Coquitlam

Bicycle Parking Design Guidelines

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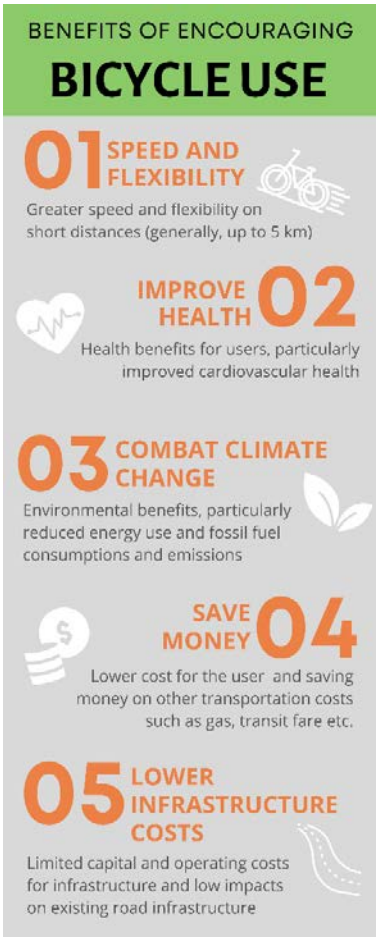
1 INTRODUCTION

Advancing active transportation and encouraging less auto dependency is part of the City's overall commitment to the development of a sustainable and healthy Coquitlam.

The Strategic Transportation Plan (STP) envisions an integrated multimodal transportation network that provides safe, reliable mode choices and access to opportunities. Active transportation options within the City's transit-oriented development areas help to enhance the livability of these neighbourhoods. Providing safe, convenient, and secure bicycle parking is key to encouraging cycling as an alternative mode of transportation. This guideline outlines the key features of bicycle parking that will allow the City to reap the health, environmental, and economic benefits of active transportation.



1.1 Background

The need to encourage active transportation is growing and it is necessary to align our practice with regional and provincial guidance. The Bicycle Parking Design Guidelines are intended to improve the quality of bicycle parking facilities. It is intended to be used in conjunction with current City policies, including the Citywide Office Community Plan Bylaw No. 3479, 2001 and City of Coquitlam Zoning Bylaw No. 3000, 1996, and serve as a tool for meeting higher standards in new developments.

Bicycle facilities must be accessible, convenient, safe, and secure. Supporting these amenities is key to promoting cycling as a primary mode for travel. These guidelines build on the City's requirement and guidance provided within the BC Active Transportation Design Guide (BCAT), which also looks to transform how we get around in a way that reduces pollution and leads to better health outcomes for people. This Bicycle Parking Design Guideline is a living document and will be updated at regular intervals to reflect evolving trends and best practices.

These guidelines are intended to improve the quality of bicycle parking that is secured through future developments. It is structured to provide an overview of key design principles, followed by in depth guidance that focuses on types of bicycle parking, complementary facilities, electric-bicycles, and emerging technologies and innovations.

2 EVOLVING BICYCLE TRAVEL

A wide range of bicycles are available including the common types listed below. The images are for illustrative purposes only and are not-to-scale.

E-Bicycles

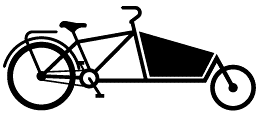
Electrical assistance reduces the amount of physical effort required to cycle. Most bicycles are available as 'e-assist' or can be retrofitted as such.

Long-tail Bicycle

An elongated tail is provided which is commonly used to seat one to three children and/or cargo. The bicycles are longer and heavier than standard bicycles.

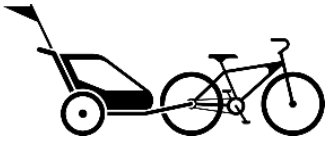
Cargo Bicycles

Used by businesses to deliver goods and parents to transport children. They range in size and weight but are always wider than standard bicycles.



Trailer Bicycle

Fitted with a trailer, these bicycles are often used by parents to transport their children but can also be used to move goods.



Recumbent

A recumbent cycling position may put less strain on the rider's back and joints.

Handcycles

Handcycles can come as one piece or as a 'clip-on' attachment for a wheelchair.

Tag-a-long

Allow a child's bicycle to be fitted to the back of an adult's bicycle, forming a tandem.

Tandem

Tandems are designed for two people to ride together.

Tricycle

Have three wheels and offer good stability. They also exist in tandem and recumbent versions.

3 DESIGN GUIDELINES FOR BICYCLE PARKING ON-SITE

The following guidelines will assist in the design and development of high-quality bicycle parking facilities within future properties. The goal will be to meet the quantity and type needed to support all cyclists and to encourage this active transportation mode.

3.1 BICYCLE PARKING DESIGN

3.1.1 Classification

There are two categories of off-street bicycle parking:

Short-term
A bicycle parking space for visitors or patrons of the building. For bicycles parked for a short period (i.e., less than 4 hours) in locations that are easily accessible.

Long-term
A bicycle parking space for employees or residents of the building. For bicycles parked for longer periods (i.e., more than 4 hours), typically requiring more secure parking.

3.1.2 Location & Access

Increased uptake in cycling as a viable travel mode may not reach its full potential if bicycle parking security is not considered at the planning and design stages. Bicycle parking should consider all types of bicycles and be designed to meet the needs of All Ages and Abilities (AAA). To that end, there are several fundamental *Guiding Principles* that influence how both bicycle parking is located and accessed:

Well-located
Convenient, accessible, as close as possible to the destination, and weather protected.

