

Thunder Bay Guidelines for Bicycle Parking Facilities



(E. Kempe, 2010)



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These guidelines also draw upon the information found in the “Guidelines for the Design and Management of Bicycle Parking Facilities”, an exceptional publication authored by the City of Toronto. Find this document online at http://www.toronto.ca/planning/bicycle_parking_guide.htm

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INTRODUCTION:

Why is bicycle parking important to the City of Thunder Bay? Having access to secure, user-friendly bicycle parking is invaluable to encouraging cycling in Thunder Bay. Our expanding network of commuter routes and multi-use trails is not complete without a complementing system of supporting facilities which include bicycle parking.

Developing infrastructure that supports active transportation will help to ensure the success of the Thunder Bay Active Transportation Plan. Providing city-wide standards for bicycle parking will support the City's Clean, Green and Beautiful Policy. Most of all, implementing high quality bicycle parking will help to legitimize cycling as a mode of transportation, encouraging cycling as a whole and contributing to a strong, healthy community.

Satisfying the needs of a variety of cyclists requires several bicycle parking options. The definition of bicycle parking in this guide is not limited to bicycle racks, but also includes higher-security parking options such as lockers and enclosed bicycle parking areas. Thunder Bay should aim to provide not only bicycle parking facilities which offer relatively low security, such as bicycle racks, but also provide for users who commute by bicycle or ride a high-quality bicycle and require highly-secure facilities, such as bicycle lockers.

Cyclists are not the only ones who will benefit from improvements to bicycle parking. Well-placed bicycle parking minimize the need for cyclists to park their bicycles against trees, fences, and other street furniture which can impede the movement of pedestrians and motorized vehicles. Providing adequate bicycle parking in business areas attracts shoppers who commute by bicycle and will improve business. Artistic bicycle parking can even enhance the streetscape.

Currently, there is a lack of adequate bicycle parking in Thunder Bay. This has been noted not only by cyclists but also by business owners, developers, and other concerned citizens. The main issues are:

- 1. Inadequate amount of bicycle parking:** Because of Thunder Bay's historical automobile dependency, bicycle parking is significantly underrepresented compared to automobile parking.
- 2. Inadequate placement of bicycle parking:** Bicycle parking is often located too far from the cyclist's destination, and / or in unsafe locations.
- 3. Inadequate type of bicycle parking:** Poor design is perhaps the most common bicycle parking issue in Thunder Bay. Many bicycle parking options do not adequately secure or support the bicycle.
- 4. Lack of standardization for bicycle parking:** Bicycle parking design and placement varies widely in Thunder Bay. In the past there have been few city standards guiding the installation of bicycle parking.
- 5. Lack of highly-secure parking facilities:** The current emphasis in Thunder Bay is on unsecured bicycle parking such as racks. There are few good examples of higher-security bicycle parking facilities such as lockers or bicycle rooms.

The goal of these guidelines is to address some of these issues by providing a series of recommendations for bike parking design, placement, and installation. These guidelines are intended to influence the site planning process of new developments, and help to direct the retrofitting process of existing developments. The intended audience is developers, business owners, City of Thunder Bay employees, cyclists, and anyone who has an interest in promoting cycling in Thunder Bay. It is the goal of these guidelines to act as a first step in the standardization of bicycle parking as a valuable component of an effective and inclusive transportation network.

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RECOMMENDATIONS FOR BICYCLE PARKING FACILITIES:

The Fundamentals: Class Two versus Class One Bicycle Parking:

Class Two bicycle parking is:

- Designed for a parking duration of about two hours or less, such as in shopping areas and public service centers
- Open to public use
- Usually unsheltered
- Not protected by an active surveillance system
- The least expensive form of bicycle parking to install

Class Two bicycle parking includes:

- Racks

Figure 1: Inverted U Rack



(Dero Bike Rack Co., 2010)

Figure 2: Post and Ring Rack



(E. Kempe, 2010)

Class One bicycle parking is:

- Designed for a parking duration of longer than two hours, such as in residences and in workplaces
- Accessed by a limited number of users
- Sheltered from weather and from vandals by a physical barrier
- Protected by an active surveillance system and / or security staff
- The most expensive form of bicycle parking to install

Class One bicycle parking includes:

- Lockers
- Bicycle Cages
- Bicycle Rooms

Figure 3: Bicycle Cage Example



(University of Leeds, 2001)

Figure 4: Locker Example



(Dero Bike Rack Co., 2010)

Table 1: Class Two versus Class One Bicycle Parking:

Consideration Type	Class Two	Class One
Length of Parking Time	Less than 2 hours	More than 2 hours or to provide security for high-end bicycles
Parking Type	Exposed bicycle racks	Lockers or bicycle racks in an enclosed area
Weather Protection	Minimal weather protection	Maximum weather protection
Security System	Passive surveillance system (highly visible to passerby)	Active surveillance system (security guards and / or cameras)
Security and Locking Options	User provides lock	Only the user has access (eg. most lockers) The user shares access with other users with or without the option of locking the bicycle within the secured area (eg. bicycle cages and rooms),
Type of Cyclist Served	Visitors, tourists, shoppers	Employees, commuters
Typical Development Types	Commercial, retail, healthcare, parks, recreation areas, community centres	Residences, workplaces, transit centres

Bicycle Parking and Storage Considerations:

Some key considerations when installing bicycling parking include Usability, Accessibility and Convenience, Capacity and Space Efficiency, Safety and Security, Cost, and Aesthetics:

Usability:

Racks must be easy to use and to lock the bicycle to. Choose a rack that:

- Allows two points of contact between the rack and the bicycle, supporting the frame as well as the wheel. This, when combined with the use of a proper lock, such as a U-style lock, prevents the bicycle from falling over while parked and permits the user to easily lock and unlock the bicycle and remove cargo
- Allows the frame and at least one wheel of the bicycle to be locked to the rack by a U-lock
- Ideally accommodates bicycles of all shapes and sizes, such as recumbent bicycles, folding bicycles, and bicycles equipped with trailers, child carriers, racks and baskets

Avoid racks that:

- Provide only one point of contact between the rack and the bicycle, especially those which support only the wheel of the bicycle. These racks can be damaging to the bicycle wheel, almost impossible to lock the bicycle to, and may cause the bicycle to fall over while parked
- Have sharp edges or rough finishes that can damage the bicycle
- Incorporate a bar across the top of the rack that conflicts with the bicycle handlebars

Figure 5: Good Rack Design for Usability



(Dero Bike Rack Co., 2010)

Figure 6: Poor Rack Design for Usability



(E. Kempe, 2010)

Class One parking areas must be:

- Clearly identified as bicycle storage facilities and labeled with directions for their use
- Lockers should be equipped with doors that open easily to a 90 degree angle to allow the cyclist to load and unload the bicycle efficiently

Accessibility and Convenience:

Class Two bicycle parking is usually located in an area open to the public and must be:

- Located no further than a 30-second walk from the cyclist's destination
- Placed in plain view, but out of the way of pedestrians and motorized vehicles
- Positioned away from street furniture, walls and trees which may impede the use of the parking

Class One bicycle parking is located away from public areas and avoids most conflict with obstacles and pedestrians. Lockers must be:

- Easy to locate with the help of signage
- Easy to access without traversing stairs or steep slopes, such as on the first floor of a building or parking garage
- In a location that is close to the cyclist's destination.

