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Bicycle Parking Made Easy

A guide to the construction of bicycle parking facilities

www.bicy.it

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A distinction is often made in the literature between infrastructure for moving bicycle and stationary bicycle traffic. Measures to improve cycling traffic usually affect moving infrastructure such as bicycle path networks. This includes building bicycle paths or multi-purpose crosswalks. The infrastructure for stationary bicycles includes all types of bicycle parking, from simple bicycle racks to bicycle parking lots to high-quality full-service bicycle stations.

To promote cycling in a city or community, therefore, the improvement of stationary bicycle traffic has to be given greater focus.

The construction of bicycle parking facilities improves conditions enormously for cycling. High quality parking facilities offer the following advantages:

- a) **Bicycle parking facilities increase protection against bicycle theft and vandalism**
- Locked bikes are better protected from theft and vandalism as free standing bicycles. A shelter protects against bad weather. This extends on one hand the life of the bicycle and on the other hand, a safe parking area is a prerequisite for encouraging the use of high-quality, expensive bikes which provide their users more cycling pleasure. Especially in light of the increasing sales of relatively expensive e-bikes and pedelecs for everyday use are secure parking facilities a must.
- b) **Well-positioned bicycle parking facilities create switch potential**
- The establishment of well-positioned bicycle parking lots at major traffic sources and destination points creates a strong incentive to travel by bicycle. If the parking spaces for bicycle traffic are in a better location than those for private motorized cars, the switch to a bicycle is even easier.

Did you know that...¹

... 72% of all stolen bikes were parked in public spaces?

... 6 bicycles can be parked in one car parking space?

... 23% of victims of a bicycle theft do not buy any more bicycles?

Definition of terms in this brochure:

This guide uses the following terms:

Bicycle stands: a street device for parking bicycles. A bicycle stand general consists of one to two bicycle parking spaces.

Bicycle parking space: a parking lot specifically designated for bicycle parking, either at a bicycle stand or in a bicycle parking facility

Bicycle parking facility: a facility which consists of at least five bicycle parking spaces and which ideally also has its own access and exit area.

To fully exploit the potential of bicycle use, a sufficient number of high quality bicycle parking spaces should be erected. This guide is aimed at local authorities and transport planners and serves as a guideline for site selection and for the conceptual design of bicycle stands.

¹ BMVIT (2010): Radverkehr in Zahlen. Daten, Fakten und Stimmungen, S. 48ff., Wien. BMVIT (2009): Präventionsstrategien zum Fahrraddiebstahl. Fakten, Hintergründe & Maßnahmen, S. 6, Wien.

2. Quality criteria of bicycle parking facilities

Following is a discussion of ten criteria for assessing the quality of bicycle facilities. A distinction will be made here between the five basic requirements that every parking area must meet, as well as five additional criteria which further enhance quality.

2.1 Quality criteria for bicycle parking – an overview

Advanced specifications Base specifications

- 1 Ability to lock bicycle to stand
- 2 Parking space
- 3 Securing a stable stand
- 4 Accessibility
- 5 Barriere-free access
- 6 Shelter
- 7 Lighting and visibility
- 8 Cleaning and maintenance
- 9 Consideration of special vehicles
- 10 Service facilities

Ability to lock bicycle to stand

An important criterion for evaluating the quality of a parking area is the ability to lock the bike to a bicycle stand. A bike that is not only locked up, but locked to a stand is better protected from theft and vandalism as a locked but free-standing bike. A bicycle stand should be well anchored to the ground.