Stair-free Access
Provision of ramps or elevators large enough to accommodate all types of bicycles. Slopes should be limited.

Minimum Widths
Appropriate widths shall be provided along all routes required to access bicycle parking facilities, including along ramp accesses, at doorways, and aisle widths in bicycle parking rooms.

Signage
Integrated, high-quality, and simple bicycle parking signage should be provided to indicate the availability and location of an off-street bicycle parking area.

Visibility
The location selected for bicycle parking shall be easily identifiable by cyclists as they are riding. It will also help to reduce theft and vandalism.

Barrier-free
Access to bicycle parking facilities should be direct and free from obstacle to accommodate all users. Provide breaks in long lengths or span of bicycle racks to allow users a more convenient path for access and egress.

Detectability
Design should be cognisant of users with physical, sensory, or cognitive impairments and should ensure the facilities are both easily detectable for these users and do not create obstacles.

Lighting
Quality lighting shall be provided to ensure facilities are well-lit to improve the overall security of all bicycle parking facilities. Tamper-proof features should be considered to prevent vandalism.

Security
Racks in visible, well-lit places that have high levels of natural surveillance.

Short-Term Bicycle Parking (Source: USL)

Building on the *Guiding Principles*, the following tables present requirements (refer to Zoning Bylaw Part 7 Section 712 and Citywide OCP Part 4 Section 2.7.2) and considerations related to where both short- and long-term bicycle parking should be located and how it is accessed.

Table 1: BYLAW REQUIREMENTS FOR BICYCLE PARKING

Principles	Short-Term	Long-Term
General Location	▪ Provide at-grade ▪ Locate within 15.0m of pedestrian building access points	▪ Locate in a private parking area, private garage or bicycle room ▪ Provide at-grade or located no lower than the first complete parking level below grade.
Access & Clearance	▪ Provide wheel ramps, as required, if stairs are provided ▪ Access routes with a minimum clear width of 2.0m ▪ Automated door openers shall be installed along the entirety of the access route	
Weather Protection	▪ Provide for all bicycle parking (either incorporate into the building design or a standalone structure)	
Visibility	▪ Be well-lit at all times	▪ Both the room and the access route shall be well-lit
Add-ons	▪ N/A	▪ Equipped with electrical outlets

TABLE 2: DESIGN CONSIDERATIONS FOR BICYCLE PARKING

Principles	Short-Term	Long-Term
Access & Clearance	▪ Level access required with no stairs ▪ Where a grade change is inevitable, a slope of 6% or less is preferred by cyclists ▪ Additional buffer space (min., 0.5 m) shall be considered if the access route is next to a wall or railing ▪ Provide sufficient minimum overhead clearance (2.1m) ▪ Aisle widths within bicycle parking rooms should have a minimum width of 1.5m, except for aisles adjacent to stacked bicycle racks where the minimum width shall be increased to 2.1m	
Visibility & Signage	▪ Locate near active entries and public amenity spaces ▪ Provide signage as needed for usage	▪ Place in clear visible locations ▪ 'Tamper-proof' lighting should be considered ▪ Directional signage should be provided along the route
Other	▪ n/a	▪ If approved, bicycle parking at Level P2 or below should have a designated bicycle parking elevator (with at least one interior dimension of 1.8m) ▪ If access is shared with vehicles, delineators should be provided to separate bicycles from vehicular traffic.

3.1.4 Parking Space Criteria

Whether the design is for short- or long-term use the criteria are similarly important in terms of making bicycle parking attractive to the user, not only from an aesthetic perspective but also regarding the security and safety that is offered as part of the facility:

Support
The rack shall provide two points of contact with the bicycle frame and keep it upright without putting stress on the wheels.

Intuitive Rack Use
The rack should be recognizable as bicycle parking and should be easy to use without the need for written instructions.

Efficient Use of Space
Available space is often a constraint, but the choice of bicycle parking should not be dictated by space alone. Racks should allow a good number of bicycles to be parked in a small area while providing adequate space between bicycles to facilitate parking and locking.

Longevity
Where weather protection is not possible, weather- and corrosion-resistant materials shall be used in the construction of the bicycle parking racks, while appropriate maintenance should be completed regularly to ensure the longevity and attractiveness of facilities.

Security
Racks shall be in secured private or indoor spaces, or in visible, well-lit places that have high levels of natural surveillance.

Larger Spaces
Ensuring the availability of spaces for larger models and reserving allocated spaces for users with accessibility requirements.

Variety
Long-term parking facilities should anticipate the presence of a variety of bicycles and accessories.

Design & Attractiveness
The design and aesthetic quality of bicycle parking facilities should reflect the surrounding neighbourhood and environment to attract users without compromising their functionality.

Short-Term Bicycle Parking in Vancouver (Source: Bunt & Associates)

3.2 SHORT-TERM BICYCLE PARKING

Short-term bicycle parking is intended to serve the needs of people who are using an area or building for a few hours or in some other transient manner, i.e., bicycle parking that is available for persons who are not employees and/or residents of the building. It requires a high degree of convenience.

