February 2023

Station Reference Guide

Bike Share Toronto

Toronto Parking Authority

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1. Guide Overview

1.1 About Bike Share Toronto

Bike Share Toronto is a public bike share system that operates in the City of Toronto, year-round, 24 hours a day, 7 days a week. The system consists of a fleet of traditional and pedal assist electric bikes (e-bikes) that are available for use on a short-term basis. Bicycles can be rented and returned to a network of docking stations distributed across the city.

Bike Share Toronto is owned and operated by the Toronto Parking Authority (TPA), North America's largest municipally-owned operator of public parking with over 18,000 on-street and 40,000 off-street parking spaces. The TPA is an agency of the City of Toronto and is fully self-sustained through rate-supported operating and capital budgets.

For more information visit the **Bike Share Toronto webpage**.

1.2 Guide Contents

This guide provides high-level guidance on Bike Share Toronto's station infrastructure. It highlights typical station components and provides guidance on bike share station typologies, dimensions and spacing requirements. Graphics are used to demonstrate the various components of a bike share station, while photos provide real-world examples of bike share stations that have been installed across the city.

1.3 Guide Purpose

The Station Reference Guide was developed in collaboration with the TPA, Bike Share Toronto's system operator, and the City of Toronto to provide guidance on station planning and siting. It is intended to be used by designers and practitioners to support the planning and implementation of bike share stations across the city.

When applying this guide, coordination should be undertaken with the TPA when planning for a bike share station to ensure context-sensitive factors are taken into consideration and that all necessary equipment is accounted for as part of TPA's annual purchase of new equipment.

2. Station Components

Bike share stations are comprised of a series of docking points for bikes on interconnected pre-fabricated modular metal plates that range in size and configuration. They may be installed on any level (or near level) surface and do not require construction unless power is brought to the site for e-bike charging. All components of a bike share station must be connected together for power to reach all docking points.

Components of a Typical Bike Share Station

1. Pavé (base metal plate)
2. Docking Point
3. Kiosk (payment terminal and internal electrical equipment)*
4. Map and Ad Panel

*Some stations do not have kiosks and the internal equipment is housed within custom ad panels. These are called **SMART stations**. Bikes can only be removed using the mobile app, mobile web page, or member card at SMART stations.

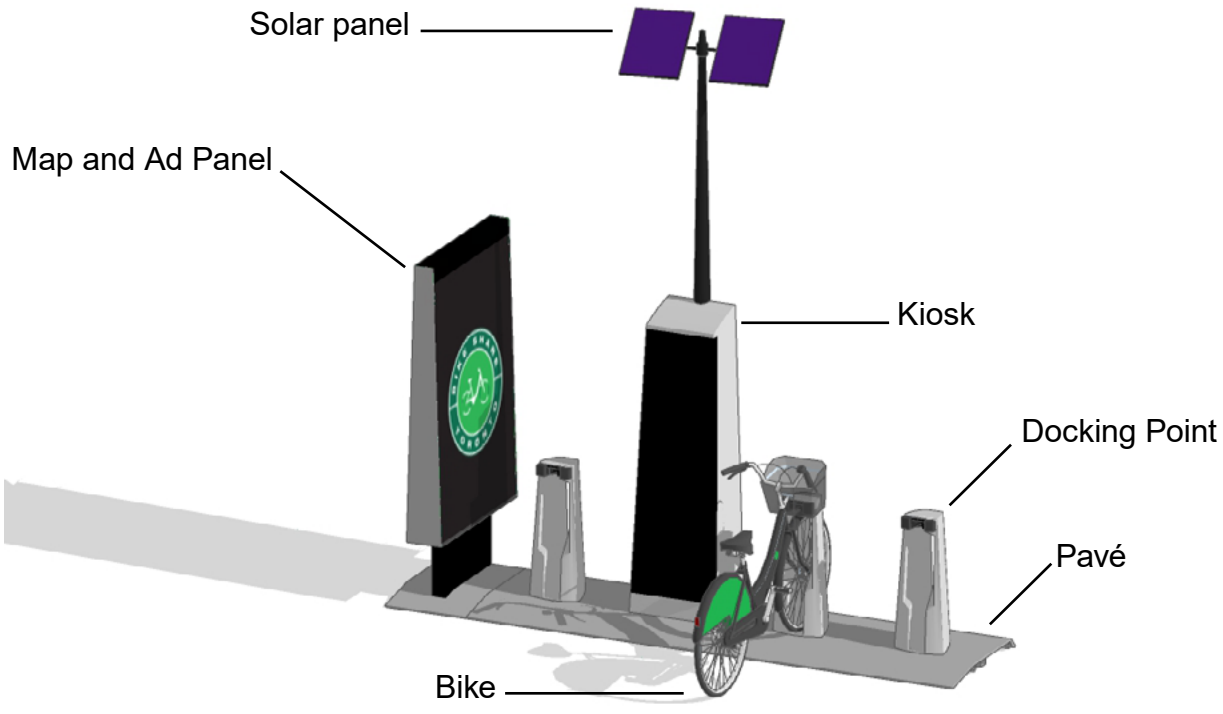
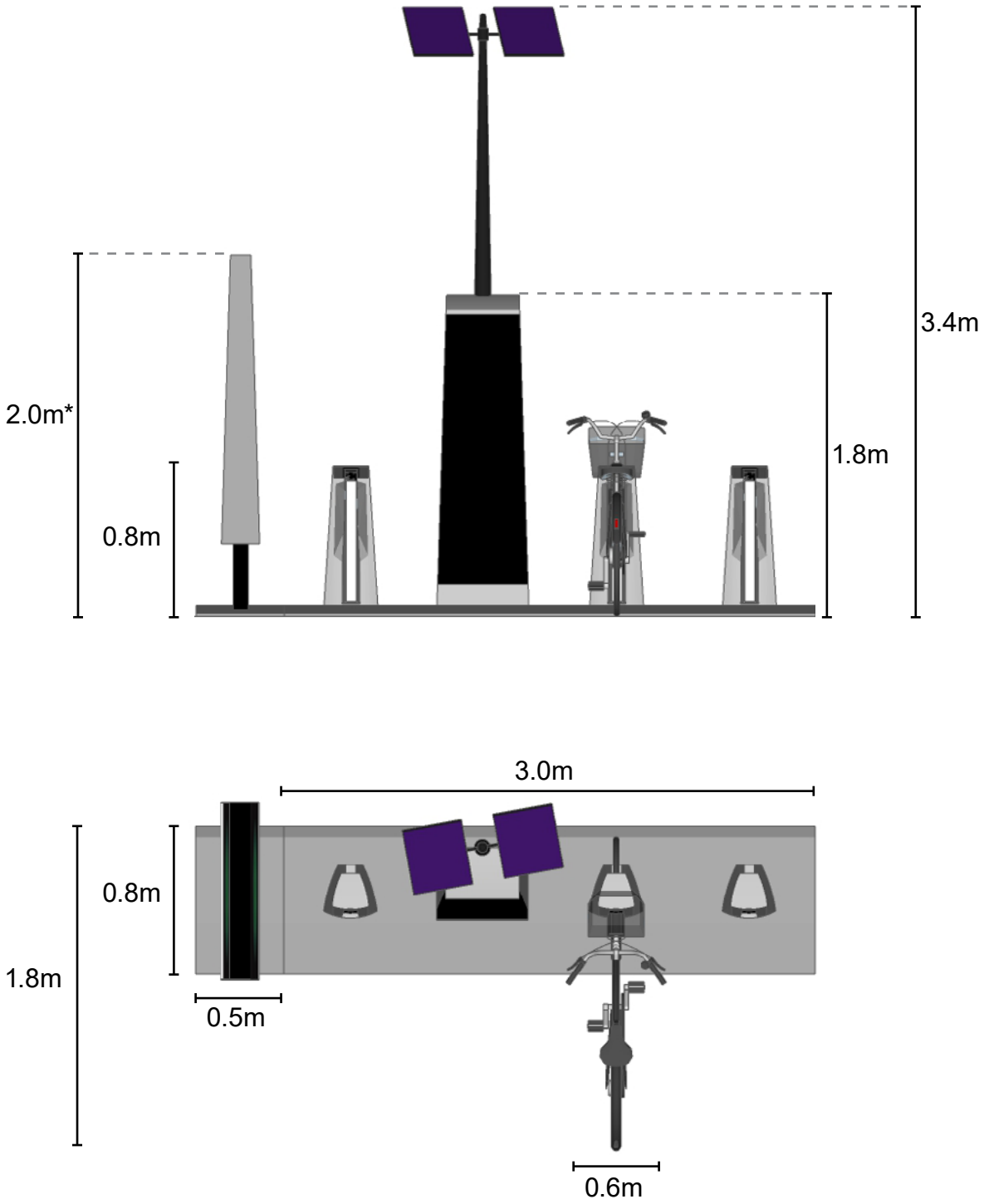