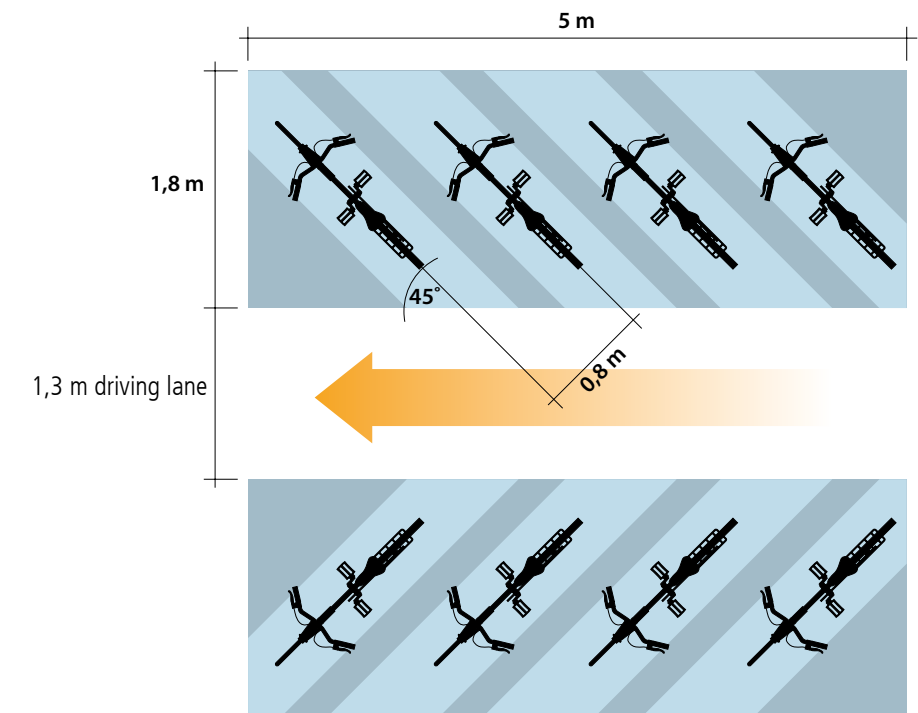
Parking space

A bicycle has a width of about 60 to 70 cm. A parking area where the bikes are parked side by side at the same level should therefore be at least 80 cm wide and 200 cm in length (1.6 m²). This is a good benchmark for the design of parking facilities. Space-saving units can be built by arranging bicycle spaces in different heights or by interchanging parking directions (front wheel overlap). Parking areas designed too narrowly put cyclists at a risk of damaging their bicycle while parking in or out of the area.



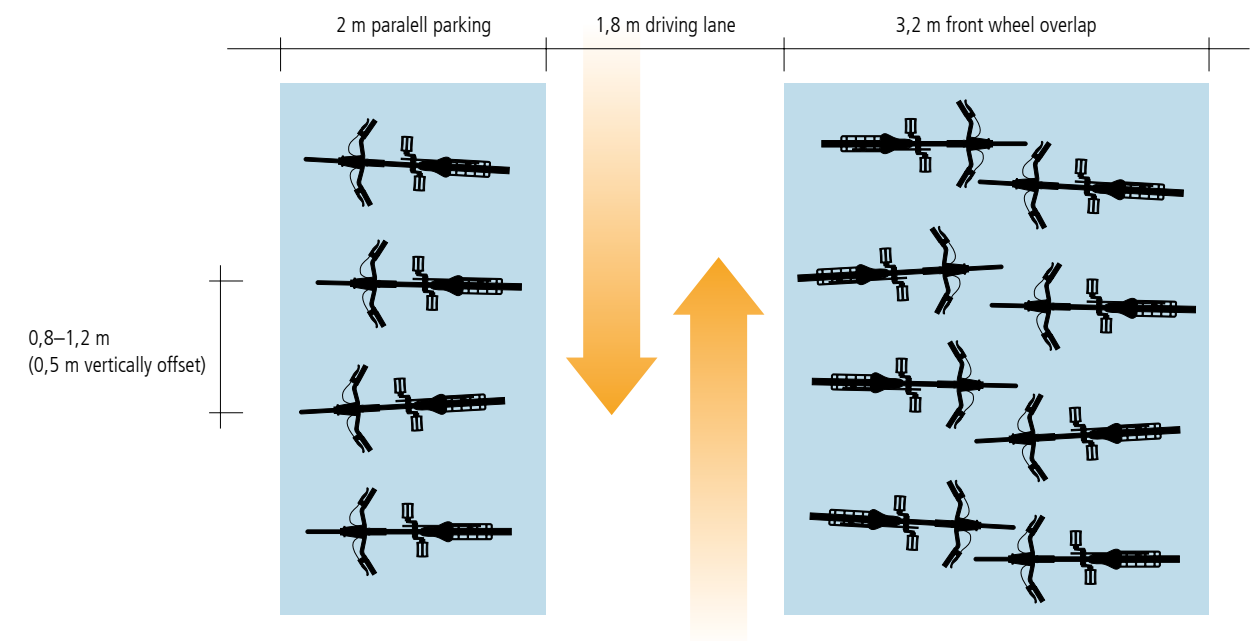
Perpendicular herringbone bicycle parking – Space requirement for 4 bikes: 9 m²

Source: RVS 03.02.13; design: FGM



Paralell parking of bikes – Space requirement for 4 bikes: 6,4–9,6 m²

Source: RVS 03.02.13; design: FGM





Picture: Rasfi GmbH

Securing a stable stand

The bicycle must be able to be locked to the stand in a stable and secure way. And while parking, the wheel should not tip over or roll away. A high quality facility provides the ability to lean the bike to a pole (bracket or frame) and also to fix the wheel if possible. Such bike racks are known as front wheel-frame holders. If only the front wheel of the bicycle is locked, the wheel can be badly damaged if the bicycle tips over. Thus “wheel benders” are an indication of a low quality parking facility.