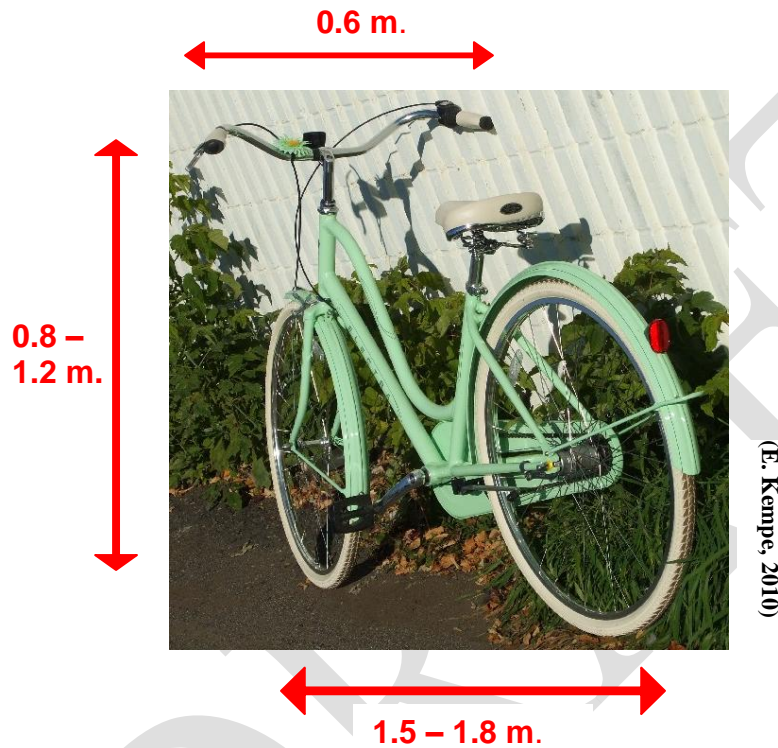
Capacity and Space Efficiency:

Bicycles are among the easiest vehicles to park. They are small in size and simple in design. Bicycle parking is significantly more efficient than motorized vehicle parking:

- Class Two (eg. racks): 1 car parking space = up to 10 bicycle parking spaces
- Class One parking (eg. lockers): 1 car parking space = up to 5 bicycle parking spaces

A Class Two bicycle parking space must accommodate both the rack and the bicycle and allow enough room for the user to easily park the bicycle without conflict with adjacent bicycles. The footprint is the amount of space required to accommodate both the bicycle parking structure and the bicycle itself, and dictates the size of a bicycle parking space. Standard bicycles are 0.8 – 1.2 meters high, 0.6 meters wide and 1.5 – 1.8 meters long. To accommodate bicycles of this size, the parking space should be 1.8 meters long and 0.6 meters wide, as suggested by the City of Toronto.

Figure 7: Standard Bicycle Dimensions



The overall footprint of Class One bicycle parking is increased by a physical barrier (eg. the walls of the facility or locker) which provide more security, but the space requirement for the racks contained within the facility does not differ from Class Two parking. Space efficiency within the facility can be increased by designing bicycle cages and rooms to incorporate wall mounted or “double decker” racks or by installing a second level of lockers. See the section “Rack Designs for Maximizing Space Efficiency in Class One Parking” for more details.

The capacity refers to the amount of bicycles the rack or locker is expected to accommodate. Poorly designed bicycle racks do not provide enough space between the parked bicycles, therefore limiting the capacity of the rack.

Cost:

When compared to car parking, bicycle parking is extremely cost-effective to implement, but as the complexity of the bicycle parking facility increases, so does the cost. Class Two bicycle parking is installed at less cost than Class One. Access to Class One bicycle parking, however, can be provided at cost to the user, providing compensation to the managing agency for the initial construction of the facility.

Safety and Security:

Place Class Two bicycle parking in full view of street traffic. This minimizes the risk of vandalism and theft through “passive surveillance”, the watchful eyes of passersby.

To further deter vandals and thieves, the rack must be:

- Invulnerable to rust. Rust weakens the welded sections of the rack and makes it easy to break. Choose proper finish types for the climate to avoid rust
- Invulnerable to disassembly, such as by unfastening pieces of the rack to remove the bicycle. Choose tamper-resistant hardware
- Able to resist the manual tools used by most thieves, such as bolt cutters, hand saws, and pipe cutters. Racks made with thin tubing are vulnerable to cutting. The thickness of the tubing can be determined by the “schedule” number on the side of the tubing. The higher the schedule number, the thicker the tubing, regardless of the outside diameter. Choose at least a schedule 40 tubing

Figure 8: Bike Rack Cut by Thieves



(E. Kempe, 2010)

Figure 9: Poorly Anchored Bike Rack



(E. Kempe, 2010)

Class One bicycle parking must be protected by a surveillance system and / or security personnel. Integrate bicycle parking into the existing security system of the parking garage or building where the bicycle parking facility is located.

Class One bicycle parking can also be vulnerable to damage and vandalism. Class One bicycle parking facilities must be:

- Constructed from a material that resists cutting. Low quality plastic locker panels and low-quality fencing on bicycle cages can be cut with hand tools
- Constructed from a material that resists fire. Some types of polyurethane lockers will burn if exposed to flame
- Equipped with a proper door. Too much space between the door frame and the door allows the thief to insert a prying tool into the door to open it. Low-quality doors may sag over time, making the door difficult or impossible to lock

Weather Protection:

The physical barrier which heightens the security of Class One bicycle parking also serves to protect the bicycle from the elements. Class Two bicycle parking is highly exposed and vulnerable to weather. Wherever possible, plan to take advantage of existing roofs and overhangs to protect the bicycle racks. If funds and space permit, consider building a shelter to provide further protection to the bicycle racks. Refer to the section, “Sheltered Class Two Bicycle Parking”, for more information.

Aesthetics:

Bike racks that are in the public eye, such as on sidewalks, can be designed as pieces of usable artwork. Aesthetics are becoming increasingly important to Thunder Bay as we recognize the need to beautify our streetscapes. Local artists can showcase their work in a functional manner by designing racks for use on city streets. Installing artistic bicycle racks enhances business areas by attracting cyclists, tourists and other customers.