Figure 1. Components of a typical bike share station



* The height of a map and ad panel with a solar panel for a SMART station is 3.6m

Figure 2. Dimensions of station components

2.1 Solar-powered Station

Solar-powered stations are the most common station type. They include a modular solar panel component that is mounted on top of the kiosk or the map and ad panel. The solar panel generates enough electricity to power basic station operations such as the dock locking mechanism and the kiosk. A solar-powered station must be located where there is adequate sun exposure (6 hours of direct sunlight).

Solar-powered stations **do not** have the ability to charge e-bikes, though e-bikes can be returned and docked at solar-powered stations. E-bikes with low battery levels will automatically lock at solar-powered stations when docked.

Figure 3. Photo of solar panel component

2.2 E-Station

E-stations are capable of charging e-bikes. They do not include a solar panel and instead receive power through a direct connection to the station. Power is typically drawn from a nearby property and connected to the station through underground or overhead electrical conduits.

E-stations are the preferred form of bike share stations for new developments and higher-order transit stations. E-stations are critical to the successful operation of Bike Share Toronto's e-bike fleet. The TPA has a goal of electrifying 20% of all bike share stations to help charge e-bikes and maintain their availability to users throughout the day.

Where planning e-stations, please contact the TPA to ensure that site layout and power supply meet the requirements for e-station operations.

Figure 4. Photo of an e-station

The following station and connection requirements should be adhered to when planning for and installing an e-station.

Input

- Input voltage shall be either nominal 120 VAC single phase, or nominal 240 VAC single phase, 60 Hz.
  - » 240 VAC is preferred due to shorter charging times (2-4 hours compared to 7-8 hours at 120 VAC)
- A utility connection feeder must be provided to the e-station consisting of 3 wires comprising Line, Neutral (Or Line 2) and Ground
- Upstream coordinated protection with the feeder wiring must be provided
  - » Where required by Code (CEC or Local Jurisdiction) a local disconnect means shall be provided for the e-station utility connection feeder
  - » Utility connection feeder can be directly from the utility (a new utility service with metering equipment and distribution panel will be required to feed the e-station utility connection feeder) or from an existing private electrical distribution arrangement

Protections

- A locally approved double-pole breaker with 30mA Ground Fault protection (GFP) should be used to connect the bike share station to the utility grid
- Breakers are installed in the kiosk and coordinated with internal wiring. Sub-components are internally protected to enable safe and rapid unit isolation while maintaining maximum availability of remaining healthy circuits
- External input over-current protection is required and should be maximum 40A

Connection

- The minimum wire size should be adequate and adapted to the input protection provided as per local laws and regulations (minimum 10 AWG)
- For supply connections, use wires suitable for at least 75°C

3. Station Configurations

The size of bike share stations vary depending on the anticipated local demand and the space available. Demand is higher when a station is in close proximity to higher-order transit, cycling infrastructure, points of interest, and areas of high residential and employment density. The number of bike share docking points should reflect the anticipated demand. Based on industry best practices, the general guidance for bike share station size is:

- Preferred station size is **15-19 docking points or greater**
- Preferred station size at transit station is **25 docking points or greater**
- Minimum station size is **12 docking points**

Due to the modular components of a bike share station, there are various options for the configuration of a station. Table 1 summarizes the various station configurations and dimensions based on the number of docking points. The dimensions provided in Table 1 reflect the footprint of the station with a map and ad panel, and with bikes docked.

Additional information on the various station configurations and where they are most applicable, is provided on the following pages.