Accessibility

Parking facilities should be accessible and easy to find. Professional bicycle areas in the immediate vicinity of a destination should be positioned at the entrance and clearly visible, so they are easily seen. It is also important to integrate the parking area and its signage into the bicycle path network without creating detours of the city or town’s cycle network. Signage to the next bicycle stands should be posted at all major destinations (i.e. train stations, shopping centers, etc.).



Picture: www.ziegler-metall.at

Barrier-free access

The faster and more convenient a bicycle ride can begin, the more frequently bicycles will be used. Parking facilities should therefore be barrier-free. Ideally they should be placed at ground level and easily accessible. Parking facilities behind stairs or those that are accessible only through narrow passages make it difficult to use a bicycle. Barriers in the form of stairs or narrow access to the parking area are obstacles. They lower the acceptance of such an area, even if ramps or sliding grooves are installed on the side of the stairs.



Picture: www.ziegler-metall.at

Cleaning and maintenance

Publicly accessible parking facilities often have the problem that they are misused as a disposal site for damaged bicycles. To counter this, periodically checks should be made regularly and signs be posted to ask owners to dispose of defective bicycles. If this is not done within the prescribed period, the community can have the bicycle removed.

Shelter

A cover protects the parked bicycles from the weather. That protects the bikes (i.e. from rust) and protects against wet saddles. Hence, the majority of parking facilities, particularly those for long-term parking, should be covered.

Lighting and visibility

Illuminated and well visible parking facilities increase perceived safety in public spaces and also help to prevent theft. If a parking area can not be supplied with power, the possibility of using solar lighting systems should be considered. Visibility refers to the visual contact between passers-bys and the parking spaces. Only if the parking area is clearly visible to the outside will it be seen. Again, the better the visibility, the higher the security and protection against theft and vandalism.

Consideration of special vehicles

A forward-looking design of a parking area includes all bicycle sizes and widths. In addition to the usual city bikes, special bicycles should also be considered. These are, for example, transport bicycles, bikes with child trailers, tri-cycles for seniors as well as children's bikes with smaller sized frames. Special wheels need more space within the system and a wide entrance. For example, at children's playgrounds especially, the higher demand for bicycle trailers should be taken into account.

Service facilities

Additional measures to increase the service quality of a parking facility. This includes lockers for equipment (i.e. bike helmets, bicycle bags) and self-service stations that are equipped with repair tools, air pumps, an inner tube vending machine or other features. Public accessibility allows cyclists to maintain or repair their bikes around the clock. Fully equipped bicycle stations or garages also offer bicycle rentals and the recharging of Pedelec batteries.