Artistic bike racks must meet good design specifications as defined by these guidelines, such as supporting the bicycle in two places and allowing for easy and secure locking. Several of the manufacturers listed in the Resources section of these guidelines offer artistic racks that are both functional and aesthetically pleasing.

Figure 10: Artistic Bike Rack







(Penn Quarterly Living, 2010)

Designs for Effective Class Two Bicycle Parking:

Materials:

The material that the rack is made out of must be durable and rust, scratch and vandal resistant. The best materials to use are treated steel and other industrial grade materials. Galvanized steel is the least expensive option, and stainless steel is the most expensive. Do not use wood, soft or untreated metals, or cast composites, all of which can easily break down or be destroyed by thieves. Bicycle parking should have few if any moving parts that could require maintenance and be susceptible to malfunction. The finishing on the rack should be smooth, with no sharp edges, to avoid damaging the bicycle. There are five finishing materials that are commonly found on bike racks, listed below:

Table 2; Bicycle Rack Materials

Finish Type	Galvanized Steel	Stainless Steel	PVC Jacket	Powder-coat	Thermoplastic
					
Colour Options	None – textured metal	None – metal	Usually black; sometimes colour options	Variety of colours	Variety of colours
Cost	Least expensive	Most expensive	Moderately expensive	Moderately expensive	Moderately expensive
Durability	Highly durable	Best durability and resistance to vandalism	Finish chips easily and increases susceptibility to rust in environments subject to road salt	Finish chips easily and increases susceptibility to rust in environments subject to road salt	Finish may chip; somewhat susceptible to rust from road salt
Maintenance Required	None or very little	None or very little	Ongoing “touching up” of finish	Ongoing “touching up” of finish	Ongoing “touching up” of finish

(Picture Credits: Dero Bike Rack Co., 2010)

Anchoring:

The rack must be mounted securely to prevent removal by thieves. The leg of the rack can be embedded into the surface, ideally concrete, or secured using a surface flange or base rail attached to the surface using tamper-proof spikes or expansion anchors.

Anchoring bicycle racks in paving stone requires that the paving stone be removed from the area and a concrete footing installed. The bicycle rack can either be embedded into the concrete or mounted on the surface. The paving stones are cut to fit around the leg of the rack and replaced.

Table 3: Bicycle Rack Anchoring Methods

Surface Type	New Concrete	Existing Concrete	Post-tensioned Concrete	Asphalt	Paving Stone	Unsurfaced
Situation	New sidewalk or concrete pad	Existing sidewalk or concrete slab	Existing concrete floor (eg. parking garages)	Existing asphalt (eg. parking lots)	Eg. walkways, curb extensions	Eg. grass, dirt, gravel
Rack Mount Type	In-ground (embedded) leg	Surface flange	Flat bar rail base	Flat bar rail base	In-ground (embedded) leg or surface flange	In-ground (embedded) leg or surface flange
Anchoring Procedure	Support rack, pour concrete around rack, allow to set	Insert and secure expansion anchors through holes in flange and pre-drilled holes in concrete	Choose large, heavy rack and adhere to concrete with high-strength epoxy	Insert and secure expansion anchors through pre-drilled holes in flat bar base and asphalt; run bead of high-strength epoxy between asphalt and flat bar	Install concrete base, secure rack to concrete, and fit paving stone over top of concrete	Install concrete base, secure rack to concrete.
Notes	Difficult to remove or replace if damaged	Easy to install and remove or replace	Do not drill holes in post-tensioned concrete; epoxy deters thieves by feeling secure	Epoxy deters thieves by feeling secure	Aesthetic but labour-intensive to install	Aesthetic but labour-intensive to install
Security	Maximum security	High security	Low security	Low-moderate security	High security	High security

Figure 11: Surface Mount Example



(E. Kempe, 2010)

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Table 4: Good Rack Design, Inverted U


GOOD DESIGN	
Inverted U and Inverted U Variations	 <p>(Palmer Group, 2005)</p>
<p>Pros:</p> <ul style="list-style-type: none"> • Provides two points of contact between bicycle and rack • Allows for both the frame and one wheel to be locked with a U-lock • Common design which is easily available from a variety of companies • Comparatively low cost for basic designs 	<p>Cons:</p> <ul style="list-style-type: none"> • Must be anchored individually by surface flange or embedded leg • Takes up more space than a Post and Ring design when installed on a sidewalk
<p>Capacity: Two bicycles per Inverted U</p>	
<p>Notes: Variations of the Inverted U design include cylindrical, diamond, and asymmetrical shapes</p>	
<p>Suppliers: Palmer Group <http://www.bikeparking.com/index.html> (Welle Series, Welle Series Flat Top, Welle Circular); Pilot Rock <http://www.pilotrock.com/bike_racks_parking/> (Hitchin' Post, Omega Bike Racks); Dero <http://www.dero.com/>(Hoop, Hoop HD, Downtown, and Swerve Racks and Excalibur Series Racks); Saris <http://www.saris.com/> (6900, 2100, 2200 Bike Dock Series Racks); Huntco <http://huntco.com/index.html> (HP Series, HP Flat Bar, SC Racks); Maglin <http://www.maglin.com> (MBR500 Series); CycleSafe <http://www.cycle-safe.com/> (U/2 Rack)</p>	

Table 5: Good Rack Design, Inverted U Series

GOOD DESIGN	
<p>Rail-Mounted Inverted U Series and Inverted U Series Variations</p>	 <p>(Palmer Group, 2005)</p>
<p>Pros:</p> <ul style="list-style-type: none"> • Provides two points of contact between bicycle and rack • Allows for both the frame and one wheel to be locked with a U-lock • Commonly available adaptation of an Inverted U rack • Weight and size of rack discourages thieves if the rack cannot be anchored adequately 	<p>Cons:</p> <ul style="list-style-type: none"> • Multiple components are difficult to ship and may require assembly • Requires a relatively large area and allows for little creativity in placement
<p>Capacity: Four to twelve bicycles; two per Inverted U</p>	
<p>Notes: Base rails available in both a c-channel and flat bar design; variations take on the same Inverted U shape, but eliminate the base rail and extend at a diagonal</p>	
<p>Suppliers: Palmer Group <http://www.bikeparking.com/index.html> (Welle Series, Welle Series Flat Top Racks); Dero <http://www.dero.com/>(Hoop, Hoop HD, and Downtown Racks); Saris <http://www.saris.com/> (Stadium Rack); Huntco <http://huntco.com/index.html> (RR Series), Function First <http://www.bikerack.com/> (Bike Rib Multi-Inverted U and Flow Racks), Creative Pipe <http://www.creativepipe.com/> (Gauntlet GL, and Enforcer Rack EF Series)</p>	