Table 1. Example Station Footprints by Configuration

Station Configuration	Linear 90°	Linear 45°	U-Shaped	L-Shaped	Stacked
12 Docking Points*	9.5m x 1.8m	12.5m x 1.4m (11 DP)		7.4m x 1.8m x 3.9m	
15 Docking Points	12.5m x 1.8m	15.5m x 1.4m (14 DP)	7.3m x 3.7m (17 DP)	7.4m x 1.8m x 6.9m (16 DP)	6.9m x 2.6m
19 Docking Points	15.5m x 1.8m	18.5m x 1.4m (17 DP)		7.4m x 1.8m x 9.9m (20 DP)	
23 Docking Points	18.5m x 1.8m	21.5m x 1.4m (20 DP)	10.3m x 3.7m (25 DP)	10.4m x 1.8m x 9.9m (24 DP)	9.9m x 2.6m
27 Docking Points	21.5m x 1.8m	27.5m x 1.4m (26 DP)		10.4m x 1.8m x 12.9m (28 DP)	
31 Docking Points	24.5m x 1.8m	33.5m x 1.4m (32 DP)	13.3m x 3.7m (33 DP)	13.4m x 1.8m x 12.9m (32 DP)	12.9m x 2.6m

*Typically, kiosks are not included on a smaller sized stations to maintain a minimum of 12 docking points (DP)

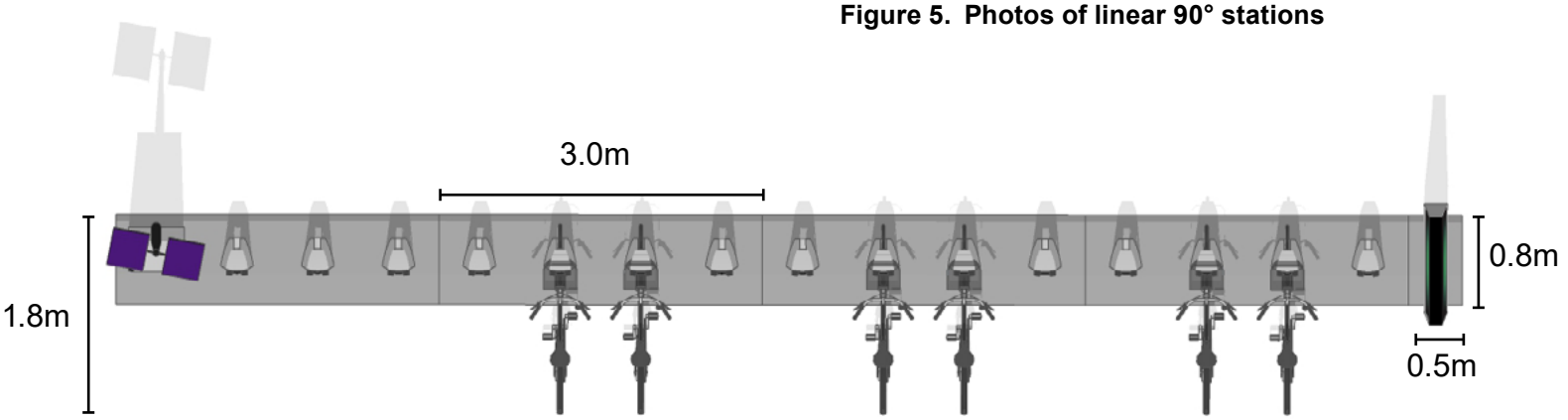
3.1 Linear 90°

Linear 90° stations are considered the standard layout of a bike share station whereby bikes are docked perpendicular into the pavés. This configuration is ideal in linear spaces like in the boulevard, on road and in park spaces.

Example Applications

- Wide furniture and planting zones
- Wide sidewalks (where the minimum pedestrian clearway can be maintained)
- Trail edges in a park space (or in the road right-of-way)
- Curb zones (parking or no parking zones)
- Painted curb extensions
- Fences or walls of buildings without doors

Figure 5. Photos of linear 90° stations



3.2 Linear 45°

Linear 45° stations are ideal in narrow spaces where there is limited width. Each 45° degree pavé has 3 docking points compared to a linear 90° pavé with 4 docking points. Additional pavés may be required to meet the appropriate dock supply for these stations. Docking points can be oriented left or right depending on the context.

Example Applications

- Narrow boulevards (to maintain the minimum pedestrian clearway requirements)
- On roads where the City's standards for lane width dimensions can be maintained

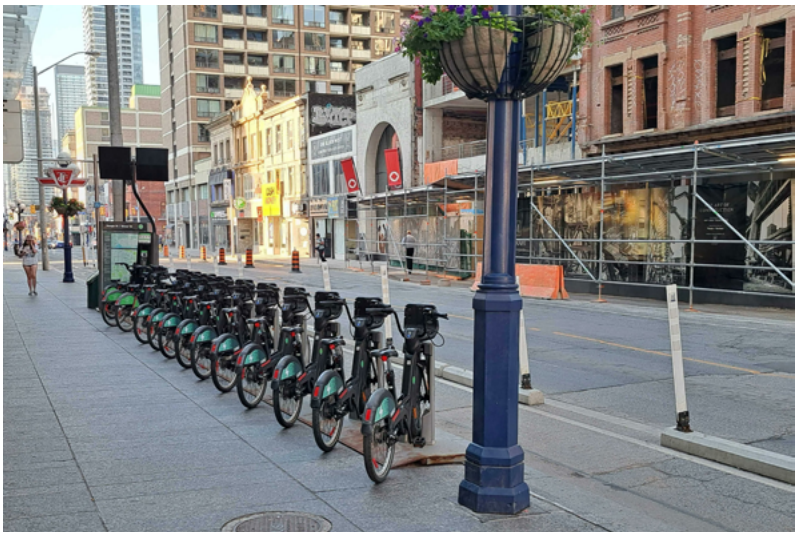
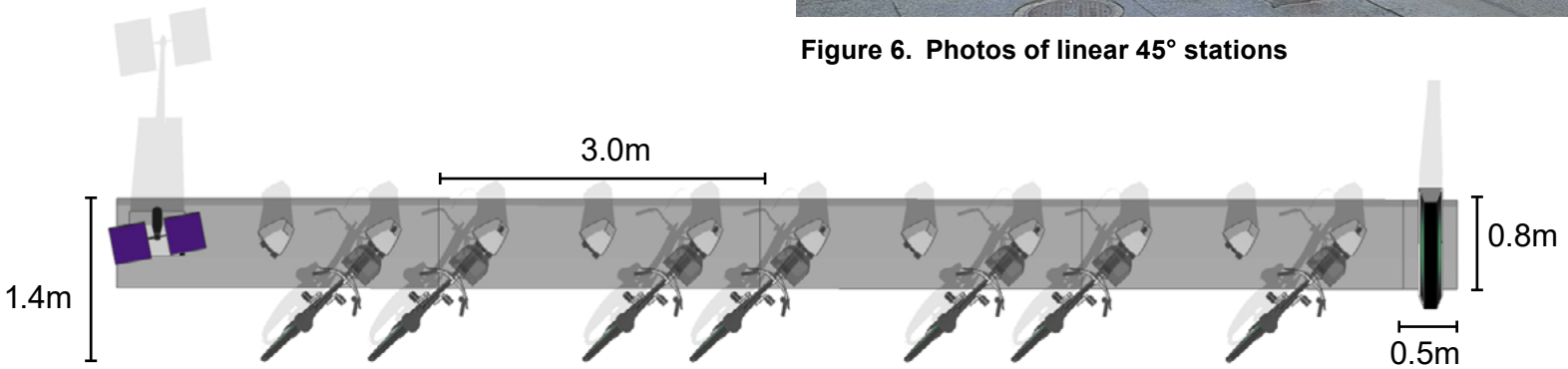