Picture: CO2 Neutra | Comune di Padova



Picture: www.pusch-schinnerl.com

2.2 Specific requirements for short-term bicycle parking facilities

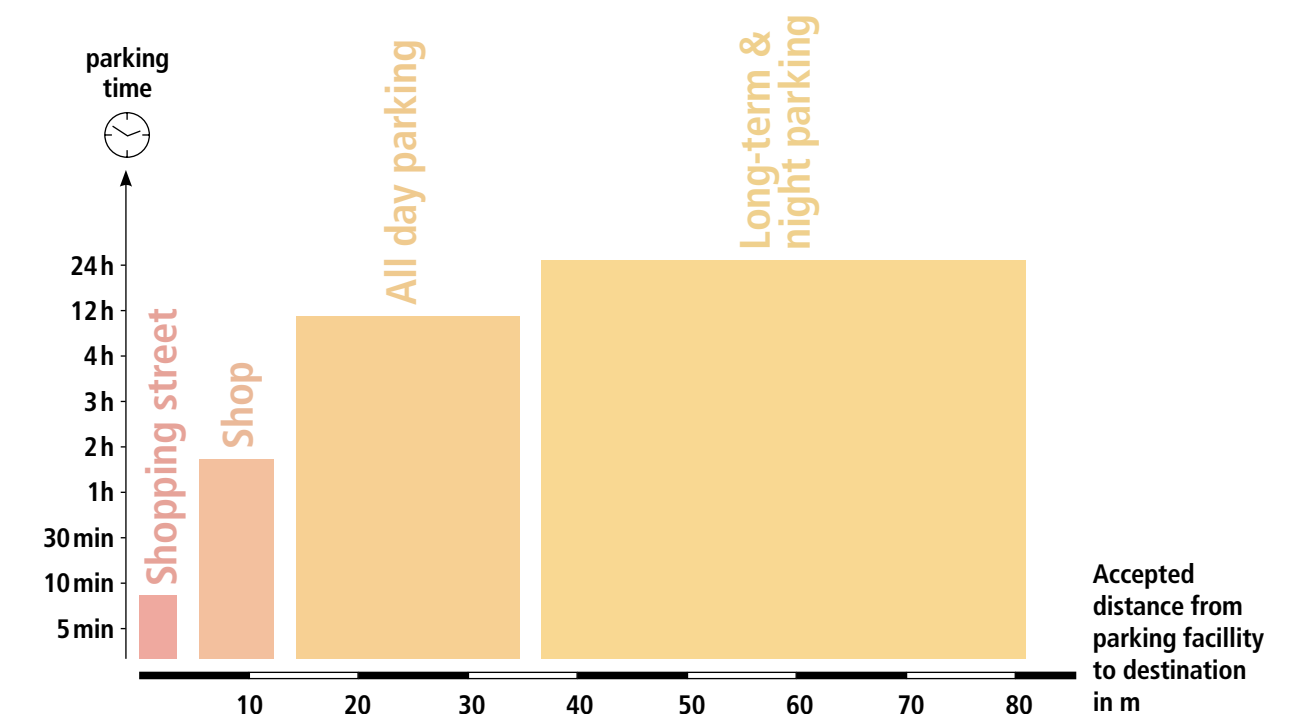
Parking facilities for short-term bicycle parking (from a few minutes to several hours) should be fast, safe, and reachable on bike. A simple and convenient usability is also important. The rule is: the shorter the stopover at the destination, the lower the acceptable distance between destination and parking space! Thus short-term bicycle parking areas have to be positioned in the immediate vicinity of the destination. If the distance between the origin or destination point and the bicycle stand too large, it will be not used and bikes will be parked anarchically anywhere. This is not only a major shortcoming for cyclists themselves, it also does not really contribute to an attractive cityscape.

A benchmark for the maximum distance between a parking area and a destination, with a stopover of a few minutes, is about five meters. Parking facilities in front of destinations where people stay for several hours should be located no more than 15 meters from the entrance.

“Optimal parking facilities for short-term parking is directly at the entrance of important points of origin and destination and directly accessible from the bicycle path network.”

Accepted distance between parking facility and destination depending on the planned length of stay

Source: Celis, Bolling-Ladegaard, 2008





Picture: Chang Yew creative commons 2.0 license

Short-term bicycle parking facilities:

U-Racks: The classic inverted U-Rack permits bikes to be safely locked up and protects well against falling. A rack has two bicycle parking spaces. Racks can be embedded in concrete or bolted to the ground.

Front wheel-frame holder: In addition to the rack, the front wheel is fixed to the stand. The bike is very stable and is well protected from tipping over and rolling away.

Mobile parking stands: Mobile systems are not fixed to the ground and thus can be removed quickly. They serve as temporary parking facilities, such as for meetings or events.



Picture: Ing. Weiss, Stadt Salzburg



2.3 Specific requirements for long-term bicycle parking facilities

Long-term parking refers to parking a vehicle for at least several hours. This can be parking the bicycle at work, at home or at the train station. Cyclists who park their bicycles for longer periods of time have special needs in parking facilities. Such aspects as security, safety and service are more important than at temporary stops. For such needs, somewhat larger distances between the destination and the parking area will be more accepted.

The minimum requirements for a long-term parking area include a U-Rack, shelter to protect from the weather as well as good lighting. To increase quality even more, the parking area can be equipped with additional services. These include repair services, lockers, luggage storage or rental bikes. To address the specific needs of e-bikes and pedelecs, battery recharging stations will become increasingly important.

Optimal protection against weather, theft and vandalism is when the bicycle can be parked in a locked room rather than outside. Bicycle lockers, bicycle parking stations and garages are among the most popular systems for long-term bicycle parking.