Table 6: Good Rack Design, Post and Ring


GOOD DESIGN	
Post and Ring and Variation	 <p>(BikeRack Mfg. and Dist. Company, 2006)</p>
<p>Pros:</p> <ul style="list-style-type: none"> • Provides two points of contact between bicycle and rack • Allows for both the frame and one wheel to be locked with a U-lock • Common design which is easily available from a variety of companies • Comparatively low cost • Rack takes up relatively little space and can be placed creatively 	<p>Cons:</p> <ul style="list-style-type: none"> • Rings may be vulnerable to cutting or removal if attached by bolts to post
<p>Capacity: Two bicycles per Post and Ring</p>	
<p>Notes: A variation of this design by which a ring is attached to an existing parking meter post is also a good, available option. Consider placement carefully to avoid pedestrian and motorized vehicle conflict.</p>	
<p>Suppliers: BikeRack.ca <http://www.bikerack.ca/index.html> (Post and Ring Rack); Dero <http://www.dero.com/> (Bike Hitch, Meter Hitch); Saris <http://www.saris.com/> (Post and Ring, Meter Ring); Maglin <http://www.maglin.com> (MBR 100, 200 and 970 Series)</p>	

Table 7: Mediocre Rack Design, Modified Coathanger

MEDIOCRE DESIGN	
Modified Coathanger	 <p>(Dero Bike Rack Co., 2010)</p>
<p>Pros:</p> <ul style="list-style-type: none"> • Provides two points of contact between bicycle and rack • Allows for both the frame and one wheel to be locked with a U-lock • Adequate space between loops allows for multiple bicycles to be parked without handlebar conflicts 	<p>Cons:</p> <ul style="list-style-type: none"> • Thinner tubing of loops may be vulnerable to cutting • Cross-bar must be high enough to accommodate most bicycles and not interfere with handlebars or locking • Requires a relatively large area and allows for little creativity in placement
Capacity: Three to eleven bicycles; one bicycle per loop	
Notes: Be sure that there is sufficient space between loops to prevent conflicts between parked bicycles	
Suppliers: Dero < http://www.dero.com/ > (Campus Rack)	

Table 8: Poor Rack Design, Undulating; “Wave”


POOR DESIGN	
<p>Undulating; “Wave”</p>	 <p>(E. Kempe, 2010)</p>
<p>Pros:</p> <ul style="list-style-type: none">• Usually allows both frame and one wheel to be locked with a U-lock	<p>Cons:</p> <ul style="list-style-type: none">• Provides only one point of contact between rack and bicycle• Typical narrow spacing between loops increases handlebar conflicts and reduces capacity• Design encourages bicycles to be parked parallel to loops, therefore limiting capacity

Table 9: Poor Rack Design, Standard Coathanger

POOR DESIGN	
<p>Standard Coathanger</p>	 <p>(E. Kempe, 2010)</p>
<p>Pros:</p> <ul style="list-style-type: none">• May provides two points of contact for bicycle• Usually allows for both the frame and one wheel to be locked with a U-lock	<p>Cons:</p> <ul style="list-style-type: none">• Insufficient spacing between loops increases handlebar conflicts and decreases capacity• Low cross bar may require bicycle wheel to be lifted over bar• Loops constructed of thin tubing are very vulnerable to cutting

Table 10: Poor Rack Design, Grid; Comb

POOR DESIGN	
Grid; Comb	 <p>(E. Kempe, 2010)</p>
Pros: <ul style="list-style-type: none">• Commonly available and relatively inexpensive• Freestanding and easy to install	Cons: <ul style="list-style-type: none">• Does not allow for bicycle to be secured using a U-lock• Supports wheel only; may not accommodate mountain bike wheels; allows bike to fall over when parked• Spaces are very close together, reducing capacity• Mostly constructed of thin tubing which is very vulnerable to cutting

Table 11: Poor Rack Design, Spiral


POOR DESIGN	
Spiral	 <p>(Palmer Group, 2005)</p>
Pros: <ul style="list-style-type: none">• Easy to install• Aesthetic	Cons: <ul style="list-style-type: none">• 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 rack available for theft

Table 12: Poor Rack Design, Wheelwell

POOR DESIGN

Wheelwell



(R.J. Thomas Manufacturing Co., Inc., 2010)

Pros:

- Easy to install
- Inexpensive

Cons:

- Does not allow for bicycle to be secured with any lock
- Provides support for wheel only; allows bike to fall when parked
- Rack cannot be anchored

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Designs for Effective Class One Bicycle Parking:

Option #1: Lockers:

Lockers provide cyclist with a means of effectively securing their bicycle without having to carry and use a U-lock (although some locker designs are available which use a U-lock to lock the door). They provide additional security to the bicycle in the form of a physical barrier between the thief or vandal and the bicycle.

Materials:

Lockers are available in a variety of materials, including metal, plastic and fiberglass. Do not choose lockers which incorporate wooden parts

Table 13: Locker Materials

Finish type	Metal	Fiberglass	Plastic
Description	Sheet metal (usually galvanized or stainless steel); can be perforated	Plastic reinforced with glass fibers; usually attached to a metal frame	Polyethylene; may be attached to a metal frame
Benefits	Best locker material Square construction makes lockers easy to stack Perforated metal makes the contents visible	Relatively inexpensive option Less vulnerable to prying than plastic	Least expensive option
Drawbacks	Most expensive option Can become very hot inside; perforated design allows air flow		Cheap plastic can be vulnerable to prying, cutting, or fire
Suppliers	Huntco, CycleSafe, Dero, Creative Pipe		

Figure 12: Metal Locker Example



(Palmer Group, 2005)

Figure 13: Polyethylene Locker Example



(Palmer Group, 2005)

Lockers require a level surface, usually concrete, and are usually attached to the surface using anchor bolts. Avoid installing lockers which have no integral floor, because these designs can be pried away from the floor to expose the bicycle.

Access Options and Security:

An advantage of using lockers is that access to the locker can be controlled, in contrast to short term parking where the rack is open to public use. Locking options include:

- Mechanical locking devices with non-duplicable keys issued by management
- Digital user access devices including magnetic stripe cards, proximity cards and fobs, keypads and display screens
- Coin-operated systems or locking systems utilizing personal locks to allow for multiple users

Lockers, despite their controlled access, can be misused and are difficult to monitor because they are fully enclosed. Lockers can be used for the storage of undesirable contents or as shelter by the homeless. Some designs feature a viewing window which allows security personnel to examine the contents.