Figure 6. Photos of linear 45° stations



3.3 U-Shaped

U-shaped stations are ideal in wide spaces where pavés can be placed back-to-back. This configuration requires a clearance of 1.0m on both sides to allow users to access bikes.

Example Applications

- Plazas
- Parkettes and parks
- Car parking spaces
- Wide commercial boulevards.

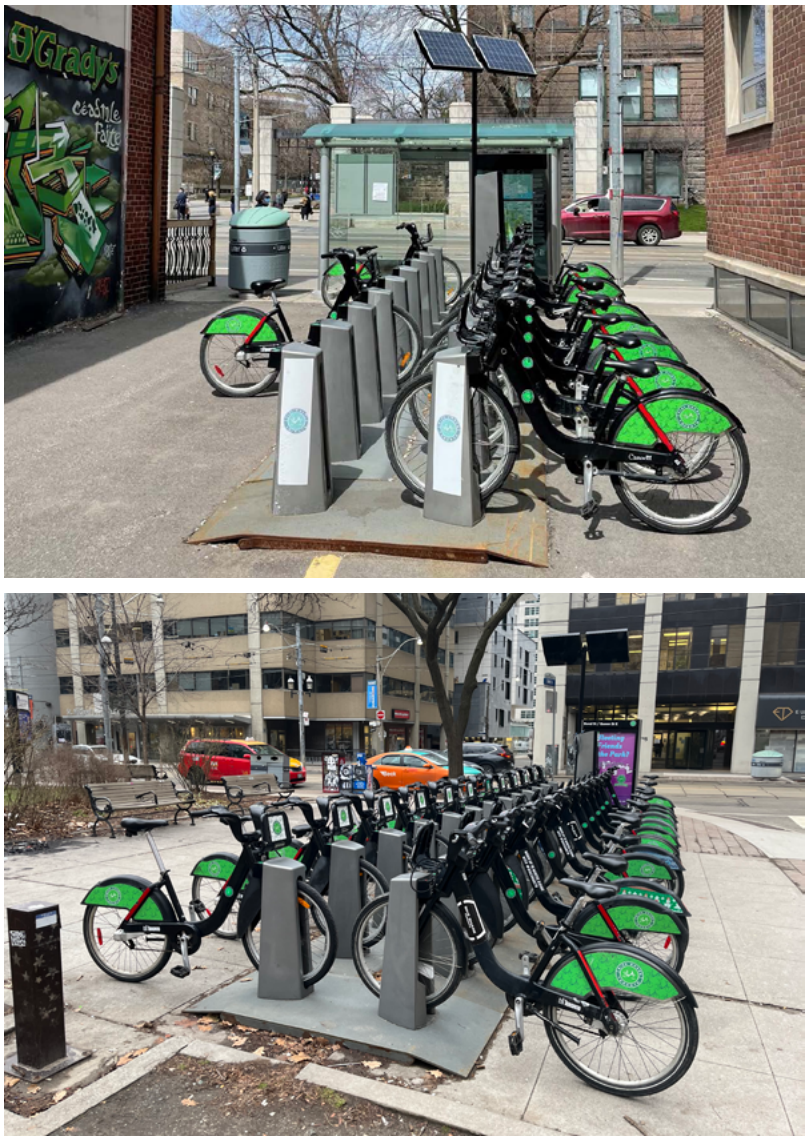
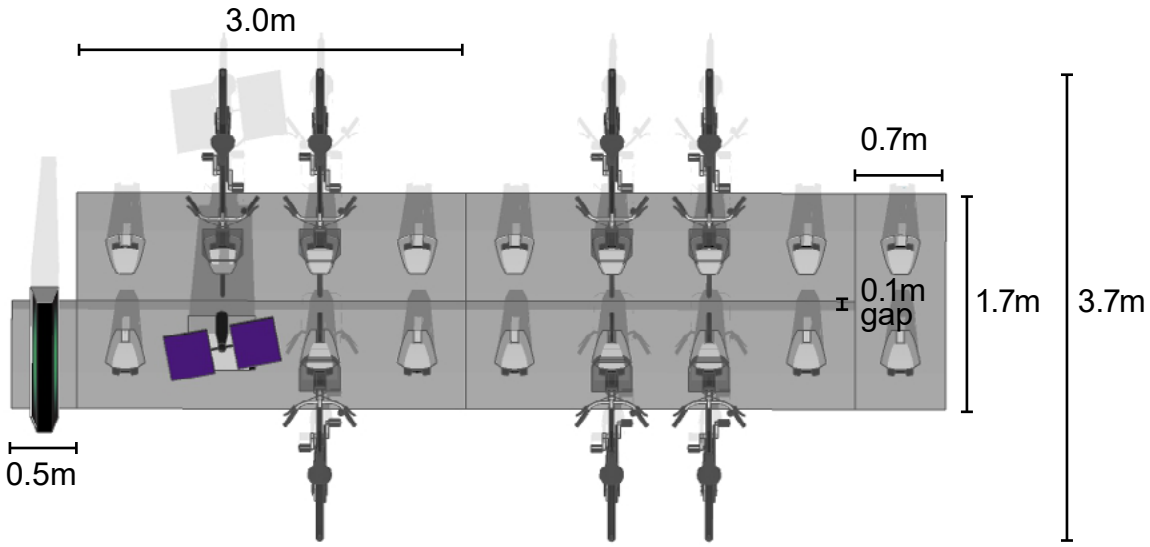