Bicycle parking facilities for long-term parking:

Covered bicycle stands: Covered parking facilities to protect against the elements. Covers come in different shapes and design so that they can integrate well into the landscape.

Bicycle Lockers: Bicycle lockers are mini garages for bicycles. Bicycles can be stored in the lockable boxes along with accessories (helmets, luggage, children's seats, etc.). The bicycle is not only protected from the weather but also from theft and vandalism. This is particularly relevant for high-quality bicycles. Battery charging stations for pedelecs and e-bikes can also be included.

Bicycle Stations: The greatest comfort in terms of safety and service is offered by bicycle stations. Here the bikes are kept in a separate building with security guards. Many bicycle stations also house additional services such as repair shops, bicycle rentals, and the sale of accessories and spare parts. Due to the high fixed costs, bicycle stations only pay off with a minimum size of about 100 spaces. Bicycle stations should therefore be established only in places with a high demand for parking spaces.



Picture: www.ziegler-metall.at



Picture: DI Spinka, Stadt Graz

2.4 Innovations in bicycle parking

In the following, little-known bicycle racks and bicycle parking facilities are outlined. These innovations are generally niche products which find meaningful use only in special cases:

Bicycle Rings: Bicycle rings are fixated to the ground, making it possible to lock-up bicycles. A special kind are so called "Cycle Hoops", which are rings that can be attached to vertical poles (lanterns, posts), walls or fences to provide a secure way of locking up bicycles. Such rings can increase the number of bicycle parking spaces on existing street facilities.



Picture: www.wsm.eu | pd-f

3. Site planning for bicycle parking



Picture: Transferstelle Null Euro Urbanismus

Bicycle Huts: These facilities are about the size of a parking space. The bicycles are suspended vertically in the huts, in which there is room for about 10 to 12 bikes per hut. Bicycle huts are of interest especially in densely populated areas (urban areas, historical building sites) with few open spaces. The huts can be locked and used by several people (i.e per apartment building).



Fully Automatic Bicycle Stations: Automatic bicycle parking stations can be erected at railway stations or central destinations where there is an above average demand for bicycle parking. These facilities, which are mainly known from Japan and the Netherlands, require relatively high investment. High-tech bicycle parking stations accomodate bicycles on several floors, some of which are underground. In Münster, Germany, a new bike park was built. The bikes are automatically transported by elevator to the upper floor and parked in a warehouse.

Type of Facility	Description	Recommended for Bicycle Types	Recommended Parking Duration	Cost per Parking Space
Open	Bicycle Rings	1 2		€ 25 – 50
	Rack	1 2		€ 60 – 100
	Mobile Facility/Non-anchored Rack	1 2		€ 100 – 150
	Front -wheel and Frame Rack	1 2 3		€ 100 – 180
	Covered Parking Facility with Lighting	1 2 3		€ 1.000
Locked	Bicycle Locker	2 3 4		€ 500 – 1.000
	Bicycle Hut (separate building or fenced in area)	2 3 4		€ 600 – 800
	Bicycle Station (incl Security und Service)	3 4		€ 3.000 – 6.000
	Full-automatic parking garage	3 4		€ 3.000 – 6.000

Source: Gemeente Utrecht 2010, velokonferenz schweiz 2008

Parking duration: = Minutes, = Hours, = 1 Day, = 2–3 Days
 4 categories of bicycle types: 1 = under € 100, 2 = € 100–500, 3 = € 500–1.500 and 4 = more than € 1.500

In order for parking facilities to be used by cyclists, they must be positioned where there is the highest demand for parking spaces. A needs-based planning considers the most important traffic sources and destination areas around a city or town. These are mainly places of residence, job locations, educational centers, public train stations and bus stops, shopping facilities and recreational destinations.

In contrast to needs-based planning, bicycle parking can also be provided on a supply driven basis. The establishment of parking facilities, for example, could provide an incentive to shifting cycling to routes previously rarely used. In addition, bicycle parking facilities can serve to increase the visibility of road space, since a fully loaded bicycle area reduces visibility much less than a full car park.