3.2.1 Rack Types

Inverted-U

- Provides two points of contact between the bicycle and rack
- Allows bicycles to be supported in an upright position
- Offers a robust and cost-effective solution that allows two bicycles to be parked adjacent to one rack
- Stands should not be placed in obstructive locations and must have a strong visual contrast with the surrounding environment – a crossbar is recommended

Post & Ring

- Provides two points of contact between bicycle and rack
- Allows bicycles to be supported in an upright position
- Common design which is easily sourced
- Comparatively low cost
- Rack takes up relatively little space
- Rings must be welded to post as rings bolted to post are vulnerable to removal

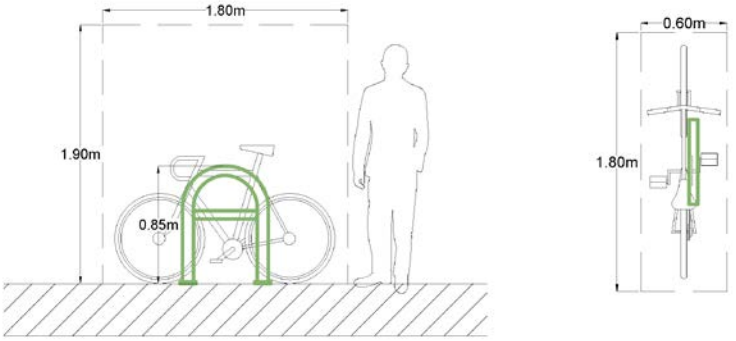
Oversized

- Provides two points of contact between bicycle and rack
- Allows bicycles to be supported in an upright position
- Accommodates non-standard bicycle types, including those with child seats, longtails, and cargo trailers
- Allows two bicycles to be parked adjacent to one rack

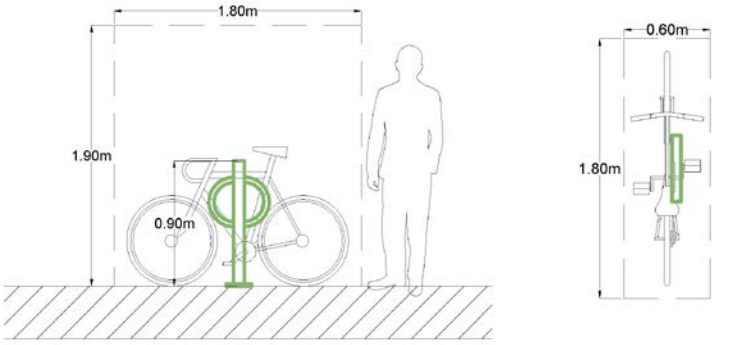
3.2.2 Short-Term Bicycle Parking Typology

Placement of bicycle racks can vary by dimensions and spacing. Rack dimensions as well as recommended spacing between adjacent racks of the same type are provided below. For detailed dimensions, please refer to manufacturing requirements.

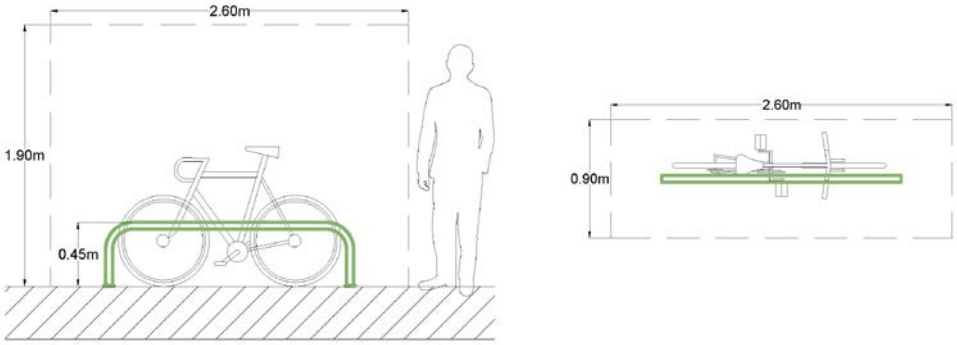
Inverted-U



Post & Ring



Oversized



3.2.3 Poor Examples

Racks that do not meet the design principles or universally designed to accommodate a variety of common bicycle types are presented below.

Coat Hanger Rack

- May not provide two points of contact per bicycle
- Insufficient space between loops increases handlebar conflicts
- Low crossbar may require bicycle wheel to be lifted over the bar
- Loops constructed of thin tubing are vulnerable to cutting

Wheel-Bender Rack

- The design incorporates concrete blocks slotted for a bicycle wheel
- These racks hold only the wheel of the bicycle
- They do not support the use of a U-shaped lock and can also cause damage to the bicycle wheel

Comb / Toaster Rack

- Does not allow bicycles to be secured using a U-lock
- Supports wheel only; may not accommodate mountain bicycle wheels
- Bicycles may fall over when parked
- Spaces are very close together, reducing capacity
- Mostly constructed of thin tubing which is vulnerable to cutting

Wave Rack

- Provides only one point of contact between rack and bicycle
- Typical narrow spacing between loops increases handlebar conflicts
- The design encourages bicycles to be parked parallel to loops, therefore limiting capacity

Spiral Rack

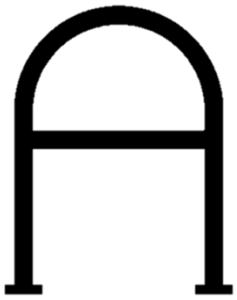
- May not allow for both frame and wheel to be secured using a u-lock
- Provides inadequate contact between bicycle and rack
- Bicycles are supported at an angle
- Spaces may be very close together, reducing capacity
- One cut makes all bicycles on the rack available for theft

3.3 LONG-TERM BICYCLE PARKING

Long-term bicycle parking typically refers to secure, indoor facilities primarily designed for residents and/or employees of a building.