Figure 7. Photos of U-shaped stations



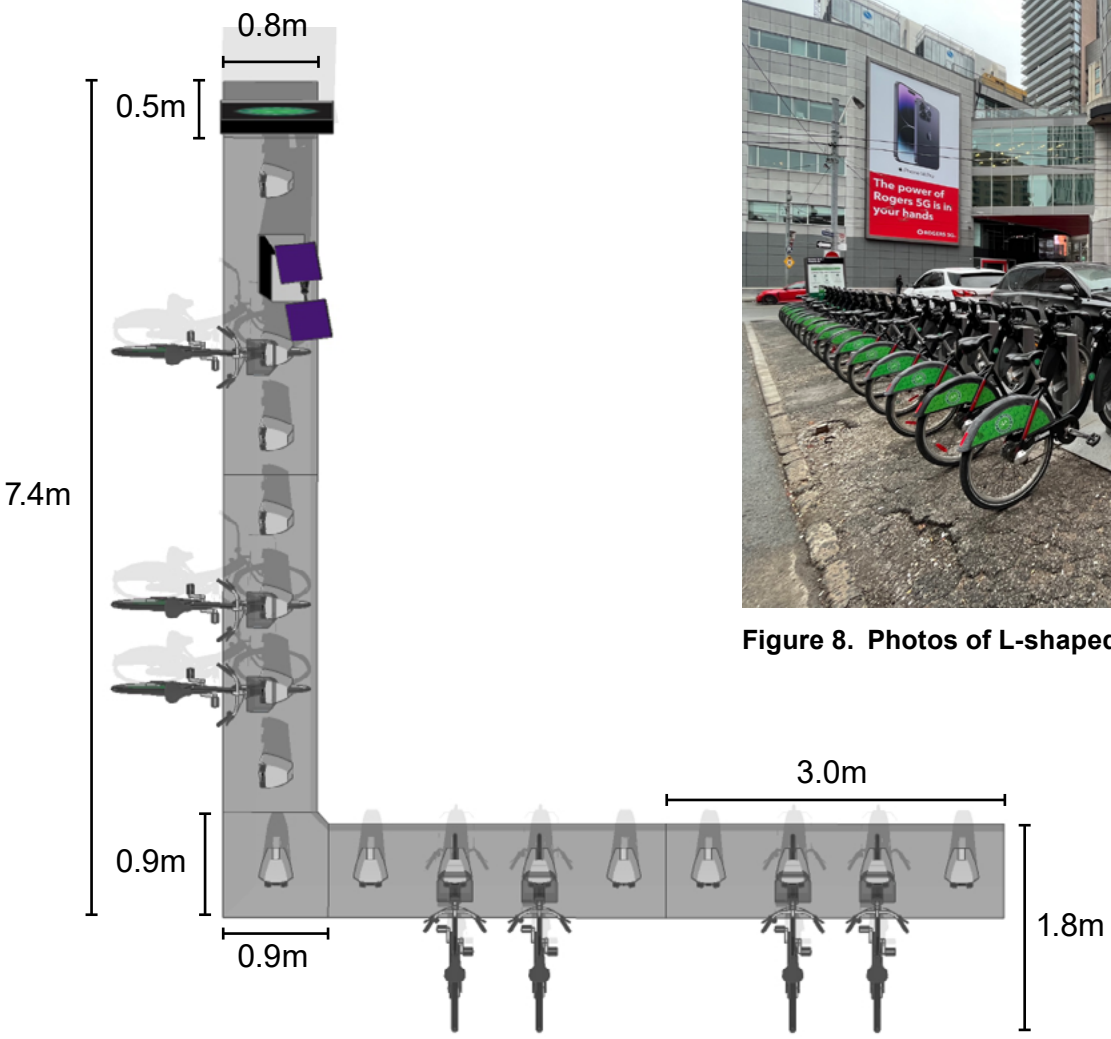
3.4 L-Shaped

L-shaped stations are applicable around corners of buildings, fences, and properties to maximize the number of docking points. The station is effectively two linear pavés joined by an 'elbow' piece with one docking point.

Example Applications

- Around corners of buildings
- Around corners of fences
- Around corners of properties

Figure 8. Photos of L-shaped stations



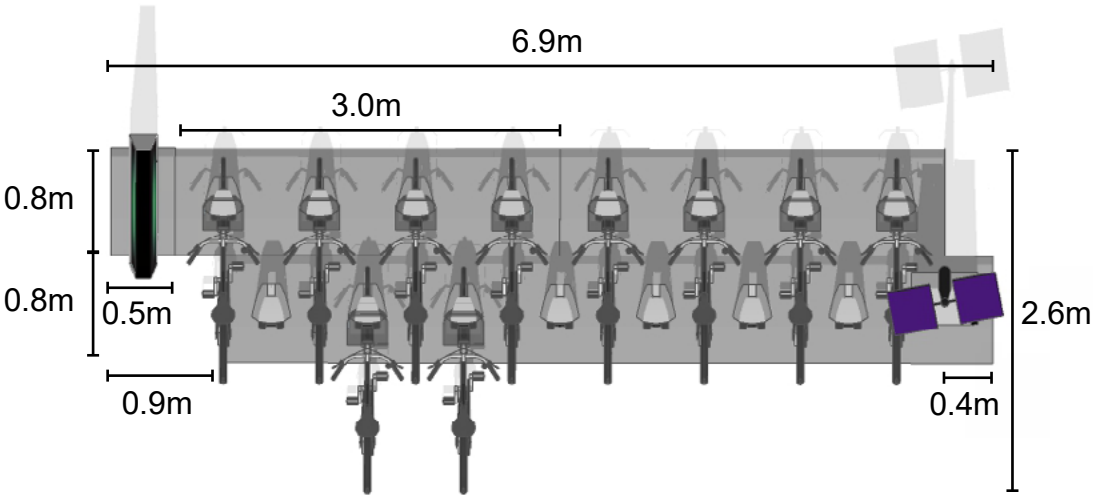
3.5 Stacked

Stacked stations have two rows of pavés that face the same direction. The two rows are offset to ensure the back row of docks are positioned between docks in the front row. When docking bikes, users are encouraged to dock in the back row first. When undocking bikes, users are encouraged to undock from the front row first.

