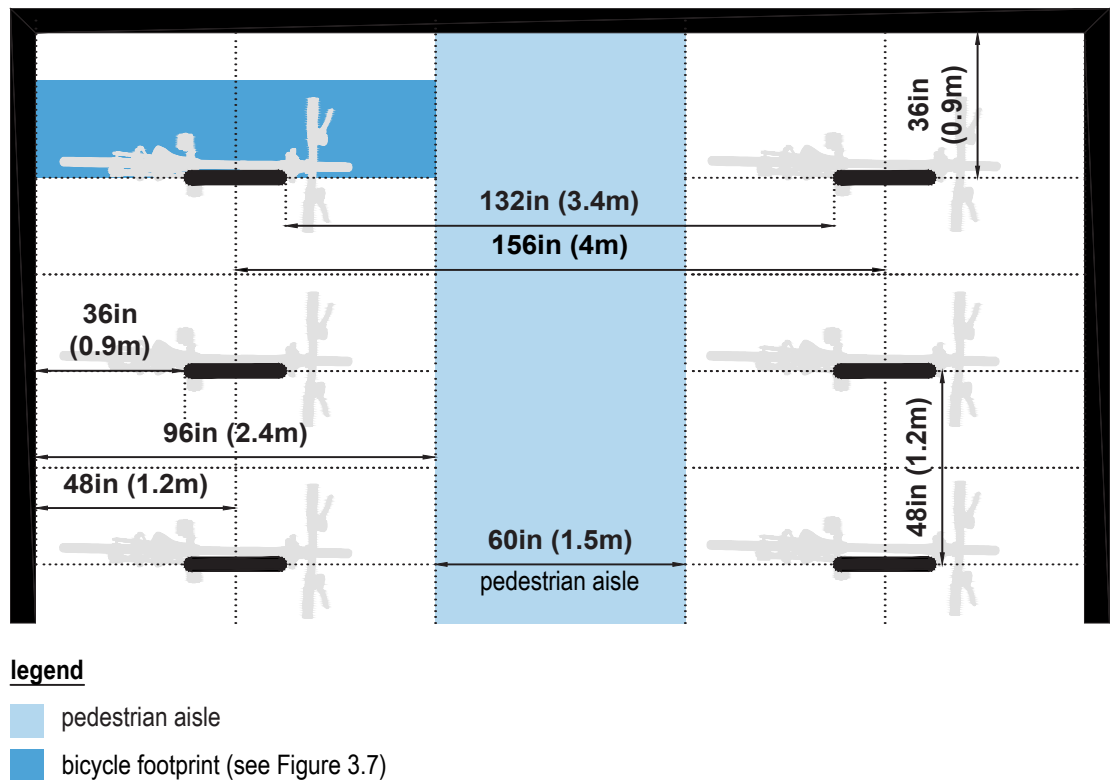


FIGURE 3.8 Site Layout and clearances for Bike Room Parking (Toole Design)



Special Cases

The rack placement guidelines above provide details for routine installation. Some situations require special designs, installations, attendance, and oversight. The following sections provide additional details on bicycle parking at schools, events, on-street (i.e. bike corrals), and transit stations.

Schools/Safe Routes to School

Schools that provide bicycle parking that is visible, convenient, functional, secure, and safe (in conjunction with communities' providing suitable bicycle routes and facilities) make clear that active transportation is a real choice for getting to and from school. Many communities have Safe Routes to School programs that employ education, encouragement and infrastructure work to increase the number of students walking and biking safely to school. It's important to work with school administrators to ensure that good bike parking facilities are being provided and maintained, and to ensure that policies are in place to encourage students and families to bike to school. Schools that provide easy vehicle drop-off and pick-up area for parents driving kids to school while locating bike racks in out-of-sight locations create an environment that prioritizes travel by car over active student travel. By placing recommended bicycle racks in visible locations near watchful eyes, schools can show that they are encouraging students to be active and arrive at school ready to learn.



Skateboard Parking Menlo Park (Photo: Alta Planning + Design)

Some schools may have bicycle, skateboard, or scooter policies that don't allow students to use these modes on campus. In these cases, the school can offer a route through campus, if possible, for bicycles, skateboards, and scooters to get to the racks, cage, or other type of storage area. These schools should also consider skateboard and scooter parking that supplements the bicycle parking. Schools that ban bike parking on campus should consider policy changes to remove such prohibitions and install safe and accessible bike parking.

The Safe Routes to School National Partnership has a resource for reviewing and assessing the bike parking at schools that provides further information. <https://saferoutespartnership.org/resources/report/school-bike-parking-assessment>

Event Parking

Providing attended or unattended temporary bicycle parking areas at events ranging from street fairs and sporting events and concerts can benefit event operations and promotions in several ways. It can:

- Significantly reduce the number of motor vehicle trips generated by the event.
- Encourage individuals, couples, and families to enjoy bicycling to the event, creating a community experience they will wish to repeat.
- Reduce locking of bicycles at unintended locations around the venue.
- Reduce the number of bicycles being walked through crowded spaces such as street fairs.
- Raise the visibility and acceptance of bicycling for transportation.



Event bike parking in Grand Rapids, MI (Photo: Richard Hartger)



Temporary event parking with valet service run by volunteers in Springdale, AR (Photo: Andy Clarke)

There are three types of event bicycle parking operations, differentiated by whether the parked bicycles are monitored and whether the bicycle is parked and retrieved by the owner or an attendant:

1. Valet

Valet and attended (self-park) operations use outdoor bicycle corrals with an enclosed perimeter or designated indoor rooms. The bicycle parking area has a single access point staffed by attendants, and a claim-check system. In valet operations only the attendants may enter the corral – the motto is “we park it, we watch it.” Aisle width can be minimized if valets are adept at wheeling bicycles and accessing the racks.

2. Attended (Self-park)

In an attended (self-park) operation the bicycle owner parks the bicycle after attaching the bicycle half of the numbered ticket pair. Although attendants check claim tickets when bicyclists exit, bicyclists are encouraged to bring locks, and the racks in the corral, as a minimum, should enable cable locking. Aisle widths should be generous (at least six feet (1.8 meters) wide) to handle peak arrival and departure flows and to allow bicycles to be walked past users who are still parking or retrieving their bicycles. Attended parking can accommodate large numbers of bicycles. For example, at Stanford University’s home football games, four large corrals each staffed by two attendants have stored as many as 1,500 bicycles.

3. Unattended

Unattended operations provide only a temporary bicycle rack area, often set up in a parking lot or on a temporarily closed street segment. Parked bicycles are not monitored except by other bicyclists. Bicyclists are expected to bring a standard lock, though racks often will not meet all the requirements for quality short-term bicycle parking for points of contact or anchoring. Enclosing the area with temporary fencing is encouraged, as this may deter bicycle and accessory theft by eliminating walk-through. If enclosed, the area should be limited to one or maximum two access points, though two access points may be appropriate to accommodate higher arrival and departure volumes.

Racks and Fixtures

Several bicycle advocacy organizations, such as Bike East Bay and the Sacramento Area Bicycle Advocates, have fabricated lightweight multi-bicycle supports that can be disassembled and transported by bicycle trailer. In Portland, OR., a local business has created a collapsible, truck-transportable rack and offers event bicycle parking services by arrangement.