3.3.1 Rack Types

Inverted-U

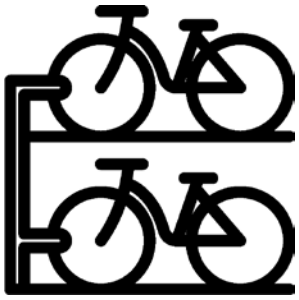


- Two points of contact between the bicycle and rack
- Bicycles supported in an upright position
- Cost-effective solution allowing two bicycles to be parked adjacent to one rack
- Stands should not be placed in obstructive locations and must have a strong visual contrast with the surrounding environment – a crossbar is recommended
- Suitable for standard bicycles, non-standard bicycles, and electric bicycles

Post & Ring

- Two points of contact between bicycle and rack
- Bicycles supported in an upright position
- Common design which is easily sourced and takes up relatively little space
- Comparatively low cost
- Rings must be welded to post as rings bolted to post are vulnerable to removal
- Suitable for standard bicycles, non-standard bicycles, and electric bicycles

Two-Tier



- Stores two bicycles in a stacked arrangement with a retractable upper tier
- One wheel and frame locked to each rail
- Ergonomic design to simplify bicycle loading and unloading
- Pneumatic lift assist aids users in lifting their bicycle and tray into place
- Should be used in conjunction with other rack types
- May not be appropriate for all ages and abilities
- Suitable for standard bicycles

Vertical

- Requires manual lifting of bicycles to mount to the rack
- Bicycle's heights can be staggered to allow for narrower spacing
- Should be used in conjunction with other rack types
- Appropriate for narrower room widths
- May not be appropriate for all ages and abilities
- Suitable for standard bicycles

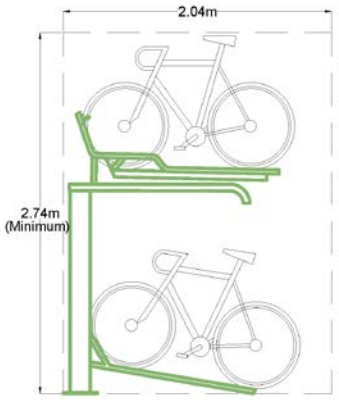
Lockers

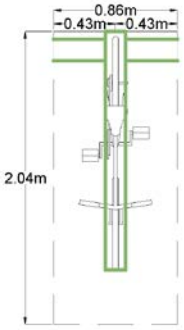
- Offers secure and dry bicycle parking
- Secures all bicycle accessories and parts in addition to the bicycle
- Can be vulnerable to vandalism or leverage by thieves
- Requires a large footprint
- Can accommodate two bicycles with two separate access doors, one on each end
- May require a management system and additional supervision
- Suitable for standard bicycles, non-standard bicycles, and electric bicycles

3.3.2 Long Term Bicycle Parking Typology

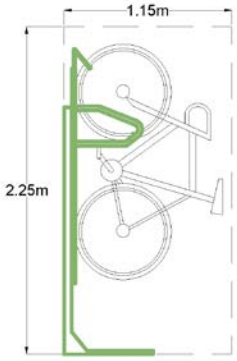
Rack dimensions as well as recommending spacing between adjacent racks of the same type are provided below. For actual dimensions, please refer to manufacturing requirements.