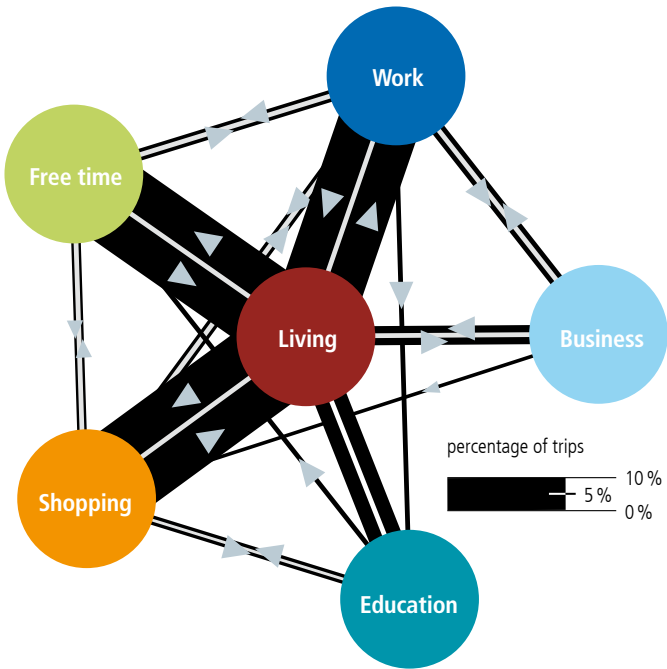
3.1 Bicycle parking at home

One’s own home is the most important starting point and destination. 80% of all trips start and end at home. The promotion of cycling, therefore, begins at home. Professional parking facilities should not be missing here. The bikes should be safe and sheltered and parking should be easily accessible, at best near the entrance or in the courtyard. A cumbersome trip to the basement impedes daily use of the bike.

The requirements for bicycle parking in residential areas are highly dependent on the respective settlement structure. In areas with low population density there is enough open space to establish parking spaces for bicycles. In dense areas, the competition for the few open spaces is hard, the price of land is correspondingly high, and the search for suitable bicycle parking spaces is considerably more difficult.

Trip connections in daily transport

Source: Ueberschaer M. M; Jaeger; G (1991)



Open construction (one and two-family homes)

Residential areas with less dense, open construction have good potential for bicycle parking. Bicycles can be parked in garages, sheds or on the property. In order to improve the quality of parking facilities, private apartment owners should be addressed, for example with specific information for this target group.



Residential areas (apartment blocks, housing estates)

In larger residential developments bicycle rooms or sheltered and lockable bicycle facilities should be erected outside. It is advisable to erect several small decentralized units with up to 10 or 20 parking spaces. This shortens the distance between the front door and the bicycle parking area and it also ensures that only a small number of people have access to the bicycles. This minimizes the risk of theft and vandalism. Bicycle racks should also be provided within the parking area to ensure orderly parking.

In large residential areas a part of the parking garage could also be taken into account in addition to bicycle rooms and outside areas. Bicycle parking spaces can be built together with car parking. In addition, bicycle areas could be erected on the ground floor of large residential areas which are often not used as living space.

To improve the situation of parking facilities in residential areas, cooperation between the housing association and property management should be encouraged.



Historical Buildings and Blocks

Particularly difficult is the construction of bicycle parking spaces in high density areas in old downtown areas. In many historical building blocks, there is very little open space outside. In this case, bicycle stands in front yards can be erected or space-saving hangers for bicycles. If there is a courtyard (accessible by a driveway) then parking facilities can be built in the courtyard.

In inner city areas, pedestrians also have to be considered. Street facilities, signage, shop windows, and outdoor restaurants all demand to have access to limited space. In such densely populated areas with few open spaces for bicycle parking the reallocation of land, for example from car to bicycle parking spaces, should be considered.



3.2 Bicycle parking at work and education facilities

Employers benefit when their employees ride their bicycles to work. A high proportion of bicycle traffic to work reduces both sick leave days as well as parking costs. In addition, official business trips can also be made by bike. Parking facilities are therefore essential.

Since bicycles are parked at work or educational facilities for a long time, areas which are sheltered and provide secure lock-up facilities shouldn't be missing. The parking area should also be positioned near the entrance. Furthermore, recharging stations for electric bikes are ideal.

The best alternative for employees is a private parking facility that is not generally accessible. Particularly in industries where there is a lot of public traffic, separate parking facilities for customers and staff should be built.