On-street Parking (i.e. Bike Corrals)

An alternative method for providing greater quantities of short-term bicycle parking is to consolidate racks, which would typically be placed along the sidewalk, and locate them in the traditional on-street automobile parking lane within the curblines. This approach is commonplace in North American cities with higher bicycle mode share.

Before deciding that on-street bicycle parking is an appropriate solution for a particular community, factors such as street sweeping and snow removal should be considered. While maintenance agreements can provide some level of street debris removal, snow belt communities should consider how on-street parking will fit into snow removal and storage plans before implementing this parking type. Communities might choose to plow around corrals, remove corrals, or store snow near corrals, accepting that parking will not be accessible during winter. The right option depends on local winter operational capacity and the context around the corral.

The design of on-street bicycle parking will vary widely between communities as each will accommodate their specific traffic engineering requirements, safety concerns, weather, and aesthetic goals.



Shared bike parking and scooter parking in old parking space to daylight intersection, San Jose, CA (Photo: Lola Torney)

Community Benefits

On-street bicycle parking is particularly attractive for commercial corridors where the high demand for bicycle parking begins to crowd available space within the sidewalk right-of-way. Depending on sidewalk width, this typically occurs when parking for 10 or more bicycles is desired.

The removal of bicycle racks from the sidewalk and consolidation of racks in a designated facility within the street provides many community benefits:

- **For businesses:** Corrals can provide on average a ratio of eight customers to one parking space and advertise their bicycle-friendliness. They also improve the outdoor café seating environment by removing locked bicycles from the area adjacent to sidewalks.
- **For pedestrians:** Corrals clear the area adjacent to sidewalks and serve as de facto curb extensions.
- **For bicyclists:** Corrals increase the visibility of bicycling and increase storage capacity.
- **For motor vehicle drivers:** Corrals improve visibility at intersections by eliminating the opportunity for larger vehicles to park at street corners. They also reduce conflicts between parked bicycles along the sidewalk and the opening of doors from parked automobiles.



On-street bike corral in Santa Cruz, CA (Photo: Heath Maddox)

Choosing the Right Location

FIGURE 3.9 Example Mixed-Use/Residential Area Bike Parking Locations (Photo: Mauricio Hernandez)



Identifying the ideal location for a corral is a question of balancing various factors. Locations are identified through consultation with business associations when feasible. Maintenance agreements are signed between businesses or community groups and the municipality to ensure corrals are debris-free. Other elements to consider are convenience, street corners, main streets, and traffic operations and street amenities.

Convenience

The facility should be located as close as possible to the entrances of high demand locations. On dense commercial corridors it is likely that a bike corral will usually benefit a cluster of businesses; however, in most cases customers are unlikely to park their bicycle more than 100 feet (30 meters) from their destination and may instead lock to sign posts or other appurtenances if present.

Street Corners

Locating bike corrals on corners will provide greater visibility benefits for pedestrians and improve bicyclist access to the facility from intersecting streets. By comparison, mid-block locations can be difficult to enter with adjacent parallel parked cars and require out-of-direction travel from side streets to reach the bike corral. Exiting bicyclists are also easier to see when the bike corral is not concealed within a row of parked cars.

Main Streets

In proximity to main streets, it is tempting to recommend locating bike corrals on side streets to move the corral away from higher traffic volumes and to avoid repurposing premium motor vehicle parking spaces. However, bicycle parking should be situated on the main street if the main street includes bicycle facilities. Locating bike corrals along the main street makes the bike parking easier to find for bicyclists, generally reduces distances to main entrances, improves visibility of business facades, and creates the most benefits for pedestrians.

Traffic Operations and Street Amenities

Bus stops, fire hydrants, turning bus movements, location of manholes and sewer valves, parking meters, and even adjacent landscaping may be obstacles when identifying a location. Care must be taken not to locate bike corrals in street areas that are within the turning path of larger vehicles, in locations where utilities require frequent access, and areas subject to flooding or deep water during rain storms.

Bike Corral Design

A bike corral is composed of the following elements: the bicycle racks, a method of demarcating the parking area that discourages motorist encroachment, and signage.

Rack Choice

Single inverted-U racks bolted to an asphalt pavement can be easily dislodged over time or by persistent vandals. One successful method for installing racks to an asphalt surface is to use racks welded to steel rails in clusters of three or more.



Installation of bike racks on asphalt surface in Fort Lauderdale, FL. (Photo credit: Mauricio Hernandez)

Bicycle Orientation

Most on-street motor vehicle parking lanes are 7 to 8 feet (2.1 to 2.4 meters) wide. By angling bicycle racks at a 60 degree angle, the depth of a typical adult bicycle is accommodated with ample buffer space to the edge of travel lane and some longer bicycles will also be accommodated. Orienting racks perpendicular to the curb provides less space between the edge of the bicycle and the travel lane and may not accommodate larger bicycles (or may encourage bicyclists with

longer bikes to park incorrectly); however, this layout accommodates a slightly greater number of bicycles within the available space. In communities where longtails, trailers and cargo bicycles are more prevalent, consider orienting the bicycles parallel to the curbline to accommodate their larger footprint.

Dimensions

Spacing racks at four feet (1.2 meters) on center allows greater convenience for bicyclists parking their bicycles, particularly with the wide variety of handlebar styles and in areas where bicyclists are using various types of panniers. A minimum rack spacing of three feet (0.9 meters) can be considered in constrained areas or where maximizing the number of spaces outweighs the convenience and maneuverability of accessing racks. A minimum of four feet (1.2 meters) spacing on center is appropriate for racks on a 60 degree angle.

Perpendicular and angled vehicle parking spaces can also be successfully modified for on-street bicycle parking with spacing requirements being similar to those above. Spaces at street corners are preferred to improve access and visibility.

Demarcation

Methods for delineating the bicycle parking area will vary based on conditions in each community. The appropriate solution will depend on the following considerations:

Flexibility versus Permanence

Pavement markings and freestanding, surface-mounted racks which bolt to the road surface are easy to remove for road maintenance or modifications such as incremental increases to meet demand. Concrete curb, parking stops, planters, bollards, or flexible delineator posts can be considered based on the desired level of permanence, maintenance considerations, and adjacent roadway speeds.

Bicyclist Access and Safety

Safety of users is a critical design component. Racks should be set back from travel lanes to provide at least a minimum two feet (0.6 meters) of buffer space from the wheel of a bicycle to the adjacent travel lane. Low roadway speed limits, low truck or bus traffic, and low parking turnover are also factors that contribute to bicyclist safety when accessing the parking area. The location of objects used for demarcation must also consider the ease of access for bicyclists to enter and exit the bike corral. The side closest to the travel lane should be more porous and the sides closest to parked motor vehicles should be hardened to provide ease of access and discourage parallel parking from encroaching into the bike corral space.

Protection

Some bike corral designs emphasize a physical barrier between the travel lane and parked bicycles, such as poured concrete curbs, bollards, or flexible delineator posts. The necessity of a physical barrier will be based on traffic speeds and safety considerations. In some communities, introducing fixed objects in the right-of-way may not be permitted along higher speed roadways if they are viewed as a safety concern for drivers. By comparison, elements like flexible delineator posts are designed to be forgiving if struck while still providing a visual deterrent to drivers.