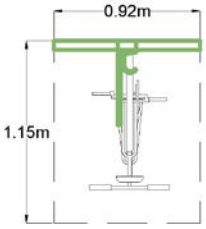
Two-Tier



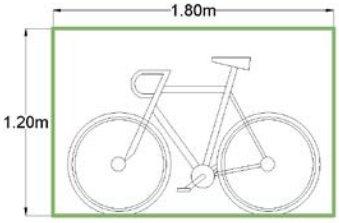


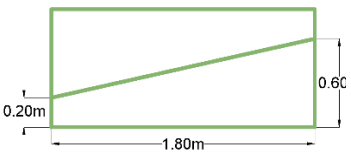
Vertical



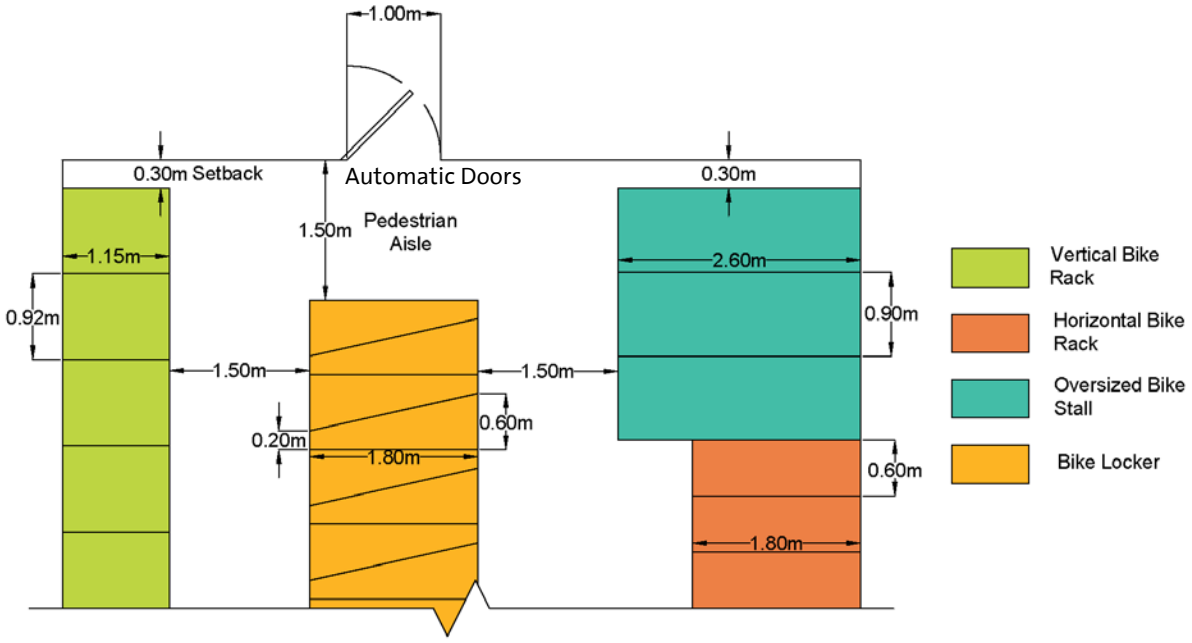


Lockers

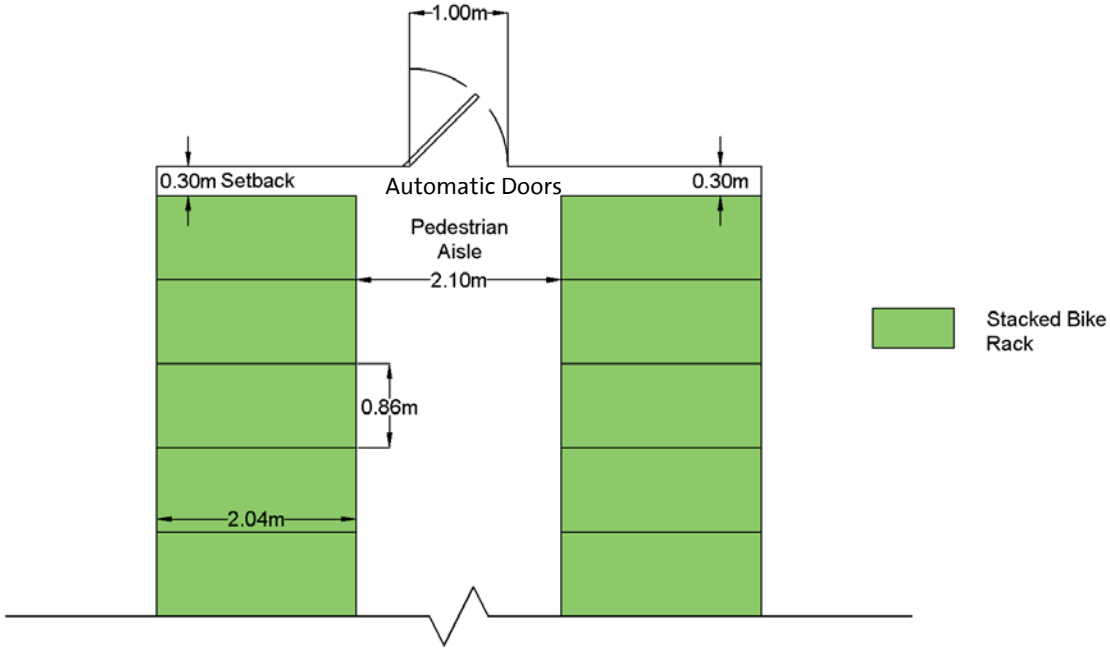




Spacing Within a Bicycle Parking Room/Secure Shelter with Varying Racks



Spacing Within a Bicycle Parking Room/Secure Shelter with Stacked Racks



3.3.3 Space Type Provision

It is important to provide a variety of bicycle parking space types. For example, given that not all users would be capable of using the stacked or vertical arrangement, these rack types must be used in conjunction with other rack types. Additionally, a minimum provision of oversized parking spaces should be used to accommodate non-standard bicycles and users should be offered the opportunity to use bicycle lockers. The following ratios should be considered:

- **Horizontal:** No minimum or maximum
- **Vertical:** Maximum 10%
- **Stacked:** Maximum 60%
- **Oversized:** Required Minimum 10%
- **Lockers:** Minimum 10%

3.3.4 Bicycle Parking Room/Secure Shelter Key Features

Direct Entrance
A dedicated, direct entrance into the bicycle parking room will improve security and convenience.

Wide Entry Doors Made of Steel
Entry doors to the bicycle room must be at least 1.0m in width. The door and the frame shall be constructed of steel and have "tamper-proof" hinges that cannot be dislodged using a wrench, screwdriver, crowbar or bolt cutter. A metal-mesh window may be provided in the door to provide permanent visual access.

Security
Long-term bicycle parking rooms shall be securely enclosed by a steel door and solid opaque walls and/or metal mesh. Where possible, the entire interio rof the bicycle storage facility shall be visible from the entryway, and painted white to improve visiblity.If possible, locate the room within view of security personnel.

Compartmentalized
For larger developments where a significant number of long-term bicycle parking spaces are required, compartmentalizing the space into smaller bicycle parking rooms can improve security by providing people with access to the room within which their bicycle space is located.

Complementary Facilities
Complementary facilities including bicycle repair areas or end-of-trip amenities are mandatory.

Lighting
'Tamper-proof' lighting should be provided to make it difficult for someone to incapacitate the light through protective methods such as recessed lighting, shielding the lighting with unbreakable or reinforced glass or plexiglass, or providing a locked steel mesh cage. The wiring must not be easily severable. The facility should be checked regularly for burnt-out bulbs.

Electrical Outlets
Electrical outlets shall be clearly visible, easy to access and evenly spaced.

High-Definition Video
High-Definition Video monitoring should be installed and provide monitoring coverage of public access points and lockers.