Option #2: Bicycle Cages:

Bicycle cages provide shelter from the weather and extra security to a series of bicycle racks. The cage containing the racks consists of a door and walls made out of strong wire mesh that resists cutting, topped by a tightly secured roof. Bicycle cages can be located inside a parking garage or on the outside of a building, against one wall. The cage is accessed by an electronic key pad, a swipe card, or similar means of security. It is best to keep the cage size small and have numerous cages instead of one large cage where there is a greater need for bicycle parking. This keeps the group of people who have access to each cage – and all of the bicycles within it – smaller, therefore minimizing security concerns. A cage the size of two standard car parking spaces can accommodate 20 bicycles.

Figure 14: Bicycle Cage



(University of Leeds, 2001)

Option #3: Bicycle Rooms:

Bicycle rooms are located inside the building and limit access. Like bicycle cages, it is better to have several small bicycle rooms than one large one. Bicycle rooms contain a series of racks and can also be equipped with a basic maintenance area including a bike stand, basic tools, and an air pump. These optimal amenities increase the functionality of the room and provide a higher quality facility. The capacity of the room can be maximized by providing double-decker or vertical racks. Bicycle rooms should be located within view of staff to further protect the facility through passive security.

Figure 15: Bicycle Parking Room



(Yvonne Bambrick, from City of Toronto, 2008)

Facilities Supporting Bicycle Commuting:

Where applicable, such as in workplaces, provide shower, change and locker facilities to accompany Class One parking. Ideally, these facilities should be located in close proximity to the bicycle parking. Where it is impractical to install new facilities, make use of existing ones, such as those located in workout rooms.

Rack Designs for Maximizing Space Efficiency in Class One Parking:

Several rack designs are available which increase the space efficiency of a Class One parking facility, by providing a second level of bicycle storage (two-tier or double-decker racks) or allowing the bicycles to be mounted vertically (wall-mounted racks). The benefits of using these rack types:

- Increased space efficiency
- Increased variety of storage options within the facility

The drawbacks of using these rack types:

- Usually no option to lock the bicycle; parking facility must be secure
- Moving parts are susceptible to malfunction and failure and require frequent inspection
- Design is not intuitive; instructional signage may need to be provided to prevent misuse and injury

Figure 16: Double Decker Rack



(Dero Bike Rack Co., 2010)

Figure 17: Wall-Mounted Rack



(Creative Pipe, 2010)

IMPLEMENTATION OF BICYCLE PARKING FACILITIES:

Bicycle Parking Requirements According to Development Type:

The amount of bicycle parking needed varies according to the use of the associated building. Estimating the amount of bicycle parking needed for the building by considering the automobile parking required by the building can be effective in some cases, but is usually inaccurate. The following charts suggest required bicycle parking based off of the occupancy and square footage of the building, adapted from the recommendations of the APBP, and the cities of Halifax, Toronto, and Vancouver. These recommendations are meant for cities such as Thunder Bay in which the bicycle commute mode share falls between one and five percent. As the bicycle commute mode share rises above five percent, the bicycle parking requirements also increase.

Table 14: Commercial and Industrial Bicycle Parking Requirements

Commercial Activity	Class One Bicycle Parking Requirement	Class Two Bicycle Parking Requirement
Grocery stores and food retail	1 space per 500 m ² of floor area; minimum 2 spaces.	1 space for each 300 m ² of floor area; minimum 2 spaces.
General retail	1 space per 500 m ² of floor area; minimum 2 spaces.	1 space per 300 m ² of floor area; minimum 2 spaces.
Office buildings	1 space per 500 m ² of floor area. Minimum requirement is 2 spaces.	1 space for each 500 m ² of floor area. Minimum requirement is 2 spaces.
Off-street parking (eg. lots and garages)	1 space per 20 automobile spaces; minimum 2 spaces	1 space per 20 automobile spaces; minimum 6 spaces
Manufacturing and production	1 space per 17 employees; minimum 2 spaces	Consider on a case by case basis

Table 15: Cultural and Recreational Bicycle Parking Requirements

Type of Activity	Class One Bicycle Parking Requirement	Class Two Bicycle Parking Requirement
Cultural services (eg. libraries, community centres, government buildings)	1 space per 10 employees. Minimum requirement is 2 spaces.	1 space for each 200 m ² of floor area. Minimum requirement is 2 spaces.
Assembly-based cultural services (eg. theatres, churches, stadiums)	1 space per 20 employees. Minimum requirement is 2 spaces.	Spaces for 1% of maximum expected attendance.
Health-related (medical clinics, hospitals)	1 space per 20 employees; minimum 2 spaces.	Consider on a case by case basis; minimum 2 spaces per public entrance
Eating establishment	1 space per 500 m ² floor area	1 space per 300 m ² of floor area
Daycare and elementary schools	1 space per 20 employees; minimum 2 spaces	1 space per 20 students; minimum 2 spaces
Junior high and high schools; colleges and universities	1 space per 20 employees plus 1 space for each 20 students; minimum 2 spaces	1 space per 20 students; minimum 2 spaces

Site Planning for Class Two Bicycle Parking:

The location of bike racks in relation to each other and their surroundings plays a significant role in how they are utilized. Position bicycle racks so that they:

- Are free of other street furniture, walls and trees
- Can be accessed easily from at least one side
- Do not interfere with pedestrian or automobile movement
- Are located no more than 15 meters from the cyclist's destination and in an area that is well lit and highly visible to the cyclists and passerby

Below are spacing recommendations for racks which stand alone as Class Two parking or are a part of Class One parking, based on the recommendations of the Cities of Toronto, Ontario and Cambridge, Massachusetts. Measure the distances based off of the nearest vertical component of the rack:

Table 16: General Spacing Requirements for Bicycle Racks

Spacing Type:	Distance in Meters:	Corresponding Letter
Between racks which are parallel	0.6	A
Between racks which are end to end	1.8	B
Between rack and obstacle (eg. wall) parallel to rack	0.9	C
Between rack and obstacle (eg. wall) perpendicular to rack	1.2	D
Between rack and obstacle (eg. wall) perpendicular to rack, to allow double-sided access	2.5	E
Aisle width from rack to rack	3.9	F

Table 17: Rack Spacing on the Public Right of Way

Spacing Type:	Distance in Meters	Corresponding Letter
Minimum sidewalk width from edge of pavement to building	2.7	G
Distance between building and rack	2.1	H
Distance between edge of pavement and rack	0.6	I
Distance between fire hydrant and rack	3	J
Distance between entrance or driveway and rack	1.5	K
Distance between other street furniture and rack	1.5	L

