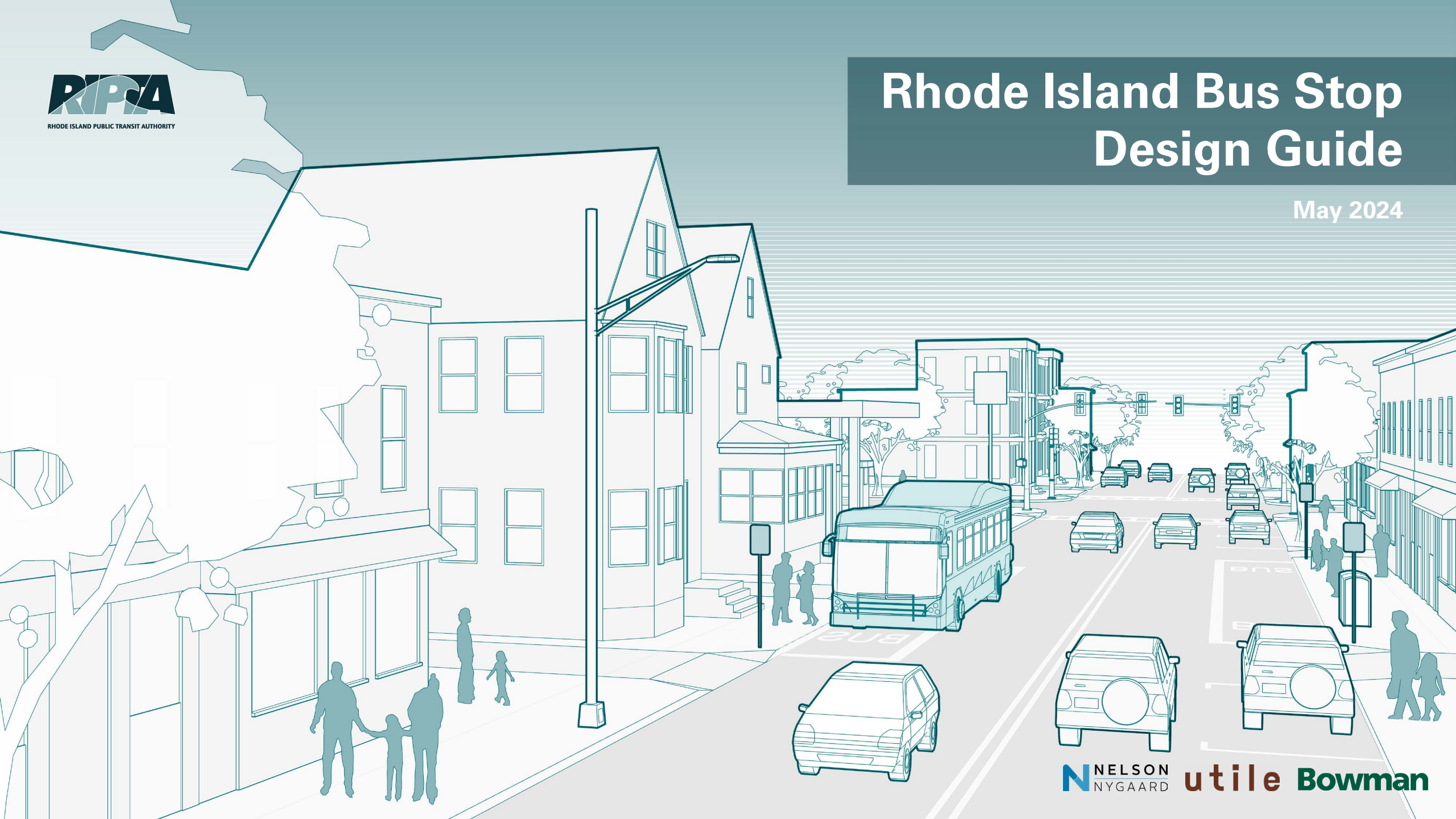
RIPTA
RHODE ISLAND PUBLIC TRANSIT AUTHORITY

Rhode Island Bus Stop Design Guide

May 2024



NELSON NYGAARD
utile
Bowman

Table of Contents

1 Introduction

Bus stops serve as the gateway for the majority of Rhode Island's transit services. When bus stops are thoughtfully designed to prioritize the safety, comfort, and accessibility of riders, individuals using the bus system enjoy enhanced mobility and increased access to destinations across the state. A well-designed, safe, comfortable, and accessible bus stop significantly contributes to an improved overall bus riding experience, as well as a safer environment for pedestrians, cyclists, and drivers.

Purpose

The Rhode Island Bus Stop Design Guide serves the following purpose and goals:

- Establish clear guidance on integrating transit effectively into the statewide roadway network.
- Provide design recommendations aimed at enhancing bus operations and improving the passenger experience at bus stops.

This guide primarily focuses on the design standard of Rhode Island Public Transit Authority (RIPTA) bus stops, not busways or transit hubs, where a more extensive design would likely be required.

Incorporating bus stop design into roadway projects is an efficient and direct way to improve transit infrastructure across Rhode Island. Most roadway projects involve sidewalk reconstruction, curb ramps, alterations to curbs, and streetscape improvements that enhance the pedestrian environment. These elements are critical components of bus stop design. Changes to these elements near bus stops directly impact access. When RIPTA, the Rhode Island Department of Transportation (RIDOT), municipalities, other agencies or private entities alter the roadway or sidewalk at a bus stop, they have a legal obligation to ensure bus stops are compliant with the Americans with Disabilities Act (ADA).

This guide is intended to provide direction on safe and accessible bus stop design and criteria for evaluation but should be site sensitive and used in conjunction with planning/ engineering judgment, and appropriate laws, ordinances, and regulations. Questions regarding this document, and particularly deviation from the recommendations outlined in this guide, should be directed to RIPTA's Service Planning department.

Why create a bus stop design guide?

- Address safety concerns
- Improve accessibility
- Enhance service operations
- Provide better passenger amenities
- Provide consistency in planning and design of bus stops
- Establish best practices to be followed
- Address Rhode Island-specific conditions
- Improve collaboration between RIPTA, RIDOT, municipalities and other affected agencies

Figure 1.1 (top) and Figure 1.2 (bottom) Kennedy Plaza

Project Background

The Rhode Island Bus Stop Design Guide was developed in response to a complete streets law (General Law 24-16-2) passed by the Rhode Island General Assembly in 2012, calling for the accommodation of all users in all roadway construction projects. It was a collaborative effort between RIPTA and RIDOT, with input from local municipalities, stakeholders, and RIPTA riders. This guide conforms to state and federal regulations, as well as having consideration for national guiding documents, and has been drafted following a review of several peer transit agency guidelines.

Figure 1.3 RIPTA staff engaging with riders

Audience

This guide illustrates to planners, engineers, landscape architects and others, that bus stops are not just a sign on a post, but an opportunity to improve access and mobility within the community. It provides municipalities, developers, and others direction on how to incorporate transit improvements into roadway design and streetscape projects. This guide assists in establishing bus stop zones that support RIPTA's operational needs, meet ADA requirements, provide rider comfort, and maintain a safe pedestrian environment.

This guide also serves as a valuable resource for the general public by providing information on bus stop design elements, as well as RIPTA's goals and practices. This empowers riders to more effectively advocate for their transit-related needs.

Interagency coordination is necessary for successful implementation of bus stop design, construction and maintenance. With different jurisdictions controlling the roadways and sidewalks, state and local agencies must work together. While RIDOT typically oversees the the majority of roadways where RIPTA buses operate, municipal jurisdiction may apply to certain areas, with local municipalities often maintaining sidewalks. Municipalities are strongly encouraged to contact RIPTA's Service Planning department when embarking on projects in locations that may impact RIPTA operations. This ensures that bus operations, rider needs, and bus stop maintenance considerations are appropriately addressed. Furthermore, RIPTA is eager to collaborate with Rhode Island municipalities to establish similar relationships and protocols for their projects.

Guide Outline

The guide covers aspects such as bus stop spacing, placement, configuration, and length, as well as ADA requirements and pedestrian accessibility, signage, streetscape elements, roadway design considerations, and the design and siting of rider amenities.

In addition to improving safety, accessibility, and user-friendliness at bus stops, this guide also aids in enhancing the efficiency of bus services. Several elements considered in good bus stop design aim to reduce delays at signalized intersections when buses re-enter traffic flow and when passengers board and disembark from the bus.

RIPTA operates within diverse roadway environments that feature different types of pedestrian facilities. These environments include downtown areas, urban and suburban streets, rural settings, as well as private properties like shopping malls, apartment complexes, office parks, hospitals, and college campuses. Sample bus stop designs are provided for guidance, tailored to the specific characteristics of these varied environments.

- Urban downtown areas with wide sidewalks which provide an opportunity for various transportation infrastructure and pedestrian accommodations.
- Suburban areas with narrow sidewalks or no sidewalks on one or both sides of the roadway.
- Constrained areas with limited right-of-way.
- Off-street locations without providing service to the front door.

Scoping and Planning

Implementing bus stop improvements is most effective when RIPTA, municipalities, state agencies, and other stakeholders adhere to a unified set of guidance and project workflow. Consistent adherence to this guidance fosters uniformity across all RIPTA bus stop projects, contributing to enhanced transit equity within the RIPTA service area.

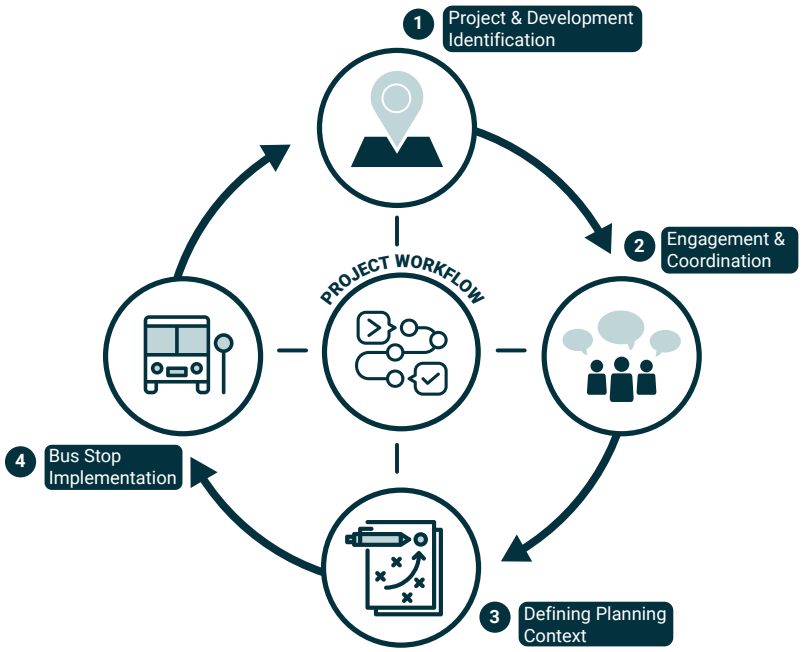


Figure 1.4 RIPTA Project Lifecycle

Project Workflow

1 Project and Development Identification
Municipalities, RIDOT, or developers (i.e., the project lead) assess if RIPTA service will be impacted. This includes any existing service or bus stops that are within one quarter of a mile of ongoing roadway, streetscape, and building projects. It is imperative to identify and address these impacts on RIPTA service or infrastructure during the project design phase.

2 Engagement and Coordination
The project lead and RIPTA coordinate to determine the extent of impacts on current service and access to bus stops, identifying possible improvements (e.g., pedestrian safety, visibility, comfort). RIPTA will subsequently decide whether a bus stop necessitates addition, relocation, or removal based on potential impacts of the project.

3 Defining Planning Context
The project lead and RIPTA coordinate to ensure that the project goals and objectives align with both municipal and state policies and plans, as well as with RIPTA's planning and design guidance.

4 Bus Stop Implementation
The project lead and RIPTA coordinate to develop construction plans and implement strategies to mitigate the impact on bus stops and existing bus service. The project lead is advised to consult with RIPTA and refer to the guidance provided in this document to determine the optimal design and configuration for bus stops. RIPTA can choose to participate throughout the entire duration of the project, during a specific phase, or not be involved at all.

Steps to Planning and Designing a Bus Stop

Figure 1.4 illustrates the step-by-step process involved in creating a process to ensure the proper planning and design of a bus stop. If it proves challenging to incorporate all components of a bus stop design, it may necessitate identifying an alternate location for the stop. A detailed bus stop checklist is also provided in Appendix B, aiding in the assessment of a bus stop's condition and facilitating planning and design for improvements.

Analyze need for a bus stop
Determine appropriate bus stop spacing by considering the distance between the prior and next stops. Assess transit demand based on adjacent land uses and major trip generators, such as medical facilities, university campuses, or shopping centers.

Conduct bus stop audit and condition assessment
Determine the ideal bus stop placement (e.g., near-side, far-side),configuration (e.g., curb extension, pull-out), and assess traffic and parking impacts to ensure safe bus service.

Evaluate bus stop accessibility
Verify that stop placement and the path of travel at the stop comply with the Americans with Disability Act (ADA) requirements. Install signage and striping to enhance bus stop safety and visibility.

Consider implementing additional bus stop elements
Determine the placement of bus stop amenities based on accessibility requirements. Implement streetscape enhancements, bike accommodations and/or bus priority treatments to improve the bus stop environment.

2 Bus Stop Placement

The appropriate siting of bus stops is determined by the placement and configuration of the stop in relation to the roadway and nearest intersection. Bus stop locations are influenced by pedestrian access and bus operations. The placement of bus stops is determined by bus lengths, the number of travel lanes, presence of on-street parking, adjacent land uses, and available right-of-way. This chapter includes guidance on how to intentionally and carefully place bus stops along the roadway to improve bus efficiency, rider accessibility, and pedestrian safety.

Bus Stop Siting

The optimal stop location should improve bus travel times, reliability, efficiency, safety, and accessibility, while maintaining and/or enhancing rider access to destinations and amenities. The siting of a bus stop not only impacts transit riders, but also drivers, pedestrians, and cyclists in the vicinity of the stop. Multiple factors must be used to determine the appropriate siting of a bus stop including demographics and land use, existing service and rider amenities, pedestrian environment, and safety.

Demographics and Land Use

Ridership – Evaluate existing and projected stop boardings and alightings, as well as the ridership profile at the stop (e.g., seniors, persons with disabilities). Low ridership stops, more specifically low ridership stops in close proximity to higher ridership stops, may be considered for consolidation or removal. The threshold for a low ridership stop will be determined when it is compared to ridership at other stops along the same, or a similar bus route, and the frequency of service provided at the stop.

Existing and Future Land Uses – Note sensitive land uses, including medical facilities, senior housing, and major transit trip generators, such as shopping malls, schools, and dense commercial or residential complexes. Stop locations must be adjusted or added to provide better access to rider origins and destinations, depending on pedestrian connections and conditions.

Figure 2.1 Riders boarding at RIPTA bus stop

Existing Service and Rider Amenities

Bus Route Connections – Consideration should be given to maintaining and or improving bus stops where transfers between two or more routes are most likely to occur. Under certain circumstances, the relocation of an existing bus stop may be necessary, and it may increase the distance for riders transferring between routes. Priority should be given to relocating the stop within close proximity of its former location, thereby minimizing the additional distance a transferring rider would have to walk between stops.

Rider Amenities – Evaluate opportunities to add amenities to new or existing stops, or upgrading of amenities at existing stops.

Pedestrian Environment

Connections and Condition – Sidewalks immediately at the stop and connected to the bus stop, as well as to the surrounding area, are an important consideration. Bus stops should be established or relocated to better, more level sidewalk surfaces, away from pinch points, and/or to wider sidewalk areas.

Crossings – Bus stops should connect to a marked pedestrian crossing, preferably a crosswalk behind the stop, so that riders are encouraged to cross behind the bus. Ideally crossings should be signalized, especially in high traffic volume and higher speed areas. Intersections and at-grade driveway crossings should have existing or the potential to add ADA-compliant curb ramps.

Safety

Lighting – Provide safety and security for riders, and better visibility for bus operators of waiting passengers at a well-lit stop. Lighting can be cast by pedestrian scale lighting, lighted shelters, overhead streetlights or brightly lit signs.

Sight Distance – Consider sight distance for transit riders, bus operators and other drivers. Avoid obstructions to sightlines between bus operators and transit riders such as trees, signs, buildings, shelters, and topography.

For optimal sight distance between bus operators and other drivers, bus stops should not be located over the crest of a hill, immediately in or after curve in the roadway to the right, or at locations that might prevent visible connectivity between buses and other vehicles.

Following vehicles need to have good visibility of stopped buses, particularly when bus stops are located in the travel lane, as well as buses decelerating when entering a stop and accelerating when exiting a stop. Similarly, bus drivers need to be able to see vehicles approaching from behind when exiting a stop. Table 2.1 provides the recommended sight distance for bus stops, given the posted speed limit. Bus stops must be sited to meet the minimum stopping sight distance provided by the American Association of State Highway and Transportation Officials (AASHTO). Bus stops cannot be placed in locations where there is inadequate sight distance. Existing stops with poor visibility should be considered for relocation or removal. Stopped buses can impact sight distance for vehicles exiting side streets. Depending on the location of the stop relative to the intersection, different vehicular turn movements can be affected.

Sight distance is the length of roadway visible to a driver. The following table shows the distance that is visible to a driver along a roadway when traveling at different speeds. This allows drivers to see and anticipate a stopped bus and potential pedestrian crossings.

Table 2.1 Sight Distance for Siting Bus Stops

Speed Limit (Miles per Hour)	Sight Distance (Feet)
15	200
20	265
25	335
30	400
35	465
40	530
45	600
50	665

Calculations are based on time gaps provided in AASHTO 2016, adjusted for right turn movements that AASHTO 2011 considers to be equivalent to pulling into traffic from a bus stop, and intersection sight distance also provided in AASHTO 2011.

Bus Stop Placement at the Intersection

There are three general placement options for bus stops along a roadway including far-side, near-side, and mid-block. Within this section, the following placement options are described, along with the advantages and disadvantages of each option.

Far-side Stop
Far-side stops are located after the intersection, and are generally preferred by RIPTA and RIDOT because:

- Crosswalks are located behind the stop, encouraging pedestrians to cross behind, and not in front of a bus
- At signalized intersections bus operators can utilize opportunities in the signal phasing and gaps in traffic flow to re-enter the travel lane
- Transit priority measures, including bus queue jump lanes and transit signal priority, can more easily and effectively be used in conjunction with far-side stops
- At curbside stops buses can utilize the intersection to pull into a stop, thereby requiring less curb space and minimizing the impacts to on-street parking

However, far-side stops can cause vehicles to block the intersection if traffic is held up behind a stopped bus.

Near-side Stop
Near-side stops are located before the intersection, and may be used:

- At stop-controlled intersections to reduce the number of times the bus needs to stop
- If there is a large trip generator on that side of the intersection
- If a shared stop is desired to facilitate through and right turning bus movements

Near-side stops are generally not preferred over far-side stops because:

- Crosswalks are located in front of the stop and less visible to bus operators
- Crossing bus riders/pedestrians have the potential to further delay the bus
- At signalized intersections, buses have the potential to be stopped twice, once serving the stop, and again for the traffic signal, increasing delays to service, and affecting the passenger experience
- Buses require more space to pull into a stop, increasing the impacts to on-street parking
- Right turning vehicles and through moving buses have the potential to be in conflict with each other
- It is more difficult to integrate bus priority measures

Mid-Block Stop
Mid-block stops are usually located between two intersections or large commercial access driveways. Mid-block stops are generally not preferred over far-side or near-side stops unless there is a large trip generator mid-block, or there is insufficient curbside space or vehicle travel lane capacity at the intersection. Mid-block pedestrian crossings are less desirable and so it may be difficult to directly connect a bus stop and crosswalk, especially when an intersection is close by, but not immediately adjacent to the stop.

1. Near-Side Bus Stop
2. Far-side Bus Stop
3. Mid-block Bus Stop

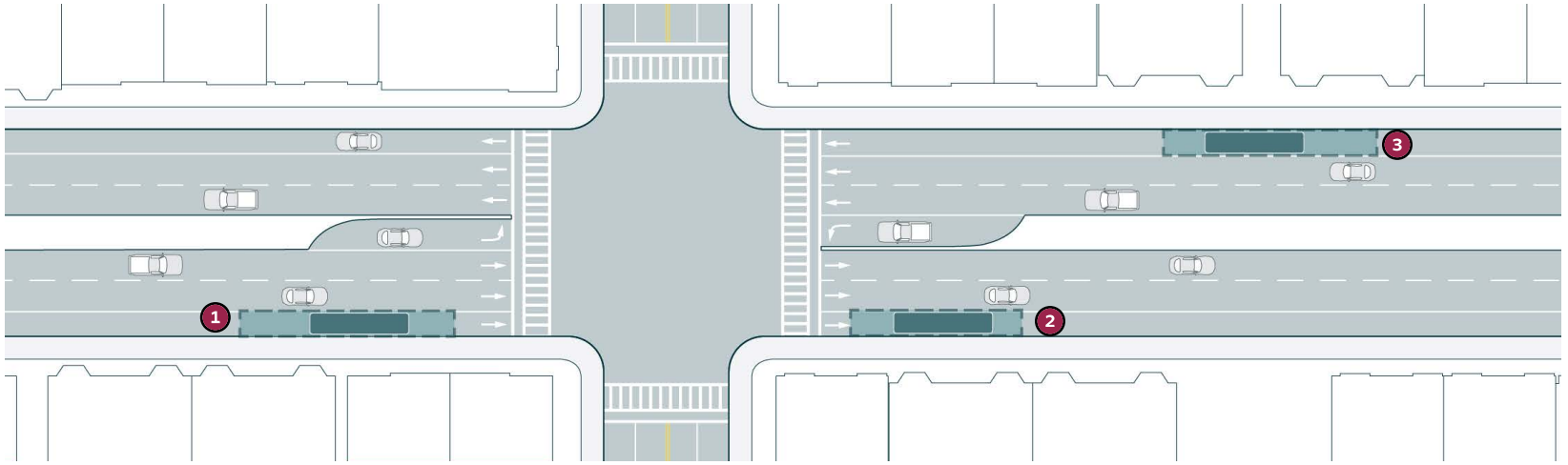


Figure 2.2 Bus Stop Placement

Table 2.2 Bus Stop Placement Advantages and Disadvantages

Stop Placement	Advantages	Disadvantages
Far-side	• Minimizes conflicts between right turning vehicles and buses • Provides additional right-turn capacity by making curb lane available for traffic at intersections • Minimizes sight-distance problems on approaches to intersection, including visibility of traffic control devices. The stopped bus does not obscure sight distance to the left for vehicles entering or crossing from the side street • Creates longer deceleration distances for buses since the bus can use the intersection to decelerate • Sight distance is improved for pedestrians at intersections where heavy traffic flows diverge, causing traffic volumes to be lighter on the leaving side than on the approaching side, far-side stops will minimize interference with major flows • If a pull out is provided, vehicle capacity through intersection is unaffected	• Could result in traffic queued into the intersection when a bus is stopped in the travel lane or more buses than fit at the stop arrive at the same time • May obscure sight distance for crossing vehicles, for example to the right of drivers entering from the cross street to the right of the bus • If signal priority is not in use, can cause a bus to stop far-side after stopping for a red light, which interferes with both bus operations and other traffic • May increase the number of rear-end collisions since drivers do not expect buses to stop again after stopping at a red light and proceeding across an intersection • May increase sight distance problems for crossing pedestrians and cause passengers to access buses further from crosswalk
Near-side	• Allows passengers to access buses closest to crosswalk • Results in the width of the intersection being available for the driver • to pull away from curb • Allows passengers to board and alight while the bus is stopped at a red light • Provides drivers with the opportunity to look for oncoming and crossing traffic, including other buses with potential passengers (to improve transfers) • Less potential conflict with traffic turning onto the bus route street from a side street	• Increases conflicts with right-turning vehicles • Buses moving around stopped vehicles may conflict with moving traffic in adjacent lane • May block the through lane during peak period with queuing buses • May cause sight distance to be obscured for crossing vehicles stopped to the right of the bus and increases sight distance problems for crossing pedestrians • Reduces capacity of the intersection a when bus is stopped during available green time • If located at a signalized intersection, and buses need to exit the traffic stream, a traffic queue at a signal may make it difficult for buses to exit and merge back into traffic
Mid-block	• Can minimize sight distance problems for vehicles and pedestrians • May be closer to passenger origins or destinations on long blocks • May result in less interference with traffic flow • May result in passenger waiting areas experiencing less pedestrian congestion • Less conflicts between waiting and walking pedestrians	• Requires the most curb clearance of the three options, unless a mid-block curb extension is provided • Without a crosswalk can encourage passengers to cross the street mid-block (jaywalking) • Increases walking distance for passengers crossing at intersections

Bus Stop Configuration

While the stop location generally determines how buses approach stops and engage with traffic operations, the physical configuration of stops impact how riders interact with the transit system, and how it integrates with the streetscape and surrounding environment.

These stop configurations are discussed in detail below, and the advantages and disadvantages of each stop type are summarized in Table 2.3.

Curbside
Curbside bus stops are currently the most common form of bus stop configuration in Rhode Island. They are located adjacent to the roadway's existing curb line and entail the bus stopping in the parking lane, travel lane, or shoulder.

Parking Lane
In areas with on-street parking, a curbside bus stop will generally fall within the parking lane and will necessitate the removal of parking spaces (Figure 2.3). A typical 40-foot bus is equivalent to two on-street parking spaces; however, additional curb space is needed for the entry and exit zones for deceleration and acceleration between parked vehicles. The parking impacts of bus stops in the parking lane can be reduced if there is a hydrant situated within the stop, or a driveway is located in the deceleration or acceleration zones.

Travel Lane or Shoulder
Buses stopping in a travel lane, including a bike lane, or shoulder, eliminate the need for the bus to merge in and out of traffic, which improves service reliability and travel time (Figure 2.3). However, it may cause the bus to temporarily block other vehicles. Stopping in the travel lane is preferred by transit agencies as it provides greater efficiency and safety but may conflict with travel flows.

Bus stops in shoulder are implemented when there is not an appropriate pull-out available on the roadway. While there are cases of bus stops in shoulder in Rhode Island, this stop configuration is not preferred by RIPTA. Bus in shoulder stops provide minimal safety to riders and buses traveling on roadways with increased travel speeds. This stop configuration should be implemented on a case-by-case basis.

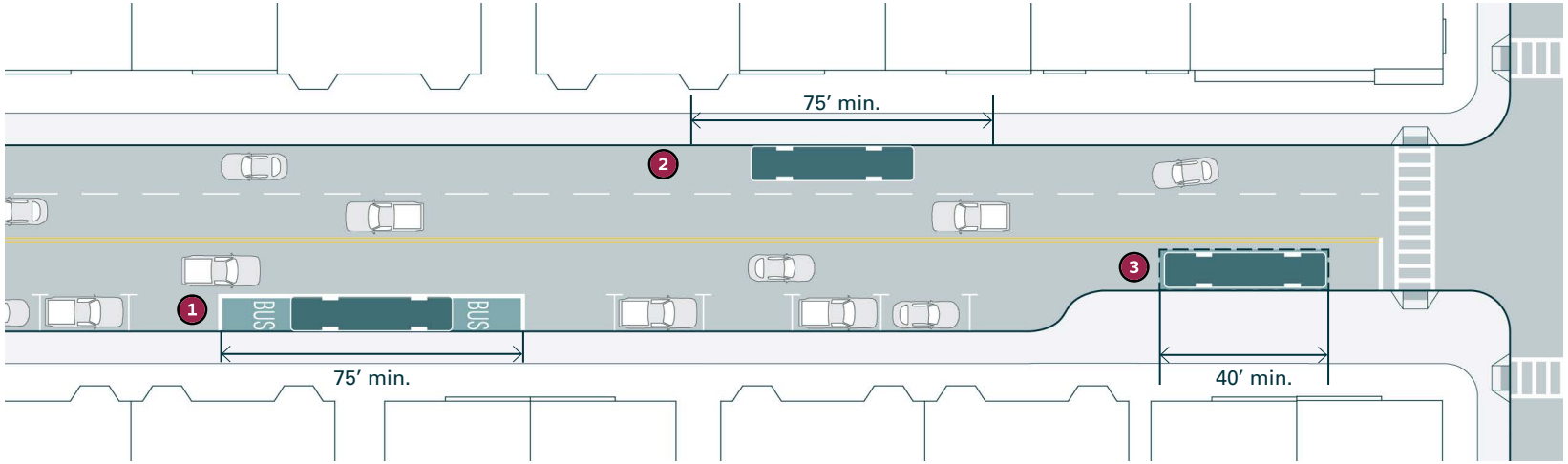


Figure 2.3 Bus Stop Roadway Configuration Types

1. Bus Stop in Parking Lane
2. Bus Stop in Travel Lane
3. Bus Stop Curb Extension

Curbside bus stops require sharing sidewalk space with other activities, but can still be desirable where:

- Curb length is adequate
- No physical obstructions are within the bus stop zone and there are no driveways to hinder boardings and alightings
- Access can be provided for passengers with disabilities
- Adequate space can be provided for waiting passengers as well as other pedestrians
- Space is available for rider amenities

Bus stops in right turn lanes are generally discouraged to prevent conflicts with vehicles that may utilize the adjacent travel lane and cut in front of a bus, a movement that is not always visible to bus operators. It is more appropriate to have a near-side bus stop in a travel lane if right turns are prohibited, such as at an intersection where the cross street to the right is one-way approaching the intersection.