For facilities that rely only on pavement markings to define the parking area, a physical barrier to discourage adjacent parallel parking vehicles from advancing too close is still recommended. This could be a 4-foot parking block, reflective flexible delineator posts, or bollards along the side adjacent to vehicle parking.

Visibility

Increasing the visibility of a bike corral is an important safety consideration as well as an aesthetic component. Various methods can provide day and night time visibility, including vertical elements, reflective material, bright colors, placement near existing street lighting, and placing corrals at street corners where adjacent auto parking does not conceal exiting bicyclists. Visible signs should also demarcate bike corrals for bicycle parking and guide bicyclists to nearby locations. Visibility can either enhance or detract from the facilities' attractiveness.

Bike Corral Implementation

Based on the successes in communities in North America, the following steps are key to developing a successful in-street parking program:

1. Adopt design guidelines (such as the best practices in this guide). Design guidelines should be adopted by the municipality, either through legislation or official policy by the community's streets department that will approve requests for installation.
2. Create community policies (maintenance and liability). Consistent policies for maintenance and liability are an important tool when working with the community and local businesses and help to address concerns about adding to a community's maintenance burden or liability exposure.
3. Choose locations based on merchant requests. The most frequent objection to in-street parking is from merchants who perceive the loss of an automobile parking space as a threat to their business. Where possible, seek out bicycle-friendly businesses.
4. Identify funding. Funding can be from local sources, project-by-project, or multiple sites can be bundled together for the purpose of larger grant applications.
5. Choose advantageous pilot locations. Pick locations that are a guaranteed success, ones which have the strongest local support and will be the most heavily used. Picking sites with few if any design or installation challenges is also important to speed implementation.
6. Document outcomes. Before and after documentation should include bicycle parking utilization (bicycle counts) at the site as well as intercept or online surveys of bicyclists, business patrons, and business owners.



Bike Corral installation, Austin, TX (Photo: Sophia Benner)

Bicycle Parking at Transit Stations

Bicycle transit centers offer opportunities for secure and weather-protected bicycle parking, typically located near major rail or bus hubs. Most bicycle transit centers offer free parking during their hours of operation, and paid memberships for 24-hour access to secure parking. In addition, each bicycle transit center location provides unique services and amenities. Bicycle transit centers sometimes offer:

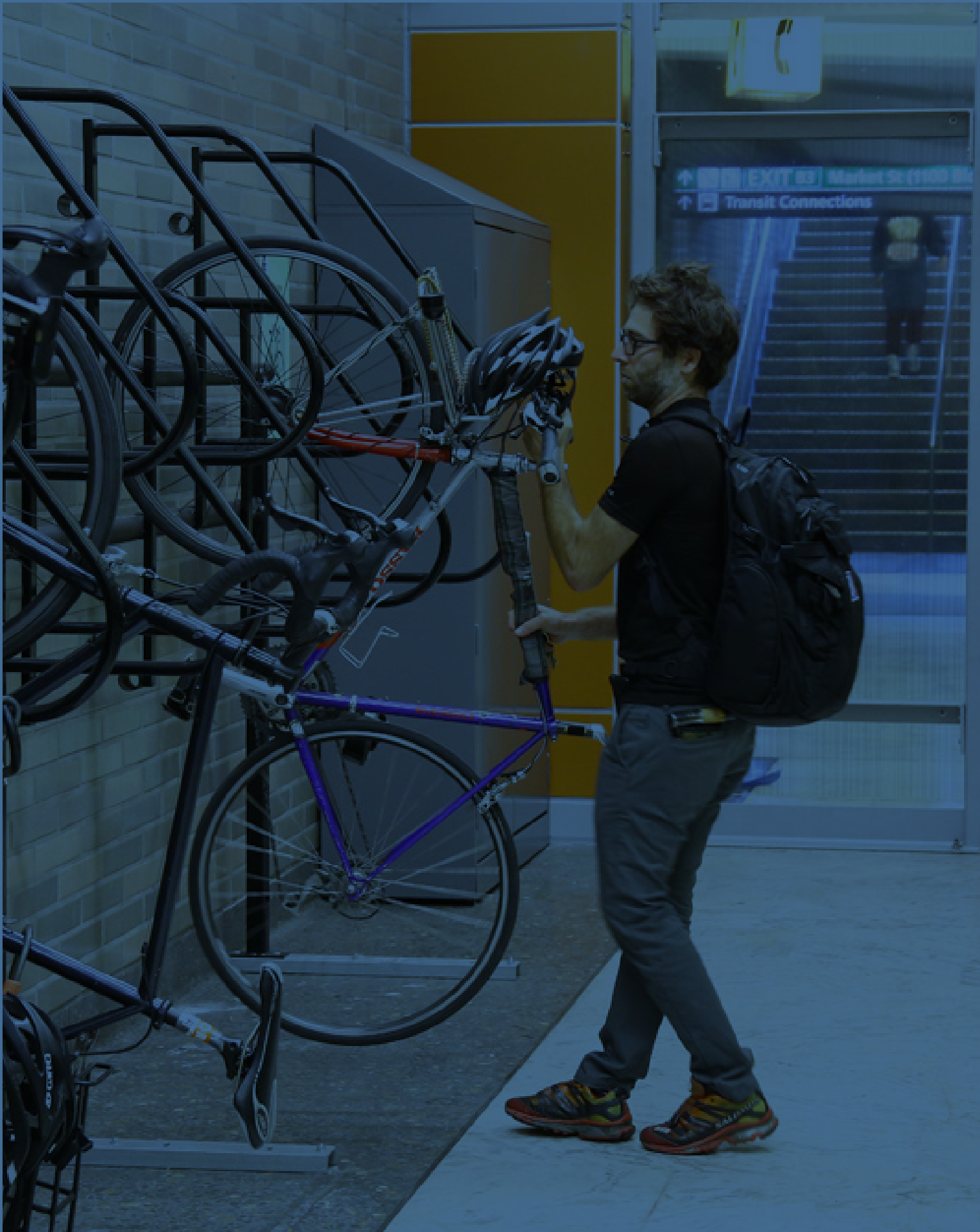
- Staffed operating hours, often with valet parking
- Information to plan commute trips
- Bicycle repair
- Bicycle and commute sales and accessories
- Shower/restroom/changing rooms
- Shared-use bicycle rentals
- Access to environmentally-clean vehicle-sharing

Bicycle transit centers have significant operating costs associated with leasing or constructing space and paying for staff time; therefore funding may be a challenge for some communities wishing to build such a facility. Some of the ways costs can be reduced include automating parking through electronic access control, sharing operations costs by partnering with or being co-located with bicycle-related businesses (e.g., bicycle shops, cafes), and limiting staff hours or having staff perform multiple duties such as retail sales and bicycle repair when not parking bicycles.

Read a case study at https://www.pedbikeinfo.org/resources/resources_details.php?id=3969



Bike Lockers at Metro Station, Falls Church, VA (Photo: Y.G. Mwangi)





4

Bicycle Rack & Locker Selection

Selection Process Considerations + Flow Chart

The selection of a bike rack must consider a variety of factors, including the space available, bicycle type(s) that will be accommodated, aesthetics, accessibility, cost, durability, and long-term maintenance considerations to name a few.