Figure 18: Rack Spacing

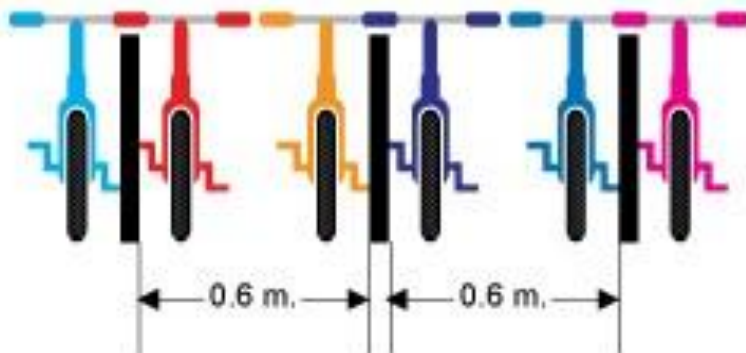
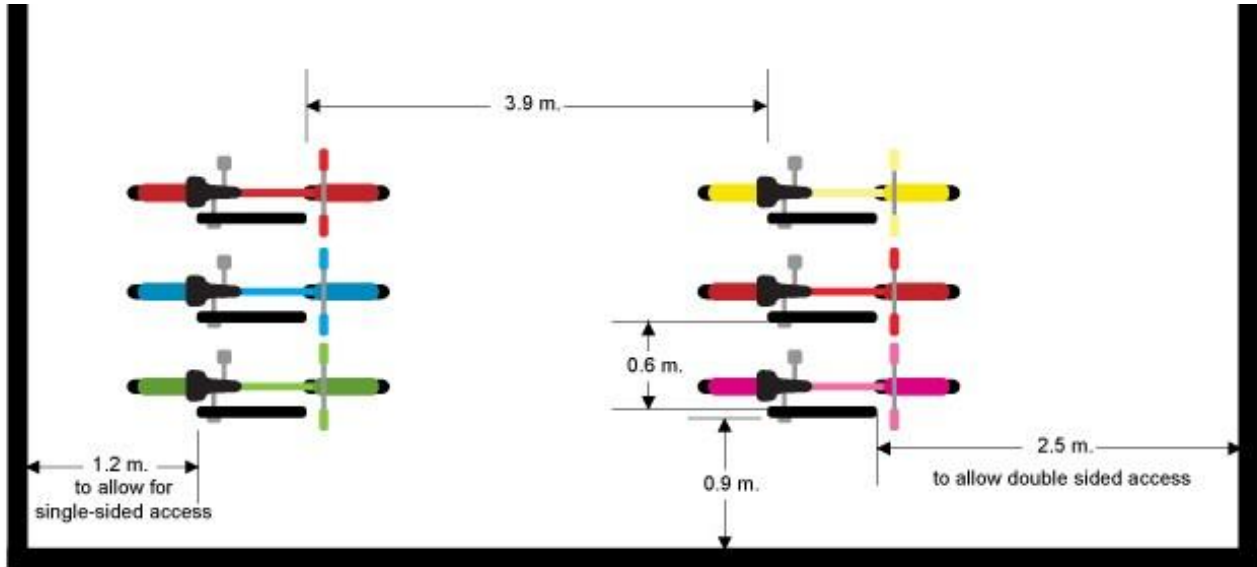
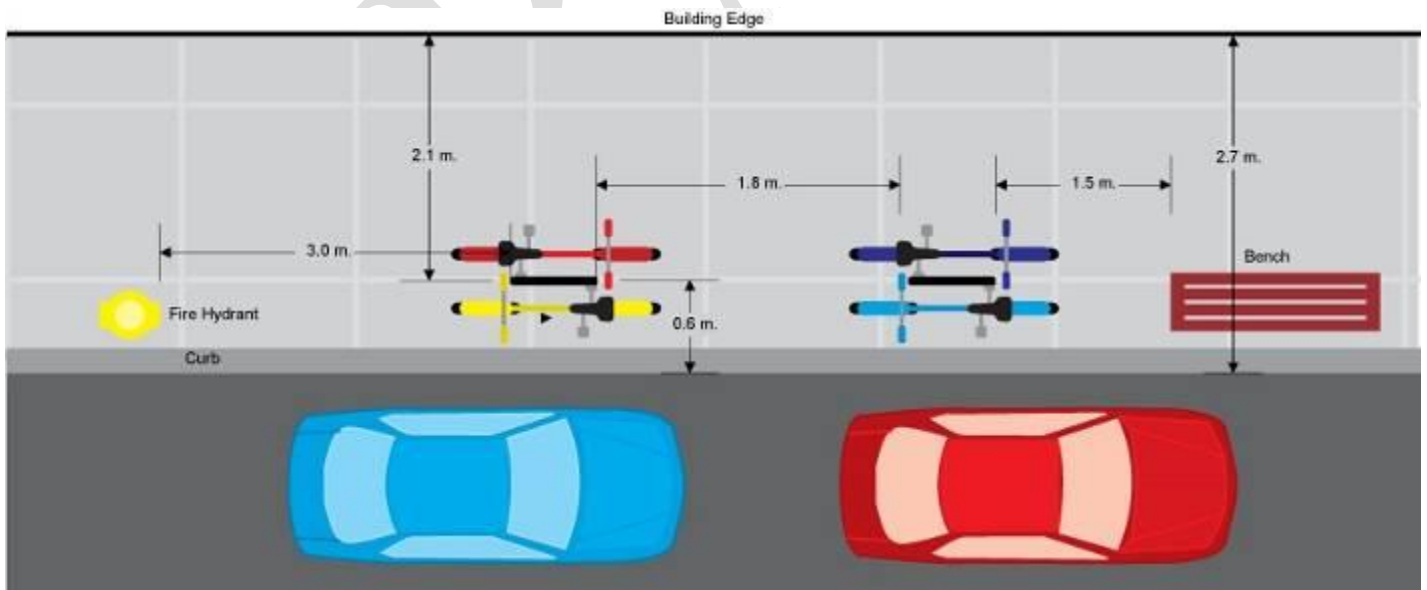


Figure 19: General Spacing Requirements for Bicycle Racks



(City of Thunder Bay, 2010)

Figure 20: Rack Spacing on the Public Right of Way:



(City of Thunder Bay, 2010)

Site Planning for Class One Bicycle Parking:

Class One bicycle parking has a larger footprint than Class Two bicycle parking. Plan Class One bicycle parking which:

- Is clearly marked by directional signage
- Allows multiple cyclists to enter, exit and secure their bicycles at once
- Allows extra room for opening and closing locker doors and lifting bicycles into a second level of storage, where applicable.

Locate Class One bicycle storage where:

- It is close to the cyclist's destination, but away from high-traffic areas like sidewalks
- It is easily accessed from ground level or by elevator
- It can be accessed without traversing obstacles such as stairs or steep ramps

See the spacing requirements specified for Class Two bicycle parking to guide the installation of racks in bicycle cages and rooms.