Alternatives to curbside stops that further enhance the pedestrian and bicycling environment, or provide more priority for transit operations, include bus stop curb extensions (also referred to as bus bulbs, or bump outs) and pull outs (also referred to as bus bays, turn outs, or cut outs).

Curb Extension

Curb extensions require extending the curb line and sidewalk area into the parking lane to create additional pedestrian space at the bus stop and enable the bus to stop in the travel lane. Widening the sidewalk improves the passenger experience by providing more waiting space for riders and can allow for the integration of bus stop amenities, particularly shelters. Figure 2.4 shows a curb extension where the shelter does not encroach areas beyond the bus stop zone. Curb extensions can allow for a wider and clearer path of travel for other pedestrians behind the bus stop zone. By stopping in the travel lane, rather than waiting for gaps in traffic to re-enter the lane, buses can continue in-lane directly after stopping, improving travel times. Curb extensions at the near-side and far-side of intersectionsare typically extended to include the adjacent pedestrian curb ramp, which reduces the intersection crossing distance for all pedestrians. New corner radii should be designed to accommodate the existing bus fleet and future service and equipment needs. Right turn restrictions may be required if there is a tighter corner radius. The American

Figure 2.4 Floating Bus Stop

Association of State Highway and Transportation Officials (AASHTO) specifies a 41- to 44-foot radius to accommodate urban transit and intercity buses.

Partial Curb Extension

Stops with curb extensions can also be alternated with pull out stops to allow vehicles to pass buses where traffic build up is a concern. Curb extensions do not necessarily need to extend into the entire parking lane. A partial curb extension can widen the sidewalk, but still allow drivers to pass a stopped bus. This type of curb extension should be installed with caution, especially at near-side stops at unsignalized intersections, as pedestrians crossing in front of the stop may not anticipate vehicles passing a stopped bus. A partial curb extension should only be provided if the adjacent travel lane is wide enough to accommodate a stopped bus and a passing vehicle, without encroaching on the opposing travel lane, or the travel lane is sufficiently narrow that vehicles will not attempt to pass a stopped bus. Partial curb extensions should be defined by front and rear bus stop signs to define the bus stop and no parking zone to prohibit vehicles from parking within the bus stop zone.

The use of curb extensions may need to be coordinated closely with RIDOT and local municipalities. They may be considered based on traffic volumes or delay criteria, the presence of a single wide travel lane or two travel lanes to allow the passing of stopped buses, or on a case-by-case basis. Curb extensions have the potential to cause vehicles to queue behind a stopped bus (unless two travel lanes are present) and may encourage drivers to make unsafe movements when changing lanes to avoid a stopped bus.

Capital costs to construct curb extensions will be higher than for conventional curbside bus stops. There may also be additional costs due to relocation of drainage structures and utilities that should be considered. It may also be necessary to rework drainage patterns to prevent water from ponding near the stop.

Applicability of Curb Extensions:

- Frequent transit service
- High bus stop ridership
- High volume of pedestrian activity
- Crowded sidewalks
- Desire to reduce pedestrian crossings distance
- Low roadway operating speeds
- Traffic calming technique
- Conditions where bus operators find difficulty in re-entering the traffic stream or merging buses cause traffic delays
- Desire for bus stop in travel lane
- Adequate right-of-way and adjacent parking lanes are available
- Can be used to protect bike lanes, creating a floating bus stop

Figure 2.5 Floating Bus Stop

Pull Out

A bus pull out allows buses to stop without impeding traffic flow by pulling into a bus stop zone and out of the main travel lane (shown in Figure 2.6). They are most appropriate along higher speed suburban and rural roadways, or where there are extended dwell times, such as at a layover location or at commercial establishments such as a grocery store or mall when boardings can be slower with passengers carrying groceries or larger items. Passenger safety is improved by providing more distance between the bus stop zone and moving traffic.

Although there are clear benefits of buses pulling out of the travel lane, pull outs can also delay bus service, as buses may have to wait for a gap in traffic in order to re-enter the travel lane. Pull outs also reduce the sidewalk space at a stop, which can have a negative impact on the passenger waiting area and incorporation of amenities at stops. They are typically constructed when there is a wide right-of-way available, or the abutting property owner provides an easement for the construction of the sidewalk and/or pull out.

The most typical pull out is a closed bay, as shown in Figure 2.6, but pull outs can also be configured as open, or partially open as described below.

- **Open pull out** - open to traffic on its end closest to the intersection and can be situated on the far-side or near-side of the intersection.
- **Far-side open pull out** - open on the bus stop approach. The curbside space is shortened, as the bus can use the intersection to pull in, but buses may be delayed in re-entering traffic on high volume streets.
- **Near-side open pull out** - open on the bus stop egress. This configuration can be used to enhance bus operations at high traffic volume intersections when used with queue jump lanes and active transit signal priority.
- **Partial open pull out** - closed on one side with a partial curb extension on the other side at the pedestrian crossing. This configuration reduces the pedestrian crossing distance, but also allows easier access or egress from the pull out, compared to a closed pull out. It can be provided on the near-side or far-side of an intersection.

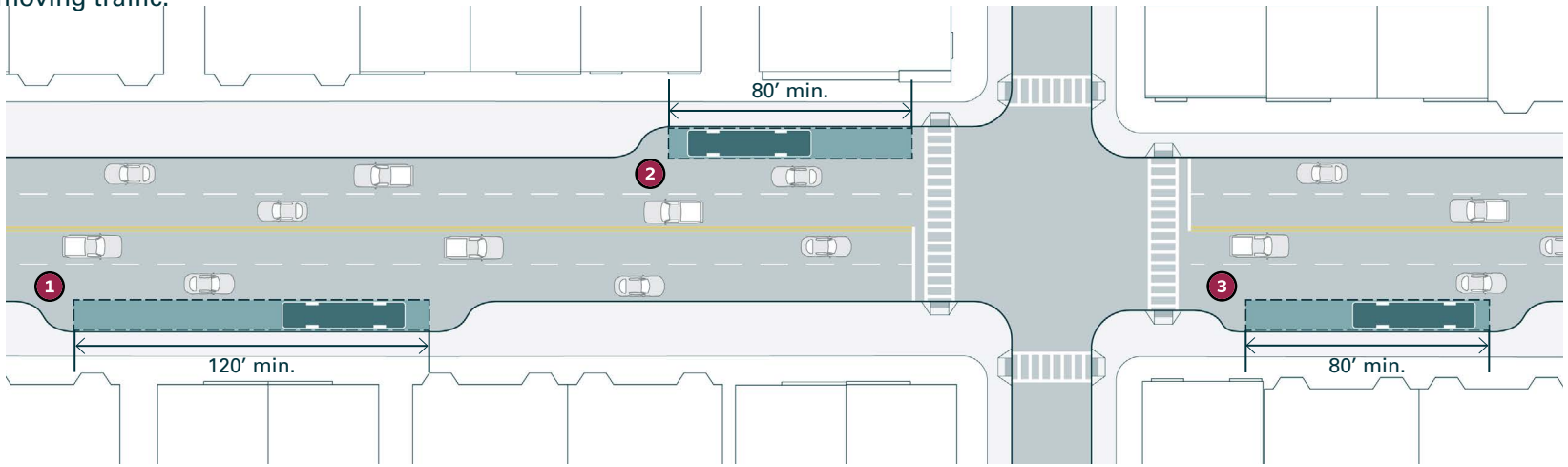


Figure 2.6 Bus Stop Pull Out Types

1. Bus Stop Pull Out
2. Far-side Open Bus Stop Pull Out
3. Far-side Partial Open Bus Stop Pull Out

Table 2.3 Bus Stop Configurations Advantages and Disadvantages

Bus Stop Configuration	Advantages	Disadvantages
Curb Extension (Bus Bulb)	For Transit Operations • Improves safety for passengers while alighting and boarding • Provides easy access for driver to bus stop • Eliminates delay for bus returning to travel stream For Traffic Management • Improves speed for transit as compared to a pull out • Used in combination with parking in the curb lane • Removes fewer parking spaces for the bus stop than curbside stop or bus pull out For Pedestrians • Provides additional sidewalk area for pedestrians and bus riders to wait for bus • Reduces pedestrian distance to cross street	For Transit Operations • Bus is not removed from travel lane while passengers alight and board • Requires a larger capital investment than curbside bus stop; more difficult to relocate For Traffic Management • Impacts other vehicles that may queue behind bus • Other drivers may make unsafe lane changes to avoid stopping behind a bus
Pull Out (Bus Bay)	For Transit Operations • Provides a protected area away from moving traffic for buses stopped for a long dwell time or layover • Allows buses to drop off and pick up passengers outside travel lanes For Traffic Management • Bus stops out of moving traffic lane • Minimizes traffic delays due to bus operations For Pedestrians • Improves safety for passenger boarding and alighting by increasing the distance between passengers and moving traffic	For Transit Operations • May present problems to bus drivers trying to re-enter traffic, especially in high-speed or high-volume traffic • Requires infrastructure modifications; more difficult to relocate For Traffic Management • Creates bus/vehicle conflicts when buses re-enter a busy travel lane • May reduce parking space curbside For Pedestrians • May reduce sidewalk space and increase pedestrian congestion

Use Bus Stop Pull Outs where:

- There is available sidewalk or other space, without adversely affecting pedestrian movement on the sidewalk
- Travel speeds are high (greater than 40 miles per hour) and passenger safety is a concern
- Vehicle/bus conflicts warrant separation of transit and passenger vehicles
- Layover space for the end of the trip, or time point with extended dwell time (10 to 30 seconds per bus) is needed
- The curb lane is used by moving traffic and traffic volumes in the curb lane are between 250 and 500 vehicles during the peak hour
- Sight distance to the stop prevents traffic from safely stopping behind a stopped bus

Bus Stop Length

There must be enough curbside space to enable bus operators to pull the bus parallel to the curb, open both doors onto the sidewalk, and pull out of the stop into the travel lane. Sufficient bus stop length will prevent buses from straddling crosswalks, blocking access for pedestrians, and will provide sufficient clearances from crosswalks. The bus stop length required at each stop varies depending on the following criteria:

- Location of the stop relative to the intersection
- Stop configuration
- Approach of bus turn movements
- Angle of the taper at curb extensions and pull outs
- Roadway speed, and thereby deceleration and acceleration space
- Presence of crosswalks, parking and driveways
- Location of landscaping and street furniture along the sidewalk edge
- Number of buses serving and/or laying over at the stop

Table 2.4 provides the stop lengths required for a 40-foot bus for different stop placements and configurations, as well as their equivalent length in parking spaces. The length of the bus stop must also include a 10-foot crosswalk buffer. This clearance can be included in the acceleration and deceleration zones.

Bus stop lengths may need to be adjusted based on site specific conditions, and if more than one bus is expected to service a stop at one time, the bus stop length should be increased by 50 feet for each additional 40-foot bus, allowing for 5-10 feet between each queuing vehicle.

Table 2.4 Bus Stop Lengths

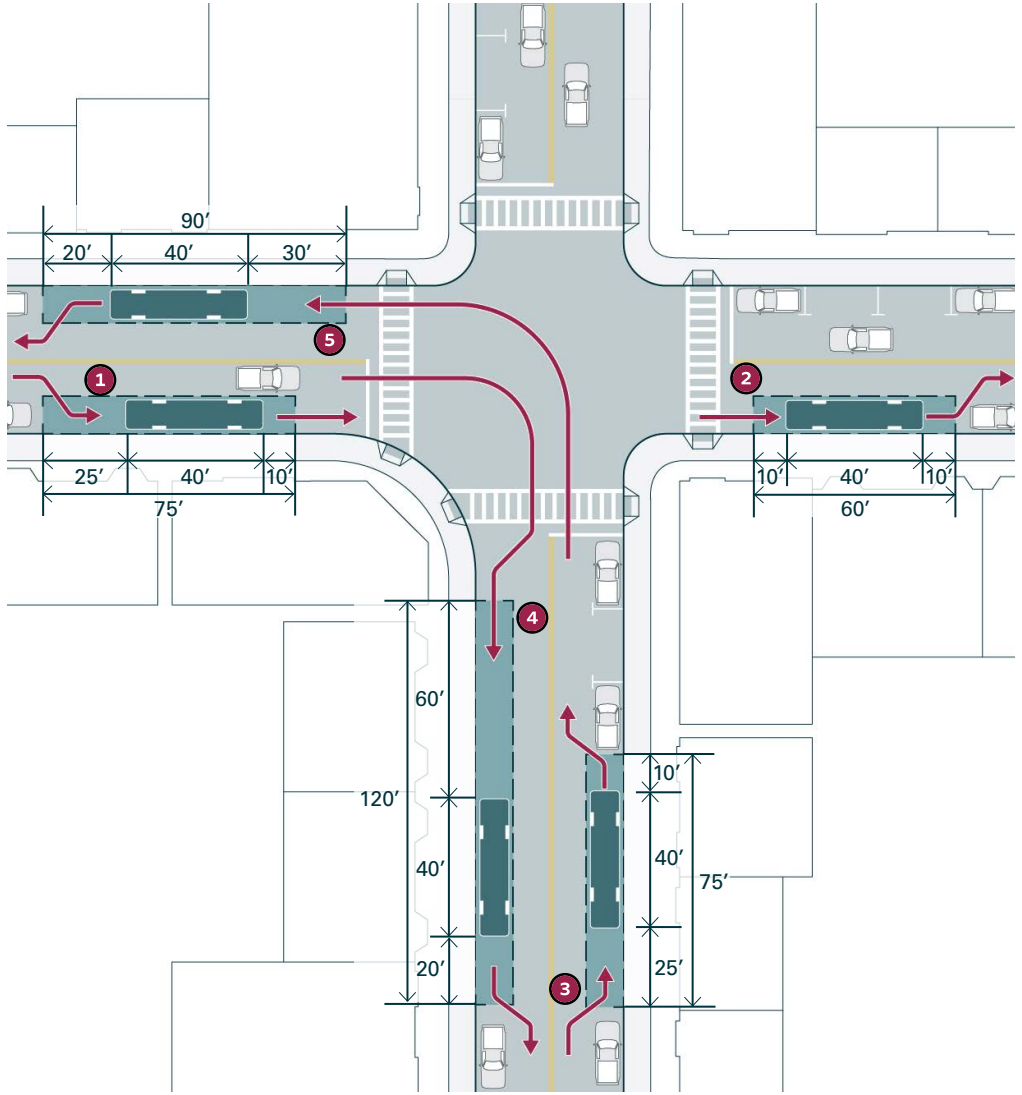
Stop Placement	Deceleration Zone (Feet)	Stopping Zone (Feet)	Acceleration Zone (Feet)	Preferred Bus Stop Length (Feet)	Number of Parking Spaces
Far-side	10	40	10	60	3
Far-side, after left turn	30	40	20	90	5
Far-side, after right turn	60	40	20	120	6
Near-side	25	40	10	75	4
Mid-block	25	40	10	75	4
Curb extension	-	40	-	40	2
Pull Out (Closed Bay)	60	40	20	120	6+

Curbside Bus Stops

The stop length of a curbside stop in a parking lane is made up of three components: the deceleration zone, the stopping zone, and the acceleration zone. The typical dimensions for curbside stops in a parking lane are shown in Figure 2.7.

Curb extensions for pedestrian crossings before and after bus stops also impact the stop length as they create barriers at the intersection that would otherwise be utilized for bus turn movements (i.e., exit movements from a near-side stop, and entry movements into a far-side stop). Curb extensions at one end of a stop with parking at the other end create the same conditions as a mid-block stop, with parking at both ends.

For bus stops in a travel lane or shoulder, the bus stop length is generally irrelevant, as the full length of the travel lane or shoulder is available for the bus stop zone. Where on-street parking terminates just before the intersection in order to facilitate an additional travel or turn lane, the length of that lane should meet or exceed the equivalent curb space needed for a near-side bus stop. The travel or turn lane may need to be extended, or a no parking area provided, to facilitate access to the stop.



1. Near-side Bus Stop
2. Far-side Bus Stop
3. Mid-block Bus Stop
4. Far-side Bus Stop after Right Turn
5. Far-side Bus Stop after Left Turn

Figure 2.7 Curbside Bus Stop Lengths

Curb Extensions

Curb extensions at bus stops help to minimize parking impacts, use less curb space and no acceleration and deceleration zones are needed, when compared to a typical curbside bus stop, as shown in Figure 2.8. Curb extensions are generally 40 feet long, excluding the taper. At near-side and mid-block curb extensions, 60 feet will enable parking movements to occur while a bus is stopped. It could be as short as 30 feet, which enables both doors to open onto the sidewalk; however, this results in the rear part of the bus overhanging and could obstruct parking access.

AASHTO recommends a 6-foot minimum curb extension in an 8-foot parking lane, leaving a 2-foot offset between the edge of curb edge and the travel lane. NACTO also recommends a 6-foot minimum, but states that the width should reflect the need for maneuvering and accommodation of stop amenities, and 8-10 feet is preferred. Narrower or partial curb extensions could be explored and will vary in length and parking impacts, depending on the depth of the curb extension.

A far-side curb extension could be extended to provide room for vehicles to queue behind a stopped bus (shown in Figure 2.8). A curb extension would also need to be longer if it becomes a floating bus stop with a crossing ahead of the stop, as well as behind it. Curb extensions should be designed to ensure that buses stop at least 10 feet clear of crosswalks.

Pull Outs

Dimensions for a bus pull out are provided in Figure 2.6. The width of the pull out should be 12 feet, though a 10-foot width is acceptable with traffic speeds less than 30 miles per hour. The length of the pull out is determined by the tapers, entry and exit speed of the bus, frequency of gaps in traffic flow, as well as traffic speed and volumes. While some guidance is provided by AASHTO, pull outs in Rhode Island typically occur in higher speed environments and should generally be 120 feet long with a taper of 5:1 on the approach and 3:1 on the egress, assuming a vehicle speed of 10 miles per hour or less.

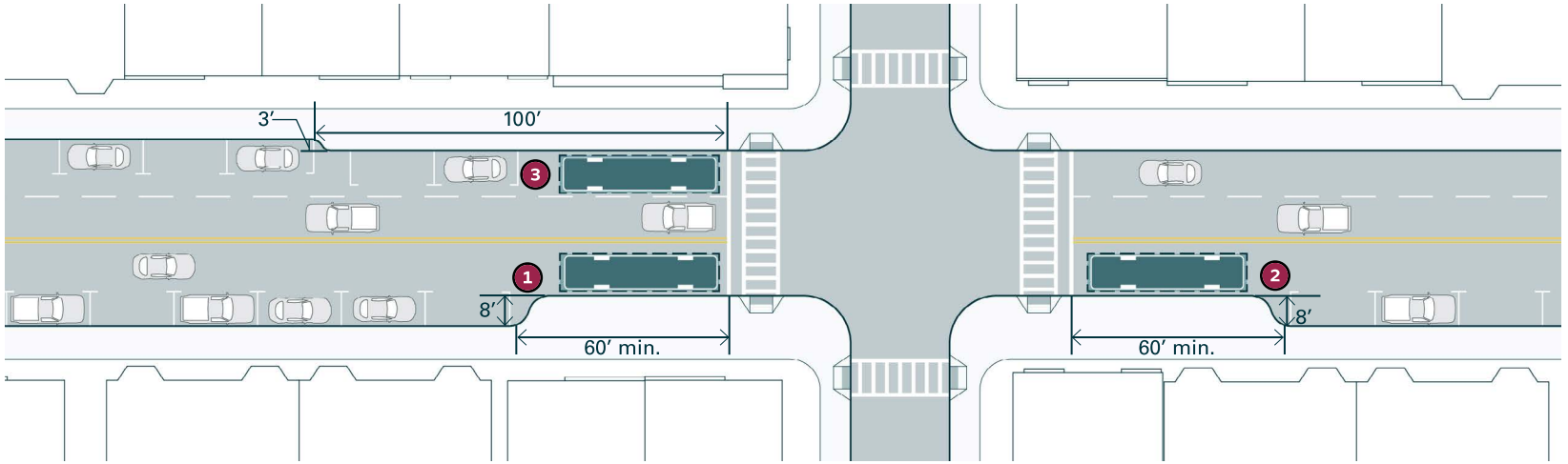


Figure 2.8 Bus Stop Curb Extension Types

1. Bus Stop Curb Extension Near-side
2. Bus Stop Curb Extension Far-side
3. Bus Stop 3′ Partial Curb Extension

3 Pedestrian Connectivity and ADA Accessibility

Accessible bus stops improve mobility for all RIPTA riders, including those with disabilities and additional mobility needs. Bus stops that are accessible remove potential barriers for riders when boarding, alighting, waiting, or accessing the surrounding sidewalk network. This chapter provides guidance that improves accessibility at both existing and future RIPTA bus stops, and outlines federal and state accessibility requirements.

Bus Stop Accessibility

Transit riders are pedestrians before and after they ride the bus. Pedestrian connectivity at, within, and beyond a bus stop is an essential component of providing bus service. Standard elements of bus stop accessibility include:

- Level landing area at the front door of the bus,
- Clear zone at the rear door of the bus
- Clear path of travel to the sidewalk

Ideally, the sidewalk at a bus stop connects to the surrounding sidewalk network, providing convenient access for passengers to and from their starting points and destinations. It is important to place priority on creating sidewalks adjacent to bus stops to ensure fundamental safety and comfort for passengers.

Bus stops must comply with the Americans with Disabilities Act (ADA) accessibility requirements which require a bus stop front door boarding area, (also referred to as a landing area) and an accessible route between the landing area, sidewalk and bus stop amenities. In addition to these elements, RIPTA bus stops are required to have a clear zone at the rear door, and pedestrian facilities connecting bus stops with the sidewalk network.

Landing areas and clear zones must be constructed to accommodate RIPTA's current bus fleet in operation. The RIPTA bus fleet is comprised of 35-foot and 40-foot buses, with both front and rear doors. The minimum amount of curb space needed to accommodate both doors opening onto the sidewalk from any RIPTA bus is 23 feet. The distance from the center line of the front door to the center line of a combination of all rear door locations on RIPTA's existing fleet is 18.5 feet (shown in Figure 3.1). RIPTA vehicle specifications are provided in Appendix A.

Bus stop audits should be conducted before bus stop improvement projects, amenity installments, or when a bus stop is expected to be impacted by adjacent roadway/ streetscape projects to identify major deficiencies and barriers to accessing bus stops. This audit process identifies the type of bus stop improvements needed at each stop, prioritizing or targeting areas with major and minor deficiencies, and helps communities be ready to engage in the design process as roadway projects are initiated. A bus stop checklist to conduct this audit is provided in Appendix B. Periodic bus stop audits will highlight where existing pedestrian facilities at bus stops, including sidewalks, crossings, curb ramps and lighting are, or should be improved over time to meet ADA requirements and standards, and enable the addition of bus stop amenities. Questions regarding ADA compliance at bus stops should be directed to the RI Governor's Commission on Disabilities.

For projects that cannot meet ADA requirements at bus stops, municipalities and state agencies are advised to coordinate with RIPTA regarding bus stop adjustments or to determine a new bus stop location in order to attain ADA compliance. If projects cannot meet ADA requirements within RIDOTs right-of-way, municipalities and state agencies should conduct a bus stop evaluation using RIDOT's Technical Feasibility policy.

For projects that cannot meet RIPTA's requirements at bus stops, RIPTA must be notified of the problem, challenges, and solutions considered but not feasible. RIPTA will confirm the appropriate action that must be taken, which may or may not include relocation or removal of the stop, or a change in the bus route alignment.

1. ADA Landing Area
2. Accessible Route
3. Rear Door Clear Zone
4. Bus Shelter

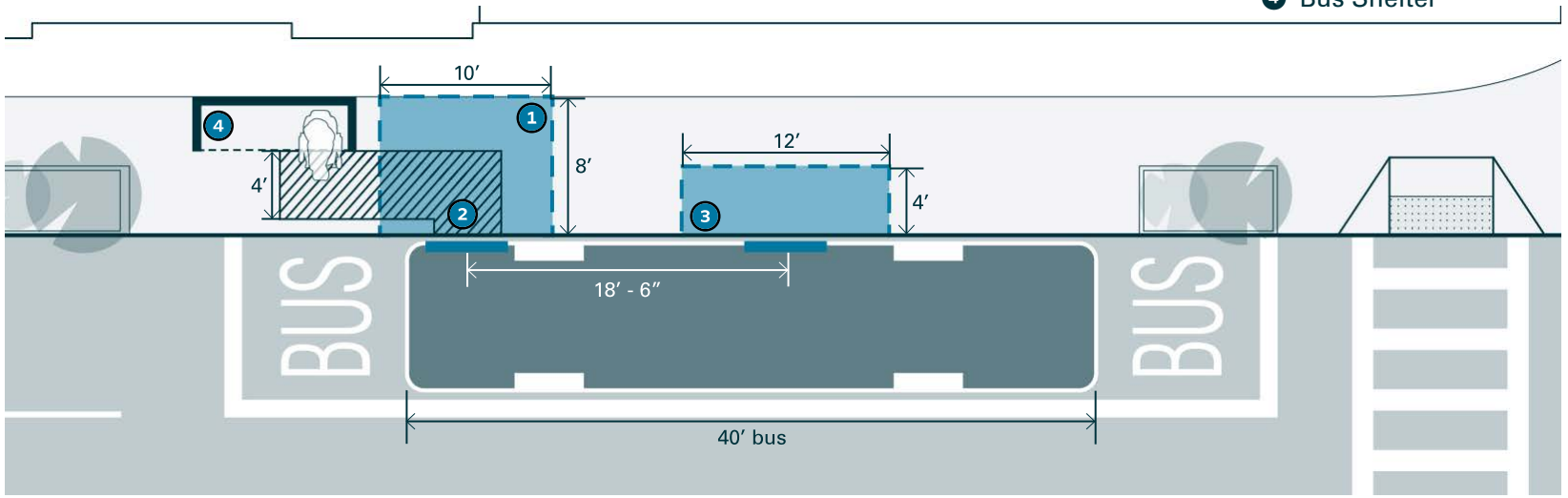


Figure 3.1 Bus Stop Accessible Landing Area

Landing Area

Landing areas are the space where riders board and alight the bus at the front door of the bus. At all RIPTA bus stops, landing areas must be 10 feet wide along the curb and 8 feet deep perpendicular to the curb. At a minimum, landing areas are required to be 5 feet wide, and 8 feet deep according to ADA standards. Landing areas must be a firm, stable surface, with a cross slope that does not exceed 2%. Parallel to the roadway, the landing area should match the roadway running slope to the maximum extent practicable.

The landing area should be concrete. Brick sidewalks or brick patterns integrated with concrete sidewalks are not desired due to leveling and maintenance concerns. If bricks are used, they should be wire-cut for a smoother finish. The landing area cannot encompass uneven or rough surfaces, such as a grass strip or tree pit, or contain dirt or gravel, or be located in a driveway.

Curbs

Low curbs, or areas without curbs, pose accessibility challenges for persons with mobility impairments, and passengers with strollers. At the landing area, the vertical step between the sidewalk and the bus (or bus ramp) must not exceed ¼ inch, with a maximum horizontal gap of ½ inch. To minimize the vertical gap and for near-level boarding, the ramp must not rise more than 3 inches or exceed 1:12 slope[1].

An 8-inch curb reveal is preferred for all RIPTA bus stops, the minimum curb reveal is 6 inches to maximize the efficiency and accessibility of its passenger service. With RIPTA vehicles' floor to ground height of 12 inches (8 inches when the bus is kneeled) a near-level boarding can be achieved with an 8-inch-high curb reveal.

If a sidewalk is being reconstructed to accommodate an ADA-compliant landing area, consideration should be given to features at the back of the sidewalk. Building entrances, walkways, stairways and other entry points should not be altered or negatively affect permanent access to abutting properties. If the access point needs to be altered at the transition area, the impacted property owner should be notified, and appropriate approvals sought when working outside of the public right of way. If the curb cannot be raised, and there is an access point at back of sidewalk, consideration should be given to moving the landing area, and potentially the stop.

Sidewalks

On narrow sidewalks (less than 8 feet wide), a 5-foot by 5-foot area on both sides of the back of the landing area should remain clear of obstructions.

The location of the landing area is primarily dependent on the siting of the stop relative to the intersection, and secondarily, on the availability of sidewalk space to accommodate an ADA-complaint landing area. Assuming the bus stop sign is placed at the front most point of the bus stop zone, the center line of the landing area would be located 14 to 24 feet back from the sign, as shown in Table 3.1.

If obstructions on the sidewalk or challenges in construction prevent the landing area from being in the ideal location, adjustments should be made. At far-side stops, the landing area should be shifted forward, while at near-side stops, it should be moved further back from the intersection. Both adjustments will result in longer than typical stop lengths. The extra stop length can be calculated by measuring the increased distance away from the ideal landing area location. For mid-block stops the landing area can be shifted in either direction, potentially impacting the stop length. If sidewalk obstructions further prevent the landing area from being located at the front of the bus stop zone or the landing area is not ADA compliant, an alternative stop location should be identified.

Table 3.1 Landing Area Centerline Distances

Bus Stop Placement	Distance from the centerline of the landing area to the bus stop sign
Far-side	24 feet
Near-side	14 feet
Mid-block	24 feet

1 Public Right-of-Way Accessibility Guidelines. Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way. Architectural and Transportation Barriers Compliance Board, August 2023

Clear Zone

For rear door passenger activity, bus stops should also have clear zones (Figure 3.1). The clear zone is the space located where the back doors of the bus open onto the sidewalk. The clear zone should be free of driveways, curb ramps and obstructions such as utility poles, hydrants, and other street furniture. Similar to the landing area, clear zones should be a level, paved, and unobstructed surface. The clear zone should be 12 feet wide by 4 feet deep. If there is sufficient right-of-way available and no obstructions between the clear zone and landing area, this should be paved as one continuous area.

Path of Travel

The critical path of travel at a bus stop is the connection between the landing area and the sidewalk and bus stop amenities, in particular bus shelters. RIPTA bus stops must have an accessible route between these elements in order to be ADA compliant and consistent with the Public Right-of-Way Accessibility Guidelines (PROWAG). RIPTA encourages and requires connectivity to the following facilities at bus stops:

Bus Stop Amenities

Bus shelters must be connected to the landing area by an accessible route, a clear, unobstructed, 5-foot path of travel must be provided, which conforms with RIDOT standards and PROWAG requirements. Although not desirable, the width may be reduced at pinch points, for example at a utility pole, to 3 feet, as long as the other clearances are met. To the extent feasible this accessible path of travel should be provided to other bus stop amenities as well.

Sidewalk and Sidewalk Network

Bus stop boarding and alighting areas must be connected to streets, sidewalks, or pedestrian paths by an accessible route. Sidewalks that provide adequate access must be connected to the bus stop and connected to a sidewalk network. Bus stops should not be isolated or located on an island, on unpaved areas, or where there is a solid platform or pad, but no connecting sidewalk. Pedestrians are likely to feel stranded and potentially unsafe if a bus stop is located in the middle of moving vehicles, or between two driveways, especially those that are heavily utilized. The appropriate dimensions to provide an adequate amount of pedestrian waiting space is determined by conducting a pedestrian level of service (LOS) analysis for queuing areas, which is specified in the AASHTO Guide for Geometric Design of Transit Facilities on Highways and Streets.

Sidewalk treatments can be used at bus stops to provide contrast with adjacent surfaces and additional emphasis on the stop, making stops more visible, safer and accessible for riders, especially seniors and persons with disabilities. Treatments may include colored concrete, textured sidewalks, pavers, truncated domes/detectable warning strips, or simply altering the pattern of the sidewalk panels as long as they are consistent colors to delineate modal zones and edges. The National Association of City Transportation officials (NACTO) recommends detectable warning strips be at least 24 inches deep along the entire curb edge of the bus stop. Detectable warning strips and other tactile warnings are recommended to be placed at the edge of the curb to indicate the boarding area at stops where pedestrians are waiting closer to the roadway or along travel corridors where conflicts may occur with other roadway users (e.g., cyclists, pedestrians).

Figure 3.2 RIPTA bus stop with tactile warning strip

Through the Stop

A 5-foot path of travel must be accessible through the stop. This space allows riders and pedestrians to pass each other comfortably and minimizes conflict at bus stops. An accessible path of travel through the stop at a minimum can be 32 inches at narrow pinch points. The path of travel through the stop should be maximized to the extent feasible, while meeting other bus stop design requirements and guidelines. These clearances are particularly important at bus stops where there are many pedestrian movements in a variety of directions. Sidewalks at bus stops must also be free of vegetation and overgrowth that can narrow the path of travel along the sidewalk.

Intersection or Crossing

Connectivity to bus stops is a crucial aspect of bus stop design. If passengers cannot physically get to a bus stop, they may choose not to use the service. Bus stops must be connected to visible crosswalks with curb ramps, and ideally to be signalized on higher speed or volume roadways.

Enhanced crossing treatments such as curb extensions, pedestrian refuge islands, raised crosswalks, and hybrid or flashing beacons may be warranted at specific locations. These treatments reduce the crossing distance and/or increase visibility and therefore pedestrian safety for riders. Missing curb ramps create an access barrier for seniors, passengers with disabilities, and riders with strollers, shopping carts or luggage. For details on curb ramp construction, refer to the Rhode Island Standard Details.

Intersection conditions that may warrant enhanced crossing treatments include:

- High pedestrian volumes
- Limited sight distance
- High vehicle speeds
- High vehicle volumes

Serving Destinations with Large Setbacks

When connecting transit services to locations with significant setbacks, such as large shopping plazas or medical centers, there are two primary approaches:

Bus stops placed on main roads: Ideally, bus stops should be linked to building entrances through a marked pedestrian path or landscaped areas. This ensures a clear path for passengers to reach their destination without delaying the bus. Property owners and developers should reference the *Bus Stop Accessibility* section, ensuring compliance with ADA standards.

Bus stops at facility entrances: If a bus can provide direct access to a major transit generator or important location, a route deviation may be necessary. However, deviation of bus routes to directly service a property is implemented solely at RIPTA's discretion. Direct access reduces walking time for riders, resolves first mile/last mile issues, and enhances the waiting experience for riders.

Property owners and developers should coordinate with RIPTA to enhance on-site amenities and stop infrastructure to improve rider experience and safety. Bus stops located on both private and public property must comply with ADA standards and PROWAG, including clear pathways and designated landing areas. RIPTA's Service Guidelines should be consulted to ensure safe maneuvering of buses and minimize conflicts with parked vehicles, traffic, and pedestrians.

Figure 3.3 SRTA sheltered bus stop at Market Basket (Fall River, MA)

4 Streetscape

Streetscape elements improve the bus stop environment and immediate surroundings. Elements including, signage, lighting, and landscaping have the the ability to increase service visibility, define the bus stop zone, reflect neighborhood characteristics, and improve the rider experience. The streetscape elements described in this chapter are intended to promote consistency regarding design and access across all RIPTA bus stops.

Bus Stop Signs

Bus stop signs are located at all RIPTA bus stops and indicate where the bus stops along the route and where riders should wait for the bus. Standard RIPTA bus stop sign elements include the agency name and logo, and a bus symbol (Figure 4.1). The sign is a standard parking regulatory sign size at 12 inches wide by 18 inches tall. In addition to the standard elements, future RIPTA bus stop signs may include route information, RIPTA contact information, service frequencies, and parking enforcement (Figure 4.2). All bus stops must be anchored with a RIPTA bus stop sign at the front of the stop that is visible to both riders and bus operators.

Bus stop signs are retroreflective to increase visibility for bus operators and other drivers in the dark and may be considered for framing to coordinate with other street furniture and provide more context sensitivity in historic or beautified neighborhoods and downtown areas. RIPTA's Operations Planning department is responsible for intaking requests for new bus stop signs, replacing damaged signs, and distributing new bus stop signs.

RIPTA bus stop signs:

- Identify the stop
- Indicate where to safely wait for the bus
- Function as marketing for RIPTA service
- Delineate parking limits
- Reinforce the bus stop zone for an accessible stop

Parking Enforcement

Due to the absence of parking regulations on current and future RIPTA bus stop signs, supplemental standard "No Parking Bus Stop" signs should be provided at both the front and the rear of the bus stop zone, to clearly delineate the bus stop zone.

Three sign codes are provided in the Manual on Uniform Traffic Control Devices (MUTCD) for "No Parking Bus Stop": R7-7, R7-107, and R7-107a. R7-107[1], as shown in Figure 4.3, must be used at RIPTA bus stops. The arrow on the "No Parking Bus Stop" sign should point in the direction of the no parking area, which will be right-pointing at the front of the stop and left-pointing at the rear of the stop. The sign codes for left-pointing and right-pointing arrows are R7-107L, and R7-107R respectively. The sign code for two-direction arrows (used at the center of long stops) is R7-107D.

Regulatory parking signs are not required when a bus stop is located in a travel lane or shoulder. If a bus stop is located in a bike lane, a "No Parking Bike Lane" sign should be considered.

Figure 4.1 RIPTA bus stop sign

Figure 4.2/Figure 4.3 RIPTA bus stop sign with supplementary parking enforcement signage

2 USDOT Federal Highway Administration. Manual on Uniform Traffic Control Devics (MUTCD). Regulatory Signs, Barricades, and Gates, 2009.

Siting Bus Stop Signs

Multiple factors need to be considered when siting bus stop signs to ensure that signs do not obstruct the path of travel or driveways, and do not pose safety risk to pedestrians or buses serving the stop. These siting factors include Americans with Disabilities Act (ADA) requirements, passenger safety, visibility, right-of-way, and other street furniture.

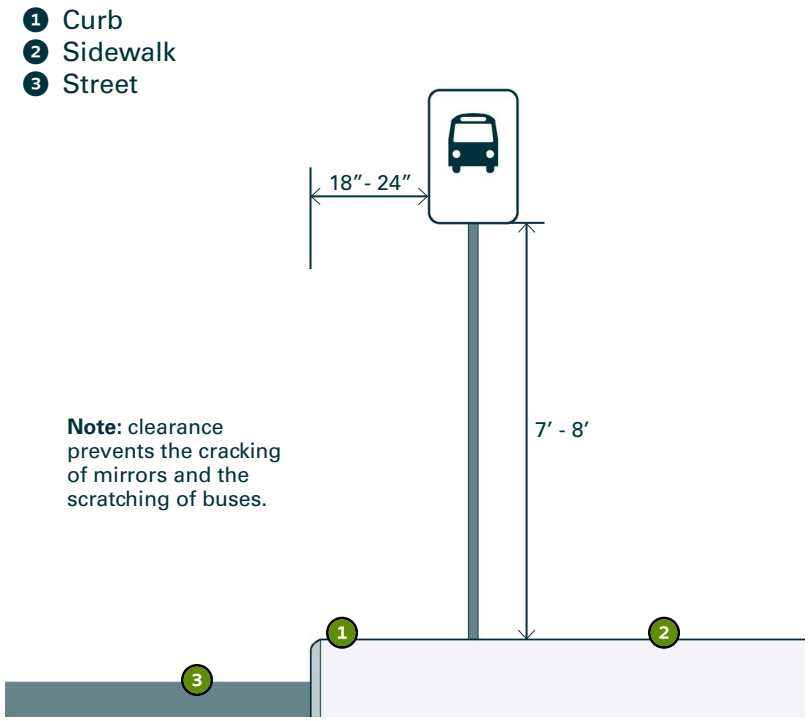


Figure 4.4 Bus Stop Sign and Post Placement

Support Structure
Bus stop signs should ideally be mounted on their own post. Historically bus stop signs have also been mounted on light poles, utility poles, signal poles, etc. However, if there are existing signs on these poles, the vertical clearance required may not be met, and so an additional sign post may ultimately be required. Signs should not be installed on bus shelters, where they are less visible from the roadway, and encroach on the pedestrian path of travel.

In accordance with RIDOT standard detail 24.6.0, U-channel posts must be used to support bus stop signs[3], unless an alternate style is required by the local municipality. Posts should be installed at least 4 feet deep for sufficient support and should enable the signs to be mounted at the correct orientation, per RIPTA requirements described below.

Location
The installation location of the bus stop sign and supplemental no parking sign, and the distance between the two signs, should correspond to the appropriate bus stop lengths and be adjusted as necessary, based on specific site conditions (see Chapter 2 Bus Stop Placement).

Sign posts should be installed 18 to 24 inches off the back of the curb, to avoid being hit by a bus or other vehicle, as shown in Figure 4.4. A minimum 5-foot clear path of travel should be provided on the other side of the post, although this could be reduced to 3 feet, if necessary, so long as ADA clearance requirements are met.

Sign post installations at driveways should be positioned a minimum of 18 inches off the back of the curb and 3 feet from the edge of the driveway to avoid being hit by vehicles turning to enter or exit the driveway. If there are large commercial vehicles active in the driveway, additional clearance may be required.

On very narrow sidewalks (less than 5’ path of travel), which do not meet ADA requirements for RIPTA bus stops and clearance for signage, installers should consider relocating the bus stop to a more suitable location.

Orientation
The bus stop sign should be positioned perpendicular to the curb with the line of traffic flow, in order to be visible to approaching buses and other traffic, as well as to pedestrians on the sidewalk. If additional passenger information is added to bus stop signs in the future, consideration should be given to orienting RIPTA bus stop signs perpendicular to the curb to ensure riders can safely read the signs away from the curb edge.

“No Parking” signs should also be set at an angle of at least 30 to 45 degrees with the line of traffic flow in order to be visible to approaching drivers.

Vertical Clearance
Bus stop signs should not be placed so low to the ground that pedestrians may hit their head, nor too high that the sign becomes illegible. According to MUTCD, signs should have a minimum 7 feet vertical clearance above the ground, as shown in Figure 4.4. To maintain visibility, the bottom of the sign

3 Rhode Island Department of Transportation. Standard Details, 2022.

should not be installed higher than 8 feet above the ground. Additionally, overhanging branches and other vegetation should be trimmed back to allow for sign visibility.
If additional passenger amenities such as information panels are provided, signs should be installed so that the top of the panel is no higher than 56 inches from the ground.

Guidelines to site bus stop signs include:

- Place RIPTA bus stop sign at the front of the bus stop to identify the front limits of the bus stop zone
- Add supplementary "No Parking Bus Stop" signs to define limits of bus stop zone
- Mount signs on a U-channel, breakaway post
- Signs must be independent of other signs, when possible
- Sign height is 7 feet minimum and 8 feet maximum above the ground
- Sign orientation is 30 to 45 degrees with the line of traffic flow
- Install sign post 18 to 24 inches from the back of the curb
- Install sign post out of the 5-foot ADA path of travel

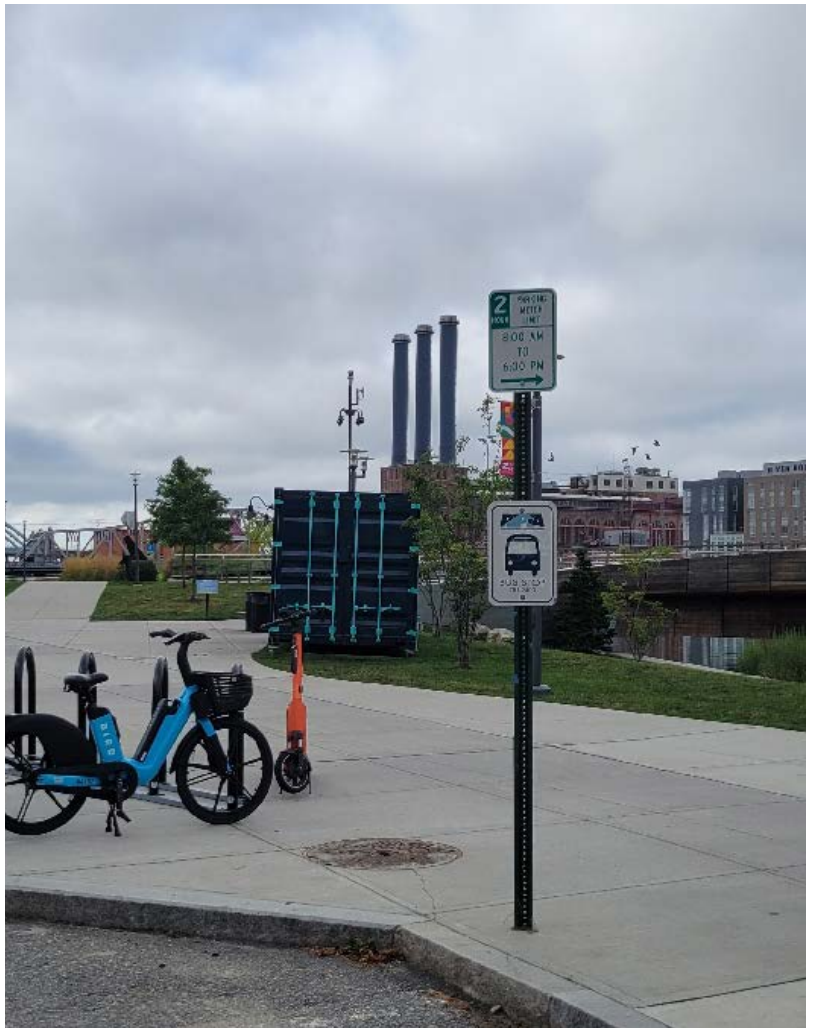


Figure 4.5/Figure 4.6 RIPTA bus stop sign placement

Lighting
Riders feel more comfortable and safe at bus stops when they are well lit, specifically in areas where street lights are not prevalent. Lighting also helps bus operators and other drivers see riders waiting at bus stops.

Bus stops can be adequately lit by overhead street lighting, lights that are built into shelter structures, or they may require additional lighting. NACTO recommends gradually increasing the illumination of street lighting closer to bus stops. Lighting installed at bus stops should be pedestrian scale with lamps not exceeding 25 feet in height and be proximate to the passenger waiting area.

The potential impacts of increased lighting on abutters of bus stops should be acknowledged when considering lighting installation. These impacts can be minimized by installing dark sky friendly light fixtures that minimize glare or by installing light sensors, limiting the activation of lighting when there is passenger activity at a stop.

Stools
RIPTA provided Urban Solar lighting poles can have Simme seating installed at the base of the pole with a 15-inch wide stool that can seat one person at a time. The orientation and position of the seat relative to passenger safety and proximity to on-street traffic should be considered before placement.

When the stool, or the post to which it is attached, is located at a curb extension or adjacent to parking, the stool may be installed at the face of sidewalk. However, RIPTA recommends that the stool be installed and oriented away from the roadway, on the sidewalk side of the support post, so the distance to the curb edge is maximized but the bus stop sign is still visible. This recommended placement provides good visibility of an oncoming bus, and be visible itself, especially on roadways where speeds may be higher.

Landscaping
Landscaping helps enhance the level of passenger comfort at a stop and improve the attractiveness of transit service. Trees at bus stops can help provide shade and protection from adverse weather. As shown in Figure 4.6, bus stops can be enhanced while also retaining existing mature trees.

The use of landscaping elements such as grass, trees, and shrubs must have consideration for passenger safety and accessibility, as well as maintenance. Unless otherwise stated or agreed upon, RIDOT and/or property abutters are responsible for maintaining grass strips, overhanging tree branches, and overgrown vegetation, particularly in areas on roadways with narrow sidewalks.

Figure 4.6 Landscaping at a Conceptual RIPTA Bus Stop on Route 114

Measures to ensure landscaping does not impact the visibility or accessibility of stops include:

- Trimming tree branches and shrubs so that they do not pose an obstacle to bus boarding and alighting or impede visibility. Tree branches should not extend lower than 80 inches above the path of travel
- Maintaining shrubs and vegetation along all sidewalks used to access bus stops to allow full utilization of the paved sidewalk width and to enhance pedestrian safety
- Maintaining a grass-free 10-foot by 8-foot landing area
- Planting trees outside of the landing and clear zone areas
- Using curb extensions to maintain horizontal tree lines and meet ADA requirements for sidewalk conditions
- Replacing older tree grates located in the path of the travel that are not ADA compliant

5 Roadway Design

The operating environment in Rhode Island varies in different municipalities and in most cases RIPTA buses will interact with general purpose traffic, bicyclists, and pedestrians on the roadway. This chapter describes a variety of roadway designs that can be applied at bus stops or on the roadway including, roadway striping and bus priority measures. Intentional roadway design can enhance RIPTA's service visibility and limit conflicts with other roadway users.

Bus Stop Striping

Bus stop striping and bus boxes enhance the visibility of bus stops for bus operators, drivers and riders. Striping reinforces the bus stop zone in on-street parking areas. Vehicles obstructing bus stops slow down service and present accessibility issues for bus operators pulling into the stop and impact the operator's ability to deploy the wheelchair ramp.

RIPTA's bus stop striping should include the word "BUS" at the top and bottom of the bus stop zone. If the bus stop is longer than the preferred length an additional word "BUS" may be added in the middle (see Chapter 2 Bus Stop Placement). The word "BUS" must be oriented in the direction of travel. The bus stop zone should be encased in a 12-inch thick line delineating the bus stop zone. Adoption of the bus stop striping detail, shown in Figure 5.1, will result in consistency at bus stops within RIPTA's service area.

Bus stop striping should be adjusted when stops are located adjacent to bike lanes as described in the *Bicycle Accommodations* section.

Note:

1. Bus stop striping should match outer edge of existing striping. In locations where there is no existing striping, outer edge of bus stop striping should be 8' from face of curb unless otherwise noted.
2. In cases where three 'BUS' stencils are proposed, the third stencil shall be centered between the front and rear 'BUS' stencils.
3. The pavement markings shall meet the requirements of the FHWA "Standard Highway Signs and Marking" Manual and be in accordance with Section T20 of the RI Standard Specifications and the Manual of Uniform Traffic Control Devices (MUTCD).

For durability, RIDOT prefers epoxy resin for bus stop striping detail. RIDOT and municipalities are responsible for the ongoing maintenance of bus stop striping, to coincide with the roadway jurisdiction and other maintenance responsibilities. In light of this, RIPTA may be flexible with the line thickness and width of the bus stop zone, to align with adjacent parking lanes, for ease of maintenance, however the overall length of the bus stop zone must meet RIPTA requirements.

Cement Concrete Bus Pads

Cement concrete bus pads are a preferred substitute for conventional asphalt paving, which is prone to distortion by constant bus turn movements at the stop. Bus pads are more durable and recommended at frequently served bus stops or where rutting has occurred. Bus pads must be at least 9 to 12-feet wide to accommodate both wheels of a bus and allow for bus operator driving variability[4] (Figure 5.1). If adjacent to a bike lane, the bus pad should extend to the inner or outer edge of the bike lane to prevent the creation of a longitudinal seam within the bike lane.

Bus pads (Figure 5.2) must stretch the length of the bus stop, encompassing the entire bus stop zone on the roadway. The bus pad must be long enough to cover the length of the bus and the deceleration and acceleration zones, where roadway wear and tear is most likely to occur.

1. 12" White Epoxy Resin
2. White Epoxy Resin Stencil
3. Curb

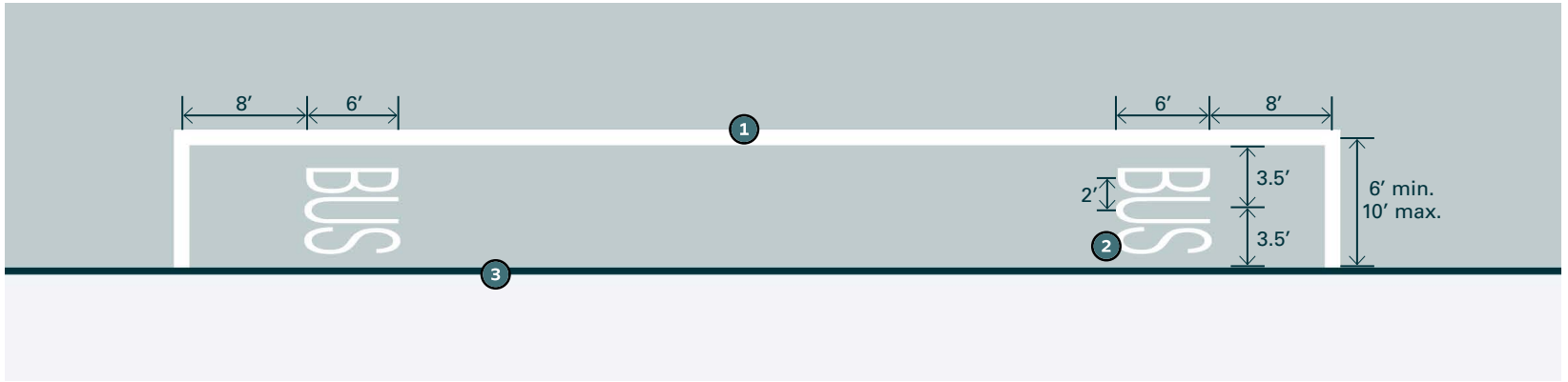


Figure 5.1 Bus Stop Striping Detail

4 National Association of City Transportation Officials. Transit Street Design Guide, 2016.

Gutter Treatment

Specialized gutter treatments can help operators assess the position of the vehicle and allow them to position the vehicle as close to the curb as possible. Gutter treatments usually consist of tactile warnings and sometimes include channel units with rumble strips to help guide operators (Figure 5.2). Gutter treatments are recommended for stops with at-level or near-level boarding. Although gutter treatments currently do not exist within RIPTA's service area or at RIPTA bus stops, gutter treatments should be considered for installation in the future at RIPTA's discretion.

Figure 5.2 GRTC BRT Station with concrete pad and gutter treatment (Richmond, VA)

Bicycle Accommodations

Bus operations adjacent to on-street bike infrastructure is very common in Rhode Island. It is critical to address the relationship between bicycle accommodations and bus stops to minimize potential conflicts between the two modes of transportation. Bicycle accommodations alongside bus stops can take multiple forms and there are three common bike lane configurations, including:

Adjacent to a Bus Stop

Bus stops that are adjacent to traditional on-street bike lanes should be dashed on the outer edge of the bus stop and the bike lane (Figure 5.3). This area is where the bus crosses over and/or might encroach on the bike lane when entering and exiting the stop. Door zone markings should also be provided in the bike lane.

Through a Bus Stop

Bus stops that are located within a curbside on-street bike lane should be delineated by continuous or dashed bike lane markings[5]. This configuration will change conditions for bicyclists when the bus is serving a stop. When the bus is stopped, the bike lane and part of the travel lane will be blocked. RIPTA recommends dashing the bike lane marking, as shown in Figure 5.4, to provide awareness of the change in use of the bicycle facility.

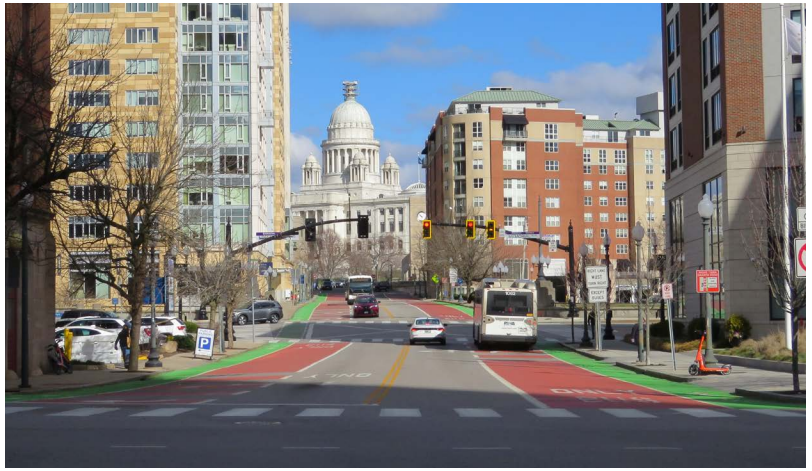


Figure 5.3 Exchange Street Dedicated Bike Lanes and Bus Only Lanes

Figure 5.4 Westminster Street Two-Way Cycle Track

5 American Association of State Highway and Transportation Officials. Guide for the Development of Bicycle Facilities (4th Edition), 2017.

Behind a Bus Stop

Bike lanes that are placed behind a stop, effectively create a "Floating Bus Stop". Floating bus stops not only separate riders from bicyclists and other pedestrian activity on the sidewalk, but also separate bicyclists from vehicular traffic, eliminating conflicts (Figure 5.5). Bike lanes can be flush with the sidewalk grade or at roadway grade, or lower than the sidewalk and curb extension grades, but connected via a crosswalk and curb ramps.

Floating bus stops are best used on streets with moderate to high bus frequency, and high bus ridership, pedestrian and bicycle volumes. Although there is potential for conflicts between bicyclists and crossing bus riders, bicyclists must yield to pedestrians. Signing and striping at the bike lane, as shown in Figure 5.5, should be applied to increase safety and minimize conflicts between pedestrians and bicyclists.

Striping of the roadway is not required since this configuration allows for buses to stop in the travel lane. Bike lanes that are placed behind bus stops must include striping, a bike symbol, and yield marks for crossing pedestrians for visibility and safety. Consider signage if warranted for additional safety measures.

Users of this guide are encouraged to reference NACTO's Transit Street Design Guide (2016), NACTO's Urban Bikeway Design Guide (2012), and AASHTO's Guide for the Development of Bicycle Facilities (2017), for additional guidance regarding bicycle infrastructure design and integration with bus stops.

Figure 5.5 Floating Bus Stop

Bus Priority Measures

Although bus priority measures are not directly related to bus stop design, the location of stops, as discussed in the previous chapter, can enable the addition of bus priority measures.

Bus Lanes
Bus lanes are travel lanes dedicated to bus use that improve speed and reliability and allow buses to avoid conflicts with other vehicles and traffic on the roadway. In some cases, on-street bike lanes may be incorporated to become a shared bus/bicycle lane. However, RIPTA will only consider these lanes on a case-by-case basis, and the shared facility must be approved by RIPTA.

Bus lanes are commonly designated with red paint and delineated with a wide solid white line next to the travel lane, with a "BUS ONLY" stencil.

Operators should treat bus stops along a bus lane as they would if located in a travel lane or shoulder. Additional striping beyond the bus lane is not required.

Queue Jumps
Bus queue jump (or by-pass) lanes are short bus lanes, sometimes shared with right turns and bicycles, located on an intersection approach. Queue jumps allow buses to by-pass a queue of waiting vehicles by using the parallel curbside travel lane to "jump the queue." These lanes typically coincide with far-side bus stops and can be combined with transit signal priority.

Transit Signal Priority
Transit Signal Priority (TSP) provides buses approaching an intersection with an extended or early green light so there is minimal or no wait time for buses at the intersection. It can provide an advanced signal phase for buses, only if it is used in conjunction with a bus lane or bus queue jump lane.

For additional information on implementing bus priority measures across Rhode Island, please refer to RIPTA's Transit Signal Priority Expansion Study (2016) and/or direct questions regarding TSP compatibility to RIPTA's Operations Planning department at planning@ripta.com.

Figure 5.6 Kennedy Plaza Conceptual Bus Lanes

6 Amenities

Amenities provide comfortable stops for riders, improve the passenger waiting experience and help increase the visibility of bus stops. Passenger amenities can help to retain and attract additional transit riders to the service by providing a comfortable and safe experience. This chapter describes RIPTA's bus stop typology, available bus stop amenities, and provides amenity placement criteria and guidance.

Amenities

Today, roughly 12 percent of RIPTA bus stops have shelters or benches. RIPTA's goal is to provide as many amenities as possible to improve rider experience and comfort at stops, and so investment in stop amenities is a high priority, where feasible. The guidance provided in this chapter includes a description of Tolar amenities contracted by RIPTA, amenity placement criteria, placement considerations, siting guidelines, and maintenance provisions. Tolar-contract amenity specifications can be found in Appendix C. Amenities not provided by RIPTA can be installed at bus stops with RIPTA's approval and must adhere to ADA standards (Americans with Disabilities Act), RIPTA's bus stop accessibility guidelines, and amenity siting guidelines provided in this chapter.

Required
1. Trash and Recycling Receptacles
2. Bus Stop Sign
3. Bench/Leaning Rail
4. Shelter

Preferred
5. Passenger Information
6. Solar Powered Shelter Lighting
7. Bicycle Parking

Optional
8. Real-time Information
9. Digital Advertising Screen

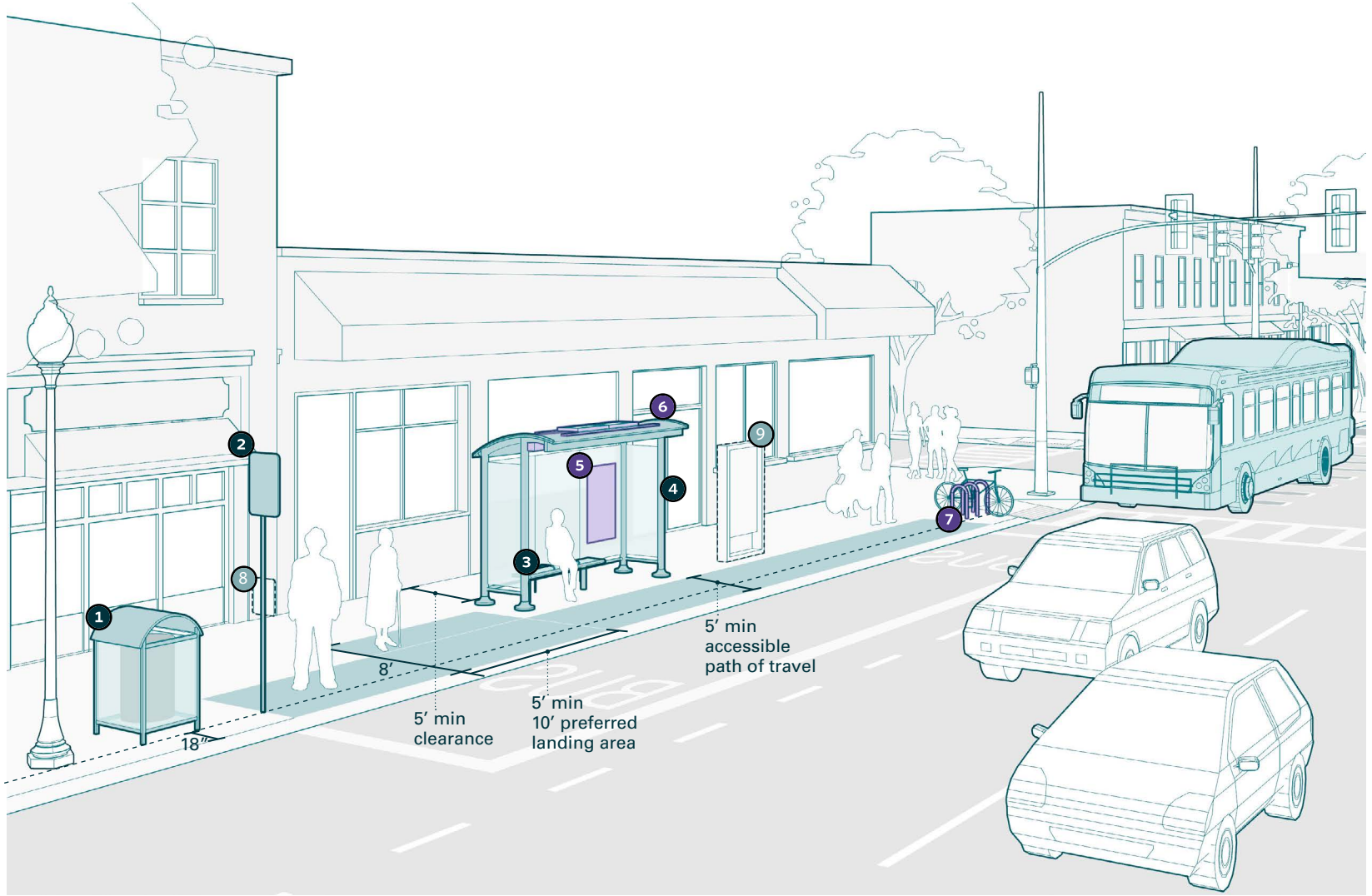


Figure 6.1 RIPTA Conceptual High Activity Stop

RIPTA Bus Stop Types

RIPTA provides bus service to many unique communities and neighborhoods in Rhode Island and varying environments including urban, rural, suburban, and historic. These factors create a range of operating environments that influence the levels of service provided, ridership volumes, and travel patterns. There are six bus stop types described in Table 6.1, this typology categorizes RIPTA bus stops by operational characteristics, service frequency, ridership, and adjacent land uses. In addition to the descriptions shown in Table 6.1, Table 6.2 shows the required, preferred, and optional amenities for all bus stop types. This table provides guidance for the acceptable amenities at each stop type but should only be placed/ considered if all amenities adhere to RIPTA's accessibility requirements. In addition to required amenities, an effort should be made to include preferred amenities unless there are physical or accessibility constraints. Optional amenities are remaining amenities that can be added at the discretion of RIPTA and other stakeholders.

Table 6.1 RIPTA Bus Stop Typology

Stop Type	Description	Typology Example
Transit Center/ Mobility Hubs	Official RIPTA Transit Hubs with 4 or more berths. Mobility hubs are a premium stop that require a significant level of investment. These stops provide connections to other routes and other transit services or modes of travel (e.g., MBTA Commuter Rail). Mobility hubs provide a comfortable waiting environment for riders and additional amenities for RIPTA staff during layovers and breaks.	• Kenndy Plaza • Pawtucket/Central Falls Transit Center • Newport Gateway Center
Downtown Transit Connector (DTC)	Stops that are designed with a unique and highly-visible identity, that provide high-frequency transit service (5 minutes or better) between the Providence Train Station and the Hospital District. This stop type is located along a high-frequency corridor with transit priority elements including dedicated bus lanes and transit signal priority.	• Dyer and Ship Street (Providence) • Hospital District
Transit Emphasis Corridor Stops (TEC)	Stops on corridors with high-frequency routes (10 minutes or better) with direct and efficient service. These stops are most likely to be served by 3 or more routes, with truncated service. These stops are in dense neighborhoods that are very walkable and provide connections between major activity centers.	• Goff Avenue (Providence) • Hope Artiste Village (Pawtucket)
High Activity Stops	Stops where ridership experiences 50 to 75 average daily boardings and/or adjacent to a major trip generator (e.g., hospital, university)	• Providence Plaza Mall • Olneyville Square (Providence)
Standard Stops	Stops that are typical within Rhode Island with lower ridership volumes.	• Pontiac before Hodsell (Cranston) • Main after Queen (East Greenwich)
Park & Ride Lots	Park & Ride lots are mostly located in suburban and rural environments that allow riders to park their vehicle and transfer to RIPTA local and express bus routes for the remainder of their trip. Park & Ride lots may be located on private property or RIPTA-owned right-of-way	• Fish Road (Tiverton) • White Church (Barrington)

Table 6.2 RIPTA Bus Stop Types and Required, Preferred, and Optional Amenities

Amenity	 Transit Center/ Mobility Hubs	 Downtown Transit Connector Stops	 Transit Emphasis Corridor Stops	 High Activity Stops	 Standard Stops	 Park & Ride Lots
Bus Stop Sign	**Required**	**Required**	**Required**	**Required**	**Required**	**Required**
Shelter	**Required**	**Required**	**Required**	**Required**	Preferred	Preferred
Bench/Leaning Rail	**Required**	**Required**	**Required**	**Required**	Preferred	*Optional*
Trash and Recycling Receptacles	**Required**	**Required**	**Required**	**Required**	*Optional*	**Required**
Bicycle Parking/Bikeshare	**Required**	Preferred	Preferred	Preferred	Preferred	Preferred
Passenger Information (e.g., system/ route map, wayfinding display)	**Required**	**Required**	**Required**	Preferred	*Optional*	Preferred
Real-time Information	**Required**	**Required**	Preferred	*Optional*	*Optional*	
Digital Advertising Screen	Preferred	**Required**	*Optional*	*Optional*	*Optional*	
Fare Machine	Preferred	**Required**	*Optional*			
Solar Powered Shelter Lighting	Preferred	Preferred	Preferred	Preferred	Preferred	Preferred
Safety and Security Elements	**Required**	Preferred				Preferred
Car Parking	*Optional*					**Required**

Shelters

Bus shelters shield riders from harsh weather conditions and environmental factors such as sun, glare, and wind, while also serving as a recognizable marker for bus stops. They offer a comfortable waiting area for passengers and are among the most prominent amenities at bus stops. Well-designed and placed shelters not only provide practical benefits but also offer opportunities for advertising, thereby contributing to the overall perception of transit service quality.

Bus shelters are considered a premium bus stop amenity and require the greatest level of investment and ongoing upkeep for RIPTA, property owners, and municipalities. Maintenance tasks may include regular trash collection, cleaning, and the replacement of panels or other shelter components. Before implementation, all proposed shelter locations must be evaluated by RIPTA, using predefined criteria outlined in Table 6.3.

Figure 6.2 Large bus shelter at Kennedy Plaza

Shelter Design

Existing shelters at RIPTA bus stops are a mix of advertising shelters, and a number of other shelters that have been designed and/or provided by RIPTA, municipalities, private property owners etc. Custom shelters are provided along the R-Line, along the Providence Downtown Transit Connector corridor, and at mobility hubs. All existing shelters vary in style, size and shape, and functionality.

RIPTA has three standard shelter types including a large shelter, standard shelter, and narrow shelter that integrate benches and advertising panels into their design. The size and type of shelter procured will largely be dependent upon the amount of available sidewalk space. The depth of standard and large shelters is 5 to 6 feet, but the length can vary from 10 to 35 feet. Large shelters with lengths greater than 20 feet are most suitable for Mobility Hubs and/or TEC stops that experience high ridership volumes and transfers. Narrow style shelters, typically 2 to 3 feet deep, are available for placement at stops with constrained right-of-way. Narrow shelters are most suitable for High Activity and Standard stops.

All aspects of the shelter design must be compliant with ADA (Americans with Disabilities Act) requirements (see Chapter 3 Pedestrian Connectivity and ADA Accessibility), including but not limited to access points between panels, clearance, and circulation space within the shelter or seating area. If a stand-alone shelter cannot be provided due to sidewalk restrictions, other options, including awnings or expanding the roof lines on abutting buildings that can overhang the sidewalk, may be considered.

Custom Shelters
Custom designed shelters or shelters that are not included in RIPTA's Tolar contract may be considered for placement at RIPTA bus stops with the exception that RIPTA cannot take ownership of the amenity and will not be responsible for custom shelter maintenance or upkeep.

Shelter Panels
Consideration may be given to shelter panels that extend close to the ground to maximize protection from the elements. The number and location of panels surrounding a shelter may vary, including:

- Rear and two side panels – most common
- Rear and one side panel – allows for side access when a shelter needs to be offset close to the curb and face the roadway
- Rear panel only – ideal for narrow sidewalks; can have an access point at the rear also
- Rear, side and front panels, which offer the most protection for passengers

All shelters will be equipped with a roof, which may vary in size and not necessarily provide coverage that corresponds with the panels that support it. Standard shelters may allow a side panel to be removed for access, and therefore the roof would only be supported by the rear and one side panel, and potentially a post on the open side. Narrow shelters may have a standard roof size supported only by a rear panel, or by a rear and short side panel.

Shelter Lighting
RIPTA recommends implementing solar-powered shelter lighting to enhance rider comfort and safety, especially where existing streetlights are absent. Solar panels are an additional cost that can be implemented during shelter installation. Solar panels must be oriented towards the sun and may be used to power amenities such as cell phone charging stations. It is recommended to use solar technology to provide lighting where feasible. If solar-powered or hard-wired lighting is not feasible, RIPTA recommends placing shelters in areas where there is existing street lighting or lamp posts.

Shelter Siting Guidelines

The placement of shelters must maintain safety and good visibility of approaching buses, free of streetscape and landscape elements in the line of sight, and ideally outside of designated landing areas and accessible path of travel (5-foot clear path).

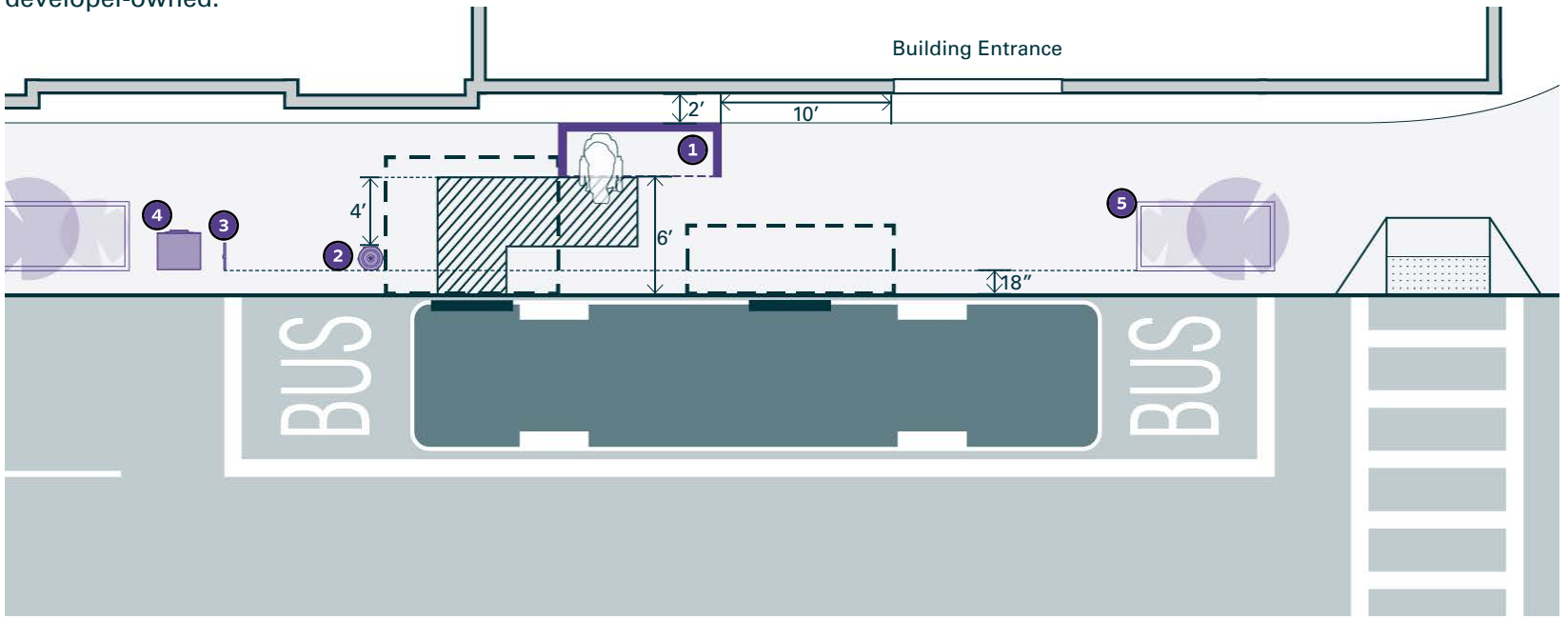
Some shelters can be bolted to the existing sidewalk, but most shelter designs require a foundation. Cement concrete sidewalks in Rhode Island are generally 4 inches thick, which do not adequately support the wind loads of a typical shelter. A shelter foundation is likely to require a concrete slab that is about 12 inches thick. The area will depend on the size of the shelter, but since footings can extend beyond the panel circumference, the foundation is likely to be slightly larger than the floor area of the shelter.

Key Shelter Clearances

Figure 6.3 illustrates the key clearances around shelter placement, while more specific siting requirements are provided in Table 6.3. While the clearances noted in these tables and figures refer to the distance to the shelter, if the shelter foundation is larger than the shelter itself, the clearances for in-ground features should be adjusted accordingly.

Ideally, shelters can be placed at the back of sidewalk, facing the roadway. In some cases, a shelter facing the back of sidewalk may be considered if a unique or constrained site context exists. A shelter facing the back of sidewalk must be placed at least 18 inches back of curb to avoid conflicts with the bus mirrors.

A 5-foot clear path of travel around shelters must be provided, in compliance with ADA requirements. This clearance provides access for trash removal, cleaning, and maintenance. If sufficient sidewalk space is not available, a curb extension could be explored, and/or a right of way easement may be investigated on the adjacent property if the land is public or developer-owned.



1. Bus Shelter
2. Light Pole
3. Bus Stop Sign and Post
4. Trash Can
5. Planting Strip

Figure 6.3 Detailed Shelter Clearances

Table 6.3 Shelter Siting Guidelines[1]

Guideline	Distance	Notes and Considerations
Distance from back of curb	6′	Preferred distance to face of shelter, facing roadway. Can be reduced if side panel is removed. 2′ acceptable for shelters with no front windscreen and no side panel on one side.
Distance from back of curb	18″	Preferred distance to back of shelter, facing towards back of sidewalk (away from roadway)
Distance from back of curb	2′	Preferred distance to shelter roof/overhang, to avoid collisions with bus side mirrors.
Distance from building entrance	10′	Shelter cannot be located in front of building access points, storefronts, or building windows used for display.
Distance from building face/tall boundary treatment on typical/narrow sidewalks - 12′ or less	2′	Preferred distance to back of shelter - with shorter, smaller or more transparent/accessible obstructions such as a planter or fence, 6″ is acceptable, as long as the shelter foundation and footings do not encroach on the abutting property and there is access for maintenance.
Distance from building face/tall boundary treatment on wide sidewalks - 13′ or more	6′	Preferred distance to back of shelter - allowing the pedestrian path of travel through the stop to flow behind the shelter, while riders congregate in the front of the shelter, at the face of sidewalk.
Sight distance	12′	From beginning or end of curb return of an intersection or large commercial access driveway to avoid obstructing sight distance.
Distance from crosswalk	15′	
Distance from streetscape elements	3′	Preferred distance from in-ground elements such as manholes, tree grates, handholes, etc. If the shelter foundation is larger than the floor area of the shelter itself, increase the clearance by the difference between the foundation perimeter and shelter circumference.
	5′	Preferred distance from tree trunk
	4′	Preferred distance from other street furniture and vertical sidewalk elements - benches, poles, etc.
	12′	Preferred distance from fire hydrant
Accessibility clearances	80″ min	Vertical clearance
	6′ (4′ min)	Horizontal clearance - pedestrian path of travel in front of or behind shelter. This may be reduced to 3′ at a pinch point.

1 Shelter Siting Guidelines reflect Americans with Disabilities Act (ADA) federal requirements and PROWAG (Public Right-of-Way Accessibility Guidelines) guidance

Shelter Placement Criteria

Specific criteria to determine how to distribute new shelters across the RIPTA system includes consideration of the following factors:

- Meeting the minimum threshold of average daily boardings
- Rider requests for a shelter at a particular bus stop
- A RIPTA-led bus stop or bus corridor improvement program that recommends a new shelter or replacement of an existing shelter
- A municipality or private entity wishing to install their own shelter at a stop

Specific criteria for determining whether a shelter can be considered eligible for a stop are provided in Table 6.4. Each criterion is given a total number of points. A location with 100 points or more is considered eligible for a shelter. The primary consideration in placing a shelter at a stop is average daily boardings. Boardings are used rather than total ridership, as they are more indicative of the number of passengers who will be waiting for the bus at a stop. Meeting these criteria does not guarantee the installation of a shelter. Local priorities and neighborhood requests, as mentioned above, can also influence the decision to add a shelter.

When to consider shelter placement:

- Meets eligibility criteria of at least 100 points (see Table 6.4)
  - Passes a site suitability test:
  - Adequate physical space and clearances
  - Location of proposed shelter to bus stop is not greater than 50 feet from designated landing areas
  - Permission from site owner and/or RIDOT to install shelter
  - Notify or obtain abutter approval – may or may not be necessary depending on the shelter's proximity to and setback from property line
- Community and municipal approval for advertising shelters
- Conforms to Federal Transit Administration (FTA) Title VI requirements[6]
- Meets RIPTA bus stop accessibility requirements – the stop is ADA accessible or will be reconstructed to meet ADA before shelter is installed
- Shelter maintenance agreement is in place.

6 United States Department of Transportation. Federal Transit Administration. Title VI Requirements and Guidelines for Transit Administration Recipients, 2012.

Table 6.4 Shelter Placement Criteria

Factor	Criteria	Points
Shelter Exists	Shelter currently exists at this stop	5
Average Weekday Ridership	25+ average daily boardings	13
	15+ average daily boardings	13
	5+ average daily boardings	13
Wheelchair Lift Deployments	Wheelchair lift is deployed 5+ times per month	8
APP/HDC Tracts	Located within an FTA designated area of persistent poverty (APP) or historically disadvantaged community (HDC)	8
Title VI Routes	Serves a designated Title VI route	8
Economic Proximity	Located within a tract with transit propensity based on TMP analysis (Population, Demographic, & Employment-Based Demand)	6
	Located within a transit-oriented development (TOD) zone	3
Healthcare Proximity	Located within 100m of a hospital	4
	Located within 100m of a doctor's office	4
	Located within a Health Equity Zone	3
Education Proximity	Located within 100m of a school	4
Service Planning	Stop serves a current or future high-capacity transit, rapid bus, or high frequency route	5
Requests for Shelter	Stop has received requests from multiple customers	3

Benches

Benches may be installed as stand-alone (or freestanding) seating at a bus stop or added as a separate element underneath or integrated into a shelter. Benches as part of the shelter design were discussed in the previous section.

Freestanding benches will be the focus of this section. Freestanding benches are a relatively low-cost bus stop amenity that can provide riders with some level of comfort, especially on bus routes that do not run very frequently, and at bus stops that have lower ridership, where a more substantial investment in a bus shelter may not be viable. Benches are relatively simple to install and more easily accommodated on narrower, constrained sidewalks, and where a shelter might not be feasible. While benches are a relatively simple amenity to install, benches may require some upkeep including maintenance and cleaning.

Figure 6.4 RIPTA bus stop with bench

Bench Design

Standardizing the style of benches distributed throughout Rhode Island provides continuity and consistency, and improves the overall visual aesthetic of bus stops. RIPTA has two standard bench types that include backrests and armrests, that are 14.5 inches deep and 6 to 9 feet in length. RIPTA also has two backless bench styles that are 14.5 inches deep and 4 to 6 feet in length.

Seating Alternatives

Leaning rails may be placed as an alternative to traditional benches. Leaning rails are particularly useful at floating bus stops, as shown in Figure 6.5, as they help establish a narrow barrier between the bus island and the bike lane behind it, deterring riders from crossing the bike lane in non-designated spots. RIPTA procured leaning rails are 72 inches in length and 36 inches tall.

Figure 6.5 Leaning Rail at a Conceptual RIPTA High-activity Bus Stop on Broadway at Knight Street (Providence, RI)

Bench Siting

The orientation of benches is an important factor in placement. Having an unobstructed view of an oncoming bus is critical for waiting passengers, shelters or trees within the line of sight must be avoided.

Ideally, the back of sidewalk is the preferred placement for benches. This placement generally provides the safest, driest, and best view for riders waiting on a bench, but 5-foot clearance must be provided. A 5-foot wide path of travel must be maintained through the bus stop to maintain compliance with ADA guidelines with an additional 1-foot of space required for knee and toe clearance. Benches placed at the back of sidewalk are less likely to be buried in snowbanks, compared to benches positioned closer to the curb.

Siting Considerations

- Before a new bench is provided at any stop the path of travel between the landing area and the bench must be ADA compliant.
- If the sidewalk is wide enough (greater than 8 feet), benches may be positioned perpendicular to the curb, providing the most direct view of an oncoming bus for riders.
- Benches may face the back of sidewalk if there is a lot of street furniture curbside along a narrow sidewalk, and/or there are numerous entryways at the back of sidewalk, posing a challenge to find a clear space at the back of sidewalk.
- Benches facing the roadway can be avoided unless the sidewalk is particularly wide (greater than 8 feet), as people's feet and belongings are likely to encroach on the curb or roadway. Backless benches are an alternative option in constrained areas.

When to consider bench placement:

- The bus stop has at least 10 average daily boardings
- As an alternative to a shelter due to right-of-way and site constraints
- A request was made by, or the stop is known to serve, sensitive land uses, older adults, or persons with disabilities
- There is evidence of riders sitting on steps, walls, etc. of the abutting property
- The stop services a low frequency non-urban/suburban/crosstown bus route, of one hour or more during peak periods, and two hours or more during off-peak periods

Trash Receptacles

The placement of trash and recycling receptacles, and or trash and recycling solar compactors is important, particularly at higher ridership stops, at stops within commercial areas and retail centers, and stops with shelters. The presence of trash and recycling receptables can improve the cleanliness of stops and the surrounding environment, improving comfortability at stops for waiting riders.

Trash and recycling receptacles can improve cleanliness at and around RIPTA bus stops, but receptacles must be emptied regularly to avoid trash accumulation at the bus stop and on bus stop amenities. Trash accumulation can be problematic particularly at shelters, as they can catch wind-blown debris, but the addition of trash receptacles alongside shelters can help keep the overall buildup of trash to a minimum. Municipalities are responsible for trash collection and RIPTA is responsible for maintenance of provided amenities.

Trash Receptacle Design

A regular open container trash receptacle is ideal for Standard stops. RIPTA aluminum trash receptacles are equipped with rain bonnets and liners that are available in a rectangular or cylindrical shape.

At higher ridership bus stops, solar powered trash compactors (such as the Big Belly Solar) may be considered for installation. Wi-Fi-enabled compactors are also available that notify refuse collection departments when receptacles need to be emptied. These receptacles are battery-charged devices. (Figure 6.8). Both trash receptacles and solar compactors are approximately 2 feet wide in diameter.

Trash Receptacle Siting

RIPTA recommends that trash and recycling receptacles be sited in shady areas away from seating areas, but in close proximity to the bus stop zone. Solar powered trash compactors need to be placed where there is access to sunlight. All trash receptables must also be located where they will not obstruct pathways and designated landing areas. Receptacles cannot be provided in enclosed alcoves and alleyways. The minimum sidewalk width required to accommodate a trash receptacle is 8.5 feet. Ideally, receptacles are located close to the curb and installed at least 18” off the back of curb for ease of collection and to maximize the path of travel through the stop. At stops with wider sidewalks this offset could be increased to 2 feet.

Figure 6.6/Figure 6.7 RIPTA bus stop with hooded trash can

Bicycle Parking

Installing bicycle parking at bus stops enhances connectivity for riders traveling to and from their starting and ending points, particularly for first and last mile connections. Moreover, it encourages transit users to opt for biking as a means to access transit services. Additionally, the placement of bicycle parking offers an alternative option for riders when the bike rack on the bus reaches full capacity.

Shared Mobility Parking
As Providence, Newport, and other municipalities offer bikeshare options, the location of bus stops may be factored into the bikeshare and electric scooter (e-scooter) planning process to improve mobility and transit access.

Bikeshare and e-scooter parking can be designated with either docking stations or parking corrals for dockless mobility devices. These docking stations must be located outside of the bus stop area and do not obstruct accessible pathways or designated landing areas. It is important that dockless mobility devices do not impede bus stop accessibility which means they cannot be parked on curb ramps, crosswalks, or within the bus stop zone.

Bike Rack Design
Bicycle parking at typical bus stops may include an inverted U-shaped bike rack. Providing sufficient designated bicycle parking prevents bicycles from being locked to other streetscape objects such as poles and fences, which helps improve the attractiveness of the surrounding environment.

Inverted U-shaped bike racks are currently provided on the R-Line, while ring and post styles can be found elsewhere in Rhode Island. While a specific design of bike racks has not been adopted by RIPTA, racks must have at least two points of contact with the bike and be consistent with the design of other bus stop amenities. For additional bike parking guidance, users of this guide may consult the Association of Pedestrian and Bicycle Professionals (APBP) "Essentials of Bike Parking" guide[7].

Bike Rack Siting
Bike racks must be placed outside of the path of travel at the bus stop and positioned so that no matter how a bicycle is locked to it, it will not obstruct the path of travel. Guidelines for the placement of bike racks include:

- Locate at a convenient location proximate to the bus stop and within sight of passengers (within 50 feet of the bus stop)
- Locate outside of the ADA path of travel and designated landing areas
- Ensure easy and unobstructed access to bike racks
- Ensure the visibility of bike racks, including non-restricted views from landscaping, shelters, or walls and under adequate street lighting for security
- Consider covered or weather protected locations as an added benefit to bicyclists
- At floating bus stops, place at the sidewalk edge, to essentially function as a barrier to discourage riders and pedestrians from crossing into the bike lane, except at the designated crossing

Figure 6.8 Trash and Recycling compactors

7 Association of Pedestrian and Bicycle Professionals (APBP). Essentials of Bike Parking: Selecting and Installing Bike Parking that Works, 2015.

Passenger Information and Other Amenities

Passenger Information
Providing information at bus stops in traditional and technical formats is an important aspect of rider convenience and comfort. Passenger information can be helpful for first-time or infrequent riders, helps identify the bus stop, and communicates general system information. Passenger information must be maintained to provide current information and ensure information is legible if information is defaced.

Traditional methods to provide schedules with static maps, trip times or route frequencies, are currently provided on the R-Line stop, but may be expanded to include typical bus stops. Wayfinding maps to specific local destinations are beneficial for integrating bus stops into the surrounding neighborhood and providing an immediate means for new riders to find their way and to access key destinations.

More recent methods of providing information to riders at bus stops include technological methods such as real-time information and digital advertising panels. Real-time information at stops may include:

- Electronic countdown signs showing "next-bus" arrival information (requires a greater capital and operational investment since it requires power and a data connection)
- ePaper Digital Bus Stop Display can be mounted to a shelter or bus stop sign post and display route and arrival information
- Unique QR codes on bus stop sign posts for riders to scan for real time information

Although many riders may choose to use smart phones and tablets to access maps, schedules, and real-time arrival information, providing static maps, schedules, and real time information at stops is still important to provide an equitable service that is easy to use for all riders, including those without personal technology devices available.

Additional rider amenities that are not included in RIPTA's Tolar contract may be considered for placement at RIPTA's discretion.

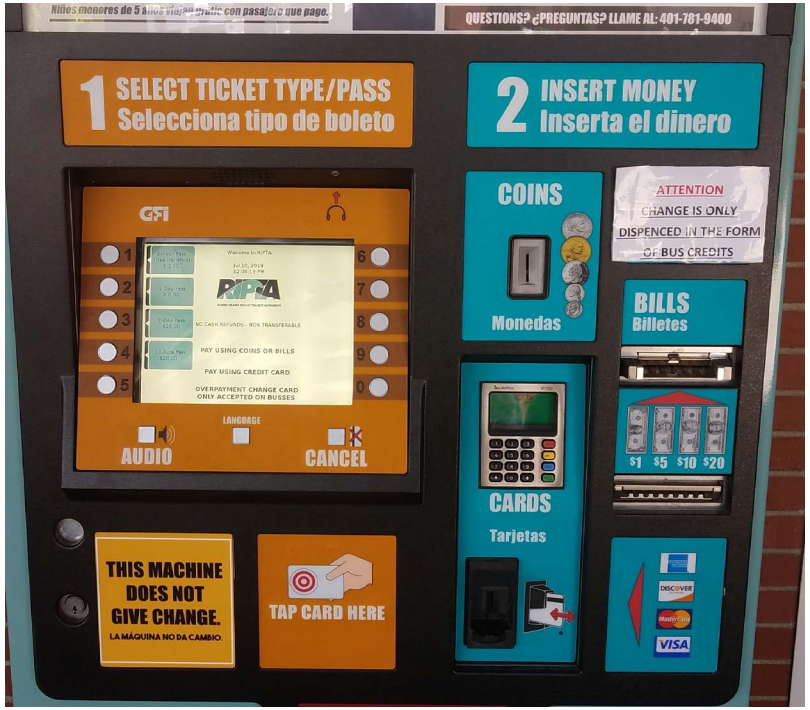


Figure 6.9 RIPTA Fare Vending Machine

Criteria to Add Amenities
Due to limited resources and physical space, among other factors, it is not feasible to install all amenities at all bus stops. The criteria listed in this section provides a method to evaluate bus stops for the potential integration of amenities into bus stop design. Existing site conditions and pedestrian infrastructure, public right-of-way availability, access and safety issues, resource availability, maintenance of amenities, and other concerns must be reviewed and addressed. Criteria for the integration of amenities is divided into two categories; primary criteria and secondary criteria, as provided in Table 6.5.

Figure 6.10 Digital Real-time Information

Table 6.5 Amenity Placement Criteria

Factor	Criteria	Placement Considerations
Primary	Average Daily Boardings	The number of boardings is a primary indicator of the utilization of a bus stop. Bus stop amenities are of greater importance at stops where there are many passengers waiting to board the bus. The number of boardings at a stop is the most influential factor in determining the placement of a bus stop amenity. • **Less than 25 average daily boardings:** Seating; bike rack; route information panel with instructions on accessing real time arrival data • **25 to 50 average daily boardings:** Narrow shelter with bench; bike rack; trash receptacle; current bus schedule; route information panel with instructions on accessing real-time arrival data • **50 to 100 average daily boardings:** Standard shelter with bench; bike rack; trash receptacle; current bus schedule; real time bus data; landscaping within 10' of primary bus stop feature (optional) • **More than 100 average daily boardings:** Large/custom shelter with bench; bike rack; trash receptacle; current bus schedule; real time bus data; landscaping within 10' of primary bus stop feature
Primary	Condition of Existing Amenities	If the condition of an amenity is such that it poses a danger to the surrounding community it must be repaired or removed immediately and may be given priority to be replaced, so long as it still meets the initial criteria for its placement.
Primary	Transfer Location	Transfer points require passengers to switch between routes or modes. This frequently requires passengers to wait at a stop. When possible, efforts can be made to provide a comfortable area at stops where it is common for passengers to wait to connect with other routes or modes. The number of transfers at a stop is an influential factor.
Primary	Equitable Distribution	In order to comply with Title VI requirements, there must be an equitable distribution of passenger amenities between Title VI and Non-Title VI areas.
Primary	Maintenance Agreement	Responsibility for maintenance of the amenity must be established in advance of installation, by way of a Memorandum of Understanding.
Secondary	Availability of Right-of-Way	The associated costs of land acquisition and construction can be evaluated and weighed against the benefit generated from adding a particular amenity to a stop. In some cases, it may not be practical to add an amenity to a location if the site is so physically constrained that it becomes cost-prohibitive. The availability of necessary right-of-way and/or the ability of adjacent property owner to dedicate or sell the necessary right-of-way must be confirmed before amenity installation.
Secondary	Sensitive Land Uses	Occasionally there is a need for amenities to accommodate land uses serving a greater number of older adults or persons with disabilities. The number of requests and the number of times that the bus ramp is deployed at a particular stop are among a few influential factors.
Secondary	Requests for Shelter	It is common for RIPTA to receive requests for shelters and these requests are to be evaluated in addition to the other criteria, however the number of requests may influence the priority of the evaluation.
Secondary	Existing Amenities	If there are existing amenities, such as a bench, and it meets the primary criteria the stop may be considered for an amenity upgrade. Otherwise, the location may be removed from the list for bus stop enhancements.
Secondary	Future Capital Project	In conjunction with long range plans for transportation projects, amenity locations should be considered in areas where there is likely to be a major node (station), or large development on a transit corridor.

Provision and Maintenance

RIPTA encourages provision of bus stop rider amenities, from shelters and benches, to bike racks and trash receptacles, solely by, or in partnership with, local municipalities or property owners. Advertising panels or small plaques may be installed on the amenities to acknowledge donors and maintenance owners. Advertising may help to offset some of the capital and maintenance costs.

Maintenance and upkeep of bus stop amenities are often the responsibility of multiple entities. Municipalities, property owners, and developers should consult RIPTA when considering amenity placement or removal for coordination and procuring RIPTA amenities.

Maintenance of RIPTA amenities includes panel replacement in shelters, cleaning and painting of amenities, removal of trash and emptying of trash receptacles and compactors. Property owners are encouraged to remove snow around amenities, as they do the sidewalk, to maintain access for riders. Snow that is not removed can become more difficult to remove once it freezes and poses a hazard particularly for older adults and persons with disabilities. Maintaining a section of the bus stop zone for snow disposal and storage must be considered in the bus stop design, especially when there are occasions with substantial snow.

Developer Responsibilities

Developers may be responsible for providing and maintaining the amenities described in this chapter when they construct or renovate a development adjacent to an existing or proposed bus stop. It is the responsibility of local municipalities to require the placement of shelters that conform to federal, state and local standards, as well as RIPTA requirements outlined in this guide.

Design plans can be submitted to RIPTA at planning@ripta.com to ensure proper coordination and placement of bus stop amenities.

7 Design Examples

Previous chapters of the guide have introduced various layouts and designs for bus stops. This chapter compiles these different alternatives or scenarios, offering summary points for consideration regarding these sample layouts.

The sample bus stop designs are provided as a toolbox of options. They are not intended to cover every eventuality in bus stop design. Additional planning and engineering expertise will be needed to determine the best bus stop design for each distinct location.

Floating Bus Stop

Floating bus stops are an extension of the curb channelized by a bike lane. This type of extension allows for buses to stop in-lane and supports at or near level boarding. This design provides additional space for amenities and other elements that may have obstructed the sidewalk adjacent to the stop. This design is most likely to be implemented in urban environments and should be applied when there is a separated bike lane planned or present on a corridor adjacent to bus stops with high ridership.

Implementation Considerations

- Floating stops should be at least 60' but can be lengthened to accommodate more than one bus.
- Curb ramps should be included or installed at all crossings
- Pedestrian access at the end of the floating stop at a far-side stop should be provided
- Green paint is recommended for bike lanes to emphasize the lane and conflict zones
- Agreements for maintenance and snow removal on the platform need to be established
- Additional signage and bike signals should be installed to alert bicyclists of bus stop and pedestrians crossing the bike lane.

MBTA Floating Bus Stop on Commonwealth Avenue (Boston, MA)

Floating Bus Stop

Design Elements

1. **Amenities** Narrow shelters/leaning rails should be considered for installation to maintain a clear path of travel (5′) at the stop. Trash and recycling receptacles should be placed on the platform, but can be placed on sidewalk if space is constrained.

2. **Safety** Bollards should be placed at both ends of the stop platform to emphasize boundaries of the elevated platform and protect riders from oncoming traffic.

3. **Streetscape** Lighting should fully illuminate the platform and pedestrian crossings at the bike lane.

4. **Bike Parking** Bike parking should be placed on the sidewalk adjacent to the stop. Parked bikes should not conflict with the bike lane or path of travel.

5. **Accessibility** An accessible path of travel (5′) should be maintained on the platform, at crossings, and the sidewalk. An accessible landing area (5′x8′ min., 10′x8′ preferred) and clear zone (12′x4′) must be provided on the platform.

6. **Curb/Edge Treatments** Detectable warnings should be used along the platform and at bike lane crossings.

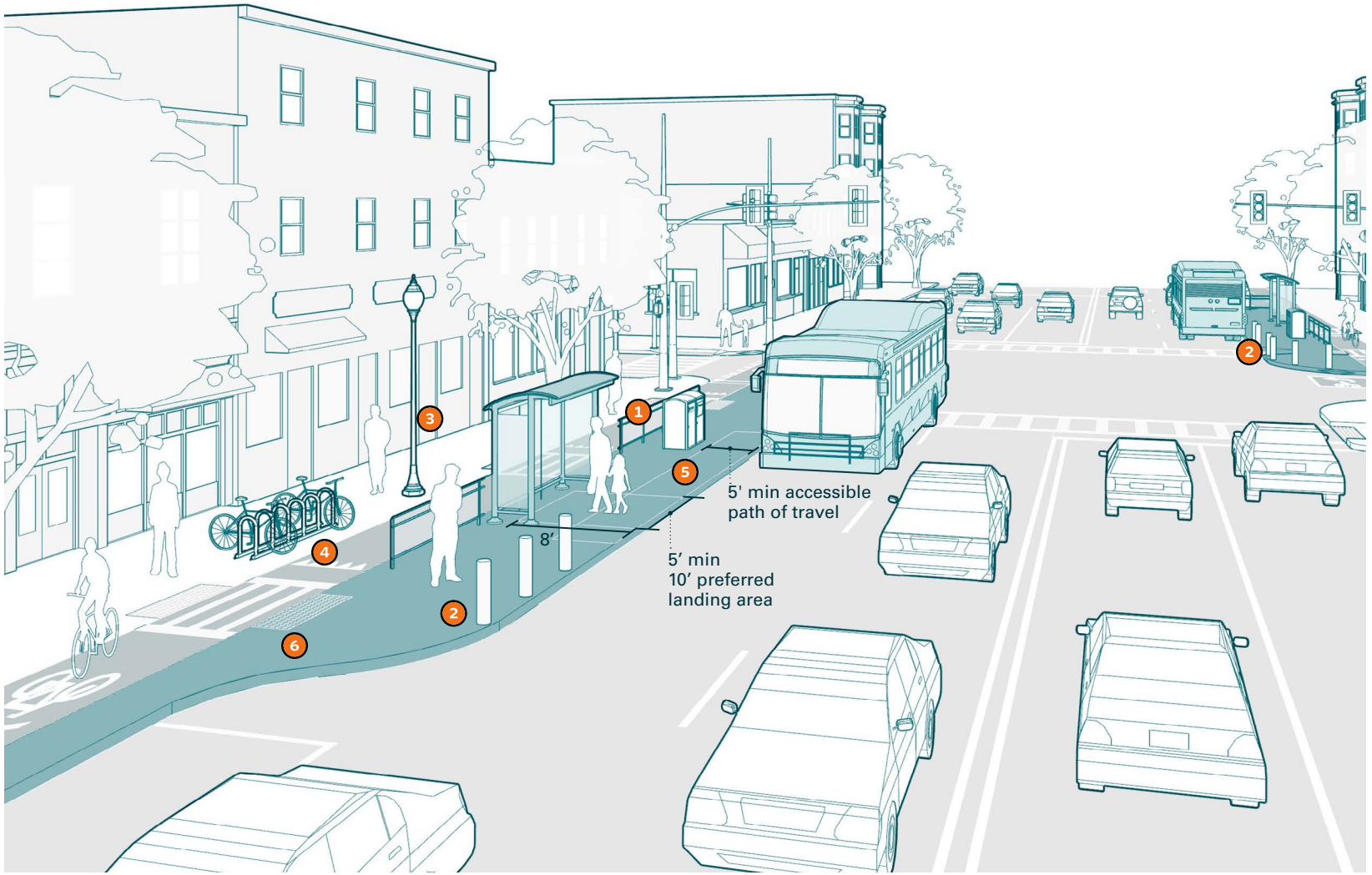


Figure 7.1 Floating Bus Stop

Bus Stop in Parking Lane with Multiple Curb-cuts

Bus stops in parking lanes are a type of curbside stop on a roadway with on-street parking. This type of stop requires the bus to enter and exit the travel lane to serve a stop. This design is most likely to be implemented in urban environments, on dense neighborhood streets with many residential driveways, or along a commercial strip. This design allows for the bus to pull adjacent to the curb so that passengers have no obstructions or conflicts when boarding or alighting but the rear-end of the bus may need to block or straddle driveway(s).

Implementation Considerations

- Bus stops in parking lanes must be at least 75 feet to ensure that operators have enough space to accelerate and decelerate between parked vehicles.
- Additional signage and parking enforcement should be implemented to ensure that the entire length of the bus stop is available so that the bus operator can safely pull in and out.
- Existing grass strip between the landing area and clear zone should be removed to maximize the space available for pedestrians and riders waiting for the bus.

Translink Stevenson Bus Exchange (Vancouver, BC)

Bus Stop in Parking Lane with Multiple Curb-cuts

Design Elements

1. **Streetscape** The bus stop should be located close enough to street lighting so that passenger waiting areas are fully illuminated.

2. **Accessibility** An accessible path of travel (5′) should be maintained on the sidewalk on the path connecting the bus stop and the sidewalk. An accessible landing area (5′x8′ min., 10′x8′ preferred) and clear zone (12′x4′) must be provided.

3. **Roadway Design** Bus box striping should be applied to further emphasize the location of the bus stop zone and no parking areas.

4. **Amenities** A bench or stool should be considered for installation if stop has constrained right-of-way. A narrow shelter may be considered if the stop meets ridership thresholds and/or the stop is located near a major trip generator (e.g., hospital, university). Trash and recycling receptacles should be placed within the bus stop zone to limit conflicts with abutting property or accessible path of travel.

Figure 7.2 Bus Stop in Parking Lane with Multiple Curb-cuts

Bus Stop in Buffered Bike Lane

Bus stops in buffered bike lanes are a type of curbside stop where the bus stop is shared with a bike lane. This type of stop requires the bus to cross over a bike lane when entering or exiting the travel lane. Buffered bike lanes provide the most protection for bicyclists, allowing for more separation between vehicles and bicyclists on the roadway.

Implementation Considerations

- Bus stops in buffered bike lanes must be at least 75 feet , depending on the depth of the buffer.
- The bus stop zone and merge area should be clearly marked to minimize potential bus/bike conflicts.

OakDOT Enhanced Buffered Bike Lane on Telegraph Avenue (Oakland, CA)

Bus Stop in Buffered Bike Lane

Design Elements

1. **Amenities** A bench or a shelter should be considered for placement depending on ridership activity and/or if the stop is located near a major trip generator (e.g., hospital, university). Bike parking should be implemented to enhance multimodal connections.

2. **Accessibility** An accessible path of travel (5′) should be maintained on the sidewalk and the path connecting the bus stop and the sidewalk. An accessible landing area (5′x8′ min., 10′x8′ preferred) and clear zone (12′x4′) must be provided.

3. **Streetscape** The bus stop should be located close enough to street lighting so that passenger waiting areas are fully illuminated. In addition to “No Parking Bus Stop” signs, “No Parking Bike Lane” signs should also be implemented along the corridor to alert bus operators and other vehicles.

4. **Roadway Design** Intersection crossing markings should be applied with green paint to indicate the continuation of the bike lane through the intersection. Bicyclists can be positioned in front of motor vehicles at intersections using bike boxes, or left turns can be made using two-stage turn queue boxes.

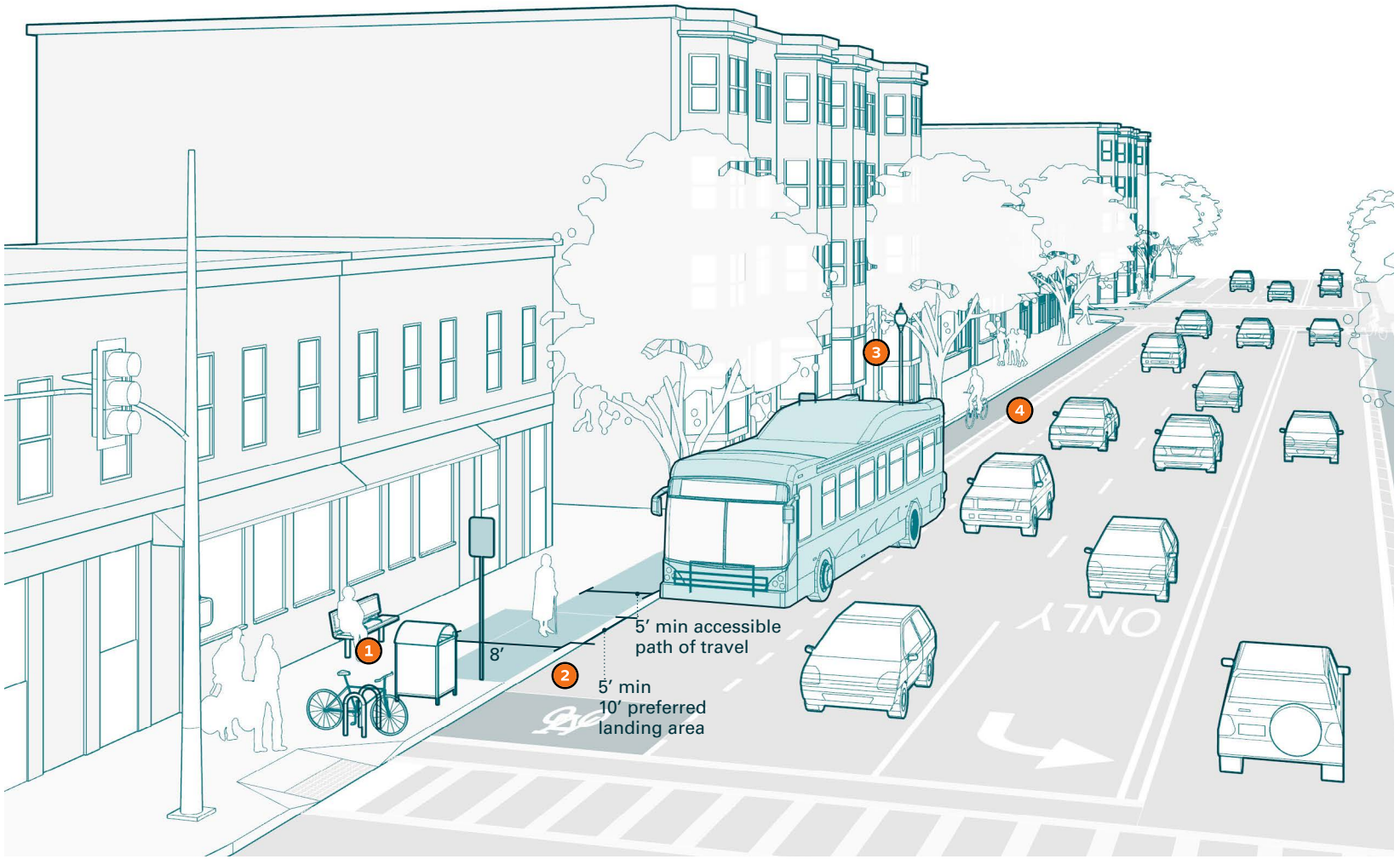


Figure 7.3 Bus Stop in Buffered Bike Lane

Bus Stop Curb Extension

Bus stops with a curb extension are a type of curbside stop where the sidewalk is extended so that the stop is aligned with the parking lane. This allows buses to stop in-lane whereas typically buses would need to merge in and out of the travel lane. Curb extensions provide additional space to accommodate bus stop amenities without encroaching on the clear path of travel at and around the stop. Additionally, this type of stop can be applied near-side and far-side of an intersection or crosswalk.

MetroLink Bus Stop Curb Extension (Glendale, CA)

1. Bus Stop Curb Extension (Far-side of Crosswalk)
2. Bus Stop Curb Extension (Near-side of Crosswalk)

Implementation Considerations

- Bus stop curb extensions must be at least 40 feet.
- An accessible path of travel (5') should be maintained on the sidewalk and the path connecting the bus stop and the sidewalk. An accessible landing area (5'x8' min., 10'x8' preferred) and clear zone (12'x4') must be provided.
- Can be modified to include a bumped out pedestrian crossing, improving pedestrian visibility, and reducing crossing distance.
- Minimal impact to on-street parking.
- Allows for major trip generators and key destinations to abut the stop without impeding pedestrian flows on the sidewalk.
- Most likely to be applied in urban environments with high pedestrian activity and can be applied as a traffic calming treatment.
- Can be shortened and applied in the middle of the parking lane (mid-block). If applied mid-block, the rear of a stopped bus may block parked vehicles temporarily.
- Far-side curb extensions may impact traffic and bicycle flows when a bus is stopped. This may lead to queuing within the intersection on two-lane roadways.
- A partial curb extension may be considered in consultation with RIPTA and/or where:
  - Parking demand is relatively low
  - Allows for general purpose traffic to pass a stopped bus without encroaching on the opposing travel lane
- An accessible path of travel (5') should be maintained on the sidewalk and the path connecting the bus stop and the sidewalk. An accessible landing area (5'x8' min., 10'x8' preferred) and clear zone (12'x4') must be provided.

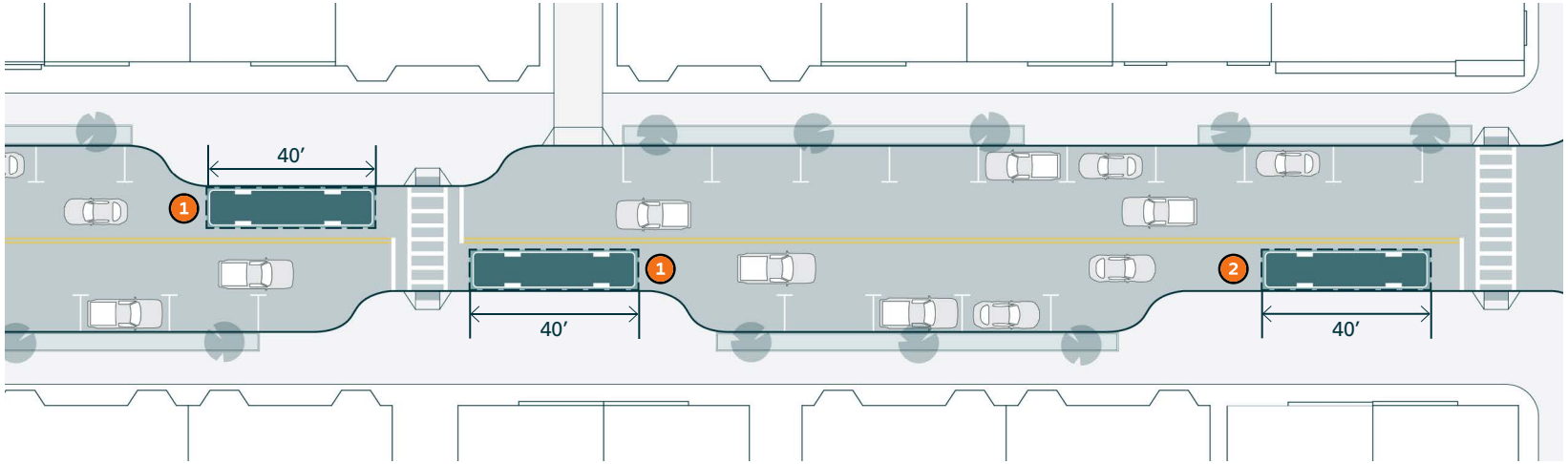


Figure 7.4 Bus Stop Curb Extension

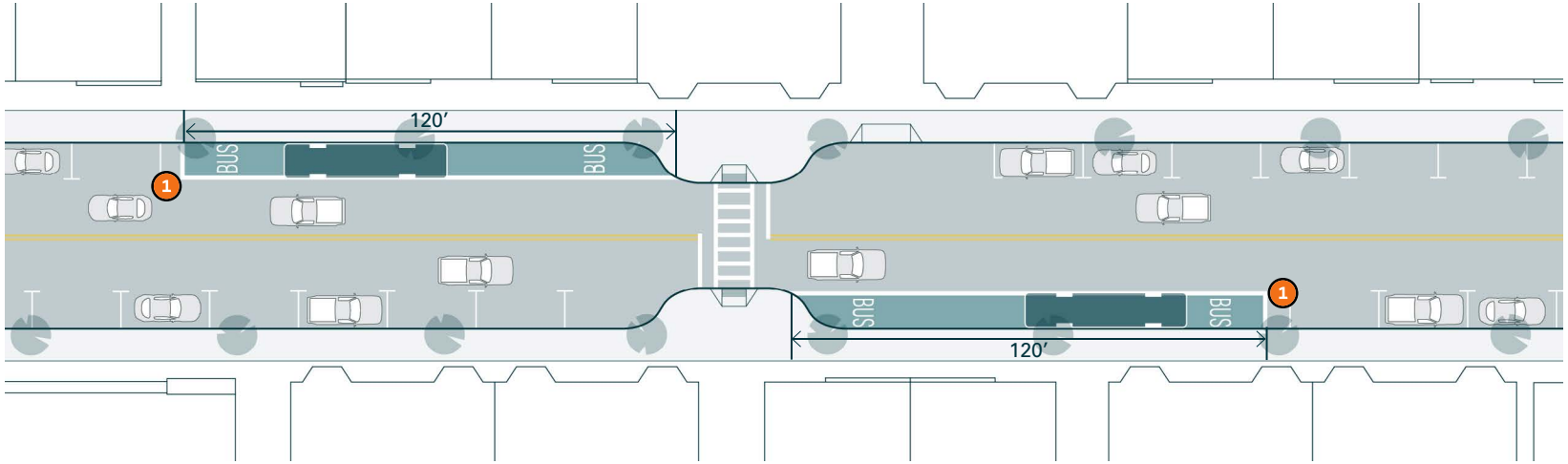
Bus Stop in Parking Lane After Pedestrian Curb Extension

Bus stops in parking lanes after a pedestrian curb extension are typical curbside stops that precede a mid-block pedestrian crossing. This type of stop is most similar to a mid-block stop and requires buses to merge in and out of the travel lane to serve the stop. This type of stop is most likely to be applied near major trip generators or large destinations such as university and medical campuses, and shopping centers.

Bus Stop in Parking lane after Pedestrian Curb Extension (Vancouver, BC)

Implementation Considerations

- Bus stops in parking lanes after pedestrian curb extensions must be at least 120 feet. This provides enough clearance for bus operators to become parallel with the curb when stopped and navigate around parked vehicles.
- An accessible path of travel (5′) should be maintained on the sidewalk and the path connecting the bus stop and the sidewalk. An accessible landing area (5′x8′ min., 10′x8′ preferred) and clear zone (12′x4′) must be provided.
- RIPTA recommends placing additional bus stop signage and supplementary "No Parking" signs at the stop for parking enforcement and to emphasize the bus stop zone.



❶ Bus Stop in Parking Lane After Pedestrian Curb Extension

Figure 7.5 Bus Stop in Parking Lane After Pedestrian Curb Extension

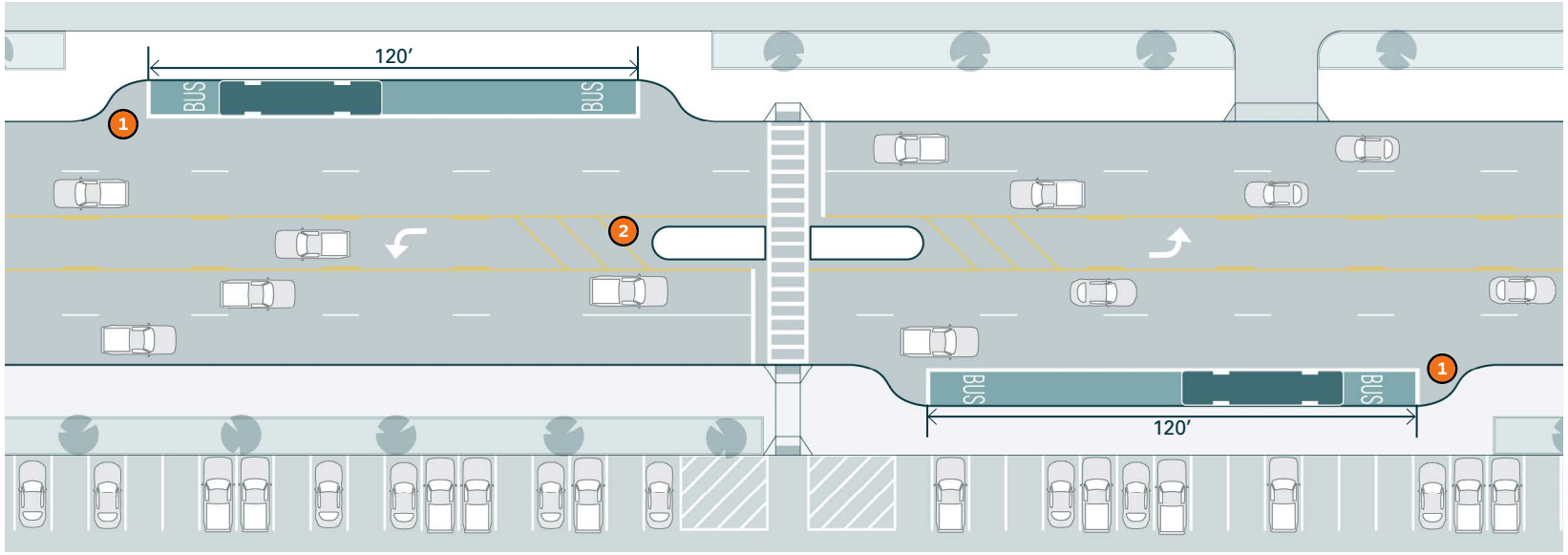
Bus Stop Pull Out

Pull out stops are usually located mid-block and provide a protected boarding and waiting area for passengers away from moving traffic. Pull outs are recommended at stops with longer dwell times or at the end of a route where layovers may occur. This type of bus configuration is a safe option on roadways with greater traffic speeds and can improve the pedestrian environment by increasing the distance between moving traffic and passengers. Pull outs are most likely to be applied near major trip generators or large destinations such as university and medical campuses, and shopping centers.

Tusayan Area Bus Stop Pull Out (Tusayan, AZ)

Implementation Considerations

- Pull outs must be at least 120 feet. This provides enough clearance for bus operators to decelerate and accelerate within the bus stop zone. This length is very critical especially on key corridors with increased traffic speeds (greater than 40 miles per hour).
- An accessible path of travel (5') must be maintained on the sidewalk and the path connecting the bus stop and the sidewalk. An accessible landing area (5'x8' min., 10'x8' preferred) and clear zone (12'x4') must be provided.
- Pull outs require buses to exit and re-enter traffic which may lead to increased delays during peak travel times.
- RIPTA recommends that the width of a bus stop pull out be at least 10 to 12 feet wide.
- Pull outs are most likely to be implemented in suburban or rural environments.
- Preferred at stops with high passenger volumes and/or adjacent to sensitive land uses where riders may be slower to board the bus (e.g., shopping centers/grocery stores when riders are carrying shopping bags).
- RIPTA recommends placing pull outs after crosswalks and traffic intersections to minimize travel delays when re-entering traffic flow.



1. Bus Stop Pull Out
2. Pedestrian Median Refuge Island

Figure 7.6 Bus Stop Pull Out

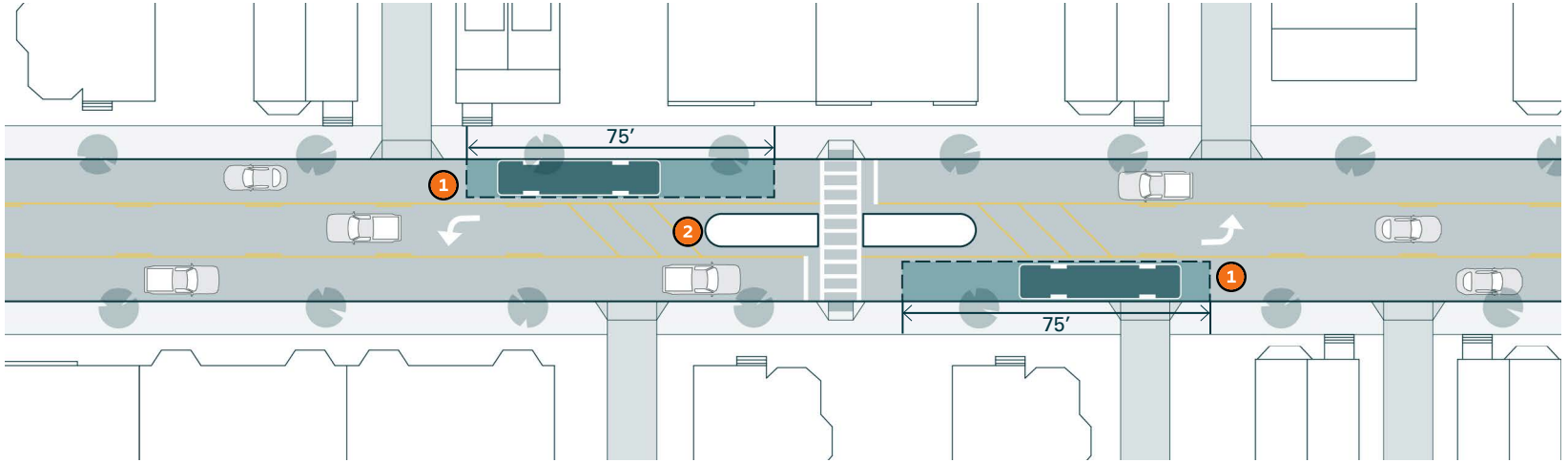
Bus Stop in Travel Lane

Bus stops in travel lanes are a type of in-lane curbside stop that are located on roadways with no on-street parking. This type of stop is most likely to be applied in dense, urban environments or neighborhoods with constrained/narrow right-of-way. Bus stops in the travel lane allow for buses to move in a straight line, eliminating the time needed to exit and re-enter the travel lane, improving reliability and bus travel times.

King County Metro Bus Stop in Travel Lane at 45th St & Corliss Avenue (Seattle, WA)

Implementation Considerations

- Bus stops in travel lanes must be at least 75 feet. This length provides enough space to prevent traffic behind the bus from queuing into the crosswalk and intersection.
- An accessible path of travel (5') must be maintained on the sidewalk and the path connecting the bus stop and the sidewalk. An accessible landing area (5'x8' min., 10'x8' preferred) and clear zone (12'x4') must be provided.
- RIPTA recommends placing this stop type after crosswalks to minimize the opportunity for unsafe overtaking by other vehicles.
- If this stop type is placed on a two-way street with a center turn lane, additional signage that emphasizes the bus stop zone and nearby crossings may be applied to create a safer pedestrian and environment and minimize unsafe overtaking by other vehicles.



1. Bus Stop in Travel Lane
2. Pedestrian Median Safety Island

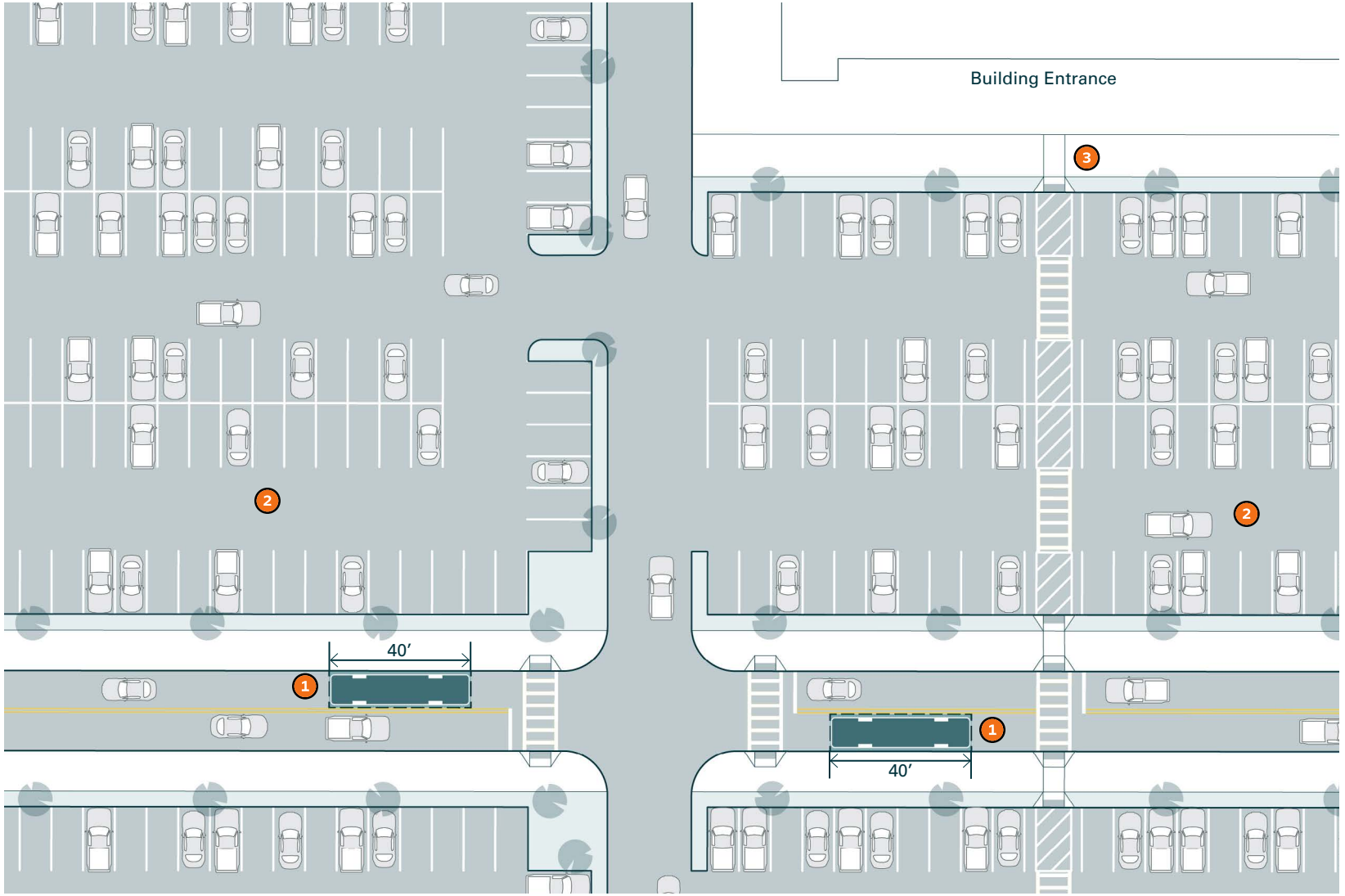
Figure 7.7 Bus Stop in Travel Lane

Off-Street Bus Stop

Off-street bus stops are typical curbside stops located away from the main travel corridor or roadway. This type of stop is usually applied within large shopping centers, on private roadways in the middle of large parking areas, and/or where there are major trip generators with large setbacks (e.g., grocery stores, hospitals). Off-street bus stops can be applied in urban, suburban, and rural environments at various types of retail or commercial developments that can accommodate RIPTA buses and turning movements.

Implementation Considerations

- Off-street bus stops must be at least 40 feet.
- An accessible path of travel (5') must be maintained on the sidewalk and the path connecting the bus stop and the sidewalk. An accessible landing area (5'x8' min., 10'x8' preferred) and clear zone (12'x4') must be provided.
- Avoid navigating around parking vehicles and narrow parking aisles.
- Pedestrian connections to and from building entrances (5' accessible path of travel) must be provided and maintained.
- RIPTA recommends locating cart corrals close to the stop to prevent pedestrians from placing carts at the bus stop that may block the sidewalk and/or boarding area.
- Off-street stops require coordination between RIPTA and private property owners. An agreement regarding upkeep and maintenance of the stop and amenities should be agreed upon prior to stop construction or placement.



1. Off-Street Bus Stop
2. Parking Areas
3. Crosswalk Promenade

Figure 7.8 Off-Street Bus Stop

Bus Stop in Parking Lane with Queue Jump Lane

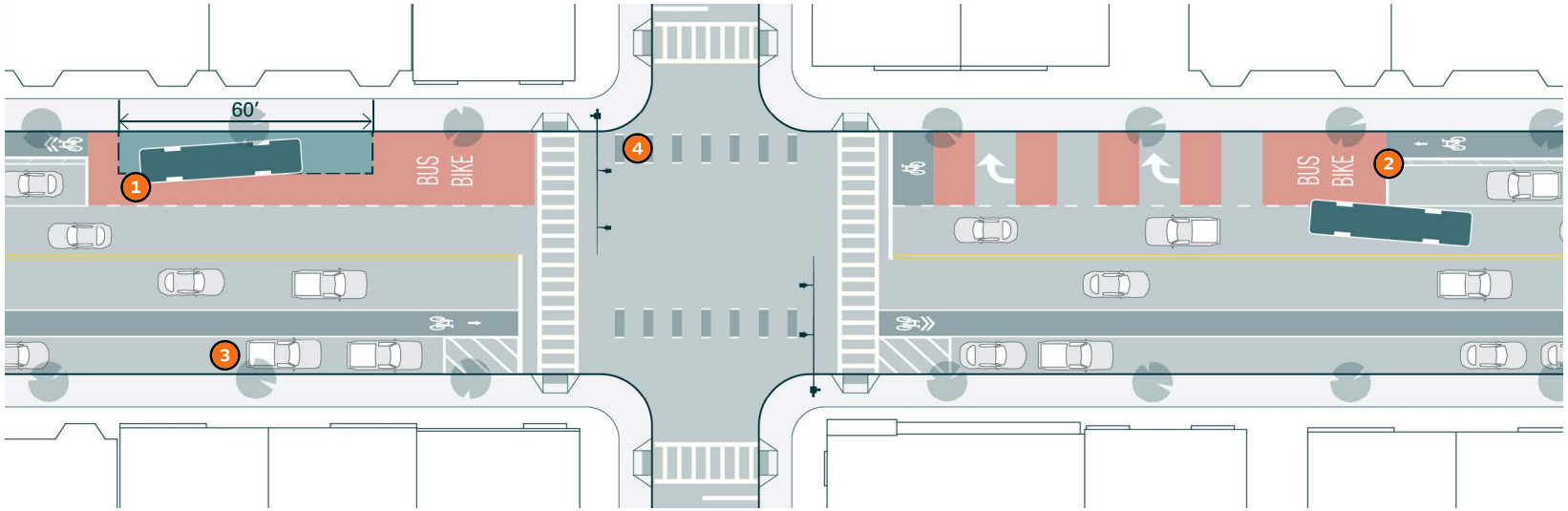
Bus stops in parking lanes with a queue jump lane are a type of curbside stop where there is a bus queue jump ideally used in conjunction with transit signal priority (TSP) and is placed far-side of a signalized intersection. Bus queue jumps are used exclusively by buses, but if curbside, there must be signal control to prevent right turns in front of the bus or right turns should be banned completely. This type of stop is most likely to be implemented on signalized streets that experience high traffic volumes during peak travel times.

TriMet Bus Queue Jump Lane (Portland, OR)

1. Bus Stop in Parking Lane with Queue Jump Lane
2. Parking Protected Bike Lane
3. On-Street Parking
4. Transit Signal Priority

Implementation Considerations

- Bus stops in parking lanes with queue jump lanes must be at least 60 feet.
- Bus queue jump lanes can be implemented between a curbside right-turn lane and a general purpose traffic lane(s) for other traffic movements to occur.
- An accessible path of travel (5′) must be maintained on the sidewalk and the path connecting the bus stop and the sidewalk. An accessible landing area (5′x8′ min., 10′x8′ preferred) and clear zone (12′x4′) must be provided.
- This type of stop requires the bus to cross over a bike lane when entering or exiting the travel lane therefore the bus stop zone and merge area should be clearly marked to minimize potential bus/bike conflicts.
- RIPTA recommends applying bike boxes at the head of the queue jump lane. Bike boxes are a designated area at a signalized intersection that provides bicyclists with a safe and visible way to get ahead of queuing traffic during the red signal phase. The application of bike boxes should be determined on a site-specific basis in coordination with RIDOT or other roadway owners.
- RIPTA recommends applying bus lanes and additional roadway striping in conjunction with TSP, however, bus lanes are not required when implementing TSP.



Glossary & Appendices

Glossary

Accessible Path of Travel – Includes a continuous, unobstructed way of pedestrian passage by means of which an area may be approached, entered, and exited. An accessible path of travel may consist of walks and sidewalks, curb ramps and exterior pedestrian ramps, or a combination of these elements.

ADA – The Americans with Disabilities Act (ADA) is one of America's most comprehensive pieces of civil rights legislation that prohibits discrimination and guarantees that people with disabilities have the same opportunities as everyone else. It is an "equal opportunity" law for people with disabilities. The Department of Justice's revised regulations for Titles II and III of the Americans with Disabilities Act of 1990 (ADA) were published in the Federal Register on September 15, 2010. These regulations adopted revised, enforceable accessibility standards called the 2010 ADA Standards for Accessible Design, "2010 Standards". On March 15, 2012, compliance with the 2010 Standards was required for new construction and alterations under Titles II and III. March 15, 2012, is also the compliance date for using the 2010 Standards for program accessibility and barrier removal. Section 810 references standards required for Transportation Facilities, including bus stops.

ADAAG – ADA Accessibility Guidelines (ADAAG) were the original guidelines developed by the US Access Board in 1991. The Department of Transportation implemented the ADA regulations by incorporating these guidelines verbatim in an Appendix to the Department of Transportation's Code of Federal Regulations 49, Part 37.

Bike Lane – A designated lane on a roadway that provides an exclusive space for bicycle travel. Lanes may be painted or designated by a single white line and bicycle symbols. Colored paint can provide added emphasis.

Bus Stop Checklist – A checklist or inspection form for an existing bus stop, or proposed new bus stop location, to determine its compliance with RIPTA and ADA bus stop design guidelines.

Floating Bus Stop – A curb extension at a bus stop where the bike lane runs behind the passenger waiting area, effectively creating an island (also referred to as a floating bus stop or bus stop bypass).

Bus Lane – A segment of the roadway designated exclusively for use by buses, to improve travel times and reliability. Bus lanes are commonly painted in red.

Bus Queue Jump Lane – A short stretch of bus lane, which sometimes includes right turning vehicles, on an intersection approach, allowing buses to jump to the front of a line of waiting vehicles. It can be combined with an advance green signal for buses only.

Complete Streets – Roadways designed to accommodate users of all ages and abilities traveling by all modes, including walking, biking, driving, and transit. The Rhode Island General Assembly passed a complete streets law in June 2012 to integrate all modes into roadway design and construction projects.

Curb Extension – An extension of the sidewalk into the parking lane to narrow the roadway and provide additional pedestrian space (also referred to as a bulb-out or neckdown, and at bus stops – a bus nub).

Curb Ramp – A ramp provided to transition between the roadway and sidewalk.

Dwell Time – The time a bus spends at a scheduled stop without moving.

Landing Area – An ADA compliant boarding and alighting area required at the front door boarding area of a bus stop. This must be at least a 5-foot wide by 8-foot deep obstruction free area on the sidewalk, on a firm and stable surface, with a cross slope of less than 2%. The landing area cannot encompass a grass strip, tree pit or similar soft surface, or include dirt or gravel (also referred to as a landing pad).

Pull Out – An area on the side of a roadway, indented into the sidewalk, where buses can pull out of the general flow of traffic (also referred to as a bus bay, cut out and turn out).

PROWAG – A set of Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way (PROWAG), developed by the US Access Board, that provides guidance on ADA design. PROWAG was developed in 2011 but have yet to be adopted by the Department of Justice. When they are adopted, they will become enforceable standards under Title II of the ADA. Several agencies, including RIDOT, have already chosen to follow PROWAG when at all feasible.

Transit Signal Priority (TSP) – A method of signal timing that prompts the signal to wait or change for an approaching bus, giving priority to transit vehicles at an intersection.

Appendix A: Fleet Specifications

The following amenities are available under RIPTA's contract with Tolar Manufacturing Company. This selection is a sample of different amenity types included within RIPTA's contract and does not include all amenities that are available for distribution/placement. For more information regarding specifications, procurement, and additional amenity types, please contact RIPTA's Service Planning Department.

RADIUS (R1) OF INNER REAR WHEEL RADIUS (R2) OF OUTER FRONT CORNER MINIMUM DESIRABLE MINIMUM CENTERLINE RADIUS = 38 FEET 28' 30' 50' 55

TURNING RADIUS TEMPLATE The minimum interior radius is 28 feet, and the minimum outer radius is 50 feet. These templates may be used in the design of facilities to identify required pavement width and possible vehicle encroachment. Additional allowance should be made under special circumstances.

Recommended Curb Radii for Right Turn Movements

Width of Approach Lane	Width of Entered Lane (ft)	Recommended Curb Radius (ft)
12 ft (i.e. one lane)	12	50
	16	45
	20	40
	24	35
16 ft (i.e. one lane with 4 ft shoulder)	12	45
	16	40
	20	30
	24	25
20 ft (i.e. one lane with parking)	12	40
	16	35
	20	30
	24	25

Source: AASHTO 2014

xcelsior CHARGE NG™

NEW FLYER

Technical Summary

The Xcelsior CHARGE NG™ Forty-Foot Battery-Electric Transit Bus

MEASUREMENTS	
Length	41' (12.5m) including bumpers
Roof Height	11' 1" (3.4m)
Step Height	14" (356mm)
Front Step Height Kneeled	10" (254mm)
Interior Height - Floor to Ceiling	79" (2m) over front and rear axle; 95" (2.4m) mid-coach
Tire Size	305/70R22.5
Aisle Width	22"- 24"
Wheel Base	283.75" (7.2m)
PROPULSION	
Propulsion System	Siemens PEM 1DB2022, 275 KW
Transmission	None - Direct Drive
CHARGING SYSTEMS	
Overhead Charging	450 KW DC charge bars compliant to SAE J3105
Plug-In Charging	Two single receptacles
ACCESSIBILITY	
Passenger Doors	Entrance: Pneumatic Vapor Slide Glide Exit: Pneumatic Medium Ameriview Vapor Slide Glide
Wheelchair Accessibility	LIFT-U LU11 GEN3 electric ramp at front door, 32" wide, with 1:7 slope
Wheelchair Positions	2
TURNING RADIUS	
Turning radius (body w/aluminum wheels)	44' (13.4m)
WEIGHT	
Curb Weight	34,640 lbs

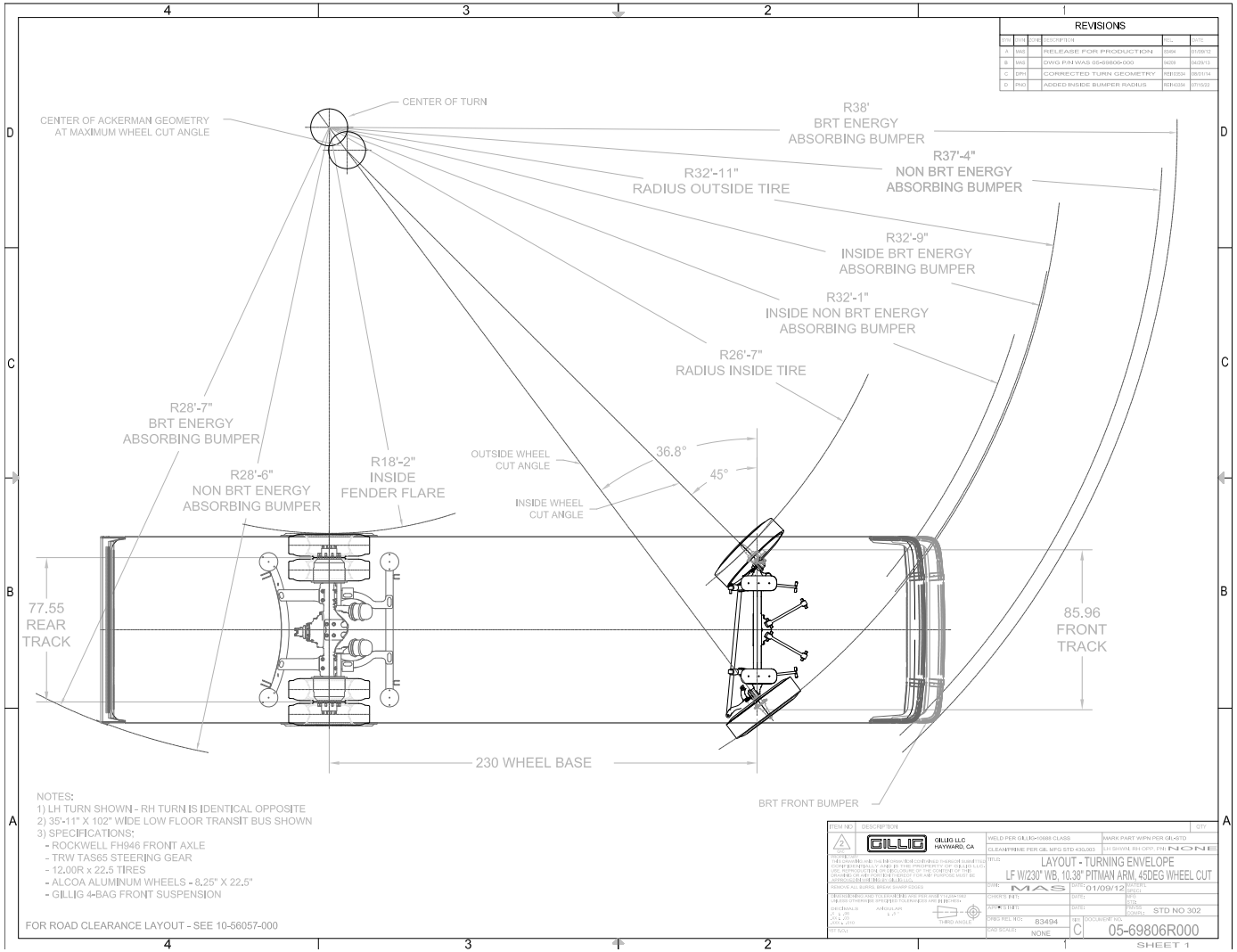
CAPACITY	
Seats/Standees	38/26
Total Capacity	64
CLEARANCES	
Approach/Breakover Angles/Departure	9º/9º/9º
MAIN COMPONENTS	
Range	320 kWh
Cooling System	EMP Radiator cooler
HVAC	Thermo King TE15 rear A/C unit
Battery Management System	Transtech regulator w/Low Voltage Disconnect, temperature and current sensors to optimize battery life
Electrical System	Vansco Instrument Panel Cluster with LCD touch display screen
Flooring	Lower deck - SpaceAge composite Upper deck - Fiberglass composite for step & floor to the rear wheelhouses Rear - SpaceAge composite
FEATURES	
Diagnostic & Monitoring System	NFI Connect™
Performance Reporting & Analytics	Connect 360™
Bike Rack	Sportworks DL2-WP (wide profile)
Additional Safety	Amerex Fire Suppression System Video Surveillance System Back-up Alarm

A 40-foot electric bus can save up to 135 metric tons of greenhouse gas (GHG) annually, which is what a traditional 40-foot clean diesel bus would emit per year.