Selection Criteria

For both short- and long-term bicycle racks, APBP recommends selecting a rack that:

- Supports a bicycle at two or more points above its center of gravity.
- Allows the bicycle frame and one or both wheels to be locked with a U-lock.
- Provides appropriate mounting locations to securely anchor to the ground.
- Resists cutting, rusting, bending, and deformation.
- Is intuitive for a first-time user of the rack.
- Accommodates a variety of bicycle shapes and sizes.
- Is pedestrian detectable and does not contain protruding objects.
- Does not bend wheels or damage other bicycle parts.
- Has few or no moving parts
- If electric charging is desired, outlets can be incorporated into bike parking racks; however, timers and security for the charging cables must be considered.

Rack Styles

Bicycle racks are available from manufacturers in a variety of shapes and sizes; however, not all bike racks meet the recommended selection criteria. APBP has identified racks that are recommended for use based on the selection criteria, and also summarizes racks that should generally be avoided.

Custom or localized bike racks have become increasingly common in some communities to reflect local businesses, districts, or arts campaigns. Localized or artistic bicycle racks support a general sense of place, but should not blend in as street furniture in the existing streetscape design. Colored finishes and alternate shapes have also increased in popularity to meet this need. A number of manufacturers produce custom racks with a variety of distinctive designs that respond to nearby uses such as cafes, restaurants or parks and open space. Some cities have sponsored bicycle rack design competitions or commissioned artists to design and produce racks as functional pieces of public art. Business districts, neighborhoods and historical areas may prefer a signature style of rack. When selecting or designing a rack it is essential to balance aesthetic concerns against critical functionality and safety issues. If custom racks are considered, the design should be easily understood as a bike rack (and not just a piece of art) and they should comply with the selection criteria mentioned above.



Examples of decorative bike racks (Photos: Toole Design)

Racks Recommended for All Applications



Inverted U-Rack

Inverted u-racks are one of the simplest and most effective bike rack styles. Each rack can support two bicycles (one on each side parallel to the rack) and they are often installed in groups to provide higher density parking options.



Inverted U-Rack in Berkely, CA. (Photo: Heath Maddox)

TABLE 4.1 Inverted U-Rack Summary

Cost	Low to medium cost per bicycle.
Space	Rack is smaller than bicycle footprint, though when improperly used can expand the parking footprint.
Materials & Maintenance	No moving parts. Anchors and finish may need occasional maintenance.
Aesthetics	Variety of finishes and shapes available. Can be supplemented with a decorative central panel/cross bar, though some designs can reduce the functionality of the rack.
Security	Can lock one wheel and frame with u-lock. Can remove the second wheel and lock with a single lock or use a secondary cable to lock the second wheel while attached. Square tubing is recommended as it is less susceptible to pipe cutting tools. Inverted u-racks can benefit from the installation of a horizontal crossbar located half-way up the height of the rack to prevent theft that might occur by dislodging the rack and slipping the bicycle lock over the end of the post.
Detectability	Bike rack and bicycle are detectable to pedestrians if a horizontal crossbar is located less than 27 inches (685 mm) or less above the sidewalk surface.
Usability	Most common bike rack type that is recognizable and easy to use. Must be spaced and located properly to accommodate two bicycles and be accessible from both sides.
Capacity	Two bicycles per rack. Some bicyclists traveling together may lock together on one side of a rack, but this behavior may make an adjacent rack inaccessible.
Use	Suitable for both long-term and short-term parking.

Post and Ring Rack

Post and ring racks have a much smaller footprint and therefore take up less street space when bicycles are not locked to them. They only provide one mounting point to the ground. Parking meter poles may be converted to post and ring racks.



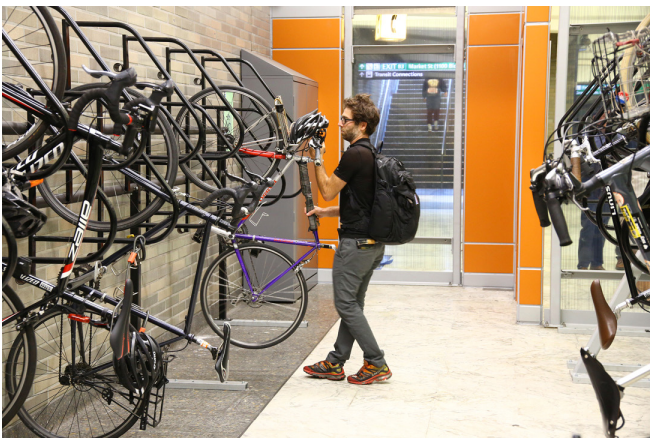
Post and ring rack outside of Chez Panisse in Berkeley, CA.
(Photo: Heath Maddox)

TABLE 4.2 Post and Ring Rack Summary

Cost	Low to medium cost per bicycle.
Space	Rack is smaller than bicycle footprint, though when improperly used can expand the parking footprint.
Materials & Maintenance	No moving parts. Anchors and finish may need occasional maintenance.
Aesthetics	Variety of finishes, designs, and shapes available. Some designs or shapes can reduce the functionality of the rack.
Security	Can lock one wheel and frame with u-lock. Can remove the second wheel and lock with a single lock or use a secondary cable to lock the second wheel while attached. Square tubing is recommended as it is less susceptible to pipe cutting tools. Cast metal rings may be vulnerable to prying.
Detectability	Bike rack and bicycle are detectable to pedestrians as long as the bottom of the ring is 27 inches (685 mm) or less above the sidewalk surface. Rings that are greater than this height cannot protrude more than 4 inches (100 mm) from the pole or they require a base with a height of at least 2.5 inches (64 mm) as shown in the image above.
Usability	Intuitive. Must be spaced and located properly to accommodate two bicycles and be accessible from both sides. When retrofitted on existing parking meter poles, may not accommodate parking on the street-side.
Capacity	Two bicycles per rack. Some bicyclists traveling together may lock together on one side of a rack, but this behavior may make an adjacent rack inaccessible.
Use	Suitable for both long-term and short-term parking.

Vertical Rack

These racks allow a bicycle to be hung by one wheel which minimizes the horizontal space that is used. When these racks are used, other options on the ground are essential for larger and heavier bikes, as well as to accommodate people who have difficulty lifting their bike.



Vertical parking in self-park BART bike station, San Francisco, CA
(Photo: Eric Londgren Photography)

TABLE 4.3 Vertical Rack Summary

Cost	Low cost per bicycle.
Space	Rack is smaller than bicycle footprint. Can be installed in a staggered vertical pattern to avoid handlebar conflicts and increase overall capacity. Very space efficient.
Materials & Maintenance	Round steel bar stock may be less secure than racks with thicker materials. Can be integrated with a cable to lock the rear wheel. Anchors and finish may need occasional maintenance. Rubberized treatments are recommended where the wheel attaches to the rack to prevent damage to bicycle rims.
Aesthetics	Rack type is usually not installed in public spaces, so aesthetics is often less of a concern. Variety of finishes and shapes available.
Security	Intended for secured areas, but if located in unsecured areas they can be bent, cut, or detached from the wall. Can lock one wheel and frame with u-lock. Can lock the second wheel using a secondary or included cable if attached.
Detectability	These racks are not detectable and should not be installed adjacent to pedestrian accessible routes and can benefit from the installation of directional indicators to guide pedestrians in a space that is not in conflict with the hanging bicycles or the protruding elements of these racks.
Usability	Less intuitive and requires the bicycle to be lifted. May not be suitable for heavier e-bikes and are not compatible with recumbent, tandem, cargo, and other bike types. On-ground parking should always supplement these racks.
Capacity	One bicycle per rack.
Use	Suitable for long-term parking.