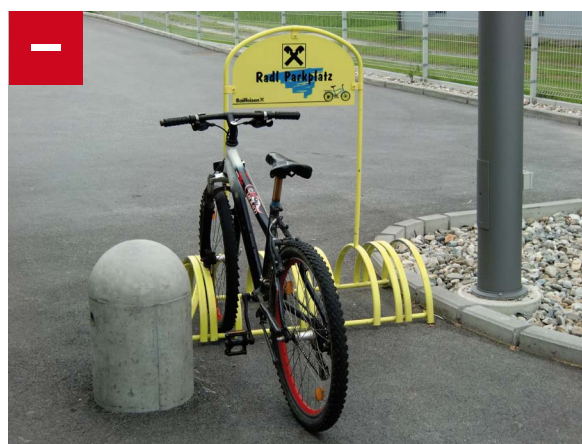


3.3 Bicycle parking at shopping centers

Good bicycle parking spaces are in the interests of customers and business. Close distances to local businesses which offer goods for everyday needs can be quickly and easily covered by bicycle. Cyclists enter stores more often and buy smaller quantities which can be carried on a bicycle. They also move around quietly and need little space to park their vehicle. Thus, they are attractive customers for retailers.

In addition, good parking facilities help deal with "anarchic parkers" in front of shop entrances and windows.

Nevertheless, good bicycle parking spaces at shopping centers are not very common. Few businesses have good quality parking facilities. Often only the minimum requirements are met by erecting front wheel holders. Even those shopping centers, consumer or professional markets which are potentially accessible to cyclists because of their location rarely offer good parking facilities.



3.4 Bicycle parking at public transportation stops – Bike + Ride

To fully exploit the public transportation network, bicycle and public transport should be closely linked. On the one hand, the catchment area of a bus stop expands with bicycles as feeders to public transport. On the other hand, public transport increases accessibility for cyclists. The promotion of intermodal transportation methods is therefore useful, but should always include improving the interface with each other. Switching from one mode of transport to another must be simple, convenient and fast.

Parking facilities in shopping areas should also be near the entrance, on the ground level, easily accessible and well lit and visible. Since the bikes will be loaded with purchases, they have to be parked safely and stably. There should also be plenty of room for accessories such as children's seats or trailers. Since bicycles are parked in front of shopping centers only for short periods open parking facilities are sufficient.

For temporary business activities (i.e. open Sundays, week sales and theme fairs) in which there is a temporarily increase in the number of customers, mobile parking facilities should be erected. These are not firmly anchored in the ground and can thus be quickly dismantled.

In terms of combining bikes with public transportation, this means that bike parking facilities should be available at every bus stop and station. Due to prolonged absences, facilities at railway stations should protect against theft by providing secure parking and lock-up facilities. Sheltered, lockable facilities (such as bicycle lockers and garages) are very important. The best would be a combination with other services (lockers, pump stations). Bicycle parking garages or bicycle stations combine these services under one roof.



3.5 Bicycle parking for car parking – Park + Bike

Park + Bike stands for a combination of bicycle and motorized transport (MT), in which the last stretch of the commute, the "last mile" is covered by bicycle. This system is particularly attractive because traffic caused by looking for parking spaces at destinations can be circumvented and bicycles provide their own flexibility.

In order to meet these conditions, either one's own bicycle must be transported in the car (such as a folding bike), or it must be placed at the parking area in suitable bicycle parking facilities. Since the bicycles are parked here for a long time, sheltered and lockable parking facilities are particularly important.

Park + Bike systems can be incorporated in park and ride facilities (switching from car to public transport) or be erected as separate, small-scale facilities.



3.6 Bicycle parking at Recreational Destinations

Bicycles as modes of transportation to recreational destinations in the city are often underrated. To encourage bicycle use, parking facilities should be built at all sports venues, parks and at cultural and tourist sites. Expansive public spaces such as parks and squares have enough free space to make bicycle parking spaces possible. At sport facilities parking spaces can be installed at the entrance.

For those buildings protected as landmarks (i.e. castles, historic town centers), mobile parking facilities offer a solution. These are not anchored in the ground and usually require no building permits. Because they can be easily removed at any time, mobile bicycle racks are an attractive solution in urban sensitive areas.

Mobile units are also appropriate for temporary recreational events (i.e. sports events, concerts, or festivals). Since such events also lead to traffic congestion due to the emergence of a high number of short-term visitors, it makes sense here to promote bicycling as an alternative mode of transportation. The combination of bicycle parking facilities with service, security, sign-posting and targeted marketing can be a solution for large events and has already proven itself at some large events.

4. Determining parking needs

After previous chapters described good high-quality bicycle parking facilities (see Chapter 2) and discussed where such bicycle parking spaces should be positioned (Chapter 3), we now explore the question of the number of bicycle parking spaces which should be put in place in a community.