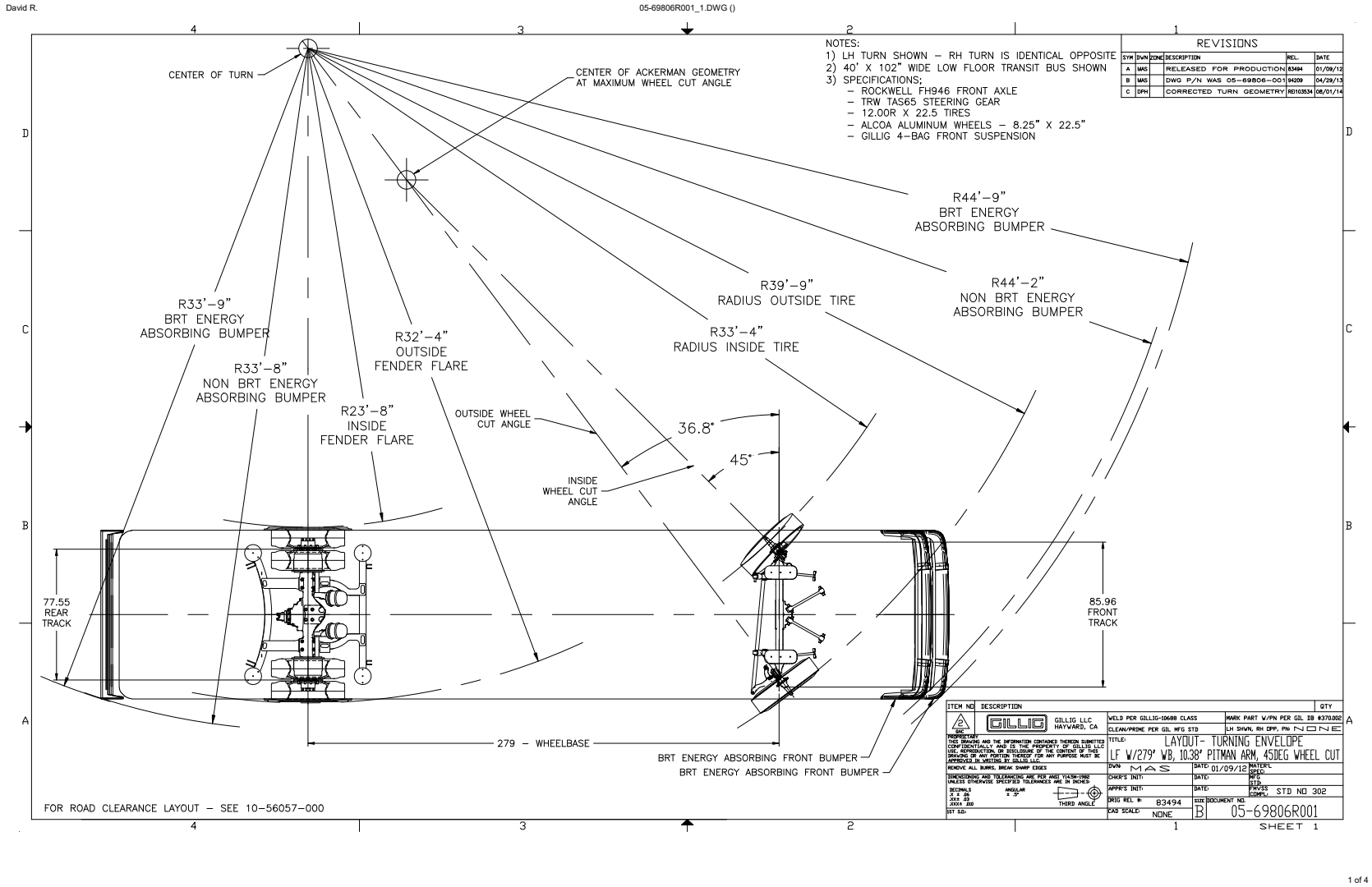
newflyer.com/NG

Built to Rely On®

Appendix A: Fleet Specifications

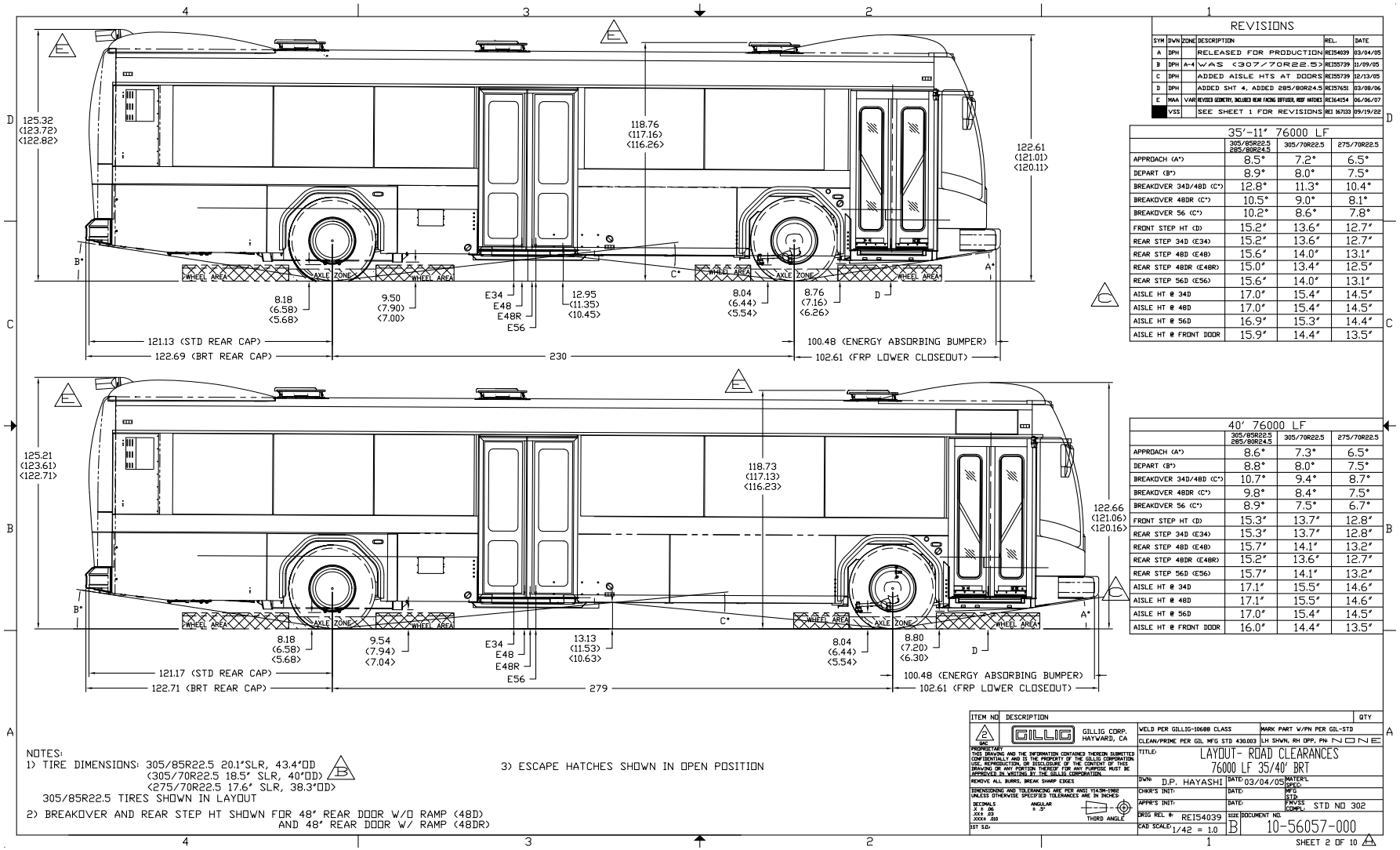


Appendix A: Fleet Specifications



1 of 4

Appendix A: Fleet Specifications



REVISIONS					
SYM	DWN	ZONE	DESCRIPTION	REL.	DATE
A	DPH		RELEASED FOR PRODUCTION	REI54039	03/04/05
B	DPH	A-4	WAS <307/70R22.5>	REI55739	11/09/05
C	DPH		ADDED AISLE HTS AT DOORS	REI55739	12/13/05
D	DPH		ADDED SHT 4, ADDED 285/80R24.5	REI57651	03/09/06
E	MAA	VAR	REVISED GEOMETRY, INCLUDED REAR FACING DIFFUSER, ROOF HATCHES	REI64154	06/06/07
	VSS		SEE SHEET 1 FOR REVISIONS	REI 167133	09/19/22

35′-11″ 76000 LF			
	305/85R22.5 285/80R24.5	305/70R22.5	275/70R22.5
APPROACH (A°)	8.5°	7.2°	6.5°
DEPART (B°)	8.9°	8.0°	7.5°
BREAKOVER 34D/48D (C°)	12.8°	11.3°	10.4°
BREAKOVER 48DR (C°)	10.5°	9.0°	8.1°
BREAKOVER 56 (C°)	10.2°	8.6°	7.8°
FRONT STEP HT (D)	15.2″	13.6″	12.7″
REAR STEP 34D (E34)	15.2″	13.6″	12.7″
REAR STEP 48D (E48)	15.6″	14.0″	13.1″
REAR STEP 48DR (E48R)	15.0″	13.4″	12.5″
REAR STEP 56D (E56)	15.6″	14.0″	13.1″
AISLE HT @ 34D	17.0″	15.4″	14.5″
AISLE HT @ 48D	17.0″	15.4″	14.5″
AISLE HT @ 56D	16.9″	15.3″	14.4″
AISLE HT @ FRONT DOOR	15.9″	14.4″	13.5″

40′ 76000 LF			
	305/85R22.5 285/80R24.5	305/70R22.5	275/70R22.5
APPROACH (A°)	8.6°	7.3°	6.5°
DEPART (B°)	8.8°	8.0°	7.5°
BREAKOVER 34D/48D (C°)	10.7°	9.4°	8.7°
BREAKOVER 48DR (C°)	9.8°	8.4°	7.5°
BREAKOVER 56 (C°)	8.9°	7.5°	6.7°
FRONT STEP HT (D)	15.3″	13.7″	12.8″
REAR STEP 34D (E34)	15.3″	13.7″	12.8″
REAR STEP 48D (E48)	15.7″	14.1″	13.2″
REAR STEP 48DR (E48R)	15.2″	13.6″	12.7″
REAR STEP 56D (E56)	15.7″	14.1″	13.2″
AISLE HT @ 34D	17.1″	15.5″	14.6″
AISLE HT @ 48D	17.1″	15.5″	14.6″
AISLE HT @ 56D	17.0″	15.4″	14.5″
AISLE HT @ FRONT DOOR	16.0″	14.4″	13.5″

NOTES:
1) TIRE DIMENSIONS: 305/85R22.5 20.1″SLR, 43.4″OD
(305/70R22.5 18.5″ SLR, 40″OD)
(275/70R22.5 17.6″ SLR, 38.3″OD)
305/85R22.5 TIRES SHOWN IN LAYOUT
2) BREAKOVER AND REAR STEP HT SHOWN FOR 48″ REAR DOOR W/O RAMP (48D)
AND 48″ REAR DOOR W/ RAMP (48DR)
3) ESCAPE HATCHES SHOWN IN OPEN POSITION

ITEM NO	DESCRIPTION	QTY
2	GILLIG CORP. HAYWARD, CA	

WELD PER GILLIG-10688 CLASS | MARK PART W/PN PER GIL-STD
CLEAN/PRIME PER GIL MFG STD 430.003 | LH SHWN, RH OPP, PN: NONE

PROPRIETARY: THIS DRAWING AND THE INFORMATION CONTAINED THEREON SUBMITTED FOR CONFIDENTIAL USE AND IS THE PROPERTY OF THE GILLIG CORPORATION. USE, REPRODUCTION, OR DISCLOSURE OF THE CONTENT OF THIS DRAWING OR ANY PORTION THEREOF FOR ANY PURPOSE MUST BE APPROVED IN WRITING BY THE GILLIG CORPORATION.

REMOVE ALL BURRS, BREAK SHARP EDGES

DIMENSIONING AND TOLERANCING ARE PER ANSI Y14.5M-1982
UNLESS OTHERWISE SPECIFIED TOLERANCES ARE IN INCHES:
DECIMALS: .X ± .06, .XX ± .03, .XXX ± .010
ANGULAR ± .5°
THIRD ANGLE
1ST SQ:

TITLE: LAYOUT- ROAD CLEARANCES
76000 LF 35/40′ BRT

DWN: D.P. HAYASHI | DATE: 03/04/05 | MATER'L SPEC:
CHK'R'S INIT: | DATE: | MFG STD:
APPR'S INIT: | DATE: | PRVSE COMPL: STD NO 302
DRIG REL #: REI54039 | SIZE: B | DOCUMENT NO: 10-56057-000
CAD SCALE: 1/42 = 1.0 | SHEET 2 OF 10

Appendix B: Bus Stop Checklist

Date: _____ Surveyor's Name: _____

1. Stop ID / Code: _____

2. Stop Name: _____

3. Route Served: _____

4. Municipality: _____

5. Street Full Name: _____

6. Roadway Speed Limit: _____

7. Roadway Owner (Circle One): Municipal State Private Other

8. Adjacent Property Type: Residential Commercial Industrial Other:_____

Stop Characteristics:

9. Signage Type: New Old Missing

10. Signpost Type: None U-Channel Square Post Round Post Utility Pole Streetlamp Other

11. Signpost Owner: RIPTA Roadway Owner Utility Other

12. Shelter Type: None Lamar Brasco TransArt Streetsmart Municipal Other

13. Shelter Condition: N/A Poor Fair Good

14. Seating: None Lamar Brasco Streetsmart Municipal Other

15. Seating Condition: N/A Poor Fair Good

16. Bicycle Parking: None RIPTA Other

17. Trash Receptacles: N/A RIPTA Other

18. Schedule Info: Y or N

19. Lighting: None RIPTA Shelter Streetlamp Utility Pole Other

20. Lighting Power: N/A AC Solar/Battery Other

21. Lighting Condition: N/A Poor Fair Good

(More on the back →)

22. Bus Stopping Zone: Y or N

23. Clear/Landing Zone: Y N Unknown

24. Pedestrian Path of Travel (Sidewalks): None Poor Fair Good

25. Crosswalk: None Poor Fair Good

26. Pedestrian Signal Equipment: Y or N

27. Other Stop Amenities (If Any):

_____

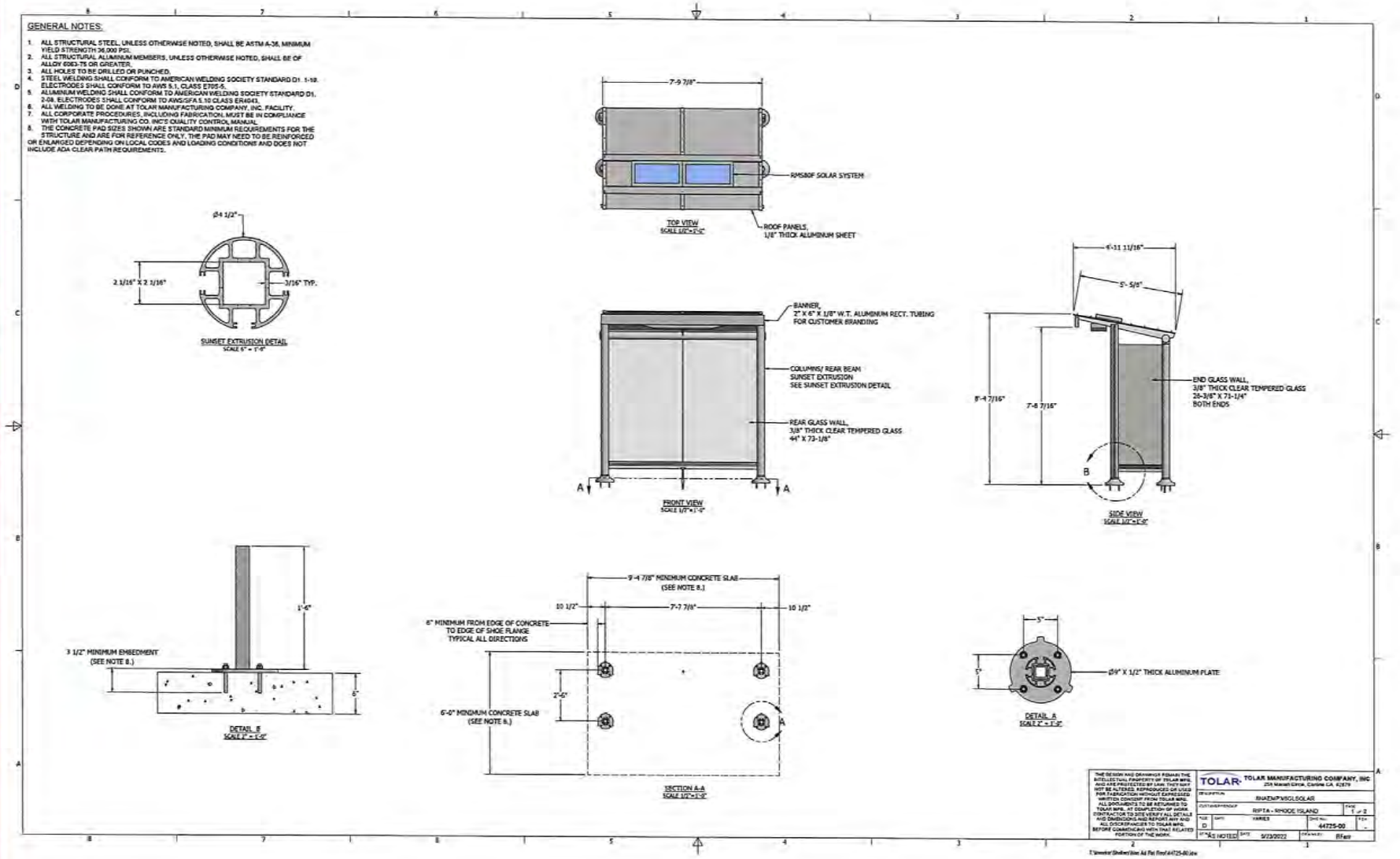
_____

28. Comments:

29. Need Additional Support? Y or N

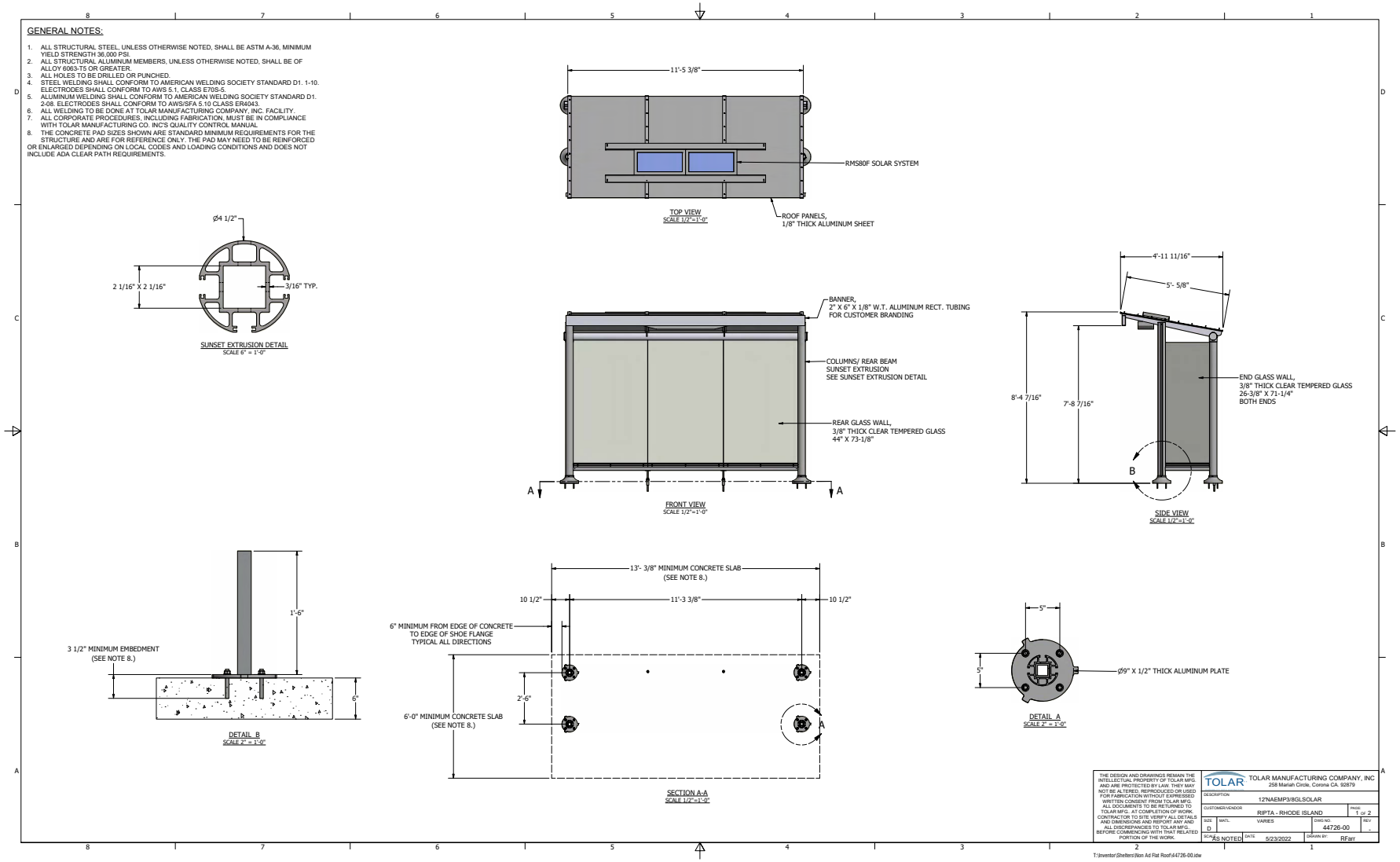
When finished, please take photos of this form, with Surveyor's Name and Stop ID clearly shown on top, then take photos of the stop. Upon return to RIPTA office, please file the form and upload all the data and photos into the online database.