High-Density Racks

Inverted U-Rack Series

These racks have all the benefits of standard inverted u-racks, but increase the bike parking capacity by providing multiple u-racks. The u-racks are mounted directly to metal rails or channels, structurally connecting multiple u-racks together. These systems are common for use in on-street parking corrals. They may be constructed with both straight and skewed bike parking alignments to accommodate different site conditions.



High Density Rack at 19th St. BART (Photo: Heath Maddox)

TABLE 4.4 High-Density Inverted U-Rack Summary

Cost	Low to medium cost per bicycle.
Space	Rack is smaller than bicycle footprint, though when improperly used can expand the parking footprint.
Materials & Maintenance	No moving parts. Anchors and finish may need occasional maintenance. If individual inverted u-racks are bolted to the steel plates then individual racks can be replaced if damaged.
Aesthetics	Variety of finishes and shapes available. Can be supplemented with a decorative central panel/cross bar, though some designs can reduce the functionality of the rack.
Security	Can lock one wheel and frame with u-lock. Can remove the second wheel and lock with a single lock or use a secondary cable to lock the second wheel while attached. Square tubing is recommended as it is less susceptible to pipe cutting tools.
Detectability	Bike rack and bicycle are detectable to pedestrians if a horizontal crossbar is located less than 27 inches (685 mm) or less above the sidewalk surface.
Usability	Inverted u-racks are the most common bike rack type that is recognizable and easy to use. Each u-rack must be spaced and located properly to accommodate two bicycles and be accessible from both sides.
Capacity	Two bicycles per individual inverted u-rack, and often installed to accommodate between 6-12 bicycles. Some bicyclists traveling together may lock together on one side of a rack, but this behavior may make an adjacent inverted u-rack inaccessible.
Use	Suitable for both long-term and short-term parking.

Two-Tier (Double Decker) Rack

Tiered bike racks allow one bike to be placed at ground level and a second bike to be placed above the ground level bike. Systems that provide two points of contact should be specified to meet the selection criteria. Select wheel channels that will accommodate wider-width tires (e.g. fat tire bikes) where appropriate. These racks are typically provided in large groups to provide a high density parking option.



Two-Tier Rack in downtown Berkeley Bike Station, CA (Photo: Heath Maddox)

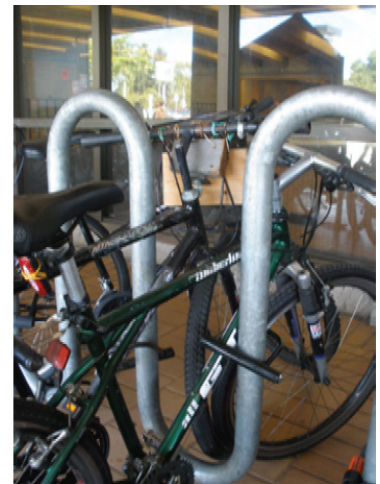
TABLE 4.5 Two-Tier Rack Summary

Cost	Medium to high cost per bicycle.
Space	Space efficient when properly designed and used, but racks are larger than the bicycle and when deploying the top tray they require additional space to load and lift the bicycle.
Materials & Maintenance	Top trays include hinges, sliding movements, and locking mechanisms that may require lubrication and occasional maintenance.
Aesthetics	Rack type is usually not installed in public spaces, so aesthetics is often less of a concern. Variety of finishes and colors available.
Security	Intended for secured areas, but if located in unsecured areas they can be bent, cut, or detached from the wall. Can lock one wheel and frame with u-lock. Can lock the second wheel using a secondary or included cable if attached.
Detectability	Bike rack and bicycle are detectable to pedestrians.
Usability	Many racks include lift-assisted trays to make use of the top rack easy, but without this feature some users may find it difficult to use. Rack is only accessible from the rear and may not always be intuitive. May not be compatible with recumbent, tandem, cargo, and other bike types which may require supplemental U-rack parking.
Capacity	One bicycle per tray.
Use	Suitable for both long-term parking.

Racks to Avoid



A variety of other bicycle rack types are available on the market and may currently be in wide use. Unfortunately, many of these rack types do not meet the selection criteria discussed in previous sections. APBP recommends against installing racks that do not meet these guidelines. A brief summary of racks that should be avoided and common issues is provided below.



Wave racks. Not recommended. (Photos: John Ciccarelli, Eric Anderson)

Ribbon/Wave Racks

This rack type does not provide two points of contact unless bikes are parked incorrectly. Additionally, many of the undulating designs cannot accommodate the number of bicycles that they claim to accommodate. If damaged, the entire rack needs to be replaced.



School yard racks. Not recommended. (Photos: John Ciccarelli, Eric Anderson, Mike Lydon, The Street Plans Collaborative)

School Yard/Grid/Combo Racks

This rack type does not provide two points of contact unless bikes are parked incorrectly. Many of these designs cannot accommodate the number of bicycles that they claim to accommodate, particularly adult sized bicycles. These racks are also often installed too close to walls or other elements that hinder their proper use. If damaged, the entire rack needs to be replaced.



Wheel well secured racks. Not recommended. (Photos: Arthur Ross, City of Madison; Creative Pipe, Inc.; John Cinatl)

Wheel Well Secured Racks

This rack type does not provide two points of contact, though it does allow the front wheel to be stabilized when locking. They are uncommon and may not be recognized as bike racks. They also include protruding components that may not be detectable by pedestrians or may require additional features to be detectable. If damaged, the entire rack needs to be replaced.



Wheel well racks. Not recommended. (Photos: Eric Anderson; R.J. Thomas Mfg. Co., Inc.)

Wheel Well Racks

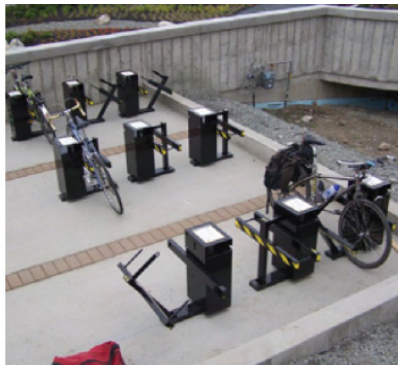
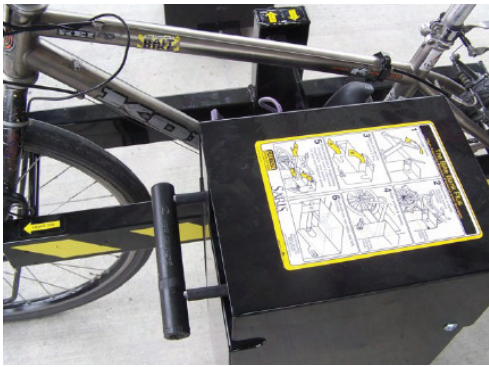
This rack type does not provide two points of contact and is also not often intuitive for users as it may appear to be a parking stop or precast curb. Provides limited or no opportunity for locking. May also damage bicycle wheels (often called “wheelbenders”). Some may accommodate bikes with wider tires, but may pose a tripping hazard when not in use.