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SPECIAL CASES FOR BICYCLE PARKING:

Bicycle Corrals:

Many cities in Europe and the United States have responded to a growing need for Class Two bicycle parking by dedicating a vehicle parking space on the street or in large off-street parking lots to bicycles. This space is called a bicycle corral. Bicycle corrals utilize a series of racks to park up to ten bicycles per single vehicle parking space. Well-placed bicycle corrals benefit:

- Pedestrians by opening up the sidewalk in high-traffic areas
- Cyclists by providing a highly visible and easy to use bicycle parking option
- Drivers by improving visibility on the street corners. Placing a bicycle corral on a street corner can greatly improve visibility that would otherwise be hindered by a parked car

Bicycle Corral Design Considerations:

- Place the corral on a street corner to increase visibility for drivers and pedestrians and allow easy access for cyclists
- Avoid locating the bicycle corral on a side street in the interest of preserving the vehicle parking on the main street. Locating the bicycle corral in high-use areas such as main streets encourages cyclists to use it by increasing the visibility of the corral and reducing the distance to surrounding businesses
- If you are using a bike rack design that parks two bicycles per rack, position each rack at a 60 degree angle to the curb to maximize the buffer of space between the street traffic and the parked bicycles
- Demarcate the bicycle corral by using bollards or stanchions to provide a visual barrier for drivers, increase the safety of the cyclists, and increase the security of the bicycles
- Refer to the spacing requirements specified under “Site Planning for Class Two Bicycle Parking” to plan the rack spacing within the corral

Figure 21: Bicycle Corral



(City of Portland, Oregon, 2010)

Sheltered Class Two Parking:

Sheltered Class Two bicycle parking is utilized particularly by cities located in rainy climates, but can also serve to protect cyclists and their bicycles from other forms of extreme weather more common to Thunder Bay, like snow. These shelters, similar in construction to bus shelters, can provide not only protection from the elements but also a location in which to post information that is relevant to the cyclist, such as route maps.

The spacing requirements of the bicycle racks contained within the shelter remain the same as those for regular, unsheltered short term parking. The overall footprint of sheltered bicycle parking is larger than most forms of Class Two parking because of the addition of a roof and footings to support the roof. These structures must adhere to the specifications of Thunder Bay's building codes.

Figure 22: Sheltered Bicycle Parking



(John Luton, from City of Toronto, 2008)

Special Event Parking:

Thunder Bay is the host of frequent special events during the summer months. There has been evidence of a growing public desire to access these events via bicycle. Special event bicycle parking supports this growing trend.

Special event parking consists of a series of temporary racks, surrounded by fencing. The most commonly available rack design for special event parking consists of a series of metal a-frames which support a main beam. The bicycles are parked by hooking the seat over the main beam. Do not choose this rack design as a permanent option. The intention and advantage of this rack design is that it is easily disassembled, transported and stored.

Figure 23: Special Event Bicycle Parking



(CycleSafe, 2010)

Provide bicycle parking at special events to:

- Reduce the amount of motorized vehicle trips taken to access the event
- Reduce the amount of vehicle parking needed at the event
- Increase people's awareness and acceptance of cycling as a mode of transportation.
- Reduce the amount of improperly parked bicycles at the event, increasing the safety of event participants and improving the visual appeal of the area.

There are three main types of special event parking systems, offering varying levels of security:

Option #1, Valet Parking: The cyclist turns his or her bicycle over to the valet and receives a numbered ticket similar to a coat check. The valet parks the bicycle with the other half of the numbered ticket attached. This is the most secure but potentially most costly option.

Option #2, Attended (Self-Park): The attendants of the parking facility distribute and monitor claim tickets, but the cyclist is responsible for attaching the numbered ticket to his or her bicycle and parking the bicycle.

Option #3, Unattended: The parking facility is not monitored, and thieves are discouraged by the fence and the passive surveillance of the cyclists who use the parking. The racks must be able to accommodate the use of locks (an option offered by some special event rack distributors), and cyclists are expected to bring and use their own lock. This is the least costly but also the least secure option.

BIKE PARKING MANAGEMENT AND MAINTENANCE:

Snow and Debris Removal:

Snow removal is of special concern for Thunder Bay. Consider snow removal when determining the location of bicycle racks. Bike racks should be included in the snow removal schedule to allow the racks to be accessed year round.

Class Two Bicycle Parking Maintenance:

Bike racks generally require very little maintenance, but they should be checked occasionally for damage. Inspect the following parts of the rack:

- **The anchor.** This is the weakest part of the rack. Replace anchoring bolts as necessary by removing the old anchor head and pounding in a new bolt over top of the old one to push it into the ground.
- **The rack itself.** Damage to the rack itself is rare, but some thieves will partially cut the rack so that they can break through it entirely with a hammer when they want to steal a bike. Check for this kind of damage and any other weakening of the metal such as rust.
- **The rack finish.** Racks with PVC jackets and powdercoat finishes require ongoing maintenance. Racks are subject to frequent use which weakens the surface at a much faster rate than is normal for other street furniture. Touch up the finish of the rack as required to prevent deterioration (eg. rust).

Abandoned bicycles are unsightly and discourage cyclists from using the rack. If a bicycle looks obviously abandoned, a notice stating its pending removal should be posted on the bicycle at least two weeks before the removal date, to give the owner an opportunity to claim it.

Class One Bicycle Parking:

Lockers and bicycle rooms and cages require more maintenance than simple bicycle racks. Consider the following maintenance tasks:

- Inspect the racks contained within bicycle rooms or cages for vandalism and wear.
- Inspect the enclosures themselves, particularly bicycle cages, for vandalism.
- Inspect the moving parts found on the locker, cage, or room doors and on two-tier racks. Consult with the manufacturer of the locker or rack; many offer an extended warranty or free replacement parts.
- Change the keys and access codes of the facility regularly to ensure the continued security of the facility

The regular inspection of the facilities is the responsibility of the managing agency. Some training may be required to provide staff with the skills to make repairs.

Responsibility for Maintenance:

If a business owner installs bicycle parking on their property or the public right of way, they are responsible for the maintenance of the parking. City maintenance crews are responsible for the maintenance of bicycle parking which services City facilities. As bicycle parking increases in Thunder Bay so will the importance of keeping these amenities accessible and appealing to cyclists. It is recommended that the City establish a year-round schedule for maintaining, inspecting and conducting repairs to bicycle parking, and removing abandoned and derelict bicycles. Business owners should be educated about and encouraged to follow a similar maintenance schedule. Creating a notice for the removal of abandoned bicycles and incorporating its use into the maintenance routines of both City crews and business owners would standardize the process of dealing with abandoned bicycles. Developing a partnership with an agency who could make use of these bicycles, such as Bikes for Humanity, would provide a positive solution to disposing of the bicycles that are still useable.