Stacked stations are appropriate in locations where bikes can only be accessed from one side and space restrictions limit the length of the station for a linear configuration. They may also be used to increase the dock supply of linear stations in areas of high demand.

Example Applications

- On-street and boulevard parking spaces
- Plazas
- Parkettes
- Wide sidewalks



*Map and ad panel can be placed in back row left position (as shown), front row left, or front row right positions

Figure 9. Photos of stacked stations

4. Hardscape Stations

In addition to modular stations, bike share stations may also be installed directly onto a hard surface (concrete) without pavé base plates. This is achieved by laying underground conduits, pouring concrete, and drilling docking points and kiosks to the settled concrete. Wires are fed between the docking points through the conduits to the kiosk to power the station.

'Hardscape stations' are ideal for sidewalk, boulevard, plaza, and park reconstruction projects. Since they do not include pavés, they are less prone to rusting and creating rust stains on concrete. Installing docks directly into the ground integrates the station with the surrounding urban design. Hardscape stations permit the flexibility to create non-linear configurations, such as aligning stations around the curve of a building or curved trail.

Once installed, hardscaped stations can be temporarily removed as needed by removing docks and kiosks, and covering open conduits with metal plates until the station can be reinstalled.

Figure 10. Photos of hardscaped station in London, UK (Photo Credit: Santander Cycles)

5. Station Location Principles

Planning for a bike share station involves adherence to a number of policies and by-laws to ensure the station meets standard clearances. These include the City's Coordinated Street Furniture Program Design and Policy Guidelines, Tree Protection Policy, Road Engineering Design Guidelines, Municipal Code Chapter 950 - Traffic and Parking, Municipal Code Chapter 743 – Use of Streets and Sidewalks, Toronto Accessibility Design Guidelines and the Accessibility for Ontarians with Disabilities Act - Integrated Accessibility Standards. Though these policies and by-laws do not represent an exhaustive list of guiding documents, they are most applicable for the wide range of locations and contexts where bike share stations are planned and installed.

The following are standard clearances that must be adhered to when planning and installing a bike share station:

- Station to be placed on a level surface
- Maintain a preferred pedestrian clearway width of 2.1m (minimum of 1.8m)
- 0.5m set-back from curb or building face
- 25.0m from outward facing advertising or information board
- 2.0m from end of corner radius
- 5.0m minimum setback from near-side of an intersection and 9.0m minimum setback from far-side of an intersection (where a station is proposed on-road)
- 2.0m clearance from a fire hydrant/service connection
- 1.0m clearance from maintenance hole, vault, traffic and utility poles
- Maintain the minimum tree protection zone as per the City's Tree Protection Policy
- 0.45m clearance from the edge of the sidewalk
- 1.5m clearance from driveway
- 1.0m clearance from curb cut for disabled access
- 1.0m clearance from permitted street vendor
- 6.0m from an entrance/exit from building
- 12.0m away from the approach of boarding, disembarking, or queuing transit passengers
- 6.0m away from fire hydrants
- Does not obstruct the sightlines of pedestrians, cyclists and drivers
- Adequate sun exposure for solar powered stations (6 hours direct sunlight)

In addition to these station planning principles, coordination should be undertaken with the TPA when planning for a bike share station to ensure context-sensitive factors are taken into consideration. Coordination with the TPA is critical to ensure appropriately-sized stations are planned for, and that all necessary equipment is accounted for as part of TPA's annual purchase of new equipment.

The following are graphic illustrations of the four most common station placement scenarios, highlighting the various clearances necessary.