4.1 Methods of Need Assessment

Flat-rate assessments by observation:

A general reference point to the need for parking facilities comes from observing “anarchic or haphazard parking” and bicycle theft. In places where many bicycles are parked at random, there is an evident need for more parking facilities. Available data or experience regarding the bicycle theft rate can also indicate the need for new facilities. The higher the theft rate, the greater the need for action.

Traffic Count:

Another variant in assessing the need for bicycle parking facilities is to conduct a traffic count. In this case, the traffic at each point of origin and destination (i.e. at bus stops of public transport) is counted. Bicycle parking spaces, the number of parked bicycles and the number of haphazardly parked bicycles are counted. The difference between the number of parked bikes and the number of parking spaces provides information about where and how high the demand is.

Predictions based on structural data:

The number of required bicycle parking spaces may be calculated selectively. The basis for calculating is the number of people traveling to a destination (home, work, etc.). By taking into account the percentage of cycle traffic, a forecast can be made about the number of cyclists and bicycle parking spaces needed in the area.

To calculate a specific need, measuring factors are assigned to each destination. For example, one standard is that a bicycle parking space should be provided for every



five workplaces. If it is known how many workplaces are provided at which locations in a community, the number of required bicycle parking spaces can be derived. One can continue analogously with other structural data (population density, visitor numbers at recreational facilities, ridership in public transport, shopping center customers). The values for the calculation of parking spaces can be found in the following table. Here one should distinguish between two sets of values: Flat-rate values (i.e. 5 spaces per bus stop) and relative guidelines (i.e. 1 space per 2 visitors). For locations in which it is difficult to estimate the number of visitors, building sizes could be included (for example, the sales area in m²).

In general, it should be noted that any needs assessment is an assessment of current, existing needs. The construction of a new parking area is an incentive to switch to the bike. In the future, it can thus lead to more parking (supply-oriented planning). Therefore, parking facilities should be planned so that extensions are possible.

4.2 Guidelines for Assessing Parking Space Needs

At the national level there are different guidelines or rules for calculating the parking needs of a specific target group. These apply to new buildings or extensive renovations. The values listed here are based on Swiss guidelines.

Residential Areas	
Residents	1 parking space per room
Work Areas	
Employees (Service Sector, Trade und Industry)	1 Parking space for every 5 workplaces
Visitors (service enterprise with many customers)	1 Parking space for every 5 workplaces
Visitors (service enterprise with fewer customers/visitors)	1 Parking space for every 20 workplaces
Educational Facilities	
Primary Schools	1 Parking space for every 3 to 10 pupils
Middle and Upper Level Schools	1 Parking space for every 1-2 pupils
Colleges and Vocational Schools	1 Parking space for every 2-3 students
Shopping	
Grocery Stores	1 Parking space per 30 – 50 m² sales area
Other Stores	1 Parking space per 100 – 200 m² sales area
Shopping Centers	1 Parking space per 100 m² sales area
Public Transportation Stops	
Train Stations, Bus/Tram Terminals	1 Parking space per 3 bis 10 travellers
Tram / Bus Stops	5 Parking spaces per stop
Park + Ride	1 Parking space per 20 car parking spaces
Restaurants and Hotels	
Restaurants	1 Parking space per 5 seats
Hotels	1 Parking space per 10 beds
Lodges and Hostels	1 Parking space per 5 beds
Sports Center	1 Parking space per 2 visitors
Leisure, Sports und Cultural Activities	
Library	1 Parking space per 3 visitors at a time
Disco, dance bar	1 Parking space per 2 bis 3 customers at a time
Recreation Center, Fitness Center, Public Outdoor Swimming Pool	1 Parking space per 2 visitors at a time
Cemetery	1 Parking space per 1000 m² area
Swimming Pool, Gymnasium	1 Parking space per 2 to 3 visitors at a time
Cinema	1 Parking space per 2 bis 3 seats
Church	1 Parking space per 20 seats
Museum, Exhibition	1 Parking space per 100 m² area
Stadium	1 Parking space per 10 spectator seats
Theater	1 Parking space per 10 seats
Zoo	1 Parking space per 1000 m² area

BUNDESAMT FÜR STRASSEN / VELOKONFERENZ SCHWEIZ (2008): Veloparkierung. Empfehlungen zu Planung, Realisierung und Betrieb. Handbuch. Bern, Biel.

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A large, stylized, light red graphic of a person riding a bicycle, positioned behind the website address.

www.bicy.it