Coathanger racks. Not recommended. (Photos: John Luton, Capital Bike & Walk)

Coathanger Racks

This rack type may support two points of contact, but often has a larger footprint than other bike racks. Does not easily accommodate bicycles of different sizes and shapes. Additionally, many of the coathanger designs cannot accommodate the number of bicycles that they claim to accommodate. The locking loops may also be less cut resistant than thicker tubed racks. If damaged, the entire rack needs to be replaced.



Swingarm secured racks. Not recommended. (Photos: John Luton, Capital Bike & Walk; John Ciccarelli)

Swingarm Secured Racks

These racks provide a relatively high level of security, but are susceptible to cutting and prying. They are not intuitive to use, can damage bikes and wheels, and include moving parts that require maintenance. Each rack has a large footprint and only accommodates one bicycle each.

Rack Materials and Coatings

Bike racks need to be constructed of strong, durable metals that can be securely anchored to the ground (or walls). Typically bike racks are manufactured of steel, but the design and finish should be selected to meet the aesthetic needs of the site while withstanding typical weather conditions, including consideration for rain, salt, and snow.

Materials

Bike racks should be made of steel to provide a strong, durable, and heavy rack that can discourage cutting and theft. The thickness and shape of the steel can affect how vulnerable the rack may be to cutting and theft.

Finishes & Coatings

The surface of a bike rack will affect the aesthetics, durability, and maintenance considerations. For finishes that accommodate different colors, matte black is commonly selected based on its ability to hide dirt, but other options are available to meet the aesthetic needs of the community.

Recommended bicycle rack finishes include:

TABLE 4.6 Recommended Bicycle Rack Finishes

Finish	Appearance	Notes
Hot-dip Galvanized (Zinc)	Dull silver, slightly rough.	High resistance to rust. Least expensive, highly durable, and virtually maintenance free. For bike parking, hot-dip galvanization is far superior to thinner and less durable electro-galvanization.
Stainless Steel	Bright and smooth, various levels of polish can be specified.	Highest resistance to rust and harder to cut than mild steel. Most expensive option.
Powder Coat	Typically smooth, available in a wide variety of colors and finishes.	Powder coating is a metal finishing process employing any of a variety of materials (polyester, epoxy, thermoplastic) that are heat-cured onto the metal. More durable than conventional paint, but racks should be galvanized first so that the inevitable nicks, scratches, and chips in the finish do not lead to rusting.
Plastic or Rubber Dipped Coatings (PVC/Vinyl/Plastisol)	Black or colored, typically smooth with a rubberized feel.	Surface is softer and less prone to chipping than powder coat but more susceptible to vandalism. Provides some cushioning to prevent scratches or dents to bike. Racks should be galvanized first.

Bicycle Lockers

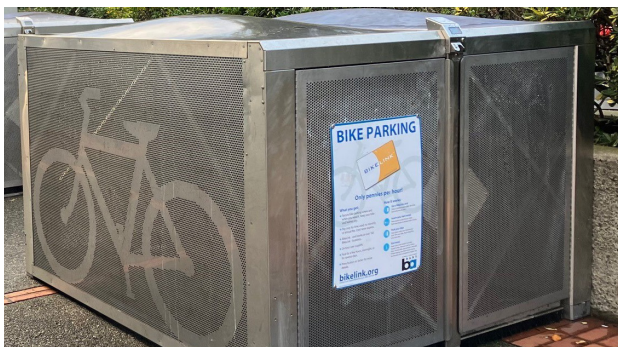
Bicycle lockers provide a secure, enclosed, individual space. The security of a bicycle locker depends on the security of the wall panels, door, frame and the locking mechanism.

APBP recommends selecting a bicycle locker that:

- Fully encloses the bicycle
- Provides weather protection
- Anchors securely to the ground
- Resists tampering and vandalism

Locking Mechanisms

- **User lock and hasp:** The least secure and least desirable locking mechanism for a bicycle locker consists of a hasp that accepts a user-provided padlock and is not recommended. This setup is vulnerable to direct cutting and prying of the padlock and hasp. Even if a hasp shield prevents the lock from being cut or twisted off, a user-provided lock creates the need to have to break the lock if a user abandons the locker or fails to remove the lock as expected. Master keys cannot be used to inspect the contents of user-locked lockers. Whenever a user-lockable locker is vacant, its unlocked door invites misuse of the interior.
- **Integral mechanical:** Most conventional bicycle lockers employ recessed internal mechanical lock mechanisms, often with pop-out T-handle latches, and non-duplicable keys owned and assigned by the locker operator. Mechanical keys pose a system management challenge when users lose or fail to return keys. Charging a substantial key deposit can deter this, but system managers must be prepared to change out or re-key lock mechanisms if necessary. Lockers with mechanical key-lock units are not easily shared, which limits their use to long-term (monthly) rentals. If a substantial number of users do not need their lockers every day, the locker bank is underutilized.



On-demand smart bike locker labeled as “Bike Parking”
(Photo: Heath Maddox)

- **Integral smart:** Lockers that employ digital “smart” locks instead of mechanical keys enable flexible usage, including on-demand reservations of lockers by one-time or infrequent users. Some systems employ user access devices such as mobile phone app, magnetic stripe cards, proximity cards, or proximity fobs. As more transit systems allow smart cards, those cards can also enable access to system bicycle lockers. Some smart lockers also provide keypads and small displays. In the simplest stand-alone digital access setups, each locker has a smart lock but the locker bank is not connected together either locally or to a broader network. If a locker bank with smart locks is also networked to a reservation system, users can determine locker availability before they begin their trip, and can reserve a locker before arrival.

Locker Vulnerabilities

Bicycle lockers may be subjected to several types of attack: cutting (of enclosure panels), prying (door and frame), door/frame failure (door sag), and fire (some plastic enclosures). As is the case with bicycle racks, most thieves will not employ power tools due to noise. Lockers also conceal or obscure their valuable contents, which may remove or reduce motive unless they have view windows or are made of perforated panels.

- **Cutting (plastic):** The plastics used for bicycle locker shells vary in their resistance to cutting with common tools. Some weak shells such as softer polyurethane can be cut can-opener style, while others will effectively resist blade intrusion.
- **Prying:** Poorly engineered enclosure frames (panel joints) or door frames can be pried apart with crowbars. Lockers that do not incorporate an integral floor can sometimes be pried off their anchors with a pallet jack. More commonly, door frames provide excess space where a prying tool can be inserted. High quality locker door mechanisms incorporate a locking mechanism that inserts two or more tabs into the internal frame to defeat door prying attacks. Lockers can also be retrofitted with metal channels that protect the door-frame gap.