Convex Mirrors
Convex mirrors shall be provided to minimize blind spots around corners.

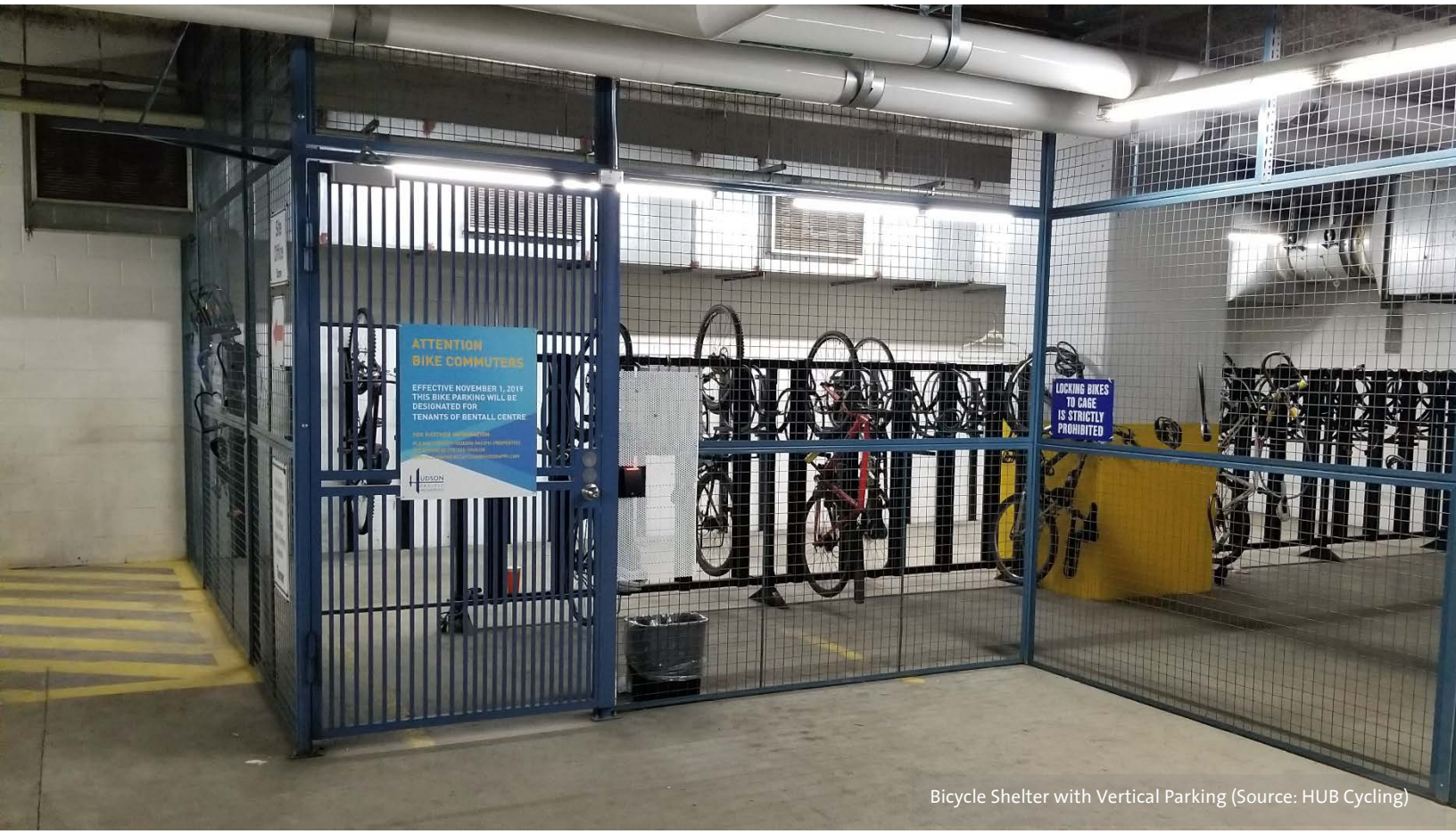
3.3.5 Electric Bicycles

- In British Columbia, e-bicycles are defined as two-or three-wheeled bicycles with a small electric motor (500 watts or less) and a maximum speed of 32km/hr on flat ground without pedalling. Most bicycles are available as 'e-assist' or can be retrofitted as such. Fully charging an e-bicycle takes about two to six hours, depending on the capacity of the battery. To accommodate e-bike parking, the following is required:

- A standard electrical receptacle for charging, with the most common method of charging utilizing a 120V electrical wall outlet
- Electrical plug setup and locations that will accommodate multiple bicycles and avoid wire-tripping hazards across nearby access pathways
- The following minimum ratios within the on-site parking rooms:

  Residential: 10% of the number of required bicycle spaces
  Non-Residential: 20% of the number of required bicycle spaces

E-Bicycles in Vancouver (Source: Bunt & Associates)



Bicycle Shelter with Vertical Parking (Source: HUB Cycling)

Additional Key Features of Secure Bicycle Parking Shelters

- Secure shelters, compounds and cages can be used to provide additional security for longer-stay bicycle parking
- Access can be enabled by a fob or swipe card operated by a registered user
- Can house various types of bicycle parking racks, allowing bicycles to be secured within the compound and enabling parking of oversized bicycles
- May require additional maintenance and management

3.4 COMPLEMENTARY FACILITIES

Complementary facilities can help to remove some of the barriers to cycling and provide a positive message that cycling is a legitimate and valid form of transport.