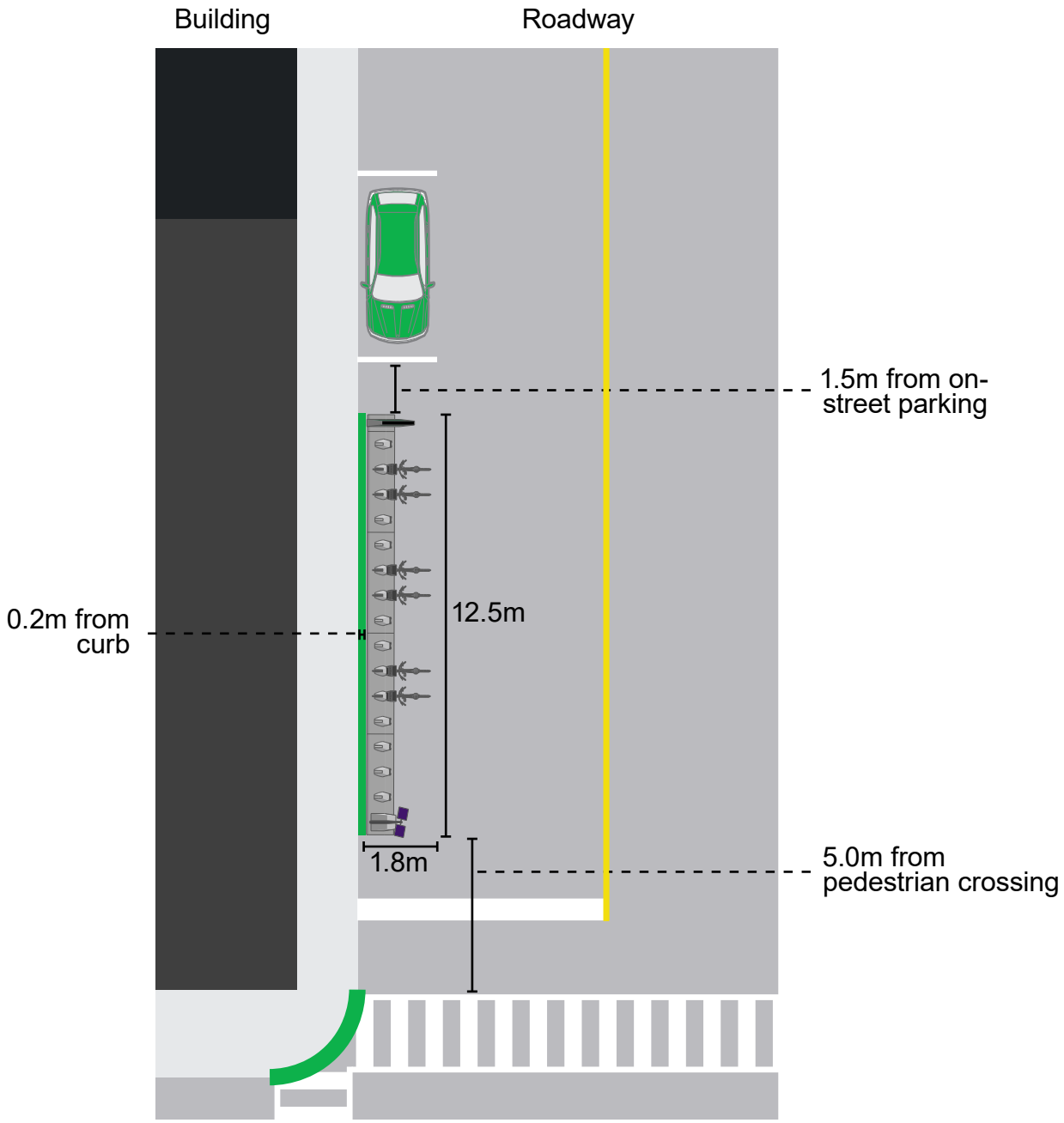


Figure 11. Illustration of on-street linear 90° station

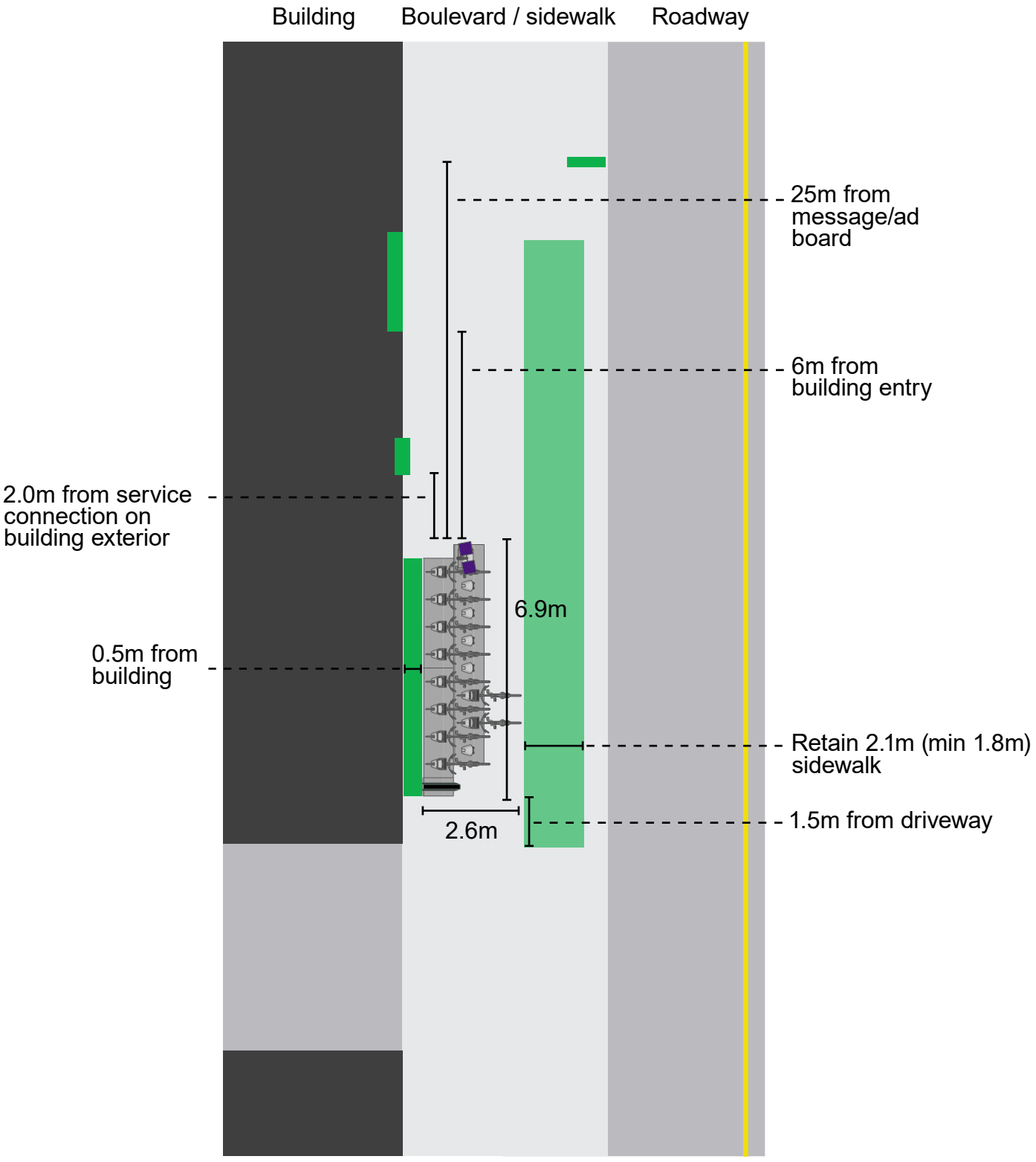


Figure 12. Illustration of stacked station in a wide boulevard

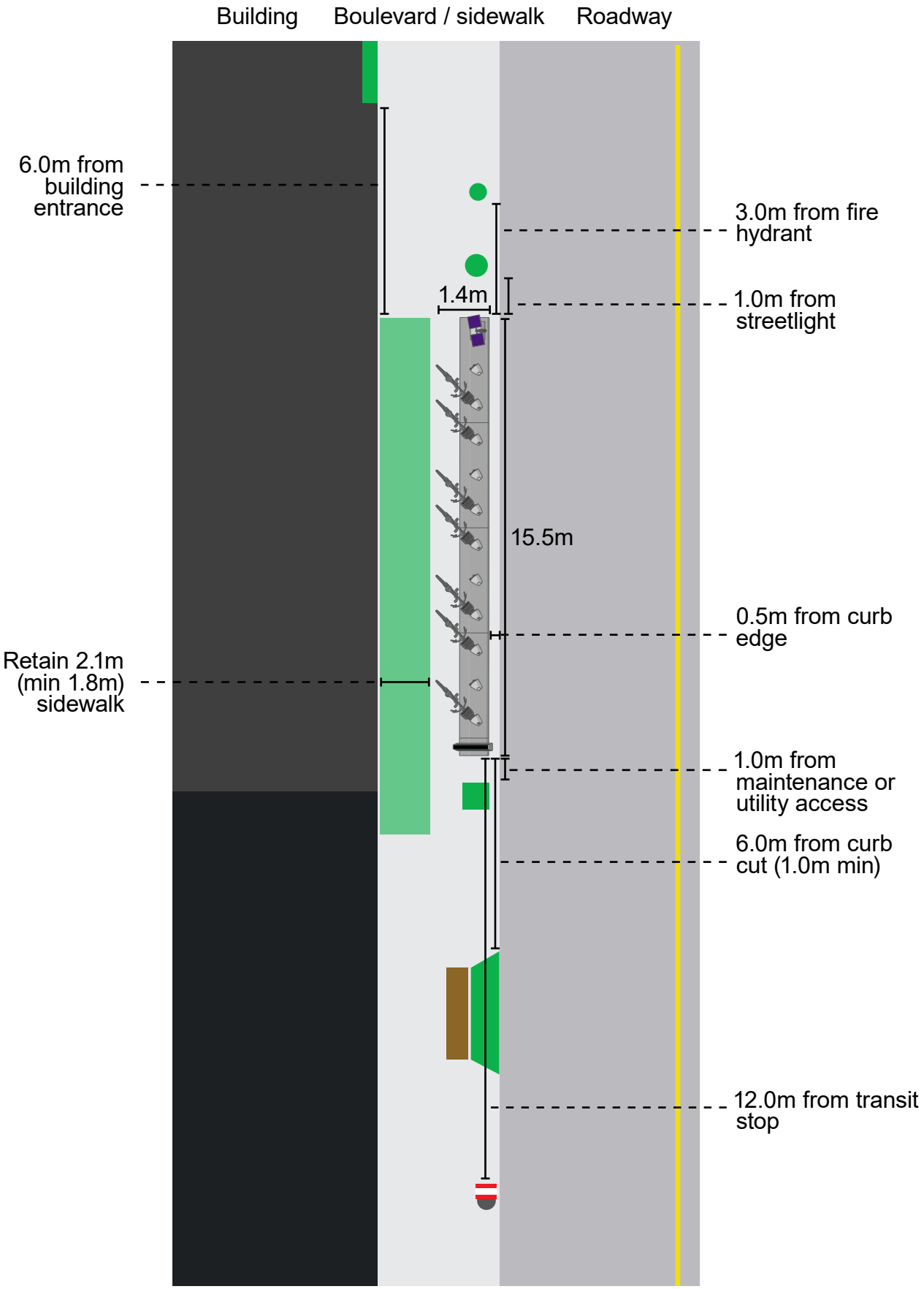