- **Door sag:** Low-quality bicycle lockers have doors consisting of panels attached to angle-iron or U-channel frames. The corners of these frames may break or bend with repeated use and weather cycles, causing the latch edge of the door to sag and possibly making it impossible to lock the unit. Repairing such doors is an expensive nuisance best avoided by initially requiring higher-quality door/frame construction.
- **Fire (plastic):** Plastic materials (e.g., some types of polyurethane) used for some bicycle locker shells will burn, such that the entire locker will burn if a vandal with a torch or lighter succeeds in igniting any part of it. Locker purchase specifications should disallow such materials.

Rack and Locker Safety

Detectability (ADA)

Bicycle rack areas on or adjacent to sidewalks and plazas should be detectable with the long cane used by people who are visually impaired to detect obstacles and tripping hazards. Some rack designs have ground-mounted elements that are detectable. A detectable device should be added for racks that cannot be located outside the pedestrian path of travel.



Detectable footing around bicycle parking area (photo: Eric Anderson)

Lockers - Special Concerns

Explosives and Weapon Storage

Security managers at sensitive locations such as airport terminals, major transit hubs, national and campus laboratories, financial institutions, and high-profile government buildings often consider bicycle lockers a risk because of their potential to conceal a bomb or weapons. Especially since September 11, 2001, locker manufacturers have responded by offering lockers that incorporate semi-transparent panels of perforated steel, and/or hardened windows into which a light can be shone for inspection (see discussion below under Visibility/Inspection of Contents).

One drawback of lockers that can be seen into is that they allow thieves to shop for bikes. In place of windows or perforations, some public agencies have begun to incorporate inexpensive IOT cameras in lockers that security personnel can monitor with a mobile app or web interface. In airports, bicycle lockers are the appropriate solution, and they can be sited away from vulnerable terminals by locating them in parking lots with safe and convenient bicycle access from nearby streets. Because the lockers will be used at night as well as during daylight, they should be located adjacent to and in direct view of parking attendant booths. They should also be near an airport terminal shuttle stop minimizing the distance luggage needs to be carried.

Unwanted Contents

Any bicycle locker or shared bicycle enclosure can be an attractive place for some individuals to store personal belongings not related to bicycle trips. Locker management programs should include policies that do not allow inappropriate storage, reserve the staff's right to inspect contents without notice, and dispose of inappropriate items in a specified manner after sufficient notice. Requiring positive identification, a deposit, and optionally a personal check or a nominal charge against a credit card can deter unwanted use.

Unwanted Activities

Bicycle lockers that accept user-provided padlocks are unlocked when the units are unoccupied. This is an open invitation for misuse, and transit agency experience has demonstrated this problem.

Usability

Lockers

There are a number of locker-specific design issues which can affect usability.

- Locker doors should open to at least 90 degrees to allow easy loading/unloading
- Lockers should be clearly labeled as bicycle parking
- Directions for use should be posted on or near the lockers
- Information about how to sign up for lockers (leased or smartcard/mobile app on-demand) should be posted on or near the locker

Capacity

Put simply, bicycle racks and lockers should hold the number of bicycles advertised by their manufacturers. This is a distinct issue from space efficiency, though it is related. For example, undulating racks are frequently advertised to hold two bicycles between each upright loop area, but the spacing between the loops may be inadequate, resulting in tangled handlebars because bicycles are parked too close together. Incorrect use of a rack may also limit capacity, as for example when a cyclist parks the bicycle parallel to an undulating rack in order to support the bike in two places and consequently blocks most, if not all, parking spots.

APBP makes two recommendations to manufacturers of bicycle parking:

- 1. Consider the spacing recommendations in this guide when designing racks, acknowledging that this may result in fixtures that hold fewer bicycles;
- 2. Consider the recommendation to support the bicycle upright in two places, as lack of support may inadvertently encourage incorrect use of the rack, thereby limiting actual capacity.



Bikes mis-parked at a wave rack. Richmond BART (Photo: Heath Maddox)



Double-decker locker with lift-assist tray (Photo: eLock Technologies)

Bicycle Locker Materials

The following table describes the most common types of bicycle locker construction.

TABLE 4.7 Common Bicycle Locker Construction Materials

Finish	Notes
All metal	Typically have flat tops, suitable for double stacking. On sunny days, can become very hot, especially if dark colored.
Molded plastic	May have flat or round tops.
Plastic panel on metal frame	Panels can separate from frame, increasing vulnerability to prying attacks.
Fiberglass panel on metal frame	Stiffness of fiberglass panels prevents prying vulnerability of plastic panels.

Visibility/Inspection of Contents

Some manufacturers offer metal lockers with perforated panels, or unbreakable windows in the door, top, or side panels to allow security personnel to view the locker contents. This is useful for on-going locker administration and security, to ensure that bicycles are not abandoned and that lockers are serving their intended use. In high-theft locations, visibility of locker contents can also help thieves target specific, high value bikes. For lockers with power and data connections, inexpensive cameras can be incorporated to provide app-based internal viewing without inviting theft.

Two-level Installations

Lockers with flat tops can form the lower tier of a two-level installation. Lockers with lift assist trays are available to make it easier to store and retrieve bicycles from upper lockers.





5

Installation & Maintenance

Installation

Methods of rack installation will vary by type of rack, mounting style, and type of surface, all of which will vary by context and/or decisions made in the planning phase.

Surface

In the public realm, racks are installed on a variety of surfaces, including concrete, brick, tile, or asphalt, and in special cases on gravel or dirt.

Techniques

There are two basic methods of installing racks: surface-mounted and in-ground (also known as subsurface or post-hole). The type of rack and surface type will generally dictate the mounting technique.

Surface-mounted racks can be installed individually or in groups by mounting two or more racks to rails for stability. Rail-mounted racks are free standing and can be quite heavy. While anchors are still appropriate to keep the racks from moving, typically fewer anchor points are needed. Racks can be welded to flat bar or channel rails during fabrication, which may complicate delivery, or bolted securely to channel in the field. Experience has shown that with the proper mounting hardware, surface-mounted racks are secure and resistant to vandalism in even the most hostile urban environments.



Welded steel flat bar rail-mounted racks anchored to concrete pavers, Oakland CA (Photo: Heath Maddox)



Bolt-on aluminum channel rail-mounted racks anchored to terrazzo floor, 19th Street BART Station, Oakland CA (Photo: Heath Maddox)

Some jurisdictions and developers may prefer in-ground mounted racks for aesthetics and the perception of permanence and security. In-ground racks are typically cast in concrete, although groups of free-standing rail-mounted racks can be installed with their rails buried in dirt or gravel. In-ground racks may be somewhat less susceptible to tampering and unwanted removal, but this same quality makes them more difficult and expensive for owners of the right-of-way to install and remove when necessary. In-ground installation is best accomplished with new construction when concrete is poured, otherwise demo work and/or costly core drilling is required in addition to fresh concrete. Once installed, in-ground racks cannot practically be moved and re-used, and replacing damaged in-ground racks will require concrete work.

Fasteners

The choice of fasteners will depend upon the surface material. To ensure that racks cannot be simply unbolted by vandals, racks should never be installed exclusively with expansion bolts and standard nuts. Concrete surface-mounted racks should be installed with at least three fasteners per flange. At least one of the three should be a Rawl or Powers mushroom head spike anchor and the other two can be expansion bolts, with the spikes on alternating sides. Threadlock or epoxy should be used to keep the nuts on the expansion anchors from loosening. When installing racks, care should be taken not to compromise the finish on the flanges to avoid rust.