POLICY:

Policies relating to the subject of bicycle rack installation are summarized below. To access the complete documents, see the Resources section of this guide.

Section 10.57 of the City of Thunder Bay Official Plan says that “Businesses, especially retail shopping areas, shall be encouraged to provide bicycle related facilities, such as bicycle racks and secure employee bicycle storage, to promote the increased use of bicycles within the City”.

Section 3.8.1.3 of the 2006 Building Code says that a “barrier-free path of travel shall provide an unobstructed width of at least 1100 mm for the passage of wheelchairs”. That means locating bike racks outside of a 1.1 m. path of travel from the doorway of a building.

Section 3.3.5 of the Transportation Association of Canada’s guidelines, the Geometric Design Guide for Canadian Roads, includes bike racks as street furniture. The design guide does not address bike racks specifically, but offers guidance on the placement of street furniture in general.

Bike rack installation is currently viewed on a case by case basis by the City of Thunder Bay. When a business plans to install a bicycle rack on the sidewalk near their establishment, the first step is to submit a License of Occupation application and fee to Realty Services. The application includes a site plan complete with setback distances and dimensions of the area features. It is reviewed by the City Engineering and Planning Departments and by companies providing city utilities. If the application for the installation of the bicycle rack is approved, a License of Occupation Agreement is created. The applicant must provide proof of adequate insurance to cover the rack. An annual fee is added to the property taxes.

RESOURCES:

Bicycle Parking Guidelines:

Association of Pedestrian and Bicycle Professionals: <http://www.apbp.org/>

Local Bike Rack Distributors:

You are encouraged to order your bike racks through local bike retailers. Not only does this help to support local economy, but these stores often offer discounts off the catalogue price. Contact the local retailers on the list below for more details.

Cyclepath: Offers Saris racks for order.

<http://www.weknowbikes.com/>

831 May Street N.

Thunder Bay, ON P7C 3S2

Tel. (807) 623 3800

Fresh Air Experience: Offers Saris racks for order (see Saris URL below)

<http://www.freshairexp.com/thunderbay/>

311 Victoria Ave., E.

Thunder Bay, ON P7C 1A4

Tel. (807) 623-9393

Petrie's: Offers Saris and Dero racks for order.

<http://petries.ca/home.htm>

125 Archibald Street North

Thunder Bay, ON P7C3X7

Tel. (807) 623-7221

Rollin' Thunder: Offers Saris racks for order.

<http://www.rollinthunder.ca/>

Algoma Street S.

Thunder Bay, ON P7B 3B4

(807) 344 2433

Online Bike Rack Distributors:

BikeRack.ca: <http://bikerack.ca/products.html> Canadian company based out of Toronto which distributes bike racks across North America. The selection offered is somewhat limited, but there is a good post and ring design available.

Belson Outdoors: <http://www.belson.com/bikeracks.htm> Illinois company offering an extensive selection of Inverted U style racks and good information on rack installation and selection.

CycleSafe: <http://www.cycle-safe.com/BikeRacks.tab.aspx>. Based out of Michigan, CycleSafe offers a basic U/2 rack and a series of artistic vintage racks based on a U-rack design, with several anchoring options. Lockers and special event racks are also available.

Creative Pipe: <http://www.creativepipe.com>. A California-based company which offers an extensive line of well-constructed bike parking options, including wall-mounted racks and lockers.

Dero: http://www.dero.com/commercial_racks.html The Canadian representative of Dero is ABC Recreation: <http://www.abcrecreation.com/products/parkfurniture.html> Dero, via ABC Recreation, offers a good selection of racks in galvanized, powder coat and thermoplastic finishings, with surface and embedded anchoring options. Lockers and special event racks are also available. Dero products are available for order through Thunder Bay bike shops.

Function First: <http://www.bikerack.com/> This Arizona company offers a limited but interesting selection of unique and innovative bicycle racks. Their best designs are the oval, inverted U, multi-inverted U and flow racks.

Highland Products Group: <http://www.theparkcatalog.com/items.asp?Cc=BR> Based out of Florida, Highland Products Group offers a variety of bollard racks similar to a post and ring design, basic u-racks and vintage-style u-racks.

Huntco Supply:

http://huntco.com/mercantool/mtool.pl?command=productpage_list&category=2 A Portland, Oregon company which offers a variety of good designs, including the Circle Rack, HP Bike Rack and RR Series.

Maglin: <http://www.maglin.com/products/bike/index.html> Street furniture distributor with an office in Woodstock. Maglin offers a good selection of powder-coated post and ring style bike racks in a variety of colours. The City of Thunder Bay has used Maglin bike racks in past projects

Saris: <http://www.saris.com/commercial-parking/commercial-racks.html> The Canadian representative of Saris is Cycles Lambert: <http://www.cycleslambert.com/default.aspx> Saris offers a wide range of bicycle parking and storage options. Solid post and ring, U-rack and U-series racks are available, as well as a unique meter ring which attaches to parking meters. Saris products are available for order through Thunder Bay bike shops. Cycle Lambert will not make private sales; any orders placed with them must be done through a bike shop.

Wheel-Up: <http://www.wheelup.ca/index.html> Wheel-Up is a small Canadian company who offers special event bike parking exclusively.

Bicycle Parking in Other Cities:

Cambridge, Massachusetts: http://www.cambridgema.gov/cdd/et/bike/bike_park.html

Madison, Wisconsin:

<http://www.cityofmadison.com/trafficEngineering/bicyclingParking.cfm>

Philadelphia, Pennsylvania: <http://blog.bicyclecoalition.org/2010/05/philly-bike-parking-update.html>

Portland, Oregon: <http://www.portlandonline.com/transportation/index.cfm?c=34813>

San Francisco, California: <http://www.sfmta.com/cms/bpark/3176.html>

Toronto, Ontario: http://www.toronto.ca/planning/bicycle_parking_guide.htm

Sources for Thunder Bay Policy Related to Bicycle Parking:

City of Thunder Bay Official Plan. Refer to Section 10, Transportation.

http://www.thunderbay.ca/Doing_Business/Builders_Developers/planning_zoning/Official_Plan_Index.htm

Ontario 2006 Building Code. Refer to Section 3.8.1.3, Barrier Free Path of Travel. Available from the City of Thunder Bay Planning Division.

Transportation Association of Canada 2008 Geometric Design Guide for Canadian Roads. Refer to Section 3.3.5, Street Hardware and Furniture. Available from the City of Thunder Bay Engineering Division.

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