3.4.1 End-of-Trip Facilities

End-of-trip facilities are on-site amenities such as showers, changing rooms, and personal lockers provided in addition to secure bicycle parking. They are an expected feature in new-build commercial spaces for office and retail employees.

End-of-trip facilities are required for non-residential buildings and should be provided in a convenient and proximate location to the bicycle parking, Enhanced facility finishes should be provided. Amenities that complement secure commercial bicycle parking are outlined below.

Table 3: Required End-of-Trip Facility Amenities

Amenity	Suggested Features
Showers	▪ Should be clean and spacious with toiletries included ▪ Provide in close proximity to each other
Changing Room	▪ Encourage towel service for cleanliness by limiting the need for towels to be left to dry within the facility ▪ Provide cloth dryer within facility ▪ Ensure seating with space to maneuver is provided ▪ Provide hair dryers for after shower use
Water Closet (Toilet)	▪ Should be clean and spacious with toiletries included ▪ Provide in close proximity to each other
Wash Basin	▪ Provide mirrors and electrical outlets
Charging/Electrical Outlet	▪ Can be accommodated within smart/electronic locker facilities
Lockers	▪ Should be secure (with a robust locking mechanism) ▪ Access provided via key, pin code, key card, smartphone access (network controlled) ▪ Well ventilated ▪ Sufficiently sized to accommodate the storage of clothing and equipment, i.e., long enough to hang clothing items ▪ Locate for safe and convenient access ▪ Should be regularly maintained so they remain clean and functional ▪ Regular audits of the locker condition should be carried out ▪ Made available with demonstrated need when demand exceeds supply ▪ Should be sited outside facility room

3.4.2 Bicycle Maintenance Facilities

Bicycle maintenance facilities are required in a designated, secure area within the building with proper drainage, with sufficient workspace for bicycle maintenance tools and supplies. As a minimum, amenities should typically allow cyclists to perform basic maintenance including fixing a flat tire, adjusting chains, and cleaning bicycles. **Tables 4** and 5 provide a summary of the required maintenance amenities, and amenities that are encouraged.

Table 4: Required Bicycle Maintenance Amenities

Amenity	Product Specifications	Approximate Spacing Requirements (W x L x H)
Work Desk	▪ Standard work desk to place tools and bicycle components	0.5m x 1.0m x 1.0m
Standalone Repair stand *	▪ Universal bicycle mounting ▪ Tools securely attach by retractable braided stainless-steel cables - secure compartment allows tools to be locked away ▪ Design allows easy service and replacement of tools ▪ Tools include: Phillips screwdriver, stubby Phillips screwdriver, slotted screwdriver, stubby slotted screwdriver, 2 x tire levers, adjustable wrench, combination wrench, multi-torx set, multi-hex set (metric) ▪ Thermoplastic finish	0.9m x 2.6m x 1.9m
Wall-mounted Repair Stand	▪ Wall-mount design, practical for small spaces ▪ Tools securely attached by braided stainless steel cables	0.9m x 2.6m x 1.9m
Bicycle Wash Station	▪ Includes vandal-resistant hose and nozzle with stainless steel fittings ▪ High Velocity Low Consumption nozzle optimized for strong cleaning power without damaging bicycle bearings while also minimizing water usage ▪ Vandal-proof auto shut-off water valve prevents wasted water ▪ Cleaning brushes attached by braided stainless steel cable to prevent theft ▪ May require municipal water and sanitary drain or dry well hookup ▪ Tools include: water house, drivetrain hose, scrubber brush, frame brush, and wheel brush	0.9m x 2.6m x 1.9m
Bicycle Tire Air Pump	▪ Dual pump head works on Schrader and Presta valves ▪ Hand or foot operated manual pump ▪ Pump should be clear of bike aisle pathway or bicycle racks	0.3m x 0.4m x 1.2m

**Note: Wall-mounted Repair Stand is acceptable and practical for small spaces. Tools are to be securely attached by braided stainless steel cables. Approximate W x L x H spacing requirements will be 0.9m x 2.6m x 1.9m.*

Table 5: Suggested Bicycle Maintenance Amenities

Amenity	Product Specifications	Approximate Spacing Requirements (W x L x H)
Wheel Chock	▪ Supports bicycles without kickstands while inflating tires ▪ Tire friction stops roll-back, upright position eliminates trip hazard ▪ Accommodates tires up to 2.75" and wheel diameters up to 29" ▪ Cannot lock bicycles to the wheel chock	0.9m x 2.6m x 1.9m
Bottle Fill Station	▪ Can be integrated into the bicycle wash station	0.6m x 0.9m x 1.9m
Air Control Panel	▪ Can be wall-mounted or pedestal-mounted ▪ Internal compressor supplies air when activated by a button ▪ Dual pump head works on Schrader and Presta valves ▪ Multiple power options available	0.9m x 2.6m x 1.9m
Vending Machine	▪ Specially designed to vend emergency bicycle repair parts and accessories ▪ Remote auditing via cellular network allows you to remotely monitor sales and inventory data ▪ Maintenance is extremely minimal and affordable ▪ Well-suited for indoor/outdoor applications ▪ High-security features ▪ Machine can be customized to accept most payment methods	0.6m x 0.9m x 1.9m

Bicycle Maintenance Repair Stand and Pump (Source: Bunt & Associates)

4 EMERGING TECHNOLOGIES AND INNOVATIONS

Automated and secure bicycle parking systems for residential, institutional, and commercial buildings are an emerging technology that strives to maximize land use efficiency and provide sustainable bicycle parking facilities. Automated bicycle parking benefits from economies of scale, i.e., as the system gets larger, the cost per bicycle space decreases. The key considerations for an automated bicycle parking system are listed below.