Figure 13. Illustration of linear 45° station on a constrained sidewalk

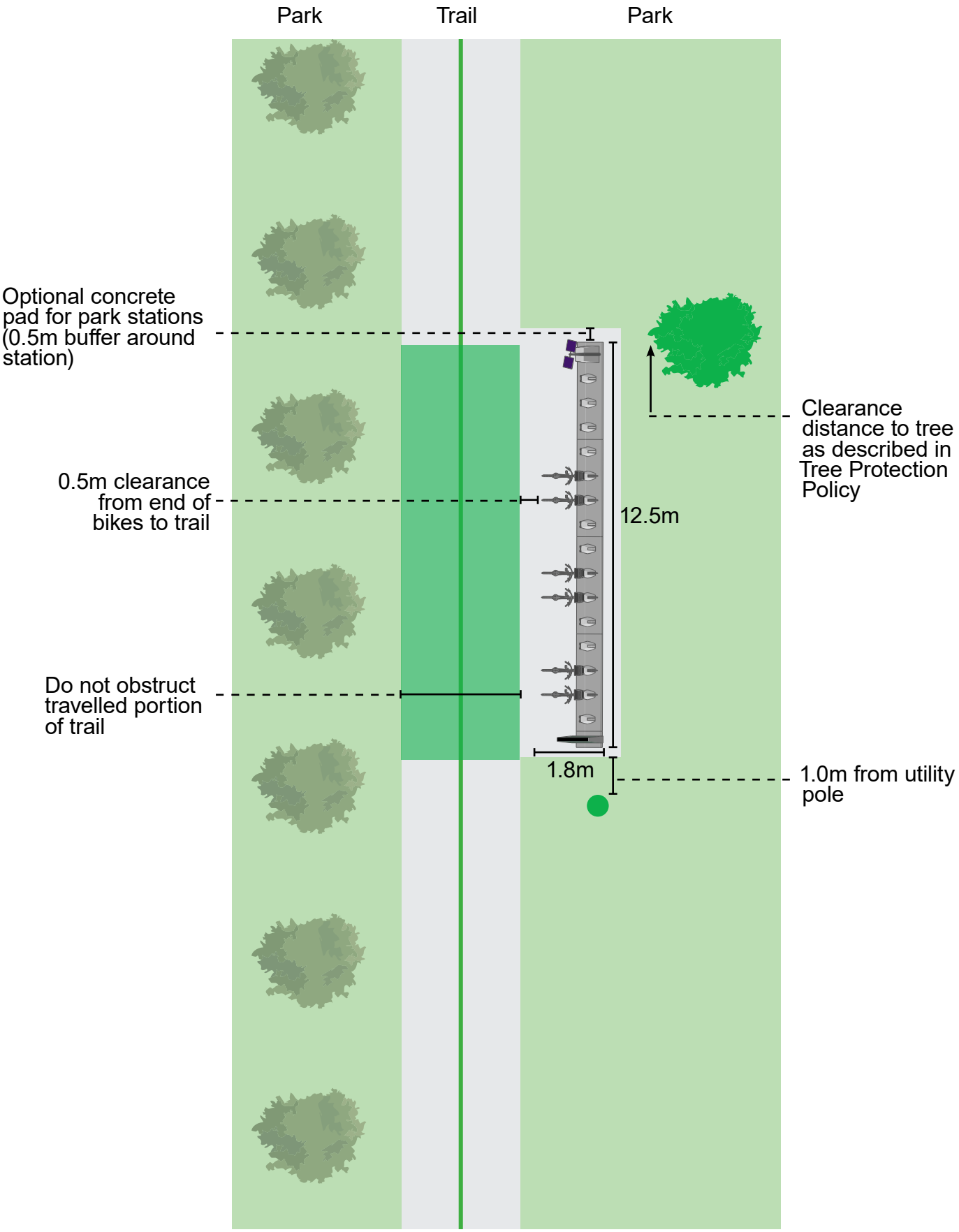


Figure 14. Illustration of linear 90° station along a trail

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