Mushroom head spike (Photo: boltsplus.com)

Surface mounted racks installed on asphalt require different hardware than those attached to concrete. Asphalt is much softer than concrete and even if there's a concrete subsurface, is prone to compression if sufficient sideways force is applied to individually mounted racks. A single stand-alone rack can serve as a very effective lever for rocking the fasteners loose on a soft asphalt surface. Therefore, only free-standing rail-mounted racks should be used in asphalt surface-mounted applications (e.g., in-street bicycle corrals). If surface mounted racks are installed on brick or tile, anchors of sufficient length to reach into the concrete substrate must be used. Alternatively, a small concrete footing can be installed for fastening each flange. To prevent galvanic corrosion, fastener material should match the material of the rack: galvanized fasteners for mild steel racks and stainless hardware for stainless racks.

TABLE 5.1 Bicycle Rack Mounting Options

Surface	Mounting Type	Anchoring Methods	Notes
Concrete (sidewalk, pad, poured footing, or non-post-tensioned floor)	Sub-surface	Embed (dig post hole, support rack temporarily, fill hole with concrete, allow to set, remove temporary support)	Suitable for new sidewalk construction. Permanent. Difficult to replace when damaged.
	Surface flange; rail-mounted	• Wedge anchor bolt • Tamper-proof spike • Industrial adhesive	Suitable for new or existing sidewalk. Easy to replace when damaged. Should not be installed over most vaulted sidewalks. Stainless steel flanges recommended to prevent rust stains on concrete.
Concrete post-tensioned floor	Rail-mounted	• Industrial adhesive	Post-tensioned concrete floors should not be drilled.
Asphalt	Sub-surface	Provide a concrete footing, proceed as above	Do not anchor directly into asphalt.
	Surface flange		
	Rail-mounted	Landscape nails (6" to 12" long spikes, typically 1/4" to 3/8" in diameter)	Drill pilot hole through asphalt using hammer drill and masonry bit. Drive nails with sledgehammer.
Unpaved (special cases, e.g. campus or park setting where paved footings may not be feasible)	Sub-surface	Provide a concrete footing, proceed as above	Do not install individual racks directly on or into ground without footing.
	Surface flange		
	Rail-mounted	Landscape nails	Drive nails with sledgehammer, bury rails in compacted gravel. Racks installed this way will not last as long as those on paved surfaces or with footings, so balance long-term replacement costs against cost of concrete work.

Maintenance

Maintenance requirements and costs for bicycle parking can vary widely according to the type of storage and other factors such as location, climate, material, finish and mounting style. Accordingly, decisions made in the planning and design process will directly affect long-term maintenance needs and costs. In the public right-of-way, choosing and installing racks to maximize long-term durability will mean they last as long as the sidewalk or roadway itself, and can often be re-used after re-paving.

Short-term Parking

Short-term parking typically involves simple bicycle racks mounted along existing sidewalks or other concrete areas. As such, maintenance needs should be relatively minor. However, there are a few key points that are important for local jurisdictions to consider.

Inspect for damage: Bike racks and their anchors should be regularly inspected for damage. Damaged spike anchors can sometimes be replaced by grinding off the mushroom head and pounding in a new anchor, pushing the old anchor shaft into the ground below the rack. Damage to racks comes most commonly from errant vehicles; however, some thieves have been known to score or partially cut bicycle rack tubing, then wait for theft-worthy bicycles to be locked up. A partially cut section of bicycle rack tubing can be easily knocked loose with a small hammer, allowing the bicycle to be slid off the rack. Inspectors should be trained to look for this sort of damage.

Replacing racks: As described above, replacing or moving in-ground racks is likely to involve concrete work and other more involved construction work. Surface-mounted racks can be moved or replaced much more easily and cost effectively.

Repainting and touching up: Zinc is by far the most durable coating for mild steel, and if damaged can be touched up with zinc-rich primer. Powdercoat and other durable non-zinc coatings can't be touched up with the same materials as they are factory-applied and removing racks for re-coating is impractical; however, exposed metal can be touched up with zinc-rich primer and then painted with a similar color paint to protect the metal and maintain the aesthetic appearance.

While stainless steel is the most resistant to corrosion and does not require surface finishing, it is not immune to discoloration. In urbanized settings or when installed along high-volume roadways, airborne particulate can accumulate on the surface of stainless steel racks and oxidize, giving once-shiny bike racks a distinctly spotty, rust-speckled look; however, different grades of stainless steel have differing corrosion resistance depending upon the specific metals included in the alloy. Grade 304 stainless is acceptable for most outdoor bike parking applications, but for racks installed in a marine environment that will be exposed to salt air and water or where salting of roadways is common, grade 316 is recommended due to its higher molybdenum content.

Jurisdictions that paint their racks should plan to touch them up regularly or monitor their condition and touch up on an as-needed basis. Some communities have accomplished this by repainting bike racks and other street furniture (e.g., metal benches, trash receptacles, light poles) at the same time. Additionally, selecting street furniture of the same color can help to reduce maintenance costs if only one or two colors are needed to maintain multiple appearances. However, it should be noted that finish maintenance requirements for bicycle racks may be greater than light poles, benches, and other street furniture since bike racks are constantly bumped by metal bicycle frames, locks, chains and cables. Unmet maintenance demand of non-galvanized bicycle racks may result in degraded appearance and premature deterioration.

Long-term Parking

For reasons of space efficiency, some long-term bike parking facilities (e.g., bike cages, bike rooms, bike stations) are more likely to include stacking or double-decker racks, which may feature moving parts and lift-assist trays. Rollers, sliders, handles, springs, or gas cartridges may need to be replaced or serviced periodically. Aside from the racks themselves, a secure long-term bike parking facility will require regular building maintenance. Doors and fixtures, including entry controls, must be kept secure and operable. Floors and windows must be regularly cleaned, and lighting levels and camera systems must be monitored and kept in working order. Signs need to be kept legible and up-to-date. These facilities may also require regular auditing for excessive storage duration and abandoned bikes may need to be removed. Prior to removing bikes that appear abandoned, they should be tagged or an attempt should be made to contact the owner directly.

Bike lockers also require periodic cleaning (inside and out) and graffiti removal. Keyed lockers will require occasional service from a locksmith. Electronic on-demand lockers usually rely upon proprietary hardware and software that may require a service contract and recurring software licenses.

Long-term bike parking facilities are prone to vandalism and theft, which can result in costly repairs that need to be performed quickly to re-secure the facility. Lockers may also be misused to store items other than bikes and even potentially inhabited or used as cover for any number of unintended activities.

Weather Considerations

Extreme weather will have implications for maintenance. Where roads and sidewalks are salted, even the most durable bike rack finish will suffer. Some jurisdictions with significant snow accumulation have opted to remove and redeploy racks seasonally using drop-in anchors and tamper-proof nuts. Vinyl or rubberized coatings will wear faster in very hot, sunny climates where racks are exposed to ultraviolet radiation.



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