- Public or private use
- Location and access
- Installation and maintenance costs
- User interface
- Bicycle type
- Electrical supply
- Local area network connection
- System operation

Automatic Underground Bicycle Parking in Tokyo

5 ADDITIONAL RESOURCES

- Association of Pedestrian and Bicycle Professionals: Essentials of Bike Parking (September 2015) https://apbp.memberclicks.net/assets/docs/EssentialsofBikeParking_FINA.pdf
- BC MoTI: BC Active Transportation Design Guide (2019) https://bicycleinfrastructuremanuals.com/manuals3/British%20Columbia%20Active%20Transportation%20Design%20Guide.pdf
- BikeHub: Not Just Bike Racks. Informing Design for End of Trip Cycling Amenities in Vancouver Real Estate https://bikehub.ca/sites/default/files/hub_cycling_amenities_report.pdf
- Capital Region: Local Government Electric Vehicle (EV) + Electric Bike (E-Bike) Infrastructure Backgrounder (September 2018) https://www.crd.bc.ca/docs/default-source/climate-action-pdf/reports/electric-vehicle-and-e-bike-infrastructure-backgrounder-sept-2018.pdf?sfvrsn=a067c5ca_2
- Central Saanich: Electric Vehicle and Electric Bike Strategy (September 2020) https://www.centralsaanich.ca/sites/default/files/uploads/documents/ev_and_ebike_strategy_report_-_final.pdf
- City of Cambridge: Bicycle Parking Guide https://www.cambridge.ca/en/learn-about/resources/Cambridge-Bicycle-Parking-Guide.pdf
- City of Kamloops: Electric Vehicle & Electric Bike Strategy (August 2020) https://www.kamloops.ca/sites/default/files/docs/city-hall/sus_2020.08.25_ev-e-bike_strat_final.pdf
- City of Nelson: Bicycle Parking Design Guidelines (September 2013) https://www.nelson.ca/DocumentCenter/View/678/Bicycle-Parking-Design-Guidelines-PDF
- City of Redmond: Bicycle Design Manual (August 2016) https://bicycleinfrastructuremanuals.com/manuals2/Bicycle%20Design%20Manual_US%20Washington%20City%20of%20Redmond.pdf
- City of Thunder Bay Bicycle Parking Guidelines (2010) https://www.thunderbay.ca/en/recreation/resources/Documents/Thunder-Bay-Bicycle-Parking-Guidelines.pdf
- City of Toronto: Guidelines for the Design and Management of Bicycle Parking Facilities (May 2008) http://www.toronto.ca/planning/pdf/bicycle_parking_guidelines_final_may08.pdf
- City of Vancouver: Parking Bylaw 6059 (January 2019) https://vancouver.ca/your-government/parking-bylaw.aspx
- City of Victoria: Bicycle Parking Strategy (August 2011) https://www.victoria.ca/assets/Departments/Engineering~Public~Works/Documents/parking-bicycle-strategy.pdf
- CycleSafe: https://cyclesafe.com/bike-parking-dimensions/
- Department for Transport, UK: Cycle Infrastructure Design (July 2020) https://bicycleinfrastructuremanuals.com/manuals5/Cycle%20Infrastructure%20Design%20-%20Local%20Transport%20Note%20-%20July%202020.pdf
- Dero Pocket Guide to Bike Parking (2015)https://www.dero.com/bike-parking-guide.pdf
- Gantner: https://www.gantner.com/industry/end-of-trip-facilities/
- Giken: https://www.giken.com/en/wp-content/uploads/developments_ecocycle.pdf
- Ground Control Systems: https://app.groundcontrolsystems.com/
- Queensland Transport End-of-Trip Facilities for Bicycle Riders (June 2006) https://bikeleague.org/sites/default/files/BFB_Queensland_End_of_trip_facilities_for_bicycle_riders.pdf
- Seattle Department of Transportation: Draft Seattle Bicycle Parking Guidelines (May 2018) https://www.seattle.gov/documents/Departments/SDOT/BikeProgram/SDOT%20Bicycle%20Parking%20Guidelines_6.11_WORKING_DRAFT.pdf

- San Francisco Planning Department: Zoning Administrator Bulletin No. 9, Bicycle Parking Requirements: Design, Layout, and Calculation https://sfplanning.org/sites/default/files/documents/reports/bicycle_parking_reqs/Leg_BicycleParking_ZABulletinNo.9.pdf
- Saris Infrastructure: https://www.sarisinfrastructure.com/resources/bike-rooms
- Simon Button, Bunt & Associates Engineering Ltd: Automated Parking (2019) https://canadianparking.ca/wp-content/uploads/Automated-Parking.pdf
- Transport Canada: Bicycle End-of-Trip Facilities, A guide for Canadian Municipalities and Employers http://publications.gc.ca/collections/collection_2011/tc/T22-194-2010-eng.pdf
- Transport for London: London Cycling Design Standards (September 2016) http://content.tfl.gov.uk/lcds-chapter8-cycleparking.pdf
- UBC: British Columbia Electric Bicycle (E-Bike) Market Review (May 2018) http://civil-reactlab.sites.olt.ubc.ca/files/2018/11/Aono_2018_BC-e-bike-market-review-report.pdf
- Urban Racks: https://urbanracks.com/

6 ACKNOWLEDGEMENTS

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Consulting Team

Bunt & Associates Engineering Ltd.