Appendix C: Amenities



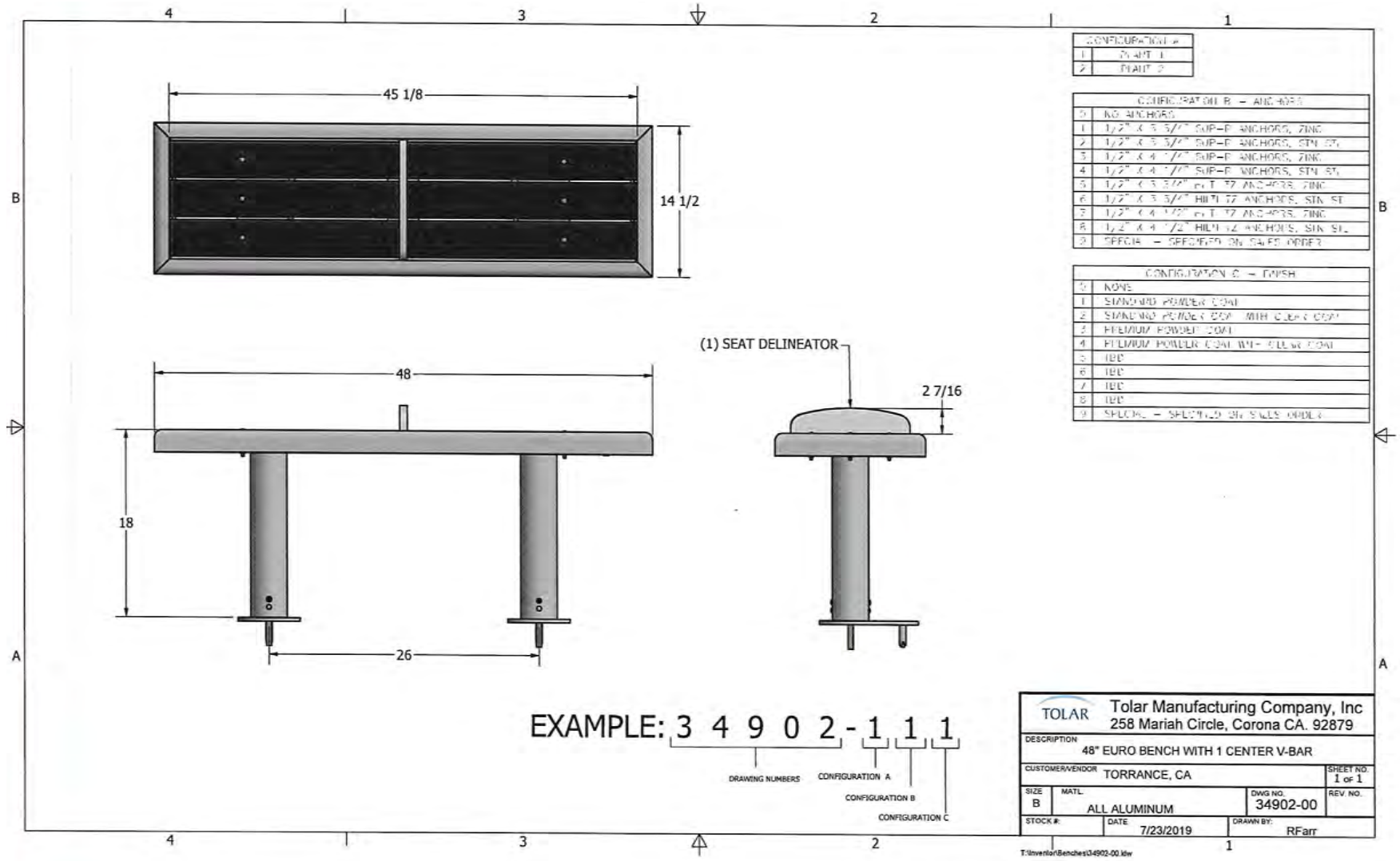
Appendix C: Amenities

Appendix C: Amenities

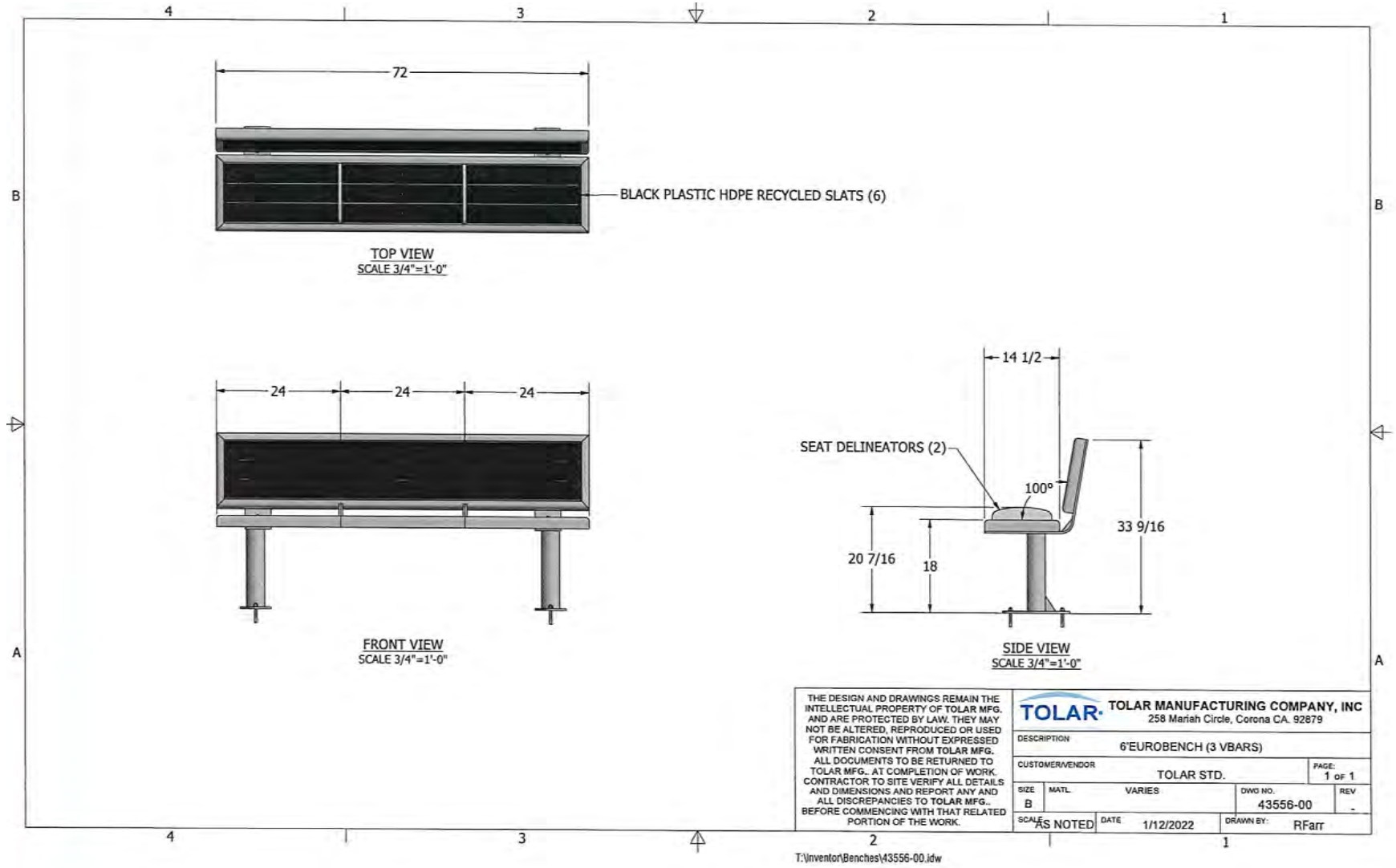


Appendix C: Amenities

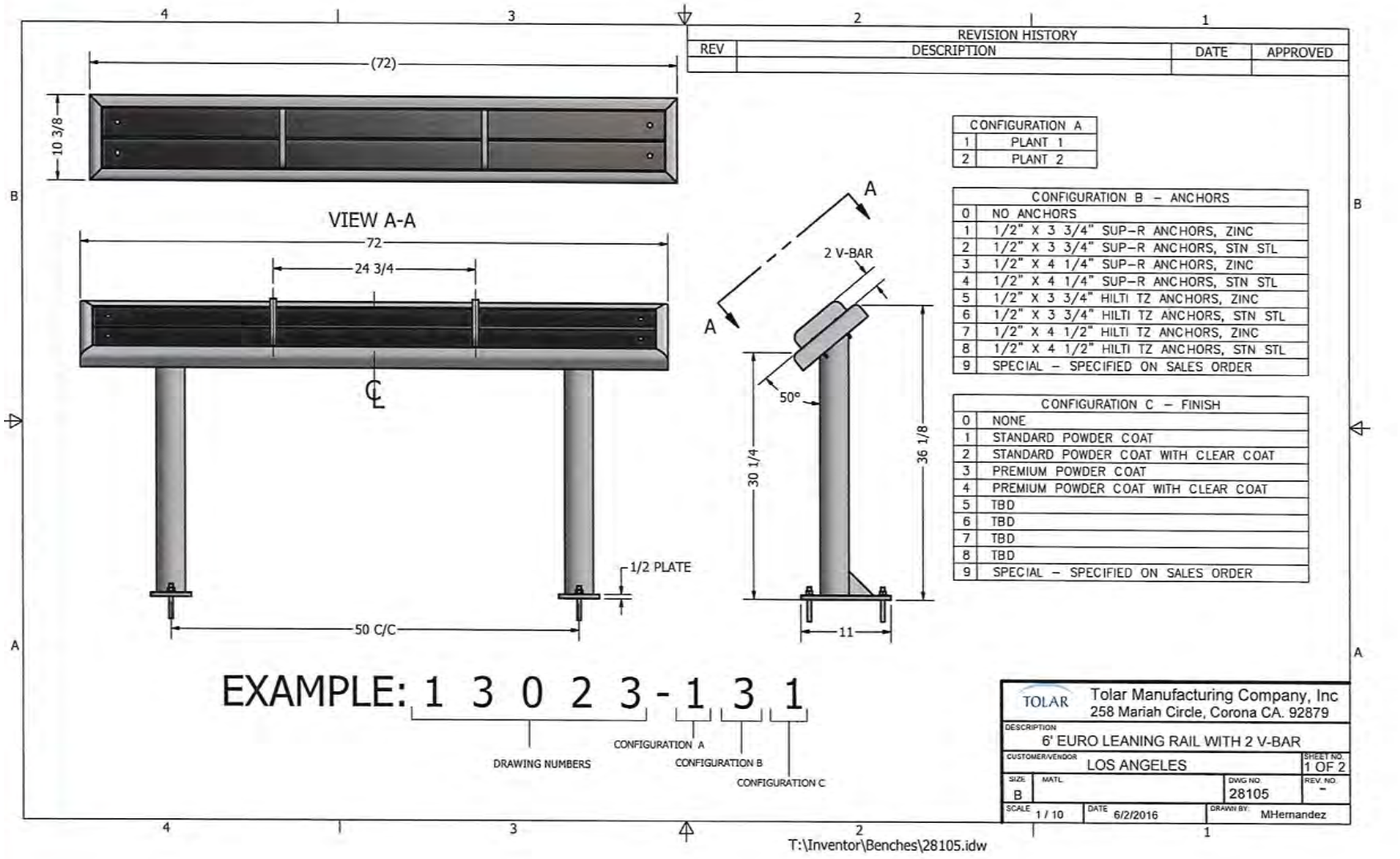
Appendix C: Amenities



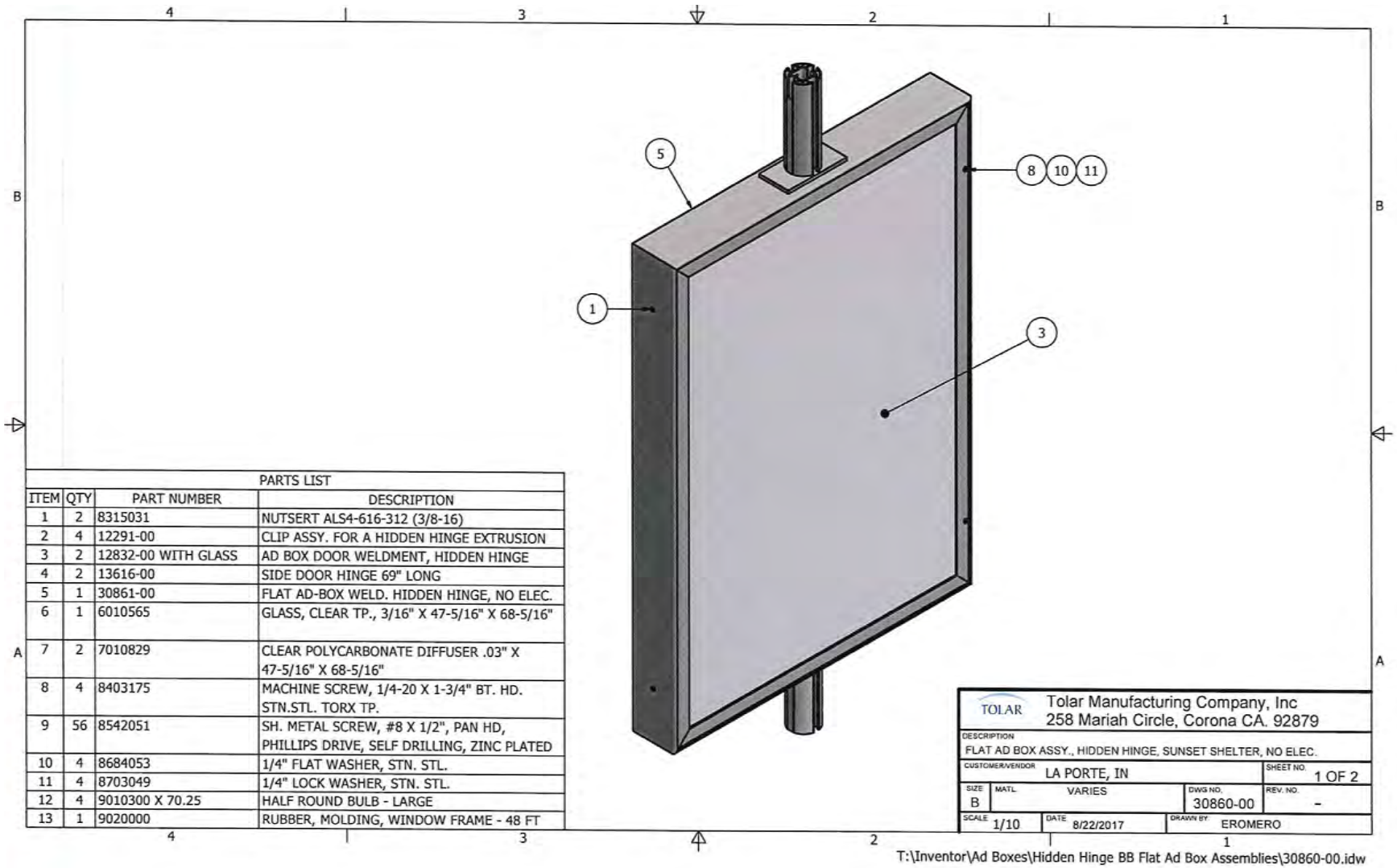
Appendix C: Amenities



Appendix C: Amenities



Appendix C: Amenities



PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	8315031	NUTSERT ALS4-616-312 (3/8-16)
2	4	12291-00	CLIP ASSY. FOR A HIDDEN HINGE EXTRUSION
3	2	12832-00 WITH GLASS	AD BOX DOOR WELDMENT, HIDDEN HINGE
4	2	13616-00	SIDE DOOR HINGE 69" LONG
5	1	30861-00	FLAT AD-BOX WELD. HIDDEN HINGE, NO ELEC.
6	1	6010565	GLASS, CLEAR TP., 3/16" X 47-5/16" X 68-5/16"
7	2	7010829	CLEAR POLYCARBONATE DIFFUSER .03" X 47-5/16" X 68-5/16"
8	4	8403175	MACHINE SCREW, 1/4-20 X 1-3/4" BT. HD. STN.STL. TORX TP.
9	56	8542051	SH. METAL SCREW, #8 X 1/2", PAN HD, PHILLIPS DRIVE, SELF DRILLING, ZINC PLATED
10	4	8684053	1/4" FLAT WASHER, STN. STL.
11	4	8703049	1/4" LOCK WASHER, STN. STL.
12	4	9010300 X 70.25	HALF ROUND BULB - LARGE
13	1	9020000	RUBBER, MOLDING, WINDOW FRAME - 48 FT

TOLAR Tolar Manufacturing Company, Inc
258 Mariah Circle, Corona CA. 92879

DESCRIPTION: FLAT AD BOX ASSY., HIDDEN HINGE, SUNSET SHELTER, NO ELEC.

CUSTOMER/VENDOR			SHEET NO.
LA PORTE, IN			1 OF 2
SIZE: B	MATL: VARIES	DWG NO.: 30860-00	REV. NO.: -
SCALE: 1/10	DATE: 8/22/2017	DRAWN BY: EROMERO	

T:\Inventor\Ad Boxes\Hidden Hinge BB Flat Ad Box Assemblies\30860-00.idw

Appendix C: Amenities

Keyser

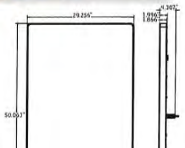
55” Commercial High Bright Outdoor Display

Keyser Industries Inc. is proud to release their brand new 55" Outdoor LCD display featuring the most cost-efficient design, allowing all customers of Keyser growing into digital, to never grow out of it! Enhance your overall customer experience with Keyser's 3000nit LCD display, that specializes in high commercial performance and high bright output remains polarized in any climate while also combating unwanted glare thanks to its high impact reflective coating.

Keyser's LCD displays are the greatest, most powerful turnkey signage solution for any outdoor business and environment. Combine confidence with convenience with the Keyser's Outdoor 55" display by leveraging this application in your digital drive thru, interactive kiosk or directory. Improve order accuracy, decrease wait times, amplify sales and promote your business' brand with this eye-catching LCD display. Invest in a digital solution that is worthwhile and guaranteed results with Keyser's most-competitive pricing.

As always, Keyser's display systems are made in the USA. "Your display needs should be served by the innovator not the imitator."

For further information and quotes on Keyser's 55" Outdoor LCD Display see https://explorekeyser.com or email sales@explorekeyser.com to learn more about Keyser's vast product line and capabilities.



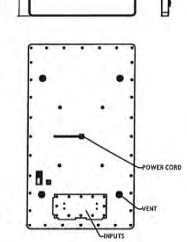
- IPS Panel for high commercial performance
- Polarizer won't black out with polarized sunglasses in landscape or portrait mode mounting.
- HD 1920x1080 resolution with a clearing temperature of 230F.
- Anti-Reflective safety glass with a beautiful optically bonded seal prevents debris intrusion and compliments a stunning image.

HIGH BRIGHT OUTPUT
3000Nit Brightness to combat the sun on the brightest of days. See your great HD images in direct sunlight.

WEATHER TIGHT MANUFACTURING PROCESS
Built to withstand the harshest of weather conditions, this Ip67 monitor stops any ingress of outside moisture, dirt and debris from effecting performance.

IK10 RATED, IMPACT RESISTANT TEMPERED COVER GLASS
Not only does the glass protect against high impact, its anti-reflective coating helps combat unwanted glare.

K-DEMAND TECHNOLOGY
Offers high bright display performance, while also providing up to a 35% decrease in power consumption. No mechanical cooling design transfers heat from the critical components while having the ability to withstand +140F degrees in direct solar load.



Model Number

LCD Display

ACTIVE SCREEN SIZE	55" (1397mm) Diagonal
PIXEL PITCH	.210 x .630mm
ASPECT RATIO	16:9
RESOLUTION	1920 x 1080
COLOR DEPTH	10b it (1.07 Billion Colors)
BRIGHTNESS	3,000cd/m (3,000NIt)
CONTRAST RATIO	1200:1
VIEWING ANGLE	178° Vertical/Horizontal
RESPONSE TIME	8ms (Gray to Gray)
REFRESH RATE	60Hz
OPERATING TIME	24/7

Mechanical

SIZE (W x H x D)	29.256" x 50.063" x 2.000" (743.1 x 1271.6 x 50.8mm)
COLOR	Black (Standard) Custom colors Available
GLASS	IK10 Rated, Tempered & Anti-reflective
VESA PATTERN	300 x 400mm
NET WEIGHT	88.19lbs (40.0kg)

Environmental

OPERATING TEMPERATURE	-31°F - 140°F (-35°C - 60°C)
IP RATING	Ip67
SAFETY/EMC	FCC Class A

Input/Output Connections

HDMI INPUT	HDMI (x2), 480i, 480p, 576i, 576p 720p, 1080i, 1080p
ANALOG AUDIO INPUT	3.5 mm Headphone Jack (x1)
USB 2.0 DATA	USB A (Female) (x2)
VGA INPUT	15 pin D-SUB (x1), up to 1920x1080@60HZ
Rs232 CONTROL	9 pin D-SUB (Female) (x1)
DIGITAL AUDIO OUTPUT	Optical (x1)
LAN INPUT	RJ45 (x2)

Power

AC INPUT	100 VAC to 240 VAC, 50 to 60Hz
POWER CONSUMPTION	200W

Operating System - Android 8.1 with Bluetooth and WIFI

Operating Temperature Range: -31°F - 140°F

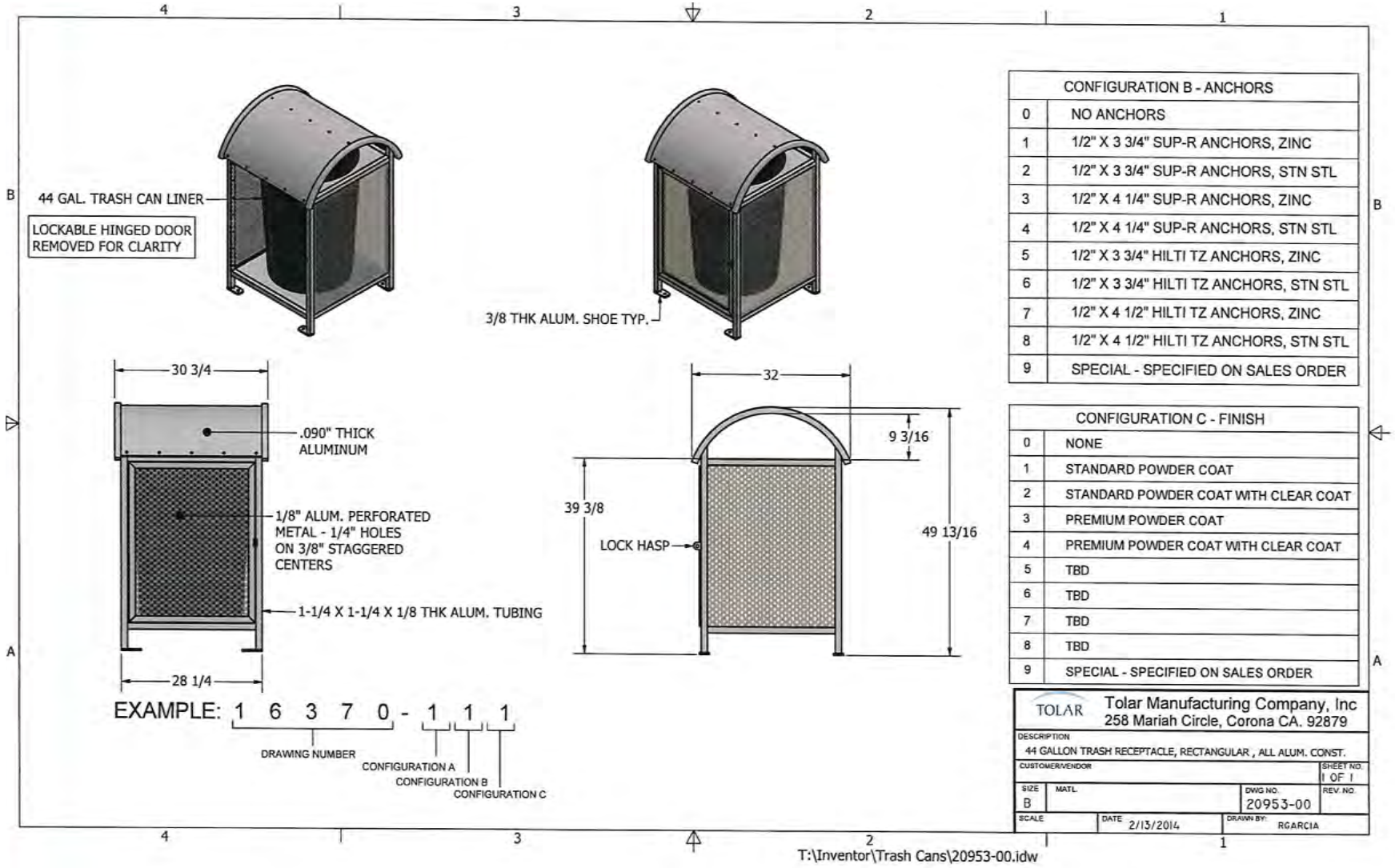
All Weather Rated (IP67)

RoHS FC CE IP UL LISTED

WARRANTY: 2 years

9015 S. Kedzie Avenue, Evergreen Park, IL 60805
p: 800.499.0400 f:708.499.4620 e: sales@explorekeyser.com
www.explorekeyser.com

Appendix C: Amenities



CONFIGURATION B - ANCHORS	
0	NO ANCHORS
1	1/2" X 3 3/4" SUP-R ANCHORS, ZINC
2	1/2" X 3 3/4" SUP-R ANCHORS, STN STL
3	1/2" X 4 1/4" SUP-R ANCHORS, ZINC
4	1/2" X 4 1/4" SUP-R ANCHORS, STN STL
5	1/2" X 3 3/4" HILTI TZ ANCHORS, ZINC
6	1/2" X 3 3/4" HILTI TZ ANCHORS, STN STL
7	1/2" X 4 1/2" HILTI TZ ANCHORS, ZINC
8	1/2" X 4 1/2" HILTI TZ ANCHORS, STN STL
9	SPECIAL - SPECIFIED ON SALES ORDER

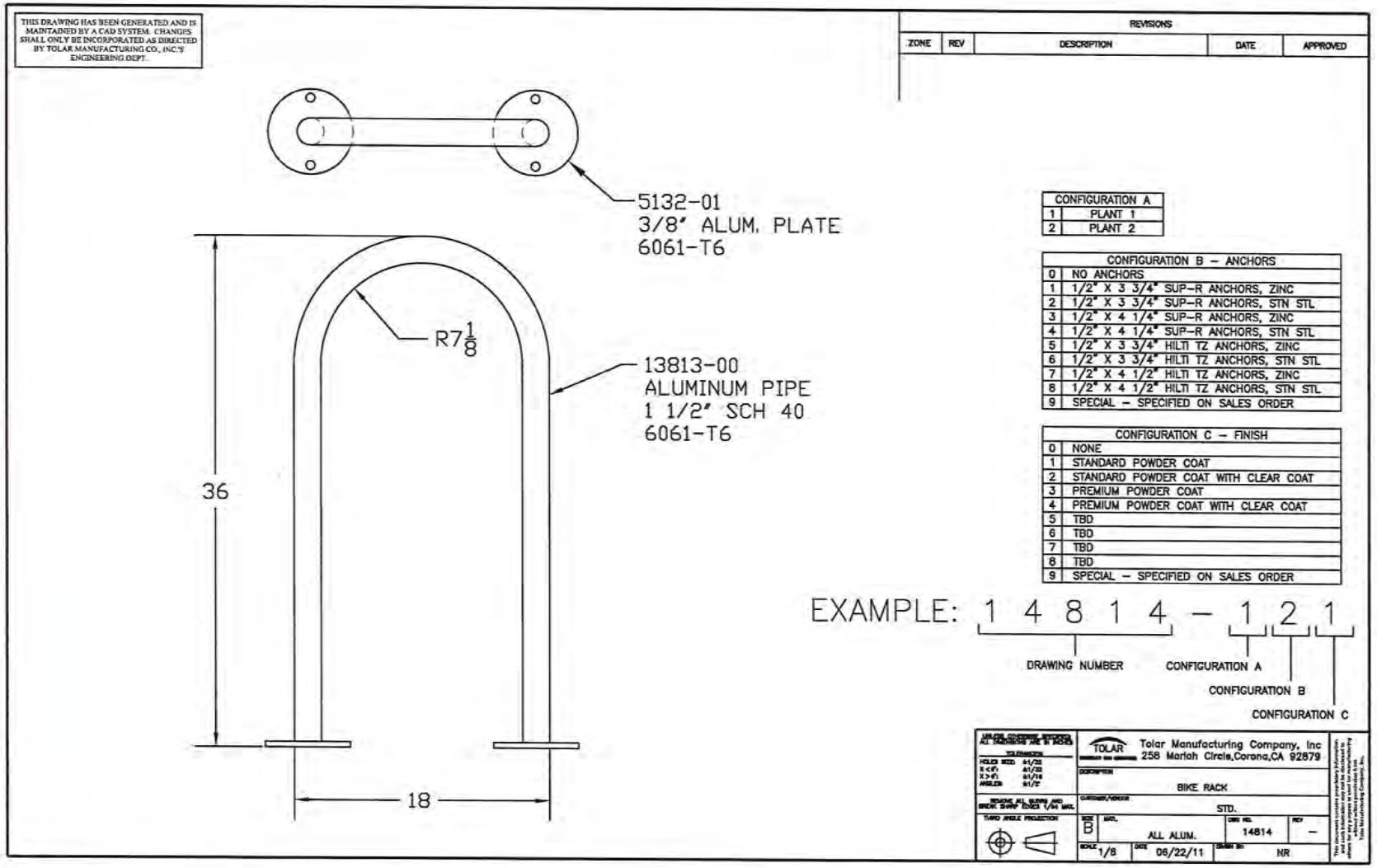
CONFIGURATION C - FINISH	
0	NONE
1	STANDARD POWDER COAT
2	STANDARD POWDER COAT WITH CLEAR COAT
3	PREMIUM POWDER COAT
4	PREMIUM POWDER COAT WITH CLEAR COAT
5	TBD
6	TBD
7	TBD
8	TBD
9	SPECIAL - SPECIFIED ON SALES ORDER

TOLAR
Tolar Manufacturing Company, Inc
258 Mariah Circle, Corona CA. 92879

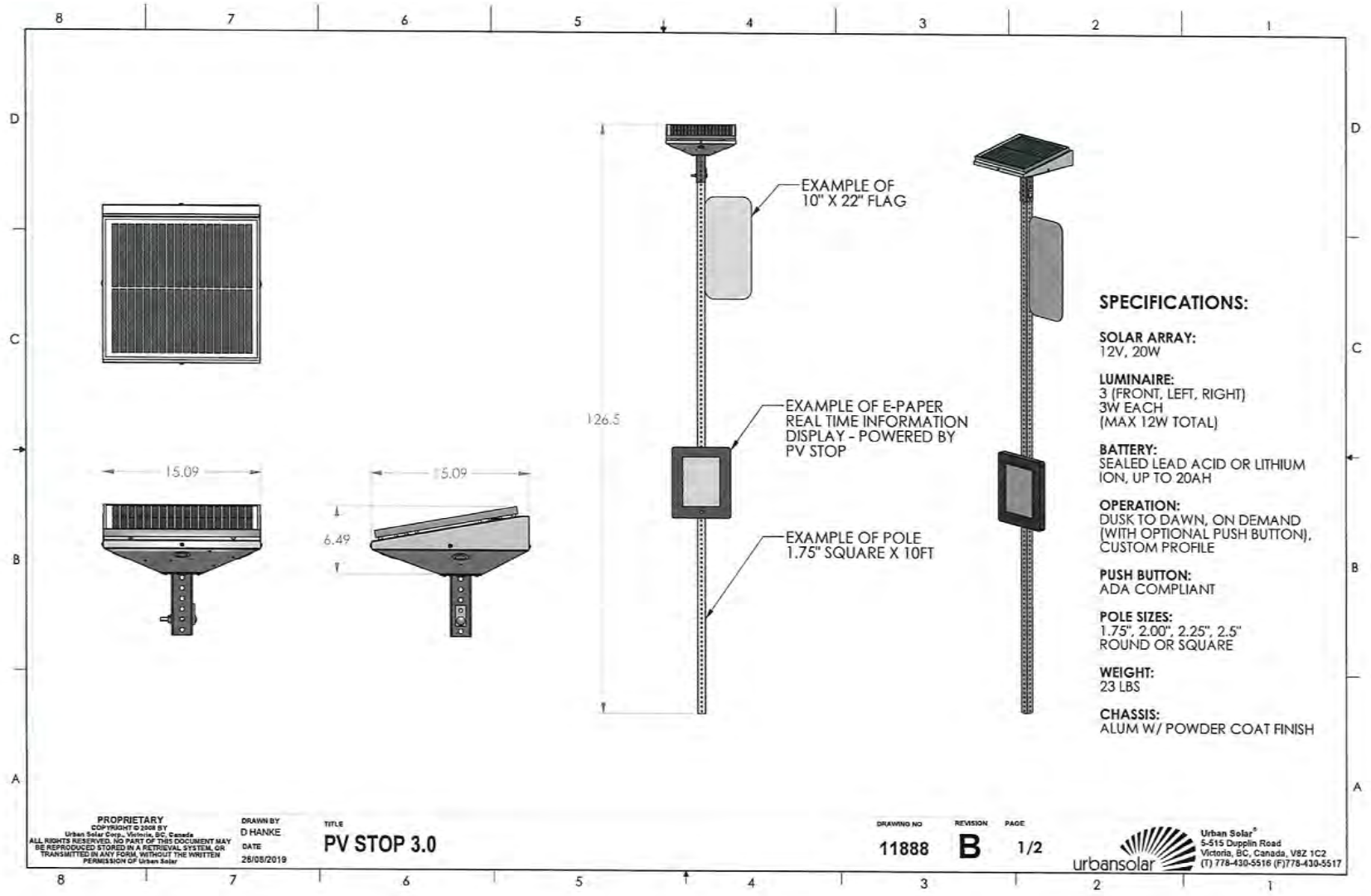
DESCRIPTION: 44 GALLON TRASH RECEPTACLE, RECTANGULAR , ALL ALUM. CONST.

CUSTOMER/VENDOR			SHEET NO.
			1 OF 1
SIZE: B	MATL.	DWG NO.: 20953-00	REV. NO.
SCALE	DATE: 2/13/2014	DRAWN BY: RGARCIA	

Appendix C: Amenities



Appendix C: Amenities



Appendix C: Amenities

urbansolar TOLAR AXENTIA

Urban Solar's e-paper series is Buy America Compliant; Built in Beaverton, OR, USA. By bringing together every digital stop amenity under one provider, from solar power, to lighting to passenger information, Urban Solar simplifies the deployment, support and maintenance of a transit agency's next generation of bus stops.

Highlights

Flexible
Battery powered, solar or hybrid functionality available
Text to Speech speaker option

Useful
Displays relevant information from GTFS RT
Time table information and text messages
Maps and pictures
Can replace paper schedules

Cost efficient
Simple installation
Long operation; 3 years between battery replacements (5+ with solar)
Uses existing mobile networks
Low maintenance and procurement costs

Practical
Weather and vandal resistant casing
Works on all stops, even where solar isn't viable
Simple configuration and administration

Technical specifications

Physical	
Colour:	Colours on demand
Standard heights:	20.6 / 31.55in
Size (W / D):	16.75/ 18.75 x 2 in
Weight:	Approx. 33 lbs
Environmental:	
Temperature:	-20°C to 70°C fully operational -25°C to 70°C reduced functionality
Humidity:	10 %– 100 %
MTBF:	80.000 hours
IP65, IK 09, UV-proof	
Display & graphical information	
Type:	EPD 13" (E-ink)
Resolution:	1600 x 1200 (150 dpi)
Front light:	LED
Active area:	10.63 x 8 in
SingleSided	
Accessories / options	
Text-To-Speech embedded module, speaker and wireless push button, AGC optional	
Accelerometer	
GPS	
Solar Powered	
Graphical Information	
Fully configurable graphical area	
Real-time, time tables, line maps, pictures etc.	
Disruption and general messages available	
Operation	
Battery:	Lithium
Battery life time:	+36 months
Data communication:	Mobile communication
Antennas:	Embedded