BROWARD COUNTY FLORIDA

# Broward County Transit
## Design Standards and Guidelines Manual

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Chapter 1

# Introduction

## 1.1 Purpose and Intent

Broward County Transit (BCT) is committed to providing its residents and visitors with valued transportation services. BCT services extend to all our customers regardless of age or disability. BCT is committed to serve the needs of its riders and to ensure access to information.

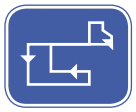
This Broward County Transit Design Standards and Guidelines Manual provides design direction and recommendations to local municipalities, design professionals and private developers for the design of transit facilities throughout Broward County. This manual should help coordinate with local municipalities, jurisdictions, developers, and designers to create consistent and well-designed transit facilities and access thereto that meets the standards of Broward County, the State of Florida and the Americans with Disabilities Act.

The standards in this manual are intended to be applied to the design and construction of any transit facility, proposed new or to be altered, located anywhere within Broward County, regardless of the entity with local jurisdiction at the proposed site. This is to ensure that all new, relocated, and modified transit facilities meet minimum standards and comply with all related ADA requirements.

This manual will help local municipalities, jurisdictions, and developers understand BCT's system, including the basic philosophies and service standards, operating criteria, access requirements, and transit infrastructure. Understanding of these components will allow for a cohesive, well designed and efficiently operated system that will be beneficial to transit users, BCT, local municipalities and developers alike.

The purpose of this manual is to:

1. Highlight the minimum requirements of the Americans with Disabilities Act that must be applied, to the maximum extent practicable, so that all new, relocated and updated transit facilities will be accessible to all residents and visitors of Broward County.
2. Provide operational and design standards for transit design across all of Broward County.
3. Provide a reference guide for local municipalities, designers, developers and reviewers throughout Broward County.
4. Review the goals and standards of BCT that are used for transit related decisions.



Chapter 1
# Introduction

The Transit Design Standards and Guidelines Manual is intended for developers, planners, engineers, architects and reviewers to provide a basis for coordination with BCT from the beginning of a project. The standards in this manual are intended to supplement existing engineering, design and environmental standards and requirements of FDOT, Broward County and local municipalities in which the transit facility is located. The design of any transit facility shall be fully compliant with all applicable laws, rules, regulations and codes. Nothing written or illustrated in this manual should be construed as a waiver of any applicable law, rule, regulation or code, nor does it relieve the designer or developer of the responsibility to verify the compliance of their designs.

## 1.2 Overview

Broward County Transit opened for service in 1974. It is the primary agency responsible for providing transit service in Broward County. Its service covers over 410 square miles and it is the only bus system in the tri-county area that has service to all three counties of Broward, Miami-Dade, and Palm Beach. BCT buses also connect with Tri-Rail commuter rail service. BCT's public transportation services are provided through a "Family of Services." This includes fixed-route bus service, contracted paratransit services for persons with disabilities, BCT-owned minibuses and mid-sized buses operate in partnerships with municipalities, and other entities for community bus service, commuter/reverse commuter service, and partnerships with other entities to provide alternative local public transit services. BCT's system includes community bus service that works in conjunction with Broward County's local municipalities to provide service to residential areas. All of the buses in BCT's fleet are wheelchair accessible and bus drivers provide assistance upon request.

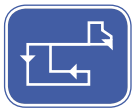
Broward County Transit is dedicated to enhancing the transit experience for all of its passengers across its entire network. BCT's network includes several thousand designated bus stops, including many with bus shelters. BCT is continuously working to improve its service and keeping up with current technology. BCT has been investing in Advanced Public Transportation Systems (APTS) since the 1990s. APTS are the transit components of Intelligent Transportation Systems (ITS). This is part of an ongoing effort to help the Broward County Commission achieve its goal of creating a sense of place by establishing a more pedestrian / public transportation friendly environment. These technologies not only make public transportation more effective and efficient, but also enhance the experience for passengers. Some technologies currently being used include:

- Automated Passenger Counters (APC)
- Real-Time Transit Information Systems
- Voice Annunciation System (VAS)
- Automated Fare Collection System (AFC)
- Geographic Information Systems (GIS)
- Comprehensive Scheduling and Customer Information System
- Automatic Vehicle Locator (AVL)

And BCT is currently looking into implementing these technologies:

- Transit Signal Priority System (TSP)
- Smart Cards

Additional information regarding all of BCT's services can be obtained by visiting its website: http://broward.org/BCT



## 1.3 Accessibility and Transit

Often public access to transit service is not considered until late in the planning process. Although provisions for transit may be hastily included in the final design, they are often overlooked or incorrectly made during the early planning phases. When the latter results, an untenable situation arises for BCT, the developer, the contractor, the municipal jurisdiction and riders. BCT realizes that developers and municipal jurisdictions may not be aware of its basic operating criteria and physical limitations. Without this understanding, a transit perspective is absent during the early phases of traffic maintenance planning and an opportunity to maintain or encourage transit service may be lost.

BCT can provide better service when a development is designed with transit in mind. Better service means that riders are offered more convenient bus stops with designed infrastructure, more desirable routing and reduced travel times. To the developer, good transit service is a means of offering residential and commercial occupants a more accessible location, an expanded labor market, and an overall reduction in transportation and traffic mitigation problems. In terms of the final outcome, designing for transit leads to bus stops within the development that are attractive yet unobtrusive, and routes that follow roads designed for large vehicles. In general, designing transit means planning a transportation asset, rather than considering transit as an afterthought. With proper design and incentives, transit can attract a variety of activities and uses (retail, community services, and special events). Acting as a stimulus for commercial redevelopment and neighborhood renewal, transit can contribute toward the livability of an entire neighborhood.

## 1.4 Sustainability

Broward County government has enacted several policies to increase environmental awareness and sustainability measures in the county. In keeping with this standard, BCT emphasizes sustainable design strategies for new construction related to the bus system. Increased bus ridership leads to decreased fossil fuel consumption, the very nature of BCT's programs are sustainable; however, individual projects should strive to do more. BCT encourages the use of alternative power sources such as solar power and reducing overall energy consumption where possible. Reforestation and landscaping are encouraged throughout the county; landscaping should be native and drought tolerant so as not to require excessive watering. Recycled materials, materials with low embodied energy and durable materials should be specified to reduce life cycle costs. All proposed bus stops should avoid impacts to the environment and where possible incorporate principles of sustainable design.

## 1.5 Definitions

**Accessibility** - The extent to which facilities are barrier free and usable by disabled persons, including wheelchair users. It also represents a measure of the ability or ease of all people to travel among various origins and destinations.

**Accessory Pad** - A paved area that is provided for bus patrons and may contain a bench, shelter, and/or other amenities. Also called "Landing Pad."

**Activity Center** - An area with high population and concentrated activities that generate a large number of trips, such as a Central Business District, shopping center, business or industrial park, or recreational facility. Also known as a Trip Generator.

**ADAAG** – the ADA Accessibility Guidelines. The Americans with Disabilities Act establishes design requirements for the construction and alteration of facilities in the private and public sectors. These requirements are known as the ADA Accessibility Guidelines. The ADAAG contains requirements for new construction and alterations. The Access Board develops the requirements as "guidelines" to serve as a basis for "standards" enforced by the Department of Justice and the Department of Transportation. ADAAG derives from an earlier Federal standard, the Uniform Federal Accessibility Standards.

**Alight** - To get off a transit vehicle. Plural: "alightings."

**Americans with Disabilities Act of 1990 (ADA)** - The law passed by Congress that makes it illegal to discriminate against people with disabilities in employment, services provided by state and local governments, public and private transportation, public accommodations, and telecommunications. The ADA requires that fixed-route transit be accessible and that complementary paratransit service be provided in the same geographic areas on the same days and hours as fixed-route service.

**Approach Angle** - A vehicle's front clearance angle, which is formed by the base of the front vehicle tire, the front ground clearance height, and the roadway.

**Arterial Street** - A roadway that is designed to move large traffic volumes between various points within a region. Typically, these roadways have limited access and connect with smaller collector streets.

**Articulated bus** - A high capacity (60-70 seated passengers) transit vehicle consisting of two sections hinged together.

**Attached sidewalk** - A sidewalk which is directly attached to the back of a curb.

**Automatic Vehicle Location (AVL)** - A type of technology that uses Global Positioning Systems to identify where transit vehicles are located, and the speed they are traveling and transmits this information to a centralized control center.

**Board** - To go onto or into a transit vehicle. Plural: "boardings."

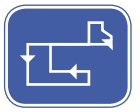
**Bus Bench** - A bench that can accommodate three or more persons and is placed at a bus stop for use by waiting passengers.

**Bus Bulb** - A bus stop where the sidewalk is extended into the parking lane, allowing a bus to pick up/drop off passengers without leaving the travel lane. Also known as a Curb Extension or Nub.

**Bus Pull-Out Bay** - A recessed bus stop area that allows a bus to leave the travel lanes to load and/or unload passengers. Also known as a Bus Turnout.

**Bus Pad** – Concrete pad constructed in the street, adjacent to a bus zone that can accommodate the weight of a bus.

**Bus Shelter** - A building or other structure constructed at or near a bus stop that provides seating and protection from the weather for the comfort and convenience of waiting passengers.



**Bus Stop** - A point along a transit route at which passengers can board or alight from a bus. A bus stop is usually identified by a sign.

**Bus Stop Infrastructure** - The various elements that can be provided at a transit stop or station to help make transit more comfortable and convenient to patrons, including benches, shelters, lighting, vending machines, garbage receptacles, telephones, etc. These elements also are commonly referred to as "amenities."

**Bus Stop Spacing** - The distance between consecutive transit stops.

**Bus Stop Zone Length** - The length of the portion of roadway that is signed or marked as being available for bus use to load and/or unload passengers.

**Bus Turnaround** - A roadway system that allows a bus to return to the street that it is serving in the opposite direction of travel.

**Bus Turning Radii** - The dimensions needed to accommodate bus turning movements.

**Bus Turnout** - A bus stop located in a recessed curb area, separated from moving lanes of traffic. See also definition for Bus Pull-Out Bay.

**Bus zone** – A length of curb designated as a bus stop where parking is prohibited.

**Clear Space** - The minimum unobstructed floor or ground space required to accommodate a single, stationary wheelchair and occupant (i.e., 30 inches in width by 48 inches in depth).

**Concrete Bus pad** - See Bus pad.

**Corner Curb Radii** - The radius of the circle formed by the curve of the curb at the corner of two intersecting streets. It is used in street design as a measure of the sharpness of the corner.

**Curb lane** - A travel, parking, or bike lane adjacent to the curb

**Curb Ramp** - A combined ramp and landing to accomplish a change of level at a curb in order to provide access to pedestrians using wheelchairs.

**Departure Angle** - A vehicle's rear clearance angle, which is formed by the base of the rear vehicle tire, the rear ground clearance height, and the roadway.

**Detectable warning** - A distinctively textured surface detectable by cane and foot, on the surface of the curb ramps to provide a tactile cue for persons with vision impairments of the approach to streets.

**Discontinuous Sidewalk** - A sidewalk that is constructed to connect a bus stop with the nearest intersection. The sidewalk does not extend beyond the bus stop.

**Far-Side Stop** - A bus stop that is located immediately after an intersection.

**Fixed-Route** - Transit service provided on a repetitive, fixed-schedule basis along a specific route, with vehicles stopping to pick up and deliver passengers to specific locations.

**Frequency** - The scheduled time interval between consecutive buses operating in the same direction on a given route. Also known as Headway.

**Grid Street Pattern** - A network of parallel and perpendicular streets intersecting at 90-degree angles, forming rectangular blocks of land that are typically equal in size and have perimeters measuring between 800 and 1600 feet.

**Headway** - The interval between the passing of the front ends of successive buses moving along the same lane in the same direction, usually expressed in minutes. See also definition for Frequency.

**Intermodal Facility** - A higher-level type of transit facility that is designed specifically to accommodate the meeting of two or more transit modes of travel. Typically includes expanded passenger infrastructure.

**Kiosk** - A freestanding, often cylindrical, device that displays transit maps and schedules and other passenger information. Kiosks typically are located at higher passenger volume stops.

**Landing** - A level area of a sidewalk, or raised island, where wheelchair users may stop before proceeding down a curb ramp.

**Layover** - Time built into a schedule between arrivals and departures, used for the recovery of delays and preparation for the return trip.

**Local Street** - A roadway that provides direct access to the adjacent land and typically accommodates a low volume of traffic.

**Mid-Block Stop** - A bus stop that is located in between intersections.

**Mixed-Use** - In land use and transit planning, generally refers to different compatible land uses located within a single structure or in close proximity to each other.

**Near-Side Stop** - A bus stop that is located immediately before an intersection.

**Overhang** - The portion of the bus vehicle body that extends beyond the front or rear axle.

**Passenger Activity** - The number of passenger boardings ("ons") and alightings ("offs") that occur at a transit stop during any particular time period.

**Paratransit** - Comparable transportation service required by the ADA for individuals with disabilities who are unable, because of their disability, to use traditional fixed-route transportation systems.

**Park-and-Ride** - A higher-level type of bus facility that incorporates a parking lot at a transit facility to accommodate the automobile as an access mode to transit. Park-and-ride facilities also can be used to facilitate bicycle access to transit, as well as auto and bike access to vanpool/carpool services.

**Parking lane** - A curb lane that is used for on-street parking.

**Passenger Boarding area** - See accessory pad.

**Pedestrian accessway** – A lighted, paved, and disabled accessible walkway that provides convenient access to transit facilities and bus stops from adjacent land uses.

**Persons with Disabilities** - People who, by reason of illness, injury, age, congenital malfunction, or other disability, are unable to use local transit facilities and services, without adequate facilities, as effectively as people who are not so affected.

**Shuttle** - A public or private vehicle that travels back and forth over a particular route, especially a short route or one that provides connections between transportation systems, employment centers, etc. Shuttle service may also provide connectivity between remote parking locations and large special events.

**Standard Bus** - A bus that is 35 to 41 feet in length.

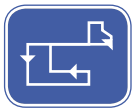
**Street-side factors** - Factors associated with the roadway that influences bus operations.

**Superstop** - A large bus staging area used where many routes come together at a point in the system. The intent of a Superstop is to not only serve as a transit system destination/transfer station, but also to act as a community focal point.

**Tapers** - The portion of lane provided at each end of a bus pull-out bay to accommodate bus speed changes when entering and exiting traffic.

**Transfer** - A passenger's change from one transit vehicle to another transit vehicle.

**Transfer Center** - A fixed location where passengers interchange from one route or vehicle to another.



**Transit accessory pad** - A concrete slab located at a bus stop. Its function is to both provide pavement to secure transit furniture and to allow an accessible landing area for passengers.

**Transit center** - A bus facility which acts as a hub for transit routes within a region.

**Transit furniture** - May consist of a transit shelter, bench, trash receptacle or other components provided at a bus stop for the comfort and convenience of waiting passengers. These may be provided by the local jurisdiction and/or private firms.

**Transit Hub** - A higher-level type of transit facility that includes an expanded bus staging area and considerable passenger infrastructure.

**Transit-Oriented Development (TOD)** - In general, TOD encompasses the specific tailoring of development patterns to be more conducive to transit use. Typically involves a mixed-use community or neighborhood surrounding a transit station, stop, or route that is designed to encourage transit use and pedestrian activity.

**Turning Radius** - The turning path of a vehicle established by the outer front overhang and the inner rear wheel.

**Waiting Pad** - A paved area that is provided for bus patrons and may contain a bench, shelter, and/or other infrastructure. Also known as an Accessory Pad.

**Wheelchair** - A mobility aid belonging to any class of three- or four-wheeled devices, usable indoors, designed for and used by people with mobility impairments, either operated manually or powered.

**Wheelchair boarding area** - A paved area or sidewalk adjacent to the front and rear loading areas of a bus that allows the extension of a wheelchair lift and safe boarding or alighting of a person in a wheelchair.

**Wheelchair Lift** - A device used to raise and lower a platform in a transit vehicle for accessibility by patrons that require the use of a wheelchair or similar mobility aid.

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## 2.1 Service Types and Standards

### *2.1.1 Bus Service Types*

BCT consists of three categories of buses:

- Fixed Route Buses
- Community Buses
- Paratransit Service

The **fixed route buses**, which serve approximately 95% of BCT's average daily ridership, consist of standard bus service, "Breeze" service and Express service. Standard fixed routes are those that run local, making frequent stops along major arterials through Broward County. "Breeze" routes make less stops, providing faster service between more important stops along major roadways. Express routes provide service between major points of interest, stopping only at major points along the route, such as the I-95 Express which provides service between southern Broward County and downtown Miami.

Broward County Transit's (BCT) **community bus service** provides service to residential areas of Broward County, allowing for larger fixed route buses to travel along major thoroughfares as part of a regional bus network. The planning of the community bus service routes is performed at a local level, through coordination with BCT. BCT currently is partnered with the local municipalities, who oversee the daily operations of their individual community bus service programs; however, the community bus service is ultimately coordinated and approved through BCT.

BCT's **Paratransit (TOPS) service** provides public transportation to individuals, who are deemed unable to use the fixed route service without assistance. TOPS vehicles are operated by private service providers, who are contracted with BCT.

Chapter 2

# Service Types and Standards

**Figure 2.1.1a - Photo - BCT Bus**


**Figure 2.1.1b - Photo - BCT Community Bus (Coconut Creek)**

**Figure 2.1.1c - Photo - BCT Paratransit (TOPS) Service**

## 2.2 Bus Information

In the design of facilities for buses, it is important to understand the design vehicle, which represents a compilation of critical measurements and characteristics from those buses currently in service in Broward County.

### *2.2.1 Bus Specifications*

Table 2.2.1 and the following graphics outline the primary design specifications for the buses currently being operated by Broward County Transit through 2010. Designers should verify with BCT that they have the correct and most current information for BCT's buses.

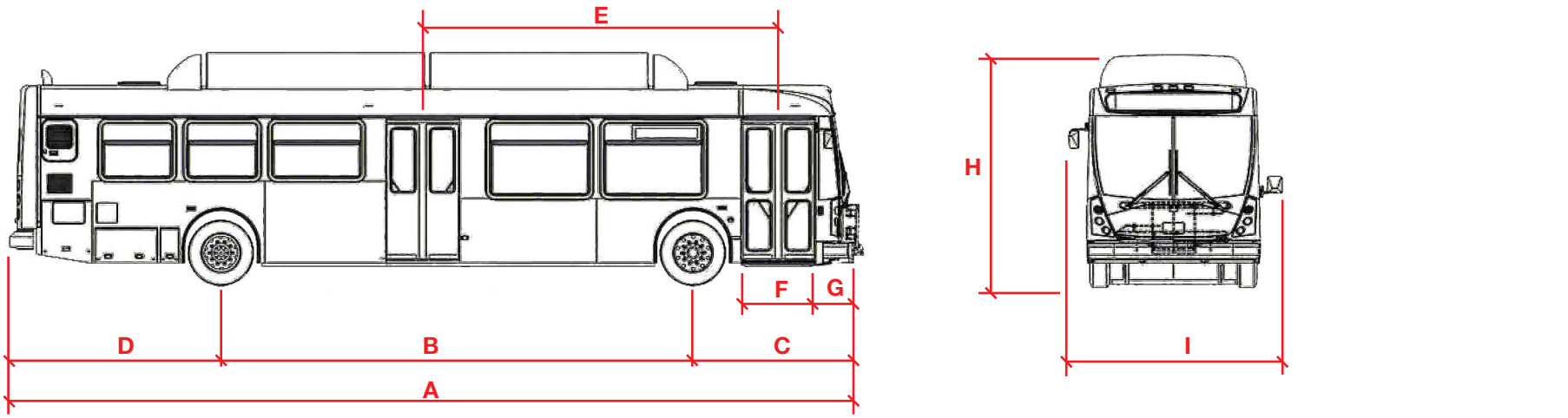


**Figure 2.2.1 - Standard 40 Foot Bus Dimensions**

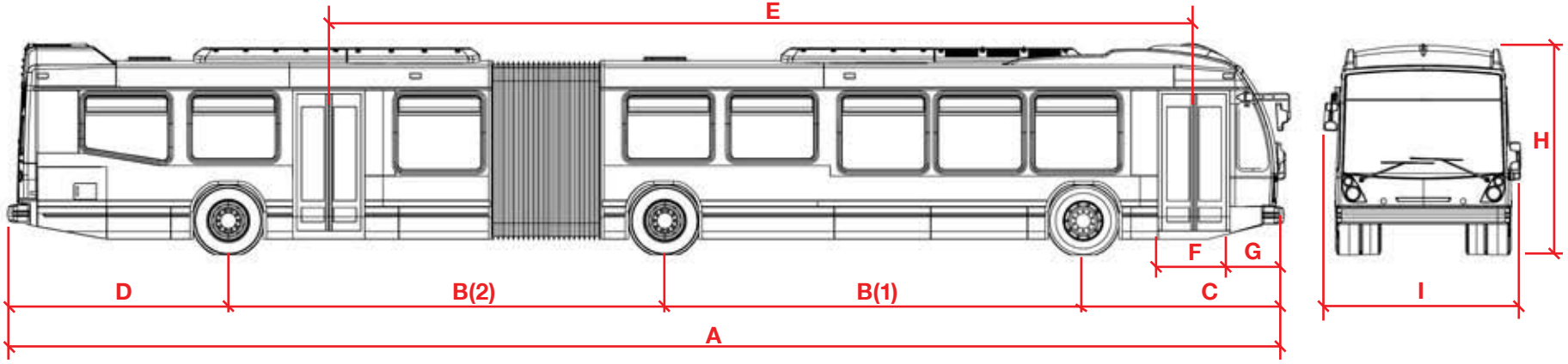


**Figure 2.2.2 - Articulated 60 Foot Bus Dimensions**

### *2.2.2 Turning Radii*

The minimum turning paths for buses must be accounted for when designing bus routes on existing streets, or new curbs and corners. Figures 2.2.3 – 40' BUS TURNING RADIUS and 2.3.4 – 60' ARTICULATED BUS TURNING RADIUS show the minimum turning paths for their respective bus types.

These templates can be applied to both left and right turns and can be utilized for the following:

- Determining proper roadway widths
- Determining allowable bus encroachment in adjacent lanes
- Determining proper intersection curve radii

These standards should be applied to all streets and facilities requiring transit accessibility. The recommended outer turning radii take into account the bus body overhang and provide allowances for extended bike rack clearances (see section 2.2.4 – Bikes on Buses) as well as driver reactions and other bus movements.

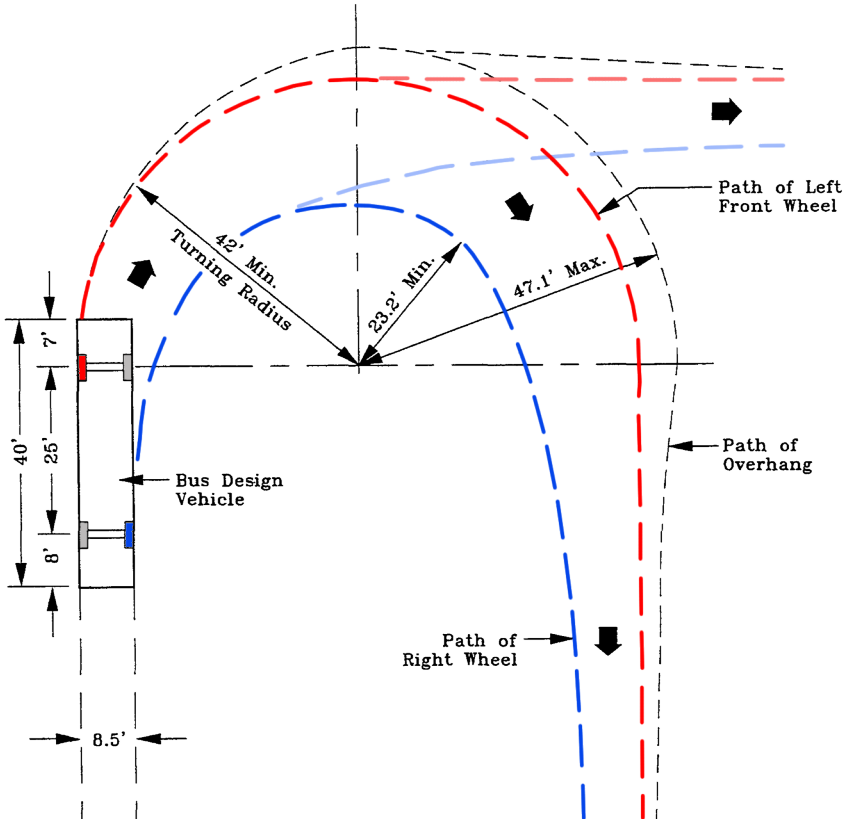


**Figure 2.2.3 - Standard 40 Foot Bus Turning Radius**

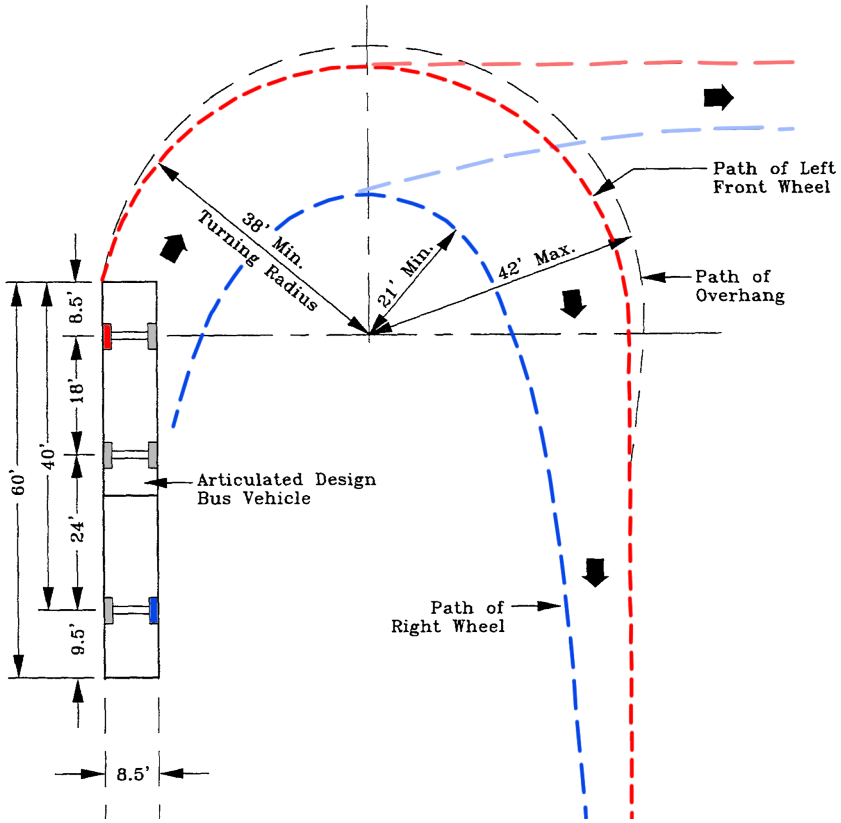


**Figure 2.2.4 - Articulated 60 Foot Bus Turning Radius**

## TABLE 2.2.1 - BUS CHARACTERISTICS FOR BROWARD COUNTY TRANSIT'S FLEET

| | Item Description | Unit | Bus Types | | | |
|---|---|---|---|---|---|---|
| | | | 40 FT Gilligs | 40 FT NABI | 60 FT New Flyer | 62 FT New Flyer (BRT) |
| A | Overall length | LF | 41' | 41' | 62' | 62'-9" |
| B | Wheel Base | FT/IN | 23'-9" | 23'-0" | **See Note 2** | **See Note 2** |
| C | Front Axle to Bumper | IN | 90" | 91" | 84" | 108" |
| D | Rear Axle to Bumper | IN | 116" | 124" | 124" | 126" |
| E | Centerline Door to Door | FT/IN | 19'-10" | 17'-9" | 41' | **See Note 3** |
| F | Clear Door Opening (Front) | IN | 39" | 41" | 40" | 40" |
| G | Door Opening to Bumper | IN | 21" | 22" | 18" | 34" |
| H | Overall Height | IN | 112" | **See Note 1** | 125" | 130" |
| I | Overall Width | IN | 102" | 102" | 102" | 102" |
| J | GVWR | TON | 20 | 20.5 | 33.5 | 33.5 |
| K | GAWR (Front) | TON | 7.5 | 7.5 | **See Note 4** | **See Note 4** |
| L | GAWR (Rear) | TON | 12.5 | 14 | **See Note 4** | **See Note 4** |
| M | Seating Capacity | | 40 | 38 | 62 | 57 |
| N | Wheelchair Ramp | | Ricon Ramp* 4:1 Slope | Ricon Ramp 4:1 Slope | New Flyer Ramp 4:1 Slope | New Flyer Ramp 4:1 Slope |
| O | Bicycle Rack | | Two Position Sportswork | Three Position Bike Rack | Three Position Bike Rack | Three Position Bike Rack |

***** 1999 40 foot Gillig Buses are equipped with a Lift-U Ramp with a 4:1 slope

Note 1: 2005 NABI Buses = 112" / 2007-2008 Non-Hybrid = 128" / 2008-2009 Hybrids = 136"

Note 2: Wheel Base 2006 and 2009 Articulated Buses, Front to Center = 19 FT / Center to Rear = 25 FT

Note 3: 09 Articulated buses are equipped with three doors. Center line door to door measurements are Front to Center = 15'-6" / Center to Rear = 25' - 0"

Note 4: GAWR for 2006 and 2009 Articulated Buses is Front - 7.5 tons / Rear - 14 tons.

### *2.2.3 Bikes on Buses*

BCT's entire fixed route bus fleet is equipped with bike racks, allowing riders to bring their bicycles with them or "bus your bike" while riding BCT. The bike racks are mounted on the front of the bus and are simple to use; just lower, lift and latch.

The bike rack extends approximately 24" off the front of the bus when in use. When they are not carrying any bikes, the racks fold up against the front of the bus, and do not affect any of the buses movements. When in the carrying position, the bike racks add approximately 3 feet to the turning radius of the bus. The bike racks used on BCT buses can carry between 2 and 3 bikes.


Figure 2.2.5 - Photo - Bike rack on front of bus

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Chapter 3

# Bus Stop Design

## 3.1 Bus Stop Locations

When determining the proper location for a bus stop, the following factors should be taken into consideration:

- Pedestian Access and Accessible Routes (ADA Compliant)
- Adjacent land use and activities
- Bus route (turning or continuing straight)
- Bus signal priority
- Impact on intersection operations
- Intersecting transit routes
- Intersection geometry
- Site / Location Restrictions and requirements
- Passenger origins and destinations
- Physical features of roadway (trees, utilities, driveways, etc.)
- Potential passengers
- Travel lanes and street widths
- Traffic control devices

The designer should take these factors into account when deciding between far-side, near-side and mid-block bus stop locations. Far-side stops are preferred by Broward County Transit.

### *3.1.1 Far-Side Bus Stops*

Far-side bus stops are located immediately after an intersection. See FIGURE 3.1.1 – FAR SIDE BUS STOP and TABLE 3.1.1 – FAR-SIDE STOP ADVANTAGES VS. DISADVANTAGES below.

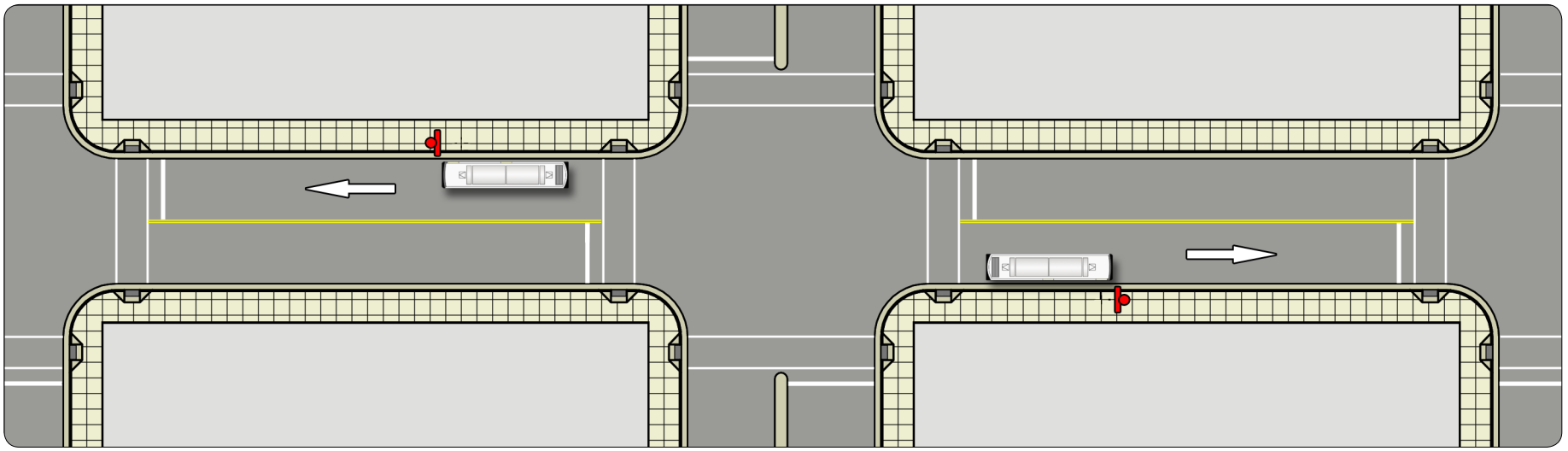


**Figure 3.1.1 - Far Side Bus Stop**

## TABLE 3.1.1 - FAR-SIDE BUS STOP ADVANTAGES VS. DISADVANTAGES

| Advantages | Disadvantages |
|---|---|
| Minimizes conflicts between right turning vehicles and buses | May result in the intersection being blocked during peak periods by stopping buses |
| Provides additional right turn capacity by making curb lane available for traffic | May obscure sight distances for crossing vehicles |
| Minimizes sight distance problems on approaches to intersection | May increase sight problems for crossing pedestrians |
| Encourages pedestrians to cross behind the bus | Can cause bus to stop far side after stopping for a red light, which interferes with both bus operations and all other traffic |
| Creates shorter deceleration distances for buses since the bus can use the intersection to decelerate | May increase the number of rear-end accidents since drivers do not expect buses to stop again after stopping at a red light. |
| Results in bus drivers being able to take advantage of gaps in traffic flow that are created at signalized intersections | Could result in traffic queued into intersection when a bus is stopped in a travel lane |

### *3.1.2 Near-Side Bus Stops*

Near-Side Bus stops are located directly before crossing through an intersection. See FIGURE 3.1.2 – NEAR-SIDE BUS STOP and TABLE 3.1.2 – NEAR-SIDE STOP ADVANTAGES VS. DISADVANTAGES below.

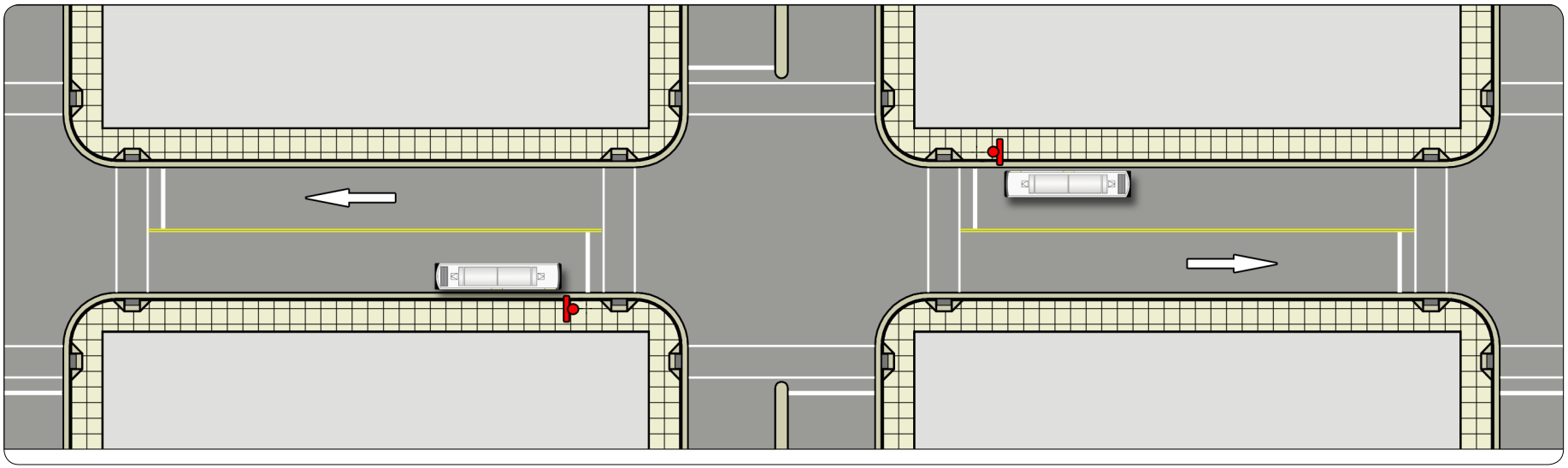


**Figure 3.1.2 - Near Side Bus Stop**

## TABLE 3.1.2 - NEAR-SIDE BUS STOP ADVANTAGES VS. DISADVANTAGES

| Advantages | Disadvantages |
|---|---|
| Minimizes interferences when traffic is heavy on the far side of the intersection | Increases conflicts with right-turning vehicles |
| Allows passengers to access buses closest to the crosswalk | May result in stopped buses obscuring curbside traffic control devices and crossing pedestrians |
| Results in the width of the intersection being available for the driver to pull away from the curb | May cause sight distance to be obscured for cross vehicles stopped to the right of the bus |
| Eliminates the potential of double stopping | May block the through lane during peak period with queuing buses |
| Allows passengers to board and alight while the bus is stopped at a red light | Increases sight distance problems for crossing pedestrians |
| Provides the driver with the opportunity to look for oncoming traffic including other buses with potential passengers | |

### *3.1.3 Mid-Block Bus Stops*

Mid-Block bus stops can be located anywhere between two intersections. These types of bus stops should only be used at major trip generators or when the distance between intersections is too long for the typical bus stop spacing. See FIGURE 3.1.3 – MID-BLOCK BUS STOP and TABLE 3.1.3 – MID-BLOCK STOP ADVANTAGES VS. DISADVANTAGES below.

### *3.1.4 Driveways and Entrances*

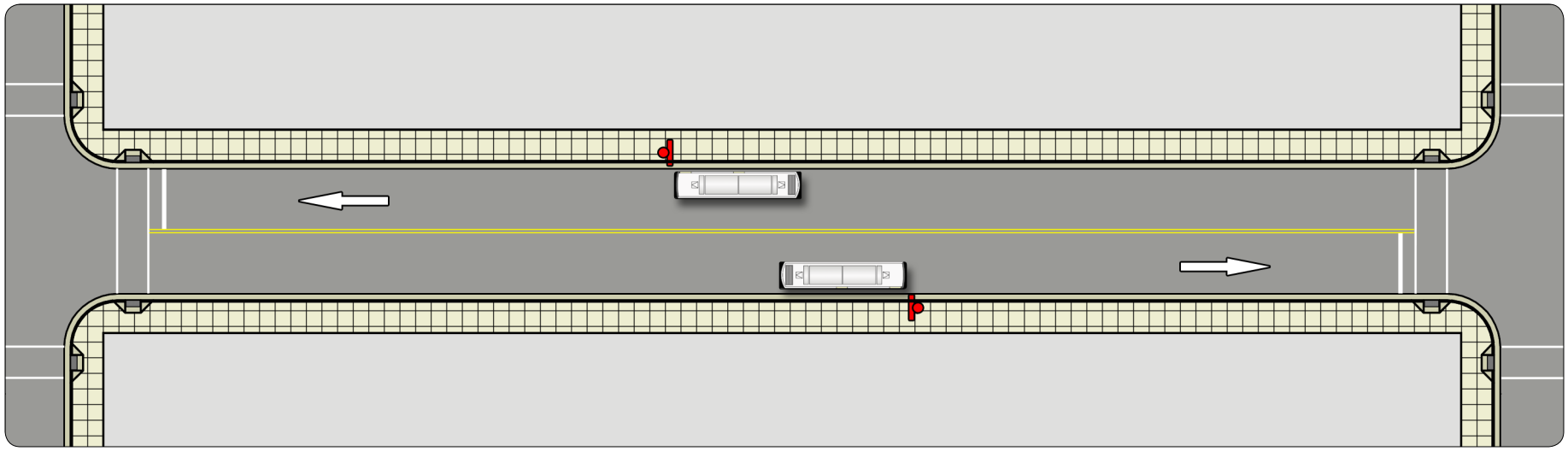


**Figure 3.1.3 - Mid-Block Bus Stop**

## TABLE 3.1.3 - MID-BLOCK BUS STOP ADVANTAGES VS. DISADVANTAGES

| Advantages | Disadvantages |
|---|---|
| Minimizes sight distance problems for vehicles and pedestrians | Requires additional distance for no-parking restrictions |
| May result in passenger waiting areas experiencing less pedestrian congestion | Encourages patrons to cross street at mid-block (jaywalking) |
| | Increases walking distance for patrons crossing at intersections |

Bus stops should be located so that buses do not block the intersection when they are stopped. FDOT and BCT recommend that bus stops be located a minimum of 100 feet beyond the end of the curb radii of a driveway, so that the bus does not interfere with the sight lines of other vehicles using the driveway. Although most design considerations at driveways are concerned with conflicts between buses and other vehicles using the driveway, BCT also emphasizes the importance of maintaining minimum passenger walking distances between bus stops and final destinations. In situations where the above recommendation cannot be met, the following designs rules should apply:

- Bus stops should be located so that stopped buses do not fully block access; attempt to keep at least one exit and entrance open for vehicle access.
- The bus stop should be located to allow for good visibility for other vehicles as they enter or exit the driveway.
- The bus stop should be located and oriented so that the passenger waiting areas are located outside the limits of the driveway, to avoid conflicts between waiting passengers and other vehicles.

See FIGURES 3.1.4a & b for recommended bus stop placement when conflicts cannot be completely avoided.

Broward County Transit recommends that developers and other designers coordinate with BCT early in the design process to ensure that conflicts between bus stops and driveways can be minimized or avoided completely.

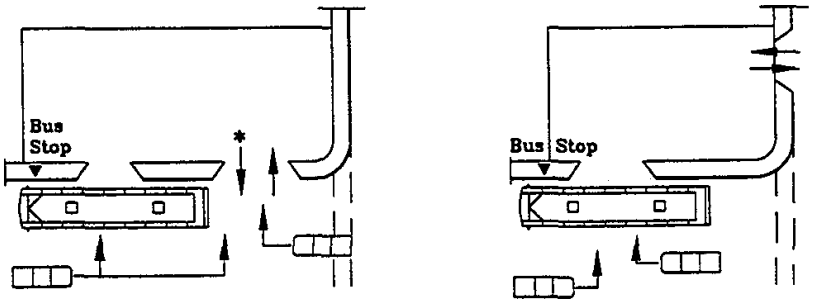



**Figure 3.1.4a - Preferred Bus Stop / Driveway Layouts**

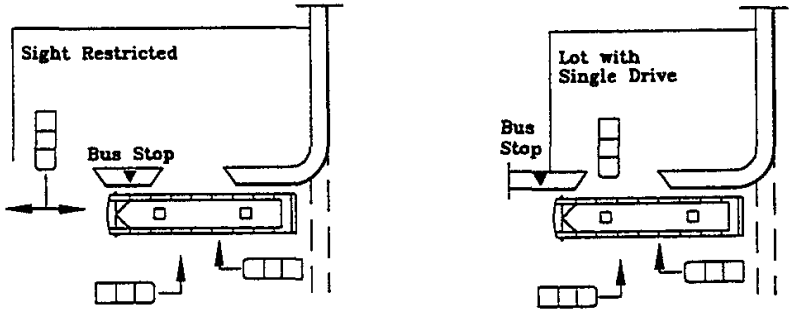



**Figure 3.1.4b - Non-Preferred Bus Stop / Driveway Layouts**

## 3.2 Placement Considerations

### *3.2.1 General Considerations*

The two most critical factors, other than ridership potential, when selecting locations for bus stops are safety and operational considerations.

Additional consideration should be given for the inclusion of passenger amenities at the bus stop location.

### *3.2.2 Commercial Coordination*

The best strategy for improving access at or to bus stops is to coordinate the development of the site with the bus stop location. Coordination and cooperation with the landowner or developer can enhance the connection between the bus stop and land use. Broward County Transit recommends that coordination begins early in the planning / development phase to ensure that optimum bus stop placement can be achieved. Openings and gates through walls or fences that are located close to the bus stop and clearly defined or designated walkways through parking lots are typical pedestrian improvements that can be achieved through early coordination (See Figure 3.2.1). These walkways can be elaborate, incorporating a landscaped sidewalk, or simple, such as a painted walkway. All pedestrian improvements must conform to the ADAAG and those guidelines described in Section 4.1 of this manual.

An alternate solution may be to locate the building closer to the roadway with the parking either in the rear or on the side of the building. An example of this solution is shown in Section 3.7 Connecting to Bus Stops.

**Figure 3.2.1a - Photo - Commercial Blvd Bus Stop (Not Coordinated with BCT) Eastbound on W. Commercial Blvd**

**Figure 3.2.1b - Photo - Designated Passenger Walkway through Parking Lot from Bus Stop. State Route 7, Walmart, Lauderdale Lakes**

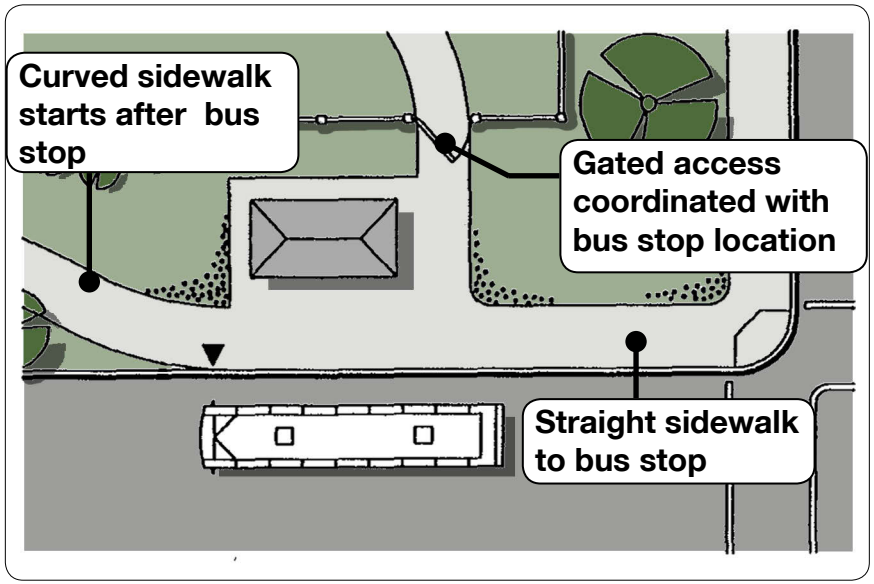



**Figure 3.2.2a - Desirable Bus Stop / Community Relationship**

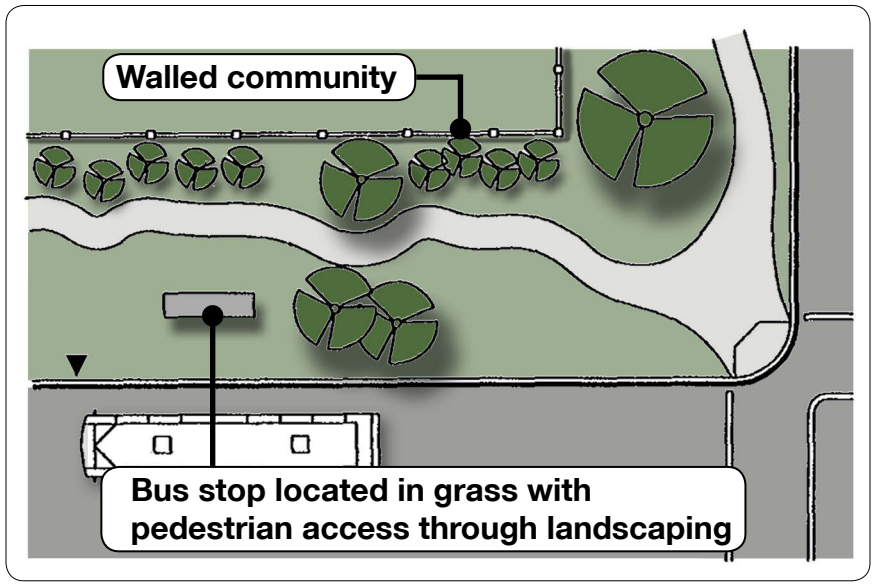



**Figure 3.2.2b - Undesirable Bus Stop / Community Relationship**

### *3.2.3 Residential Coordination*

Bus passengers need efficient ways to reach bus stops from their residences. BCT needs to be involved early in the development approval process to reduce walking times and improve direct access to and from the bus stop. Sidewalk placement that is coordinated with the land use and the bus stop is critical to encouraging the use of transit.

Walled residential communities have become more popular as they provide a greater sense of security to their residents. However, their limited number of access points often increase walking times between the residence and bus stop, because direct access is not available. Additionally, curved sidewalks with landscaping features may be aesthetically desirable, but they can also increase passenger walking times. The landscaping features can also create difficulties for BCT when determining the final location for the bus stop.

Coordination between BCT and the developer for the sidewalk design, placement of the bus stop and placement of access points is necessary in order to ensure the most direct, comfortable, convenient and safe access between the bus stop and a patron's residence. Figures 3.2.2 and 3.2.4 show examples of sidewalk design at coordinated and uncoordinated residential communities.

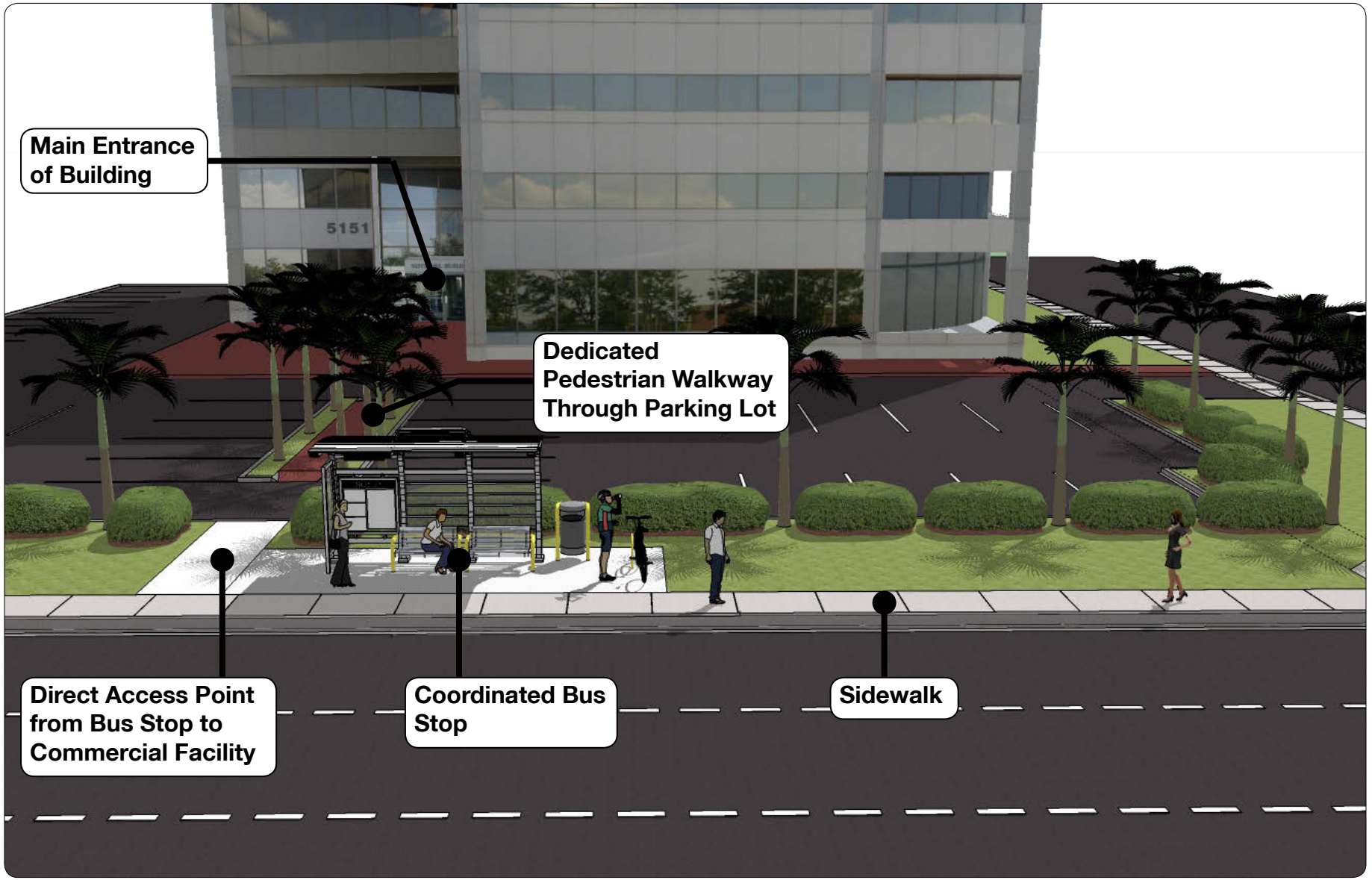



**Figure 3.2.3 - Bus Stop Coordinated with Commercial Development**


**Figure 3.2.4 - Residential Development Coordinated with Bus Stop**

### *3.2.4 Bus Stop Spacing*

When planning bus stop locations, the spacing between bus stops is a major consideration. Bus stop spacing can have a major impact on operational performance of transit along a particular route. The overall travel time and demand for transit use can also be affected by bus stop spacing.

Typically, bus stop spacing can be broken down into categories based on area type or population density, such as residential areas, commercial areas and / or Central Business Districts (CBD). See Table 3.2.2 – Typical Bus Stop Spacing, for Broward County Transit's recommended stop spacing based on area.

In addition to typical spacing, bus stops should also be located at major trip generators.

**TABLE 3.2.1 - BUS STOP SPACING CLOSE VS. FAR**

| Bus Stop Distance | Close Stop Spacing | Far Stop Spacing |
|---|---|---|
| Advantages | Short walking distance for passengers | More infrequent stops<br>Higher speeds<br>Shorter bus trips |
| Disadvantages | More Frequent stops<br>Longer Bus Trips | Longer walks for passengers |

**TABLE 3.2.2 - TYPICAL SPACING FOR BUS STOPS**

| Environment | Spacing (Feet) |
|---|---|
| Central Core Areas (CBD's) | 500 - 700 feet |
| Residential (Suburban) Areas | 700 - 1,200 feet |

### *3.2.5 Patron Access*

It is important to provide clearly defined paths of travel between bus stops and points of origin or destination. As mentioned in the previous section (3.1 Accessibility Guidelines), these paths of travel must meet the ADA requirements for accessible routes. Therefore, bus stops are not permitted to be located where they are not connected to either an ADA compliant sidewalk or crosswalk. See Figures 3.2.5a and 3.2.5b for examples of acceptable and unacceptable bus stop access.

In addition to providing access that meets the standards of ADA, it is im-

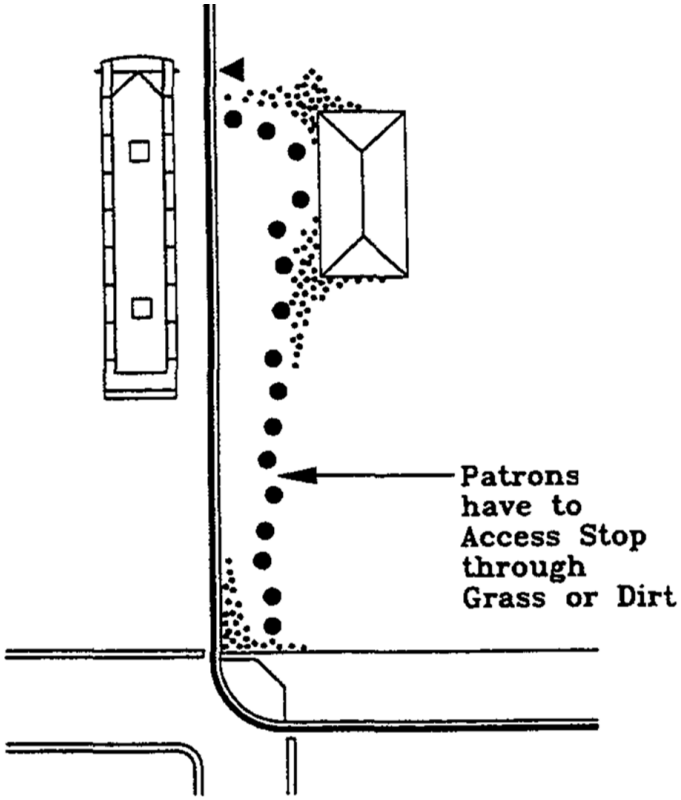



**Figure 3.2.5a - Patron Access - Non-Compliant Layout**

portant to develop paths of travel that are as direct as possible between the bus stop and destination points to discourage pedestrian "short cutting" through lawns or parking lots. Pedestrians will typically create their own "more direct" routes when the travel path provided does not create a direct connection. Access paths should be impervious, stable surfaces that have adequate lighting and drainage.

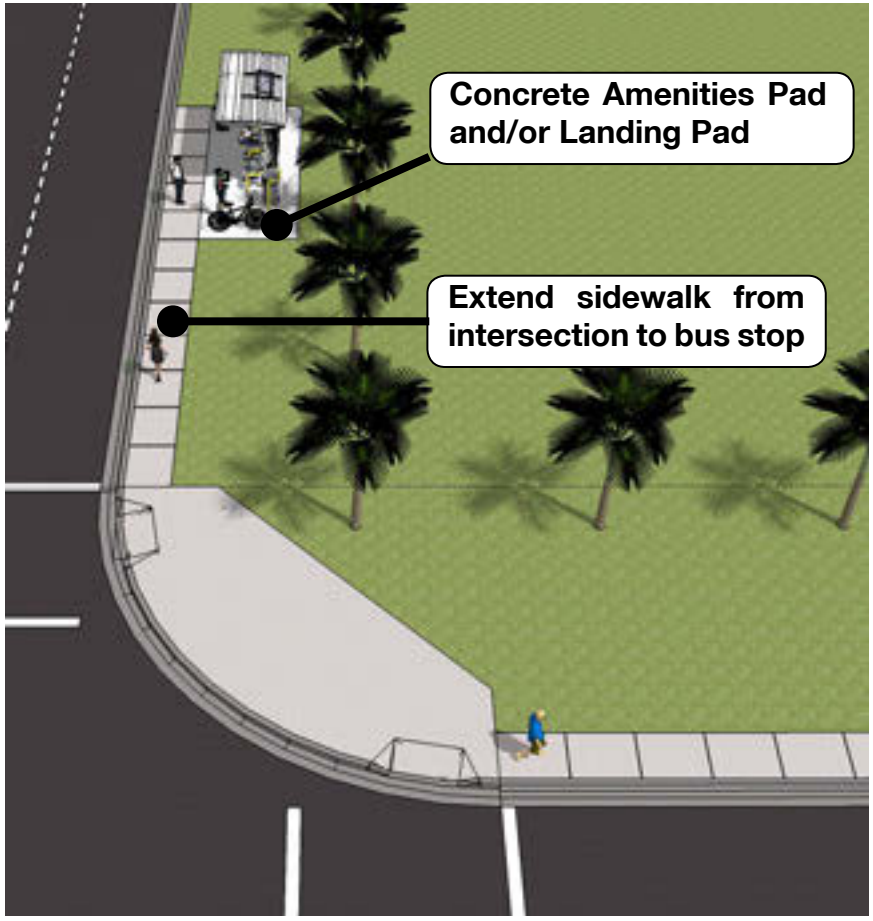



**Figure 3.2.5b - Patron Access - ADA Compliant Layout**

## 3.3 Signage / Information

Bus route and passenger information can be displayed in various ways. Flag signs, information kiosks and information displays mounted in / on bus shelters are typically the most common forms of displaying information at bus stops. BCT uses flag signs to designate all official bus stops in Broward County and should have the following information:

- Broward County's Bus Stop Logo
- The bus route numbers that serve that stop
- ADA Compliance Sticker (for ADA Compliant Bus Stops)

See Figures 3.3.2 and 3.3.3 for typical BCT flag sign design.

Schedule, route and destination information may also be provided at bus stops on separate signs. These separate signs are typically either mounted on the flag sign pole, or included in a panel on the bus shelter, when provided.

### *3.3.1 Signage Design and ADA Considerations*

The information displayed at bus stops must comply with ADA regulations as established in section 4.30 of the ADAAG and the guidelines described in this manual. All signs should be located where they can be read by all bus patrons, including those with visual impairments. Additionally, signs and posts must be located so that they comply with all ADA guidelines for clearances. Generally, a minimum clearance of 3 feet must be maintained between any sign and all other features along the accessible route, and the bottom of the sign must be at least 84 inches above the surface of bus stop or sidewalk.

Signs containing information for the route designation, bus number, nearby destinations and access information must comply with the specific guidelines provided in section 4.30 of the ADAAG. Bus maps, schedules and timetables posted at bus stops or other transit facilities are not required to meet the ADA signage regulations.

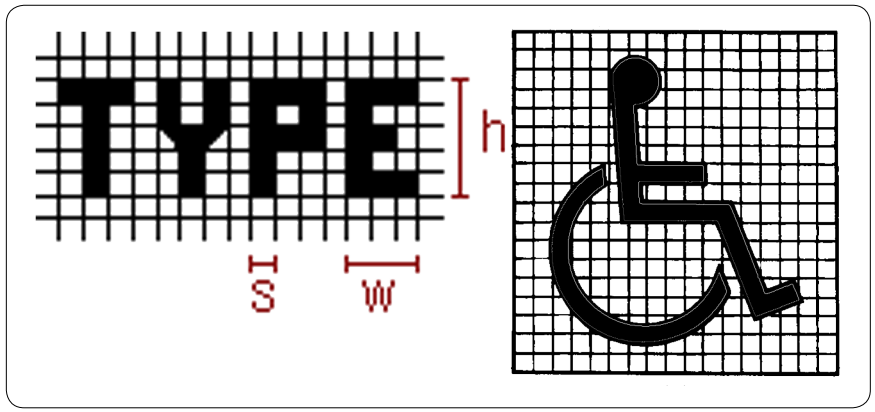



**Figure 3.3.1 - ADA Compliant Character Proportions**

In order to provide fully legible signs for all transit patrons, two sets of signage may be necessary. Route plaques and information holders mounted to the bus stop pole are possible locations for Braille information to be displayed. Additional materials in alternate formats are available from BCT on request.

### *3.3.2 Sign Placement*

Proper signage at bus stops are an important element of good transit service. Signs serve as a source of information to patrons and operators regarding the location of the bus stop and are excellent marketing tools to promote transit use. Broward County Transit uses signs with standard colors, symbols and appearance to easily identify BCT stops.

Bus stop signs should be located at the downstream end of the bus stop, on the far side of the accessible landing area (see Figure 3.3.4). This will help identify where the front door of the bus will stop. The placement of the bus stop sign horizontally from the curb will depend on the width and location of the sidewalk at the bus stop (see Figure 3.3.4). The bus stop sign must be located with a minimum of 2-feet clearance between the bus stop sign or post and the face of the curb.

**Figure 3.3.2 - Photo - BCT Standard Bus Stop Sign on Standard Yellow Post**

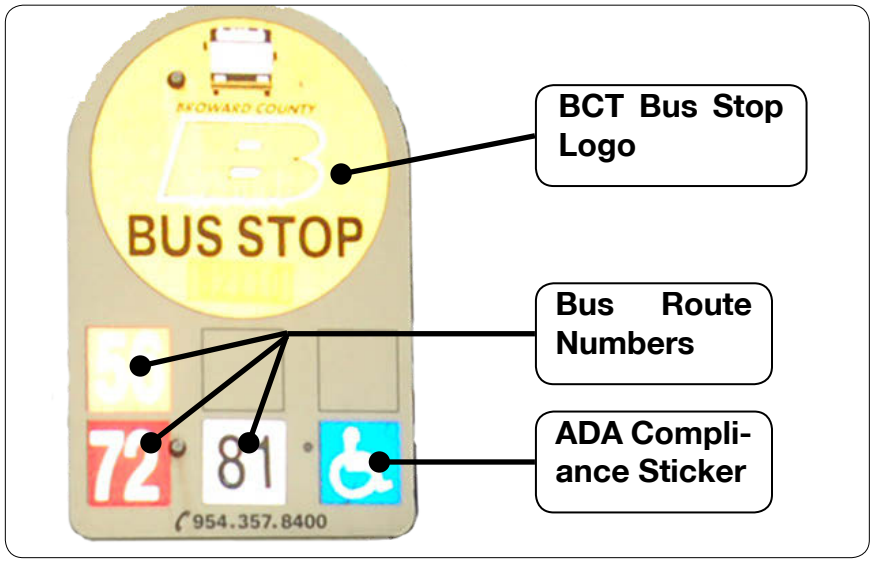



**Figure 3.3.3 - Photo - BCT Standard Bus Stop Sign**

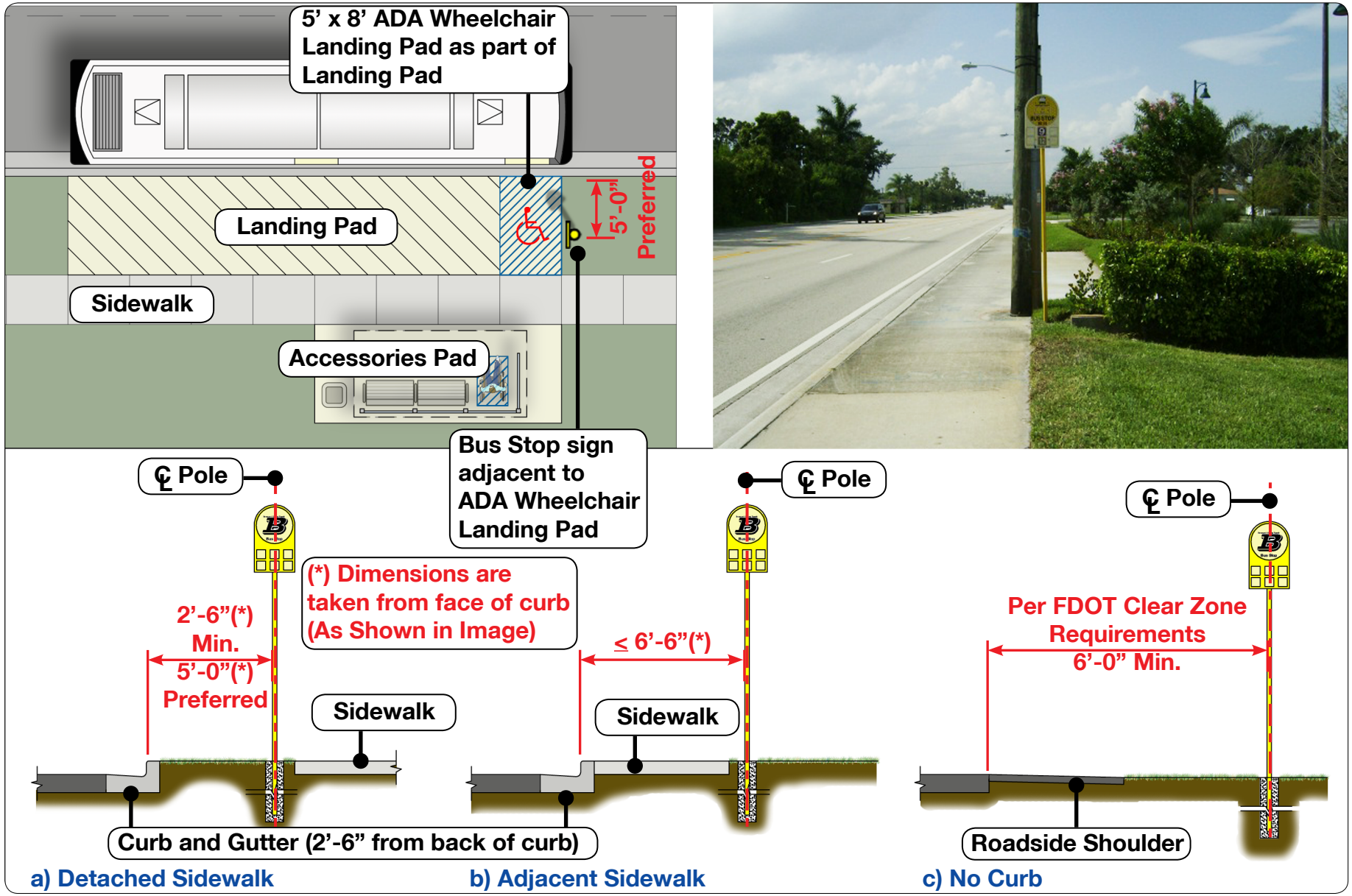



Figure 3.3.4 - Bus Stop Sign Location

### *3.3.3 Route Maps and Timetable Displays*

Route maps and timetable displays are not required to be included at bus stops, nor is it required to meet the signage requirements of the ADA. However, the availability of this information at a bus stop adds to the convenience and comfort of the passengers. Broward County Transit recommends this information should be provided at all bus stops where possible. This information is required at bus stops serving public places such as schools, libraries and governement buildings.

At bus stops with shelters, this information should be provided so that it is readable for passengers waiting inside the shelter (see Figure 3.3.5). At bus stops without shelters, schedule holders or information holders mounted to the bus stop flag pole should be used to display route and schedule information, so that it is visible from the accessible landing pad.


**Figure 3.3.5 - Photo - Information Signage at a Bus Stop**

### *3.3.4 Real-Time Information*

Real-time information is a method of providing information that also improves the experience for the passenger. Although it does not directly impact the wait time for the passenger, by providing current information on the status of approaching vehicles, real-time passenger information systems allow passengers to change their wait time expectations, thus reducing the burden associated with waiting. Real-time information systems typically display information on arriving buses along with any system updates, such as delays, service disruptions or route changes.


**Figure 3.3.6 - Photo - Realtime Information - Lauderdale Lakes (St. Rte 7)**

The implementation of real-time information is something that Broward County Transit is currently looking into. Any new bus stops should be designed to include real-time information capabilities, which must be coordinated with Broward County Transit.

Real-time information displays shall be placed either in or on the bus shelter. Figure 3.3.6 shows an example of a real-time information display used on the BCT system. BCT's preferred power source for Real Time Information systems at bus stops is solar.

## 3.4 Landing Pads and Accessory Pads

A landing pad is the area at the bus stop adjacent to the curb where passengers are able to board and alight the bus. An accessory pad is the area at a bus stop provided for passengers as they wait for the bus. If shelters, benches or other amenities are provided at bus stops, they are typically located on the accessory pad.

ADA requires that an accessible landing pad be provided at the area where a wheelchair lift or ramp can be deployed from the bus to provide access for those passengers with mobility impairments. The accessible landing pad must be a minimum of 96 inches (8 feet) long, measured perpendicular from either the back of the curb or the edge of the vehicular roadway, and at least 60 inches (5 feet) wide, measured parallel to the roadway (see Figure 3.4.3). Accessible landing pads must be kept free from any obstructions that would reduce the clear space to less than the 8-feet by 5-feet area mentioned above, and must conform to all requirements established in section 10.2 of the ADAAG.

The slope of the landing pad parallel to the roadway should be the same as the slope of the roadway, to the fullest extent practicable. The slope of the landing pad perpendicular to the roadway may be pitched up to 1:50 (2%) in order to allow for water drainage.

Where additional amenities are installed, such as shelters and benches, a wheelchair waiting area of at least 30 inches by 48 inches shall be provided. The wheelchair waiting area must be accessible to the adjacent sidewalk and accessible landing pad. Where shelters are provided, the wheelchair waiting area must be located entirely within the perimeter of the shelter.

### *3.4.1 Sizing*

The size of an accessory pad depends on several factors, including:

- Length and widths of shelters and benches
- Clearance requirements for street furniture
- Available road right-of-way and/or easements

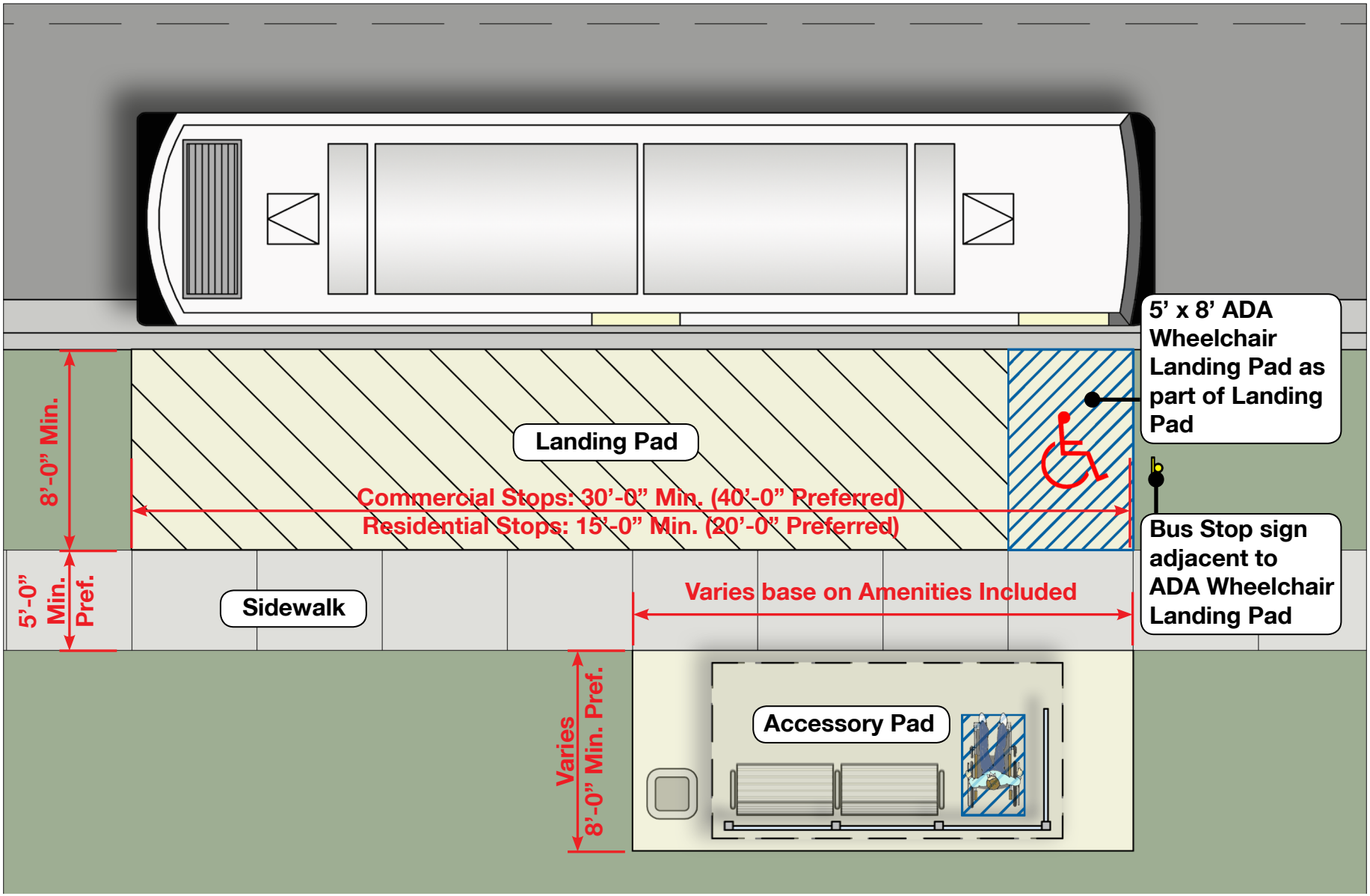



**Figure 3.4.1 - Layout for Landing Pad and Accessory Pad**

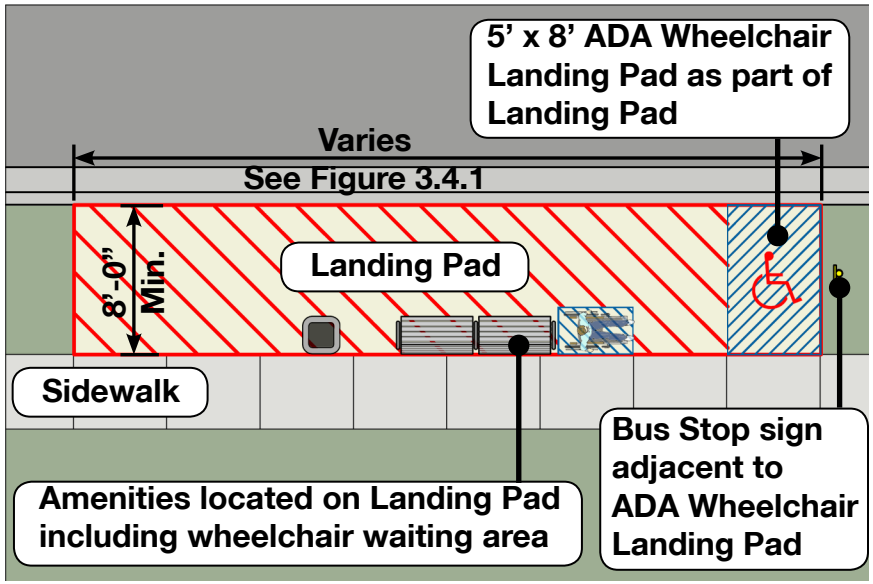



Figure 3.4.2a - Sidewalk behind landing pad, no accessory pad

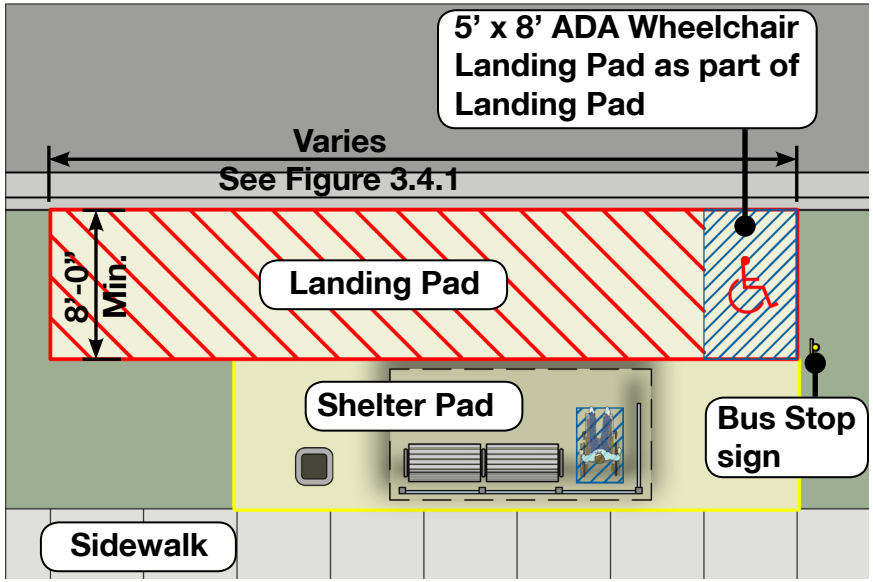



Figure 3.4.2b - Sidewalk behind landing pad W/ separate accessory pad.

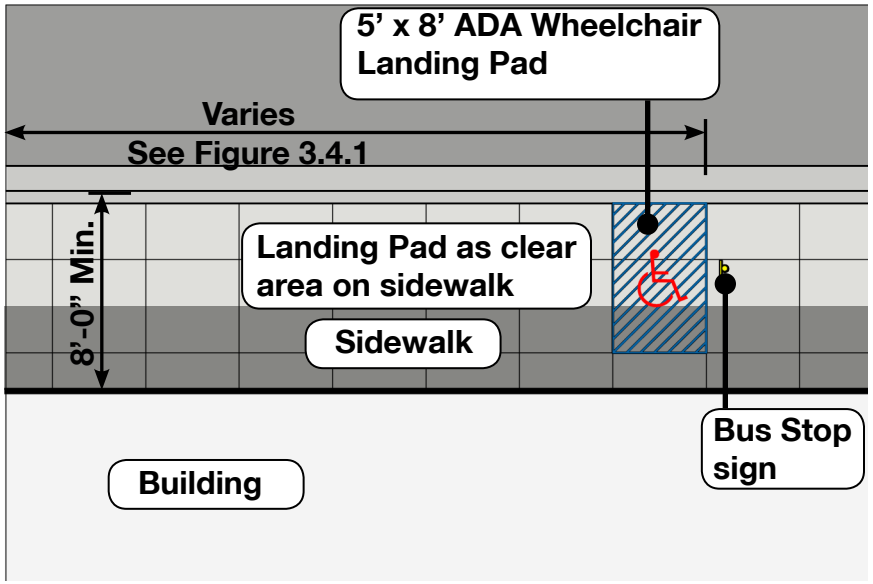



Figure 3.4.2c - Sidewalk adjacent to curb

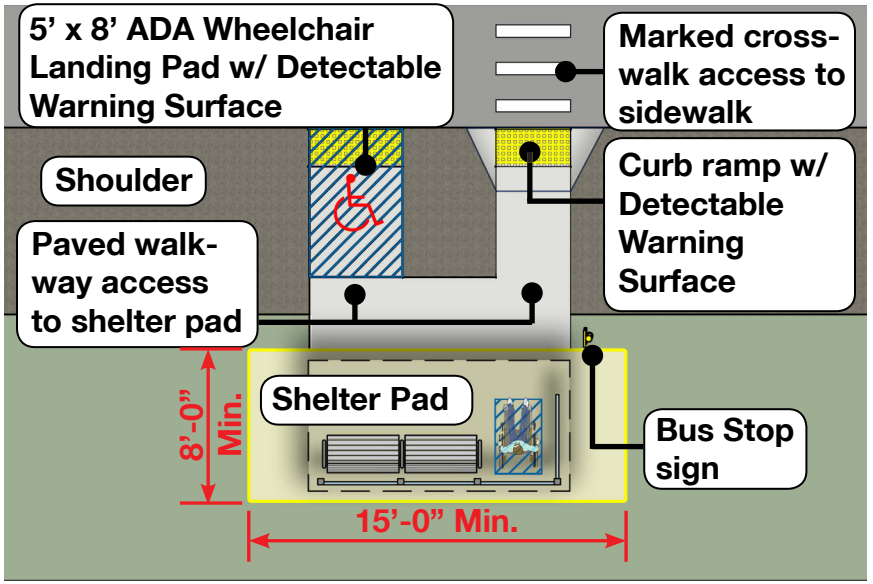



Figure 3.4.2d - Accessory pad at road with shoulder, sidewalk on opposite side

- Length of the bus
- Setback requirements
- Amenities to be included at the stop

The size of landing pads will be affected by the existing site conditions and available space at the bus stop. The ADA wheelchair landing pad typically is included as part of the landing pad. BCT recommends the following dimensions for landing pads for each bus to be stopping at the bus stop:

- Available road right-of-way and/or easements
- Minimum of 8'-0" wide
- Commercial areas: Min. 30'-0" length (40'-0" recommended)
- Residential areas: Min. 15'-0" length (20'-0" recommended)

### *3.4.2 Positioning and Layouts*

Landing pads must be located adjacent to the street to provide passengers with direct access to and from the bus. The sidewalk may be included as part of landing pad. Accessory pads should be separated from the sidewalk so that waiting passengers or transit amenities do not impede general pedestrian flow. Broward County Transit recommends that a minimum of 5 feet clear space is provided in the sidewalk to reduce conflicts between passengers and other pedestrians. Depending on the available right-of-way space, position of the sidewalk, setback requirements, location of utility poles and buildings, the waiting pad can be placed on either the side of the

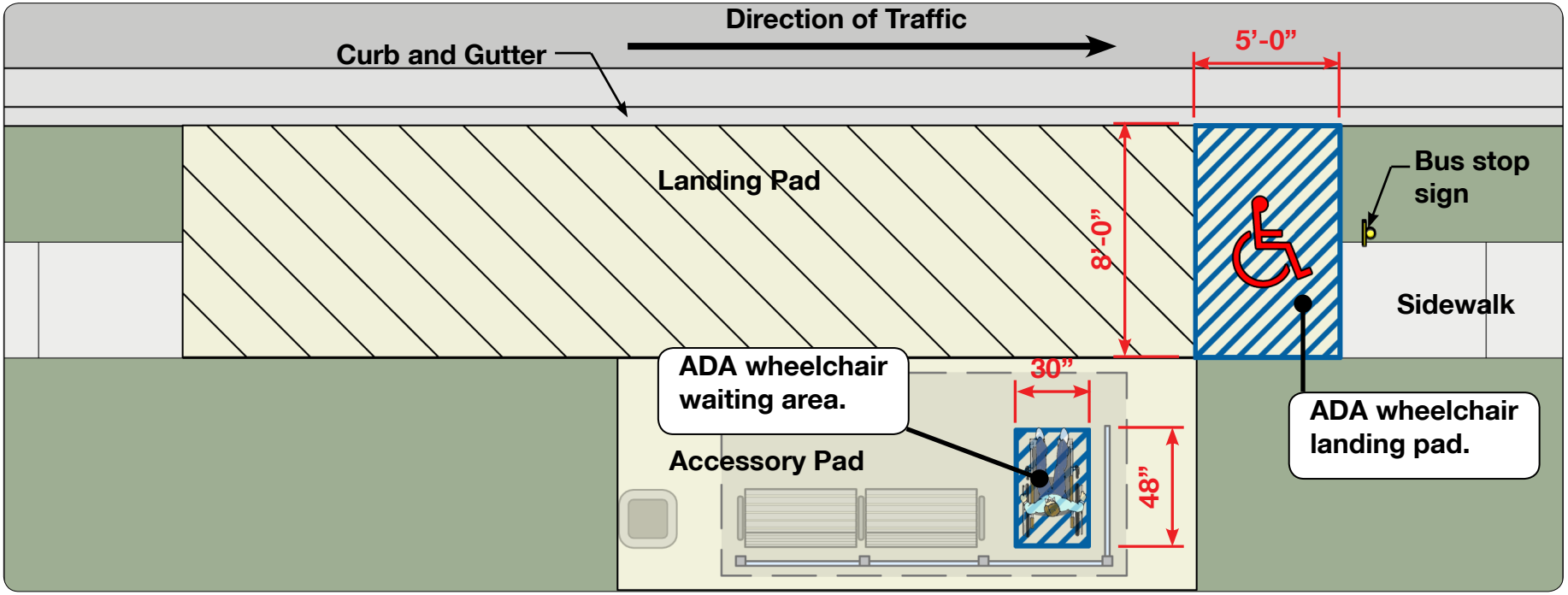



**Figure 3.4.3 - Accessible Landing Pad and Separate Wheelchair Waiting Area**


**Figure 3.4.4 - Photo - Passenger Waiting Pad**

sidewalk.

Where the waiting pad is located adjacent to the back edge of the curb, the accessible landing pad should be included in the dimension of the waiting pad. BCT recommends this type of configuration to provide for desirable boarding and alighting conditions for all passengers. In locations where the waiting pad is located on the far side of the sidewalk, or otherwise not connected to the curb, an accessible route must be provided to the accessible landing pad.

ADA mobility and clearance requirements must be followed when laying out amenities at a waiting pad. In general, a minimum of 36 inches clearance should be maintained between all amenities where passenger flow is provided.

Waiting pads may be constructed of concrete or a paving system depending on the restrictions of the local municipality or local jurisdiction at the bus stop.

## 3.5 Benches

Benches, even when installed without a shelter, provide comfort and convenience for passengers at a bus stop. Benches typically follow similar rules as shelters in regards to whether or not to install them at a bus stop, based mainly on existing or projected ridership numbers. Generally the criteria for installing a bench are less than that for a shelter.

Many of the local municipalities within Broward County have specific requirements for bench design and placement. Some of the cities have contracts with private suppliers to install and maintain benches within their municipal limits.

Typical bench dimensions are shown in Figure 3.5.1.

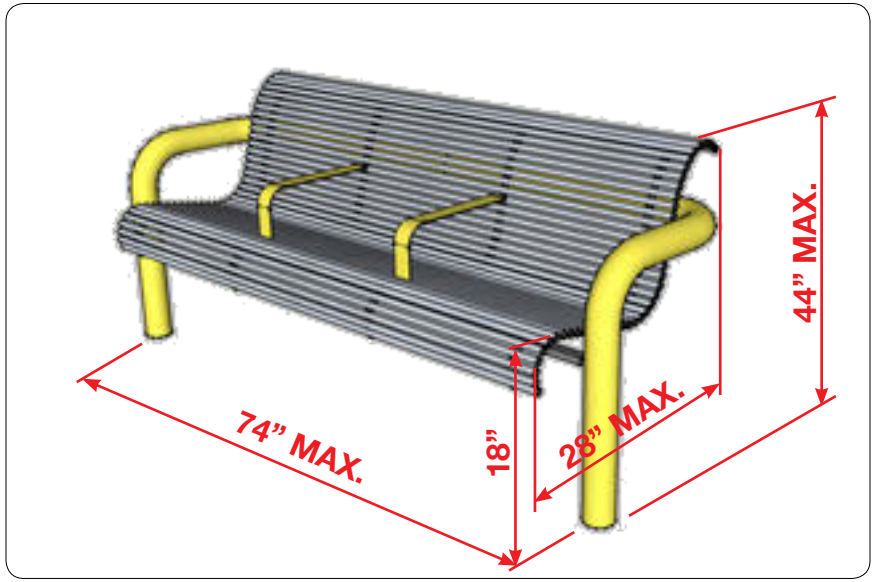



**Figure 3.5.1 - Typical Divided Bus Bench Dimensions**

Benches at officially designated Broward County Transit stops and facilities should conform to the following minimum design guidelines:

- All benches must conform to the ADA requirements as set in Section 4.37 of the ADAAG.
- Benches should be durable, vandal resistant and remain structurally sound with a minimum 10 year warranty.
- Seating for a minimum of 3 adults is recommended.
- Benches should be designed to minimize vandalism, graffiti and tipping. Anti-vagrant bars are preferred. Seating should be secured to a concrete pad or other structure.
- The seating area shall be 20 – 24 inches deep and located between 17-19 inches above the sidewalk or waiting pad surface.
- The backrest area shall be between 18-24 inches in height and no greater than 74 inches in length.
- All surfaces shall be high density; slip resistant materials designed to shed water, and properly sealed to resist the elements.
- Benches must be designed to withstand all structural and area velocity wind load requirements as required by current code. Benches must be designed by a registered architect or engineer licensed in the state of Florida. The anchoring method shall be included in the design of the bench.

### *3.5.1 Location and Spacing*

The location of benches at bus stops must comply with all clearance and accessibility requirements of the ADA as well as set-back and clear zone requirements of FDOT, Broward County or the local municipality in which the bench is to be installed. Although benches are not designed for persons in wheelchairs, the placement of benches should take them into consideration. It is recommended that at least one wheelchair waiting area, consisting of a minimum 30 inch by 48 inch clear space, be provided adjacent to the bench. A minimum of 36 inches of clear space must be maintained along all sides of the bench that are intended for passenger movement. Where the bench is adjacent to buildings or other structures, a minimum gap of 12 inches should be maintained for the removal of debris and cleaning of the bench.

Benches placed on or adjacent to sidewalks, must leave a minimum of 3 feet clearance on the sidewalk to allow for pedestrian and wheelchair movements. A minimum of 4 feet clearance is recommended by FDOT and

**Figure 3.5.2 - Photo - Divided Bus Bench**

BCT. Preserving minimum pedestrian circulation guidelines, coordinating with existing landscaping, and providing additional waiting areas can improve bench and site utilization. Benches are recommended to be located a minimum of 10 feet from the edge of the travel lane; where this cannot be accommodated, the setback must meet the minimum FDOT design criteria, as established in the Florida Intersection Design Guide. General guidelines for the placement of benches at bus stops are provided in Table 3.5.1.

### *3.5.2 Orientation*

Typically, benches should be oriented so that the seat back is facing the street (seat back is parallel to the curb). However, several local municipalities have requirements for the benches with advertisements on them to be oriented so that the seat back is set to a specified angle to the street. Before installation of a bench, the required orientation should be verified to comply with local municipality standards.

Benches should be oriented at bus stops in a way that enhances the comfort of bus patrons, while not impeding on accessibility clearances or general pedestrian movements. Patron comfort will be impacted by their protection from the elements (rain, wind and sun), walking distance to the bus, visibility and sense of safety. Figures 3.5.3 and 3.5.4 show examples of well oriented benches at bus stops.


**Figure 3.5.3 - Photo - Bus Shelter with Benches**


**Figure 3.5.4 - Rendering - Additional Benches outside Shelter**

## TABLE 3.5.1 - GUIDELINES FOR THE PLACEMENT OF BENCHES (FROM FDOT-IV TRANSIT FACILITY GUIDELINES)

| # | Descrption |
|---|---|
| 1 | Transit bus benches placed in the right-of-way shall not exceed 74-inches in length, 28-inches in depth, and 44-inches in height (Chapter 14, Florida Administrative Code). |
| 2 | Bench and other street furniture are subject to ADA mobility clearances between the bench and other street furniture or utilities at a bus stop. |
| 3 | Benches shall not be located within the 5-foot by 8-foot accessible landing pad. |
| 4 | Any bench placed on any part of the sidewalk shall leave at least 3-feet (4-feet per FDOT standards) of clearance for pedestrian traffic between the face of the bench and the back of the curb. This distance should be increased as the speed of traffic on the adjacent road increases. Bus benches must be placed outside of the horizontal clear zones. |
| 5 | Transit bus benches shall not be installed in the median of any divided highway or on limited access facilities. |
| 6 | Avoid locating benches in completely exposed locations. Coordinate bench locations with existing shade trees if possible. Otherwise, install landscaping to provide protection from the wind, sun and other elements. |
| 7 | Coordinate bench locations with existing streetlights to increase visibility and enhance security at the stop. |
| 8 | Locate benches on a non-slip properly drained concrete pad. Avoid locating benches in undeveloped areas of the right-of-way. |
| 9 | Locate benches away from driveways to enhance patron safety and comfort. |
| 10 | At bench-only stops, additional waiting room near the bench should be provided (preferably protected by landscaping) for passenger comfort. |

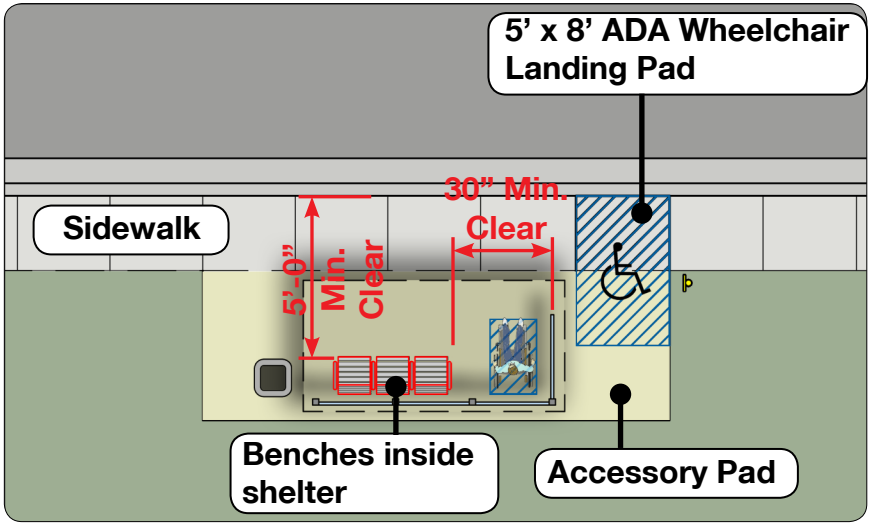



Figure 3.5.5 - Benches Located Inside Shelter

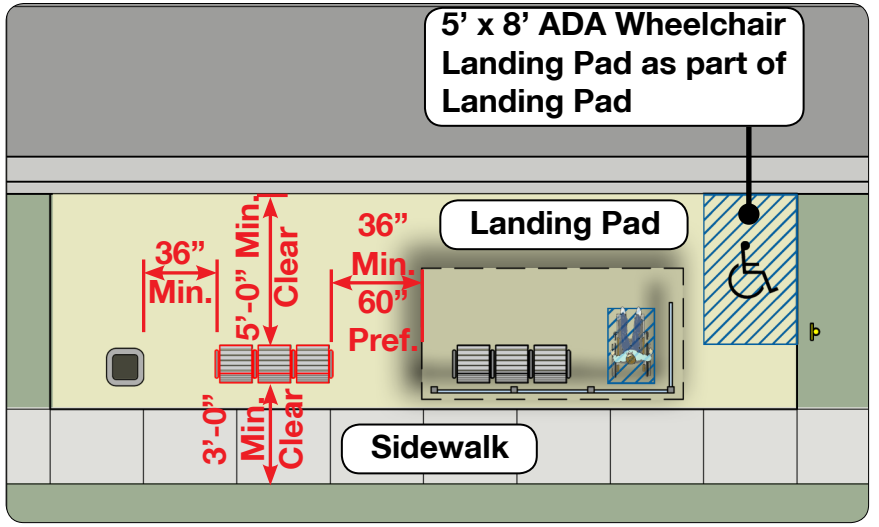



Figure 3.5.6 - Benches Located Outside Shelter

## 3.6 Shelters

A bus shelter is a structure that provides physical protection for transit passengers from extreme weather conditions and other elements. Shelter should be designed to meet the needs of the transit rider as well as the requirements of ADA.

### *3.6.1 Municipality Specific Designs*

Currently Broward County Transit is developing several standard designs for bus shelters. Additionally, several local municipalities also have developed standard bus shelter designs. Figures 3.6.2a – 3.6.2d show examples of the local municipality standard shelter designs.

The inclusion of shelters other than the standards must be approved by BCT or the local municipality responsible for the bus stop where the shelter will be installed.

### *3.6.2 Inclusion and Sizing*

The inclusion of a shelter at a bus stop should be based on several factors:

- Daily boardings and alightings
- Number of Routes Served
- Transit Oriented Developments
- Elderly or disabled populations
- Location of major trip generators
- Adjacent to social service providers

Florida Department of Transportation District IV establishes criteria for these factors from the Transit Capacity and Quality of Service Manual (TCQSM) published by the Transit Research Board (TRB). BCT is dedicated to increasing the number of bus stops across the county with shelters, and recommends that shelters be included at any bus stop where adequate space is available and a maintenance agreement can be achieved.

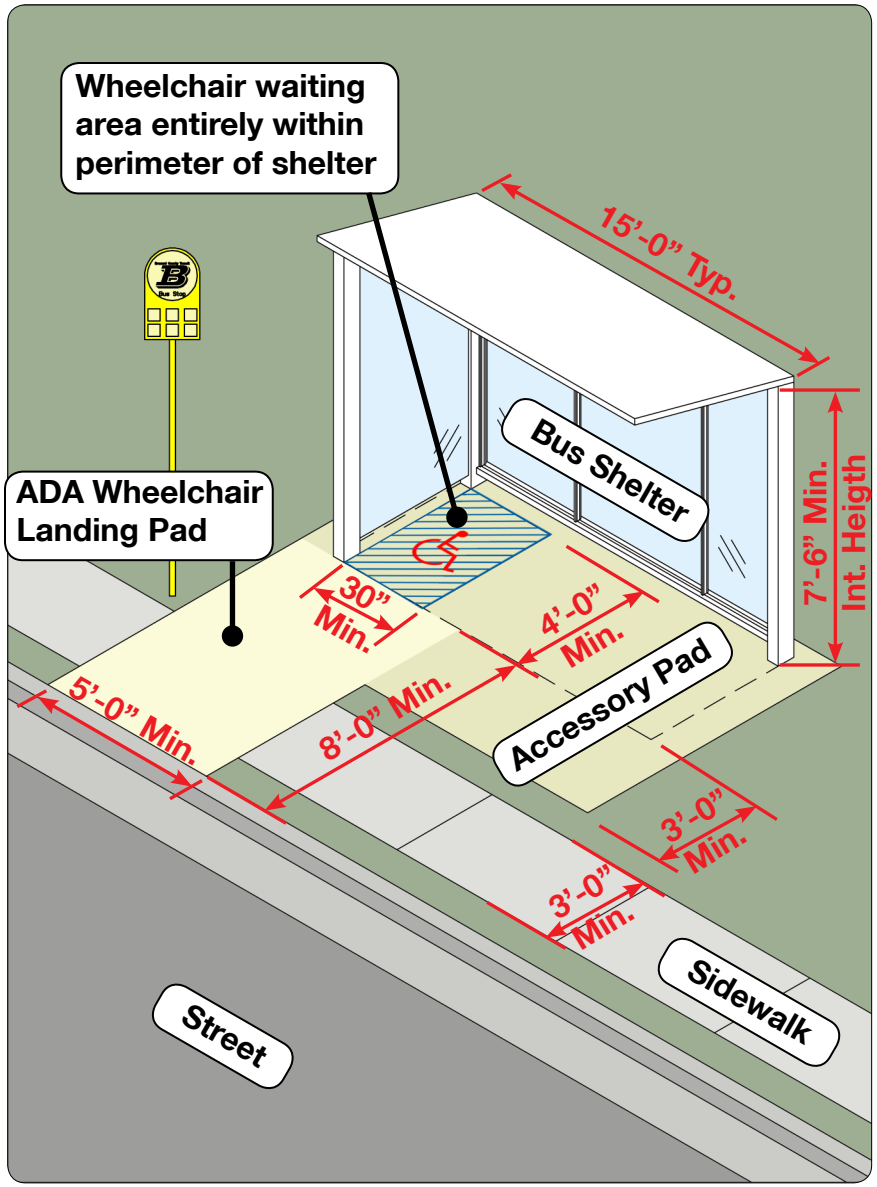



**Figure 3.6.1 - Sketch - Minimum ADA Requirments for a Bus Shelter**


**Figure 3.6.2a - Lauderdale Lakes Bus Shelter**


**Figure 3.6.2b - Lauderhill Bus Shelter**


**Figure 3.6.2c - City of Miramar Bus Shelter**


**Figure 3.6.2d - Town of Davie Bus Shelter**

**(i) Contact BCT for specific designs for each city in Broward County**

Broward County Transit recommends that the size and design of bus shelters should based on the following:

- Number of daily boardings and alightings
- Number of routes served by the bus stop
- Availability of public road right-of-way and/or easements at the bus stop
- The bus shelter must be in full compliance with ADA Guidelines
  - » Including all guidelines as set forth in this manual
- The number and size of benches to be provided
- The consideration of South Florida's climate:
  - » Roof sloped away from main area of access, including integral gutters and downspouts to protect passengers from rain;
  - » Include shading louvers or other shading mechanisms to protect passengers from the sun
- Lighting, including photovoltaic panels as a sustainable power source
- Provide a means for displaying public information and advertising.

Broward County Transit and many of the local municipalities have established standard shelters that are to be used when installing a bus shelter within each local jurisdiction. See Appendix E for design drawings of the various standard shelters.

Shelters other than the standards must be coordinated and approved by Broward County Transit or the local municipality that has jurisdiction at the bus stop where the shelter is proposed. The following are the minimum design requirements for transit shelters in Broward County:

- Full compliance with all applicable regulations of ADA, including, but not limited to, passenger access, wheelchair waiting area, and required clearance.
- Durable, vandal-resistant, low maintenance to remain structurally sound with a minimum 20-year usable life expectancy.
- Roof design sloped to the rear of the shelter (away from the main entrance) including integral gutters and downspouts, and a minimum interior ceiling height of 7'-6".
- All parts of the shelter must be designed to withstand current area velocity wind load requirements. The shelter must be designed by a registered engineer or architect, licensed in the state of Florida, with all calculations provided. For pre-fabricated shelters, the anchoring technique shall be specified as part of the design, allowing for easy removal and reinstallation.
- Sufficient roof and side coverage shall be provided to protect passengers from the elements (rain, wind and sun) without interfering with wheelchair access. Assuming a rain angle of 30 degrees from vertical.
- Shelters should include seating for a minimum of two passengers and one wheelchair (48" by 30" minimum clear area located within the perimeter of the shelter). Seats should be securely fastened to either the concrete pad or the shelter.
- Shelter foundations shall be a minimum of a 6 inch thick reinforced concrete pad extending at least 6 inches beyond the shelter "foot-print". The shelter foundation must be connected to the accessible landing pad by means of an ADA-compliant paved surface. Plans and calculations signed by a licensed engineer for alternate foundation designs must be

submitted to BCT for approval.

Figure 3.6.3 is a photo of a small BCT bus shelter to show the minimum design criteria.

**Figure 3.6.3 - Photo - City of Margate “Small” Built-in-Place Bus Shelter**

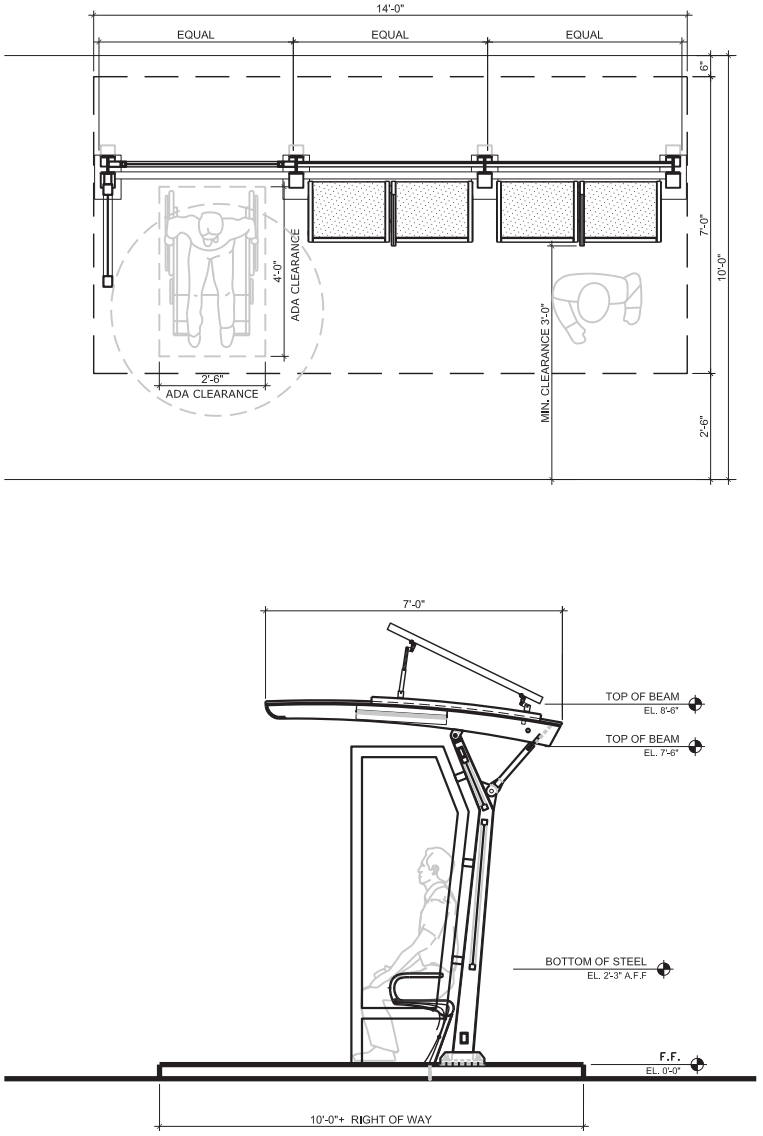



**Figure 3.6.4 - Broward County Custom Medium Prefabricated Shelter (one of several designs)**

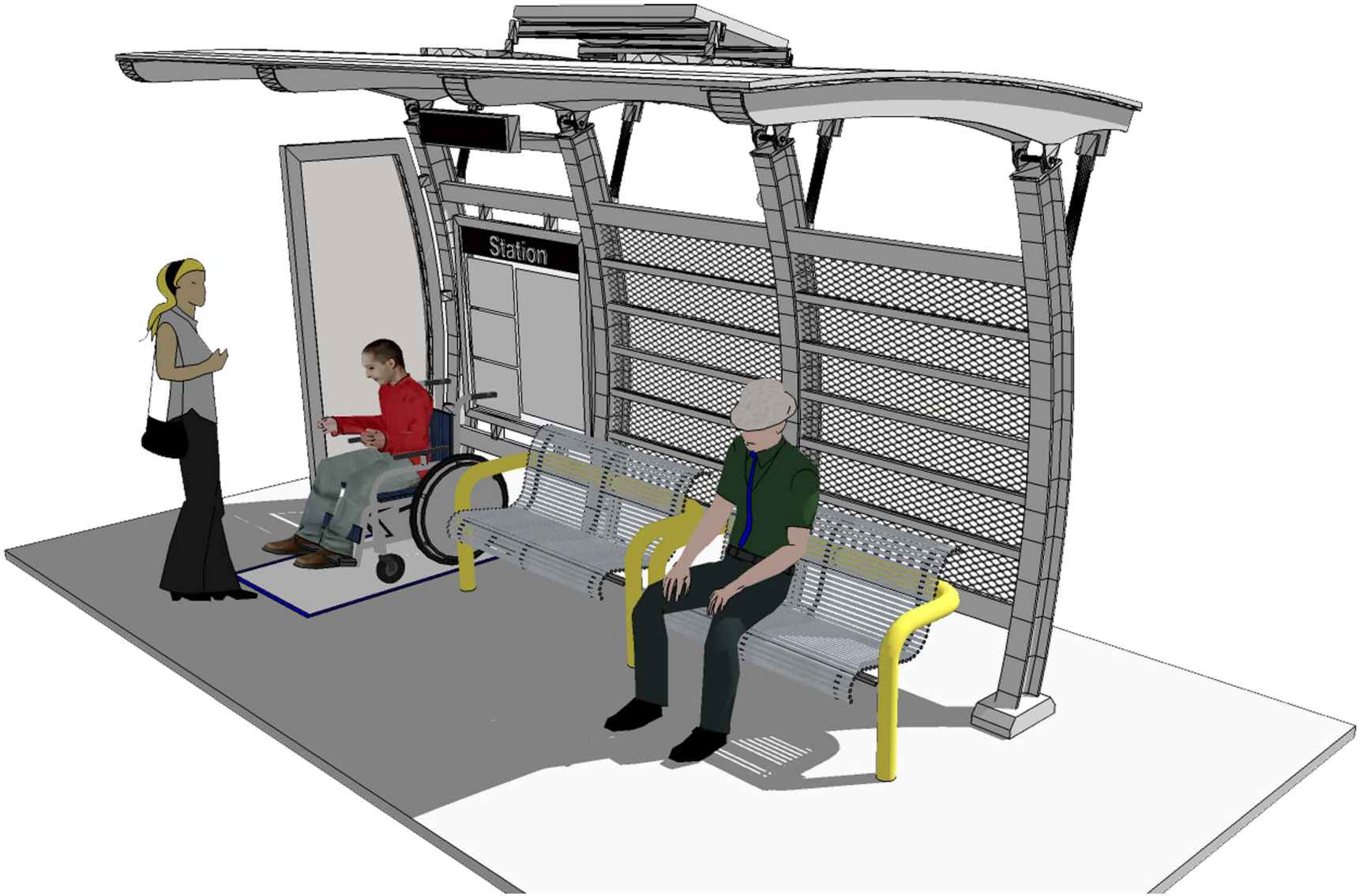



**Figure 3.6.5 - Broward County Custom Medium Prefabricated Shelter (one of several designs)**

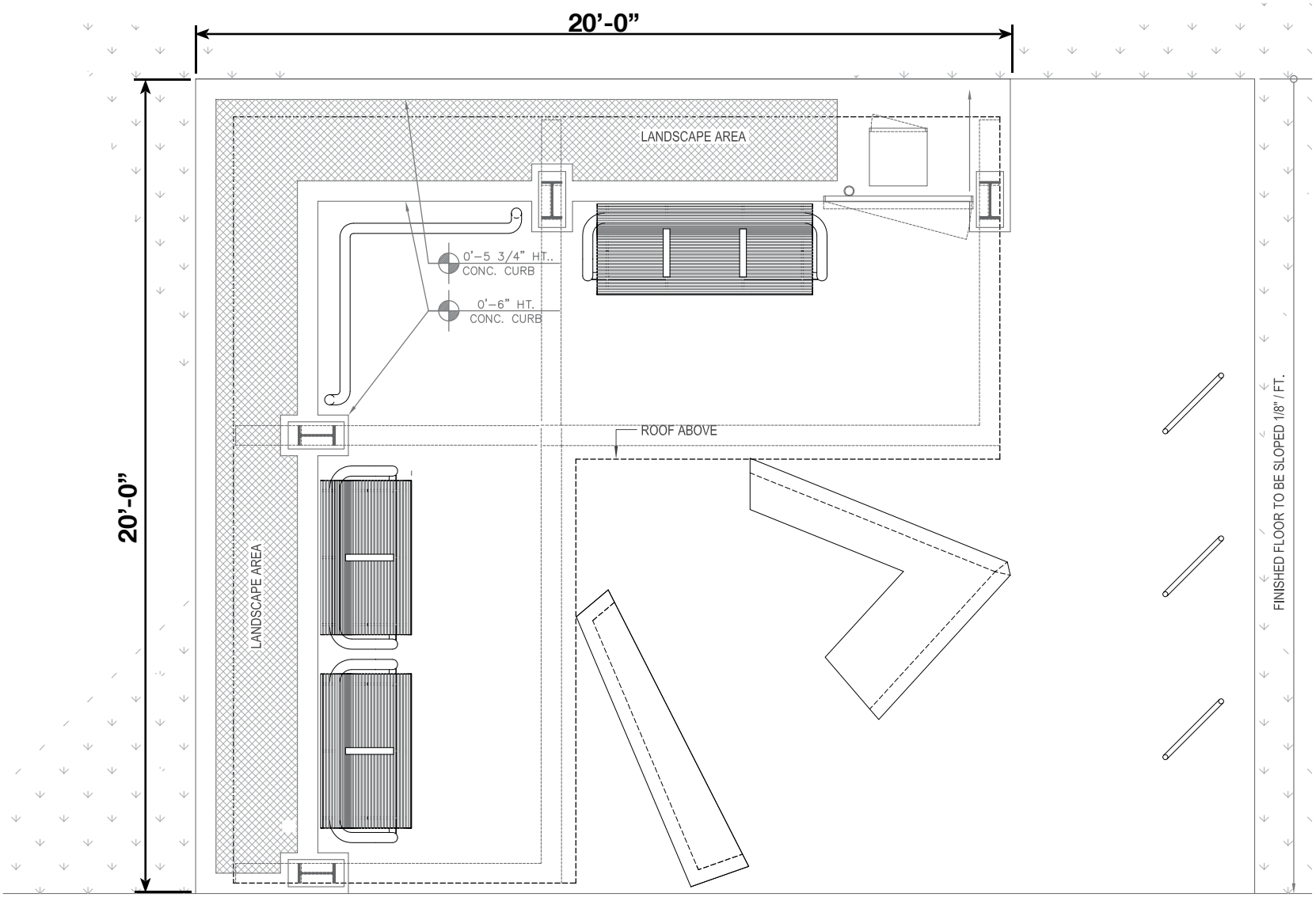



**Figure 3.6.6 - Floor Plan of Broward County Large Custom Built-in-Place Steel Bus Shelter Design (one of several designs)**

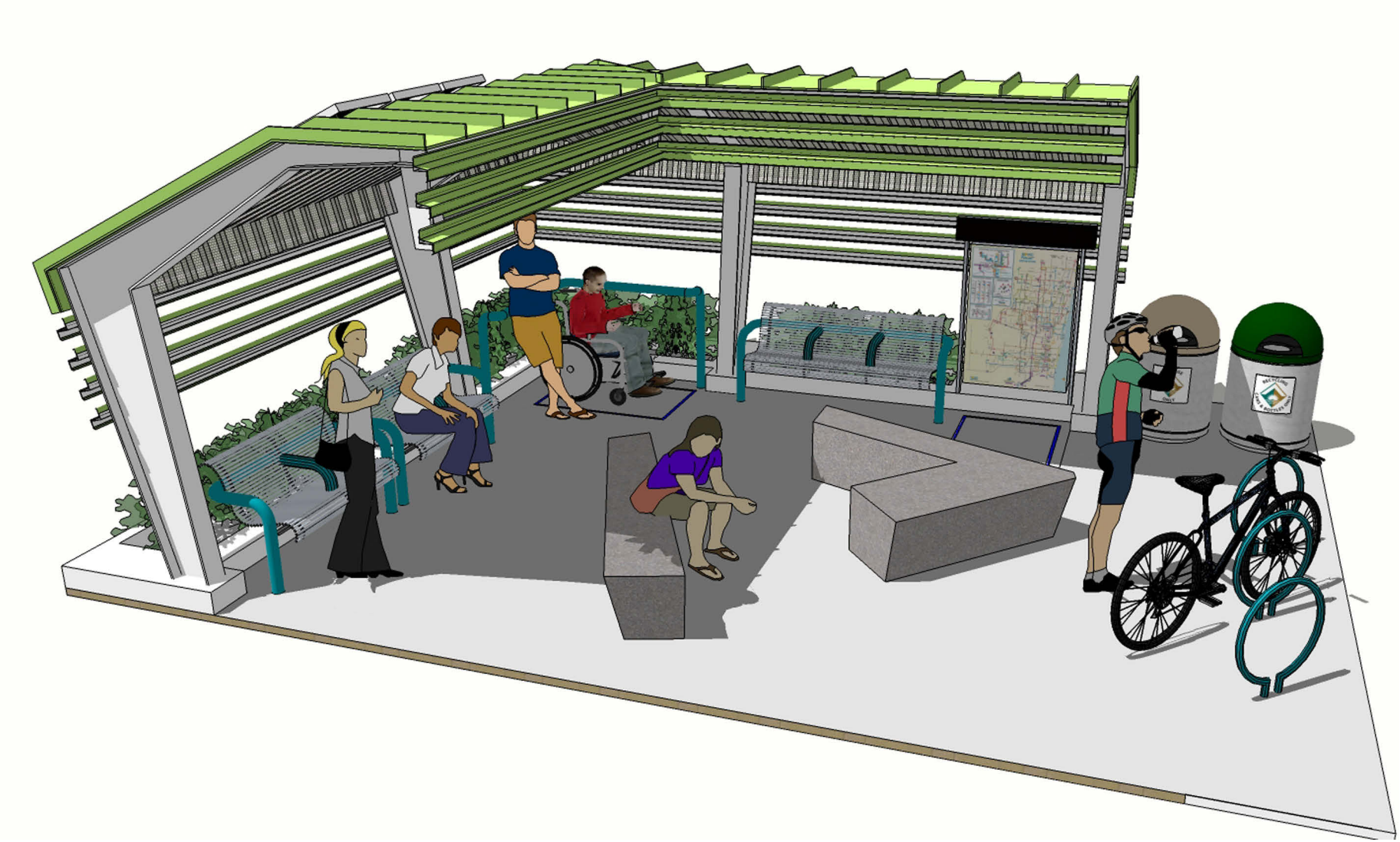


**Figure 3.6.7 - Design Perspective / Rendering of Broward County's Large Custom Built-In-Place Steel Bus Shelter Design (one of several variations)**

**TABLE 3.6.1 - GUIDELINES FOR THE PLACEMENT OF BUS SHELTERS (FROM FDOT-IV TRANSIT FACILITY GUIDELINES)**

| # | Description |
|---|---|
| 1 | Transit bus shelters shall be located a minimum of 12 feet from the intersection as measured along the tangent line of the road, beginning at the point of intersection of the radius of the connecting road and tangent to the road. |
| 2 | Shelters are prohibited in medians and on limited access roads. |
| 3 | Shelters shall not be located within 15 feet of any fire hydrant or disabled parking space. |
| 4 | A shelter shall not obstruct any sidewalk, bike path, pedestrian path, driveway, drainage structure, or ditch, etc. At least 3 feet of clearance for pedestrian traffic shall be maintained. A minimum of 4 feet is recommended. The distance shall be measured from the back of the curb to the nearest part of the shelter or bench, whichever is closer to the curb. |
| 5 | Shelters shall not be located within the 5-foot by 8-foot accessible landing pad. |
| 6 | Shelter location and design is subject to ADA mobility clearance guidelines, Chapter 14-20 of the Florida Administrative Code, and any applicable Federal, State, or local building codes. |
| 7 | Locating shelters completely or partially on the sidewalk should be avoided where ever possible. Where this cannot be avoided, a minimum clearance of 3 feet must be maintained at the sidewalk. Greater clearances are recommended. |
| 8 | To permit clear passage of the bus and its mirrors, a minimum distance of 2 feet must be maintained between the face of the curb and the roof of the shelter, or any component of the shelter. Greater clearances are preferred for safe separation of passengers from vehicular traffic. |
| 9 | Bus shelters should be located as close as possible to the downstream end of the bus stop zone to maximize the visibility of approaching buses and passing traffic, as well as minimize the walking distance between the shelter and the bus. However, where shelters are provided in conjunction with bus bus bays, they should be located to minimize the conflict between passengers loading and exiting the bus. |
| 10 | Placing bus stop shelters in front of store windows should be avoided, when possible, to limit the interferance with advertisements and displays. Blocking store windows can also increase the possibility of vandalism. |
| 11 | When shelters are directly adjacent to a building, a minimum of a 12-inch gap should be preserved to allow for trash removal and cleaning of the shelter. |
| 12 | Shelter installations should maintain a gap between the structure and the foundation to allow for cleaning and removal of debris. |

### *3.6.3 Locating at Bus Stops*

The final location of a bus stop shelter should enhance the circulation patterns of patrons, reduce the amount of pedestrian congestion at a bus stop, and reduce conflicts with nearby pedestrian activities. Shelter locations at bus stops will vary based on available space, existing site conditions (sidewalk, utilities, trees and other planting locations), passenger counts, operator visibility requirements and additional amenities provided at the bus stop.

A minimum of a 5-foot setback from the curb is recommended, although lesser clearances may be acceptable based on site conditions. Table 3.6.1 (derived from Table 4 of the FDOT District 4 Transit Facility Guidelines) provides guidelines for the placement of shelters at bus stops.

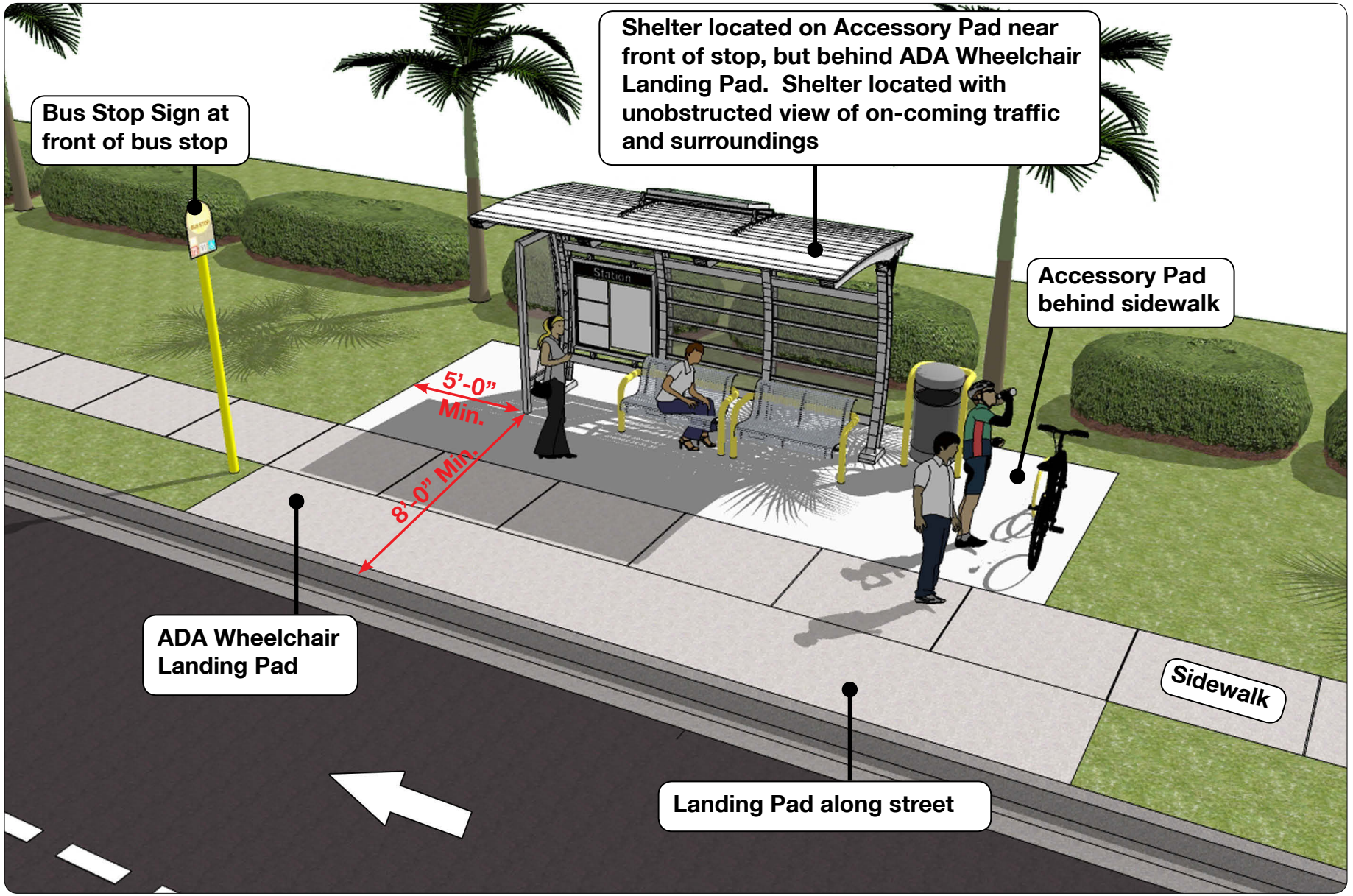



**Figure 3.6.8 - Typical Bus Shelter Layout at a Bus Stop**

### *3.6.4 Configurations and Orientations*

The orientation and configuration of bus stop shelters should take into consideration the specific environmental characteristics of each site, because placement and design will positively or negatively influence passenger comfort. For example, in hot climates, like Broward County, the shelter orientation should work with the design to shade passengers from the sun, while allowing for breezes to keep passengers cool. It is important to design and orient shelters that will maintain comfortable interiors, so that patrons will utilize the shelters instead of nearby building entrances, walls or ledges.

Broward County's climate presents two main issues that should be addressed by the orientation and configuration of shelters:

- Heat – shelters should be oriented to minimize the amount of sun allowed into the shelter while maximizing the amount of air flow.
- Rain – shelters should protect patrons from the rain as it falls, as well as not allowing water to pond in the shelter, or along the path between the shelter and the bus.

Shelters should be coordinated with landscaping, such as shade trees, or other plantings to provide maximum protection from the climate as well as enhancing the visual quality of the bus stop. See Figures 3.6.9 and 3.6.10 for examples of recommended shelter orientations.

**Figure 3.6.9 - Photo - City of Margate Large Built-In-Place Bus Shelter**

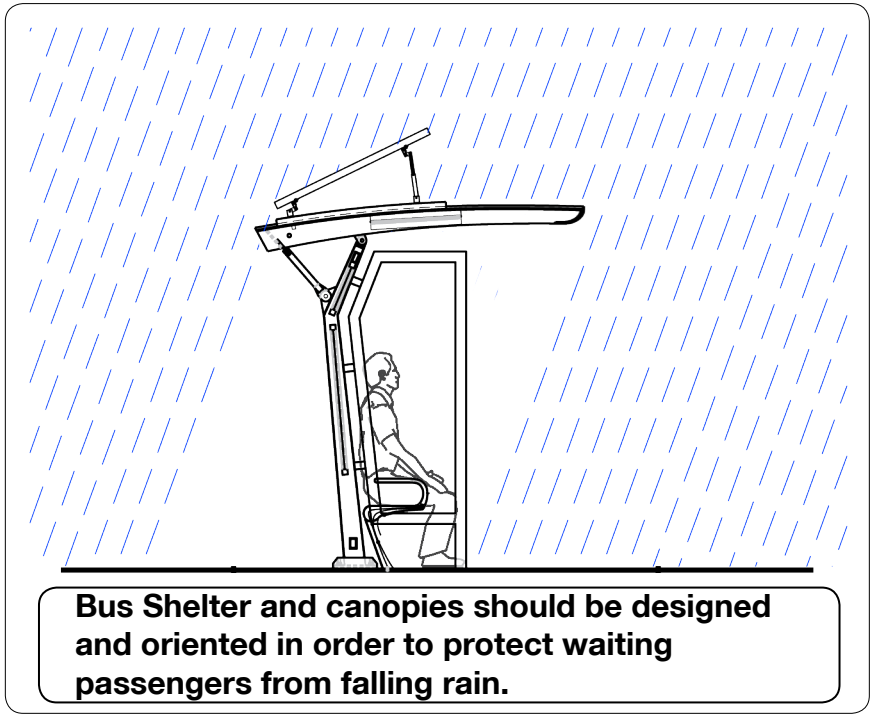



**Figure 3.6.10 - Bus Shelter configuration for rain fall**

### *3.6.5 Advertising*

Advertisements at bus stops must comply with the regulations established in the Florida Administrative Code Section 14-20. Advertisement rights are regulated by the local municipality with jurisdiction at a specific bus stop. Designers and developers must verify the advertisement requirements of the local municipality prior to including advertising at a bus stop.

Advertisements as part of the bus shelter can be used to help supplement the funding required to install and maintain the shelter. Typically, the advertisement would be placed on a panel of the bus shelter that will take advantage of the visibility that the bus stop receives from passing vehicular traffic. It is important to make sure that the location of the advertisement panel does not limit the visibility of passengers from oncoming traffic, or the view of passengers for bus drivers. Therefore, advertisements should always be located at the downstream side of the bus shelter.

Per the Florida Administrative Code Section 14-20.003, advertisements on transit bus shelters shall be no larger than 72 inches by 60 inches per side of the shelter and there shall be no more than one advertisement per side of the shelter.

The inclusion of advertisements with bus shelters must be approved by BCT, the local municipality, or other local jurisdiction responsible for the location where the shelter is to be installed.


**Figure 3.6.11 - Photo - Bus Shelter with Advertisement Panel**

**Figure 3.6.12 - Photo - Typical Advertisement on Shelter Panel**

## 3.7 Connecting to Bus Stops

How bus stops are connected to places of origin, destinations and points of interest is an important aspect of bus stop designs. The following show various examples of how these connections can be made.

### *3.7.1 Thoroughfare Access Only (not preferred)*

When little or minimal coordination and cooperation exists between BCT and the developer, the bus stop offers minimal connection with the development.

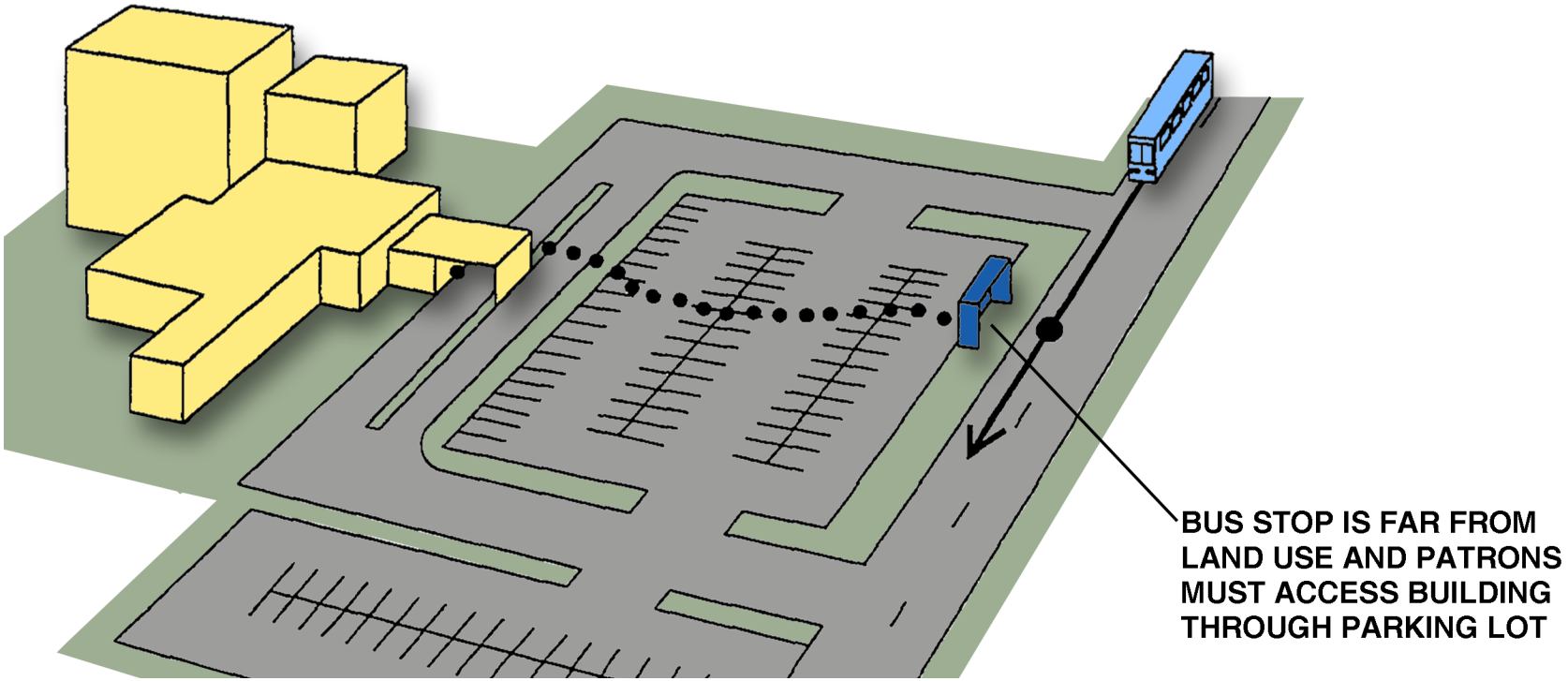



**Figure 3.7.1 - Thoroughfare Access Only (Derived from TCRP 19)**

| Advantages | Disadvantages |
|---|---|
| Bus remains on main thoroughfare, minimizing total travel time along the bus route. | Patrons must walk through a vast parking lot to reach the development. |
| Bus stop is more visible to passing vehicles and helps advertise the availability and location of public transit. | Pedestrian conflicts with general parking lot traffic. |
| | Patron security may be compromised walking through the parking lot. |
| | The parking lot is uninviting and offers little environmental comfort. |

### *3.7.2 Bus Stop to Sidewalk Connections*

At bus stop locations where the sidewalk is set back from the edge of the curb, a clearly defined accessible route must be incorporated to connect the sidewalk with the accessible landing pad and any other amenities provided at the bus stop.

The connection between bus stops and the sidewalk depends on the relationship of the sidewalk to the street and anticipated pedestrian flow at the bus stop. The configuration of the bus stop and its amenities should be coordinated with the natural pedestrian flow at the stop. See Figure 3.7.2 for examples of passenger flows at various sidewalk / bus stop configurations.

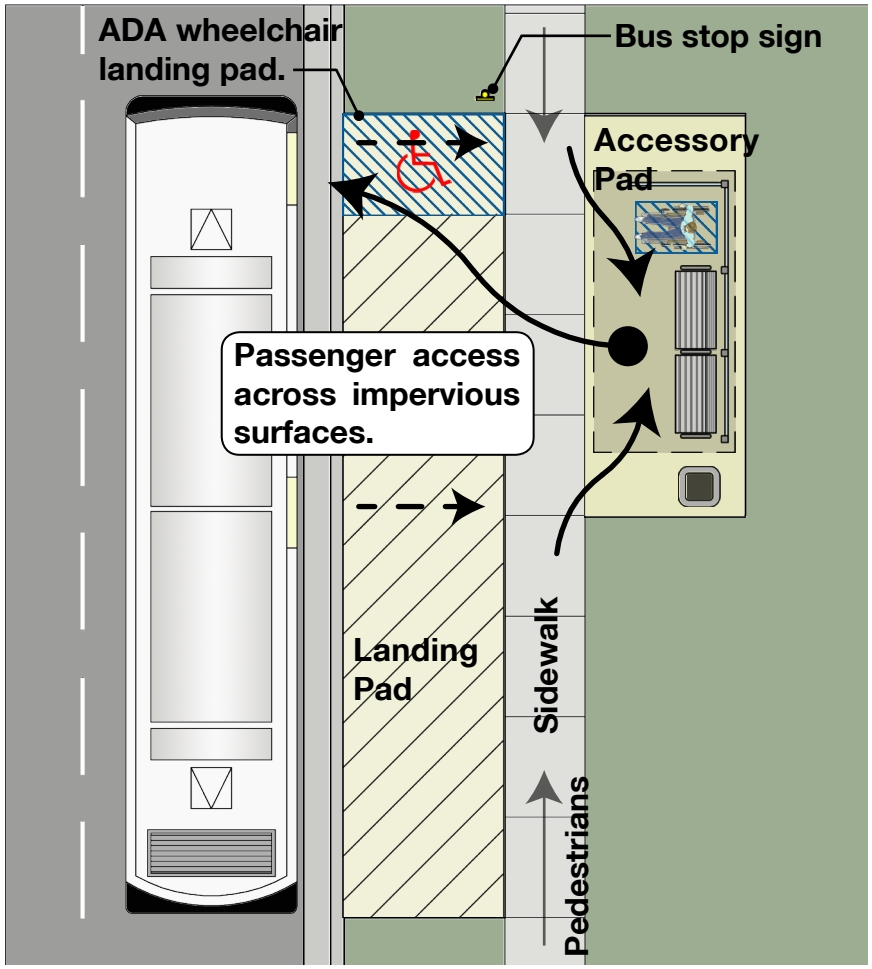



**Figure 3.7.2a - Connection to Sidewalk - Amenities Behind**

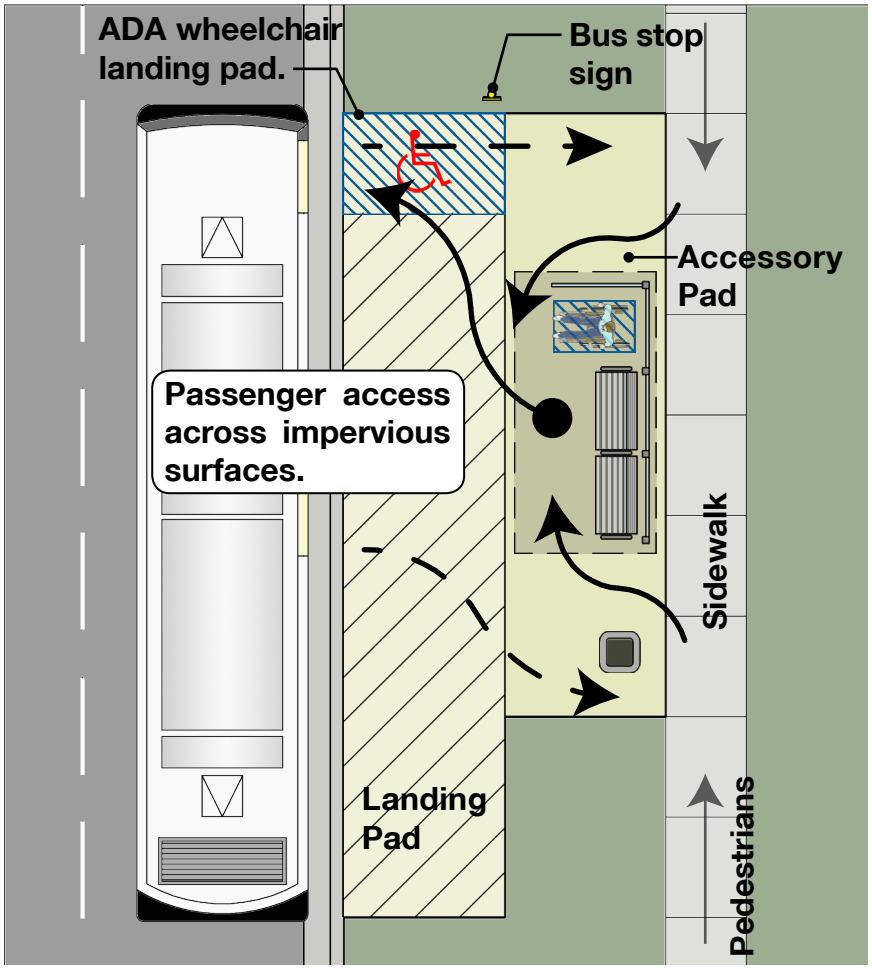



**Figure 3.7.2b - Connection to Sidewalk - Amenities in Front**

### *3.7.3 Pedestrian Promenade (preferred)*

The use of a pedestrian promenade between the bus stop and development creates a user-friendly connection between each, while maintaining the bus route for other passengers without challenging traditional land use practices.

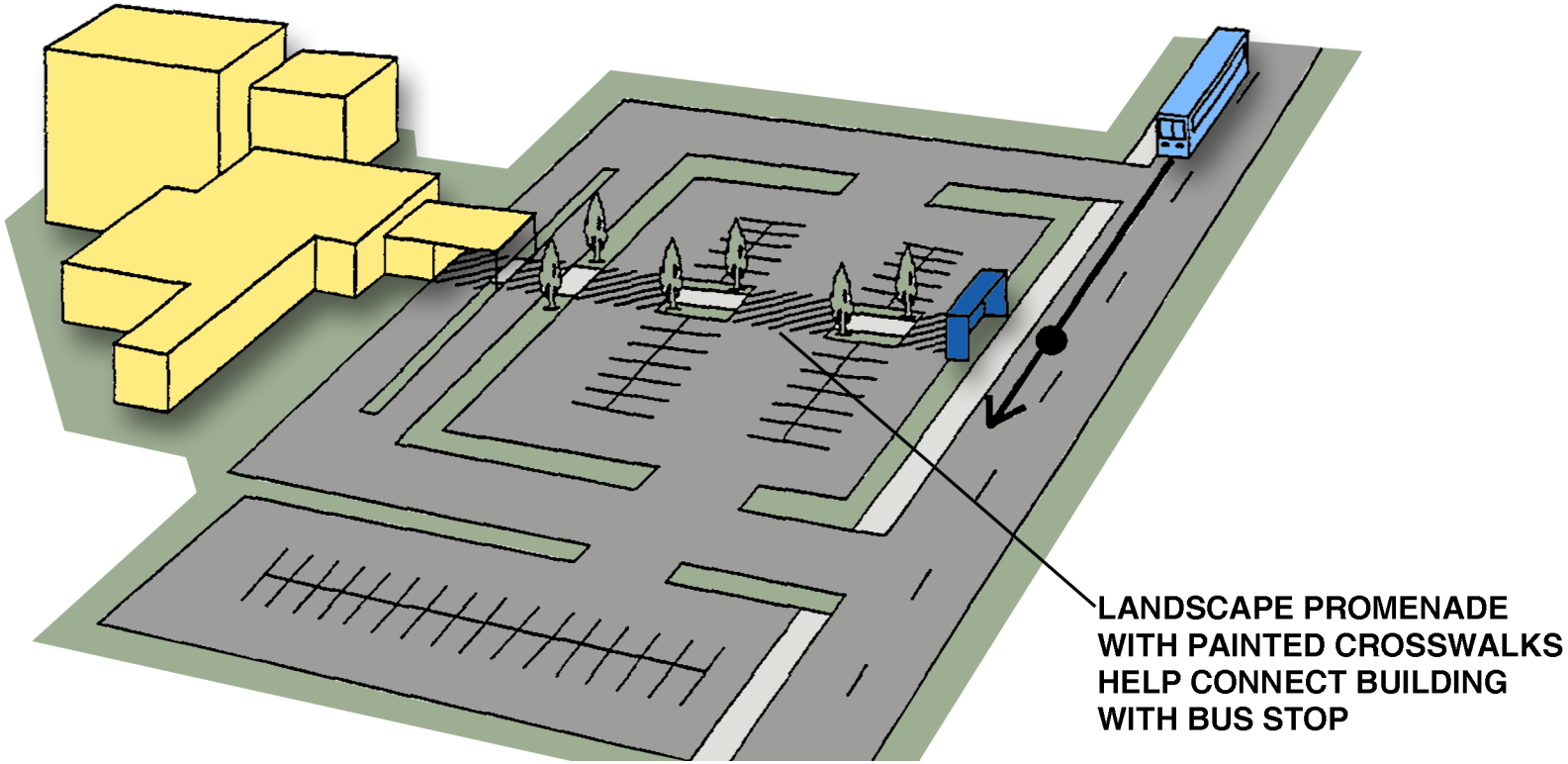



**Figure 3.7.3 - Landscaped Promenade and Treated Crosswalks with Continuous Shade Canopy (Derived from TCRP 19)**

| Advantages | Disadvantages |
|---|---|
| Bus remains on main thoroughfare. | Riders must walk through the parking lot to reach the development. |
| Reduces potential vehiclular / pedestrian conflicts. | Rider security walking through the parking lot may be compromised if sight lines are obstructed by vegetation. |
| Enhances rider comfort with shade trees. | Reduction in parking spaces. |
| Enhances rider security if promenade is well lit. | |

### *3.7.4 Bus Bay / Development Front Door Access (preferred)*

Full coordination and cooperation can create a development that emphasizes the connection between the development and public transportation.

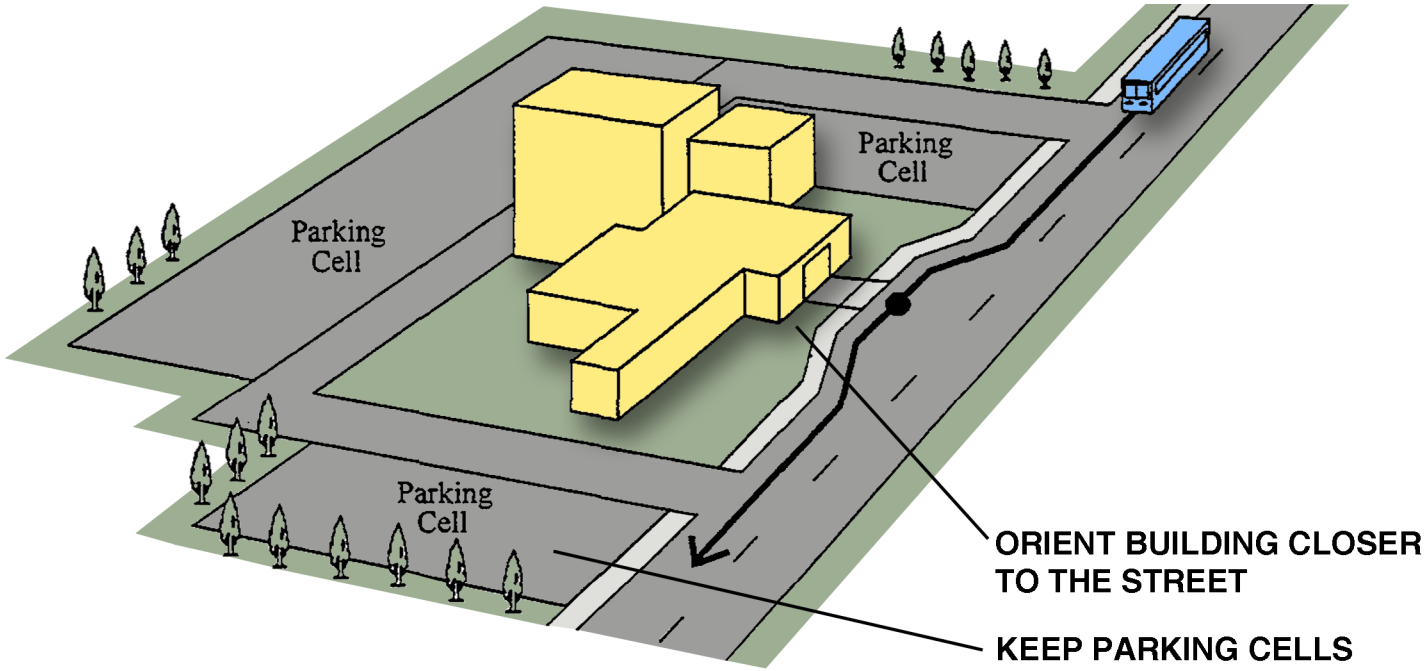



**Figure 3.7.4 - Bus Bay / Transit Oriented Development Front Door Access (Derived from TCRP 19)**

| Advantages | Disadvantages |
|---|---|
| Reduces walking time and distance to bus stop. | Challenges traditional land use practices. |
| Proximity to land use enhances rider security. | |
| Reduced potential vehicular / pedestrian conflicts. | |
| Potential use of overhang in inclement weather. | |
| Bus remains on main thoroughfare. | |

### *3.7.5 Expanded Facilities*

Coordination and cooperation between developers and BCT and local municipalities is not limited solely to new construction. Coordination during the expansion process for developments can help provide better service and accommodations for both transit passengers as well as patrons for that development.

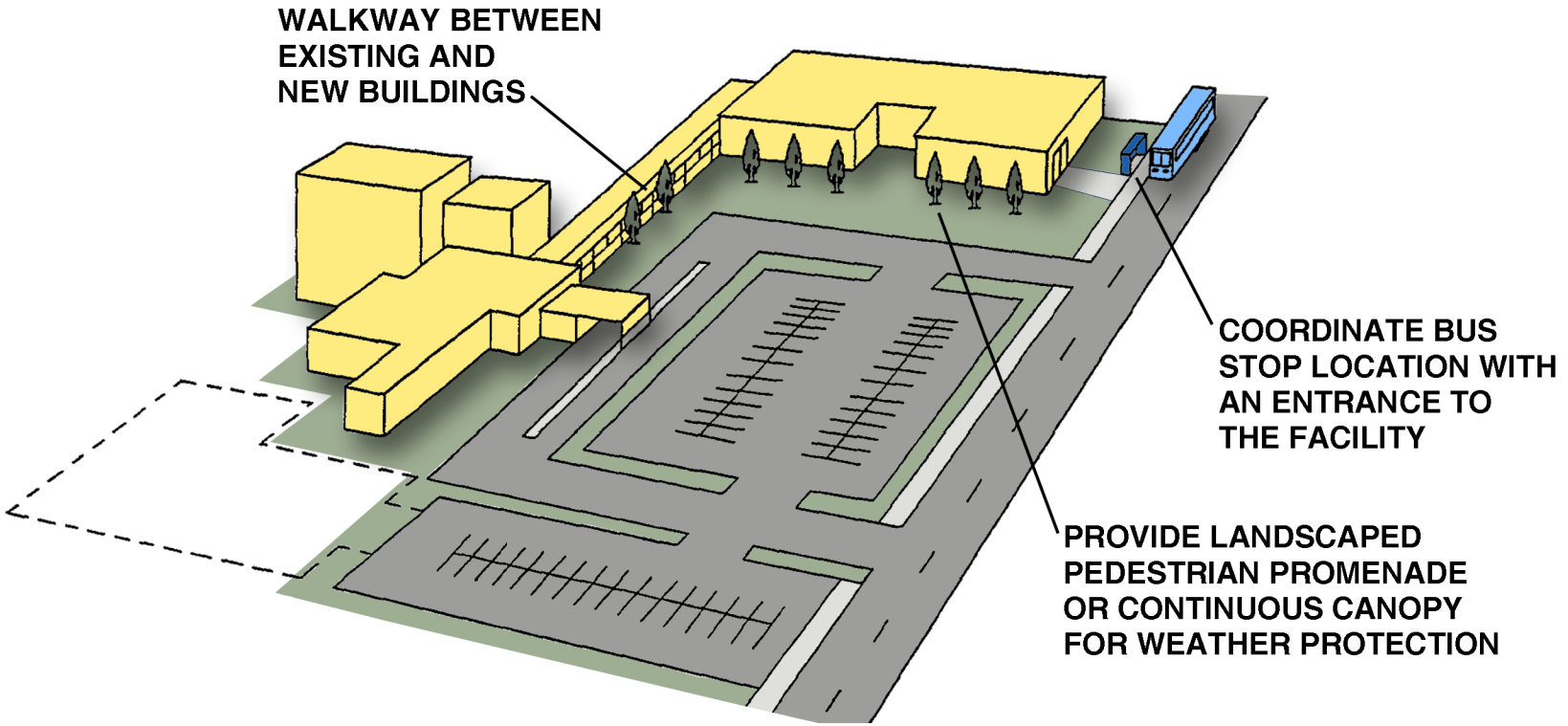



**Figure 3.7.5 - Expanded Facility (Derived from TCRP 19)**

| Advantages | Disadvantages |
|---|---|
| Bus remains on main thoroughfare. | Costly improvements. |
| Access is enhanced by juxtaposing building with bus stop and creating pedestrian promenades. | Challenges traditional land use practices. |
| Enhances rider comfort with shade trees and covered walks. | |
| Reduces exposure to weather. | |

### *3.7.6 Coordination and Cooperation*

Broward County Transit and municipal planners understand that there are many advantages for transit service and developments when coordination occurs between the various players in the transit design process. It is important to inform and demonstrate to developers that coordination with BCT will help the developer provide a better finished product. In order for the cooperation among BCT, local municipalities, and developers to be successful, a close working relationship is required from the beginning of the design process.

The following hypothetical examples demonstrate how cooperation among the various parties can create the best solution for everyone involved. These examples concentrate on Transit Oriented Corridors (**TOC**) and Transit Oriented Developments (**TOD**).

## 3.8 Amenities

There are many different amenities that can be included at bus stops. Most of them add comfort or convenience to the transit patron, but there are also disadvantages to many of them. Table 3.8.1 discusses the various advantages and disadvantages that are typically associated with common amenities at bus stops.

### *3.8.1 Trash Receptacles*

Trash receptacles at bus stops encourage patrons and general pedestrians to discard their trash in the receptacle instead of littering, which creates unsightly areas within the community (see Figure 3.8.1). However, an agreement for regularly scheduled pick-up and removal of garbage from the receptacle is required before one can be installed at a bus stop. Overflowing and undermaintained trash receptacles can be more unsightly and disturbing than occasional litter.

Trash receptacles should be installed at all bus stops. Trash receptacles along with a maintenance agreement are reccommended for installation at bus stops.

Recommendations for installing trash receptacles at bus stops include:

- Location must comply with all ADA clearance requirements for accessible routes and obstacles.
- Locate receptacles away from the accessible landing pad, and at least 3 feet of clearance must be provided between the receptacle and other infrastructure. Receptacles may be attached to the bench, shelter or kiosk when included in the design.
- Receptacles locations must comply with all set back and clear zone requirements of FDOT, BCT and local municipalities.

## TABLE 3.8.1 - AMENITY COMPARISONS

| Amenity | Section | Advantages | Disadvantages |
|---|---|---|---|
| Shelters | 3.6 | - Provide a place of comfort for waiting passengers<br>- Provide protection from the elements (sun, glare, wind, rain)<br>- Help identify transit system<br>- Can provide venue to establishing lighting at a site<br>- Can provide a space to install route and schedule information | - Requires maintenance and trash collection<br>- May be used by graffiti artists |
| Shelters w/ Advertising | 3.6 | - Can be an incentive for installing lighting at a stop<br>- Advertising company usually responsible for maintenance | - Can reduce site lines if panels are improperly located<br>- Must be compatible with local sign ordinances and land uses |
| Benches | 3.5 | - Provide comfort for patrons<br>- Help identify a stop<br>- Low cost compared to shelters | - Require maintenance<br>- May be used by graffiti artists |
| Vending Machines | 3.8.4 | - Provide waiting patrons with reading materials | - Increases trash accumulation at a site<br>- May have poor visual appearance<br>- Reduces circulation space<br>- Can be vandalized |
| Lighting | 3.8.6 | - Increases visibility<br>- Increases patron perception of comfort and security<br>- Discourages unwanted and illegal “after hours” use | - Requires maintenance of lighting elements<br>- Can be costly<br>- Requires power source |
| Trash Re-ceptacles | 3.8.1 | - Provides a place to discard trash<br>- Keeps bus stop clean | - May be costly to maintain<br>- May be used by customers of nearby land uses<br>- May smell |
| Phones | | - Are convenient for bus patrons<br>- Provides access to transit information | - May encourage loitering at or near a bus stop<br>- May encourage illegal activities at a bus stop |
| Route or Schedule Information | 3.3 | - Is useful to first-time riders<br>- Helps identify the bus stop<br>- Can communicate general system information | - Must be maintained to provide current information<br>- May be popular surface for graffiti |

- Receptacles should be anchored securely to the ground to avoid unauthorized movement.
- Avoid installing receptacles with ledges or other features that permit liquids to pool, as these can attract insects.
- Receptacles should be located out of direct sunlight to slow the affect of the heat encouraging foul odors to develop. `


**Figure 3.8.1 - Photo - Trash Receptacle Placement at Bus Stops**

### *3.8.2 Bicycle Storage*

Bicycle storage facilities such as bike racks, may be provided at bus stops for the convenience of bicyclists using transit. Designated storage facilities discourage bicycle riders from locking bikes to bus facilities or adjacent properties. Proper storage of bikes can help reduce the visual clutter at bus stops as well as prevents bikes from obstructing accessible routes.

Bicycle storage facilities can be broken into two types of facilities:

- Class I (long-term facilities) refers to storage units that protect the entire bicycle from theft, vandalism and weather.
- Class II racks (short-term facilities) provide a secure place in which to lock a bicycle but do not provide any direct protection from vandalism or weather. Class II racks are typically used at BCT stops.

The following factor should be considered when determining which type of bicycle storage, if any, should be included at a bus stop:

- Existing and potential demand of bike riders who use transit.
- Presence of bicycle lanes or paths.
- Existing bicycle activity / evidence of bicycle use at stop.
- Boarding data and number of routes.
- Type of stop (Tri-Rail, transfers stops, Park-and-Rides).
- Surrounding land uses.

Bicycle lockers are the most common type of Class I bicycle storage facility. They are completely enclosed containers, typically used where long-term bicycle parking is predominant. These types of facilities are large, require additional space, and usually look awkward next to bus shelters.

Class II, or bike racks, are usually used for short-term bicycle parking,

which is defined as two hours or less. Bike racks are recommended to provide the following features:

- Support the bike in two locations.
- Prevent the wheel from tipping.
- Supports all bike types.
- Allow both the frame and one wheel to be secured using standard U-shaped lock.
- Allows front-in parking and back-in parking..
- One rack element supports two bikes.

The Association of Pedestrian and Bicycle Professionals recommends the use of three types of bike racks:

- Inverted “U”
- “A”
- Post and Loop

Comb, wave and toast style racks are not recommended, because they are designed to only support the bike in one location, either the front or rear wheel (see Figure 3.8.2)

Bike racks should be installed in a row, leaving at least 30 inches between each rack to allow for two bikes per rack, creating a bike parking area. All bike storage facilities must be located so that no part of the rack, or any part of a bike parked in the rack impede on the minimum 36 inch wide clearance required for accessible routes. Bike storage facilities also must be located in a way that any protrusions will be detectable by a person with visual impairments.

When placing bicycle storage facilities at bus stops, the following should be taken into consideration:

- Paved access between the bicycle lane/sidewalk, bicycle parking area and the bus stop.
- Waiting area constructed of non-slip concrete or asphalt and properly cleaned.
- Racks securely mounted to a reinforced concrete slab, minimum thickness of 6”, extending at least 4” beyond all vertical rails.
- Rack height does not exceed 48 inches.
- Locate the bike parking / storage area away from other pedestrian and patron activities to improve safety and reduce congestion.
- Coordinate the location with existing on-site lighting.
- Do not locate the storage area where view of the area is restricted by shelters, landscaping or other site elements or amenities.

It is recommended that bike parking facilities be located on the approach side of the shelter to maintain visibility. Figure 3.8.3 shows an example of a layout for Class II bike racks.

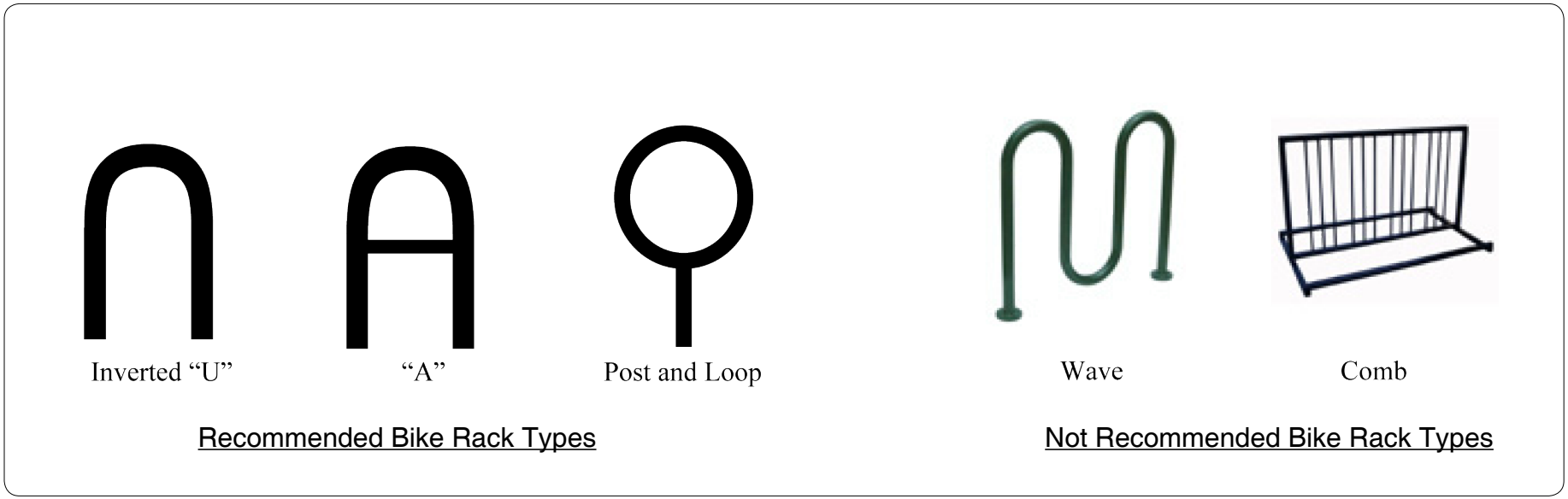



**Figure 3.8.2 - Bike Rack Types**

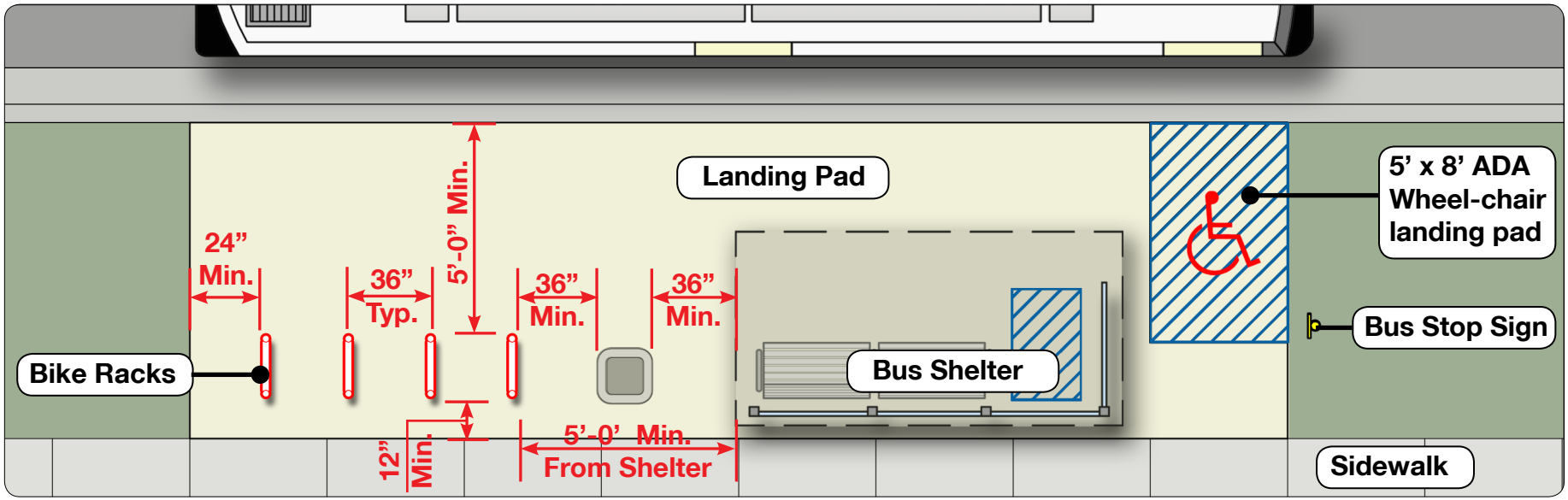



**Figure 3.8.3 - Recommended Layout for Bike Racks at a Bus Stop**

**Figure 3.8.4 - Photo - Bike Lockers**

**Figure 3.8.5 - Photo - Bike Racks at a Bus Stop**

### *3.8.3 Leaning Rails or Seating Walls*

At bus stops where site conditions and space constraints do not allow for benches or shelters, leaning rails, or seating walls are viable alternatives. These amenities are not limited to spatially confined sites, and may be used at other bus stops in conjunction with benches and / or shelters. Leaning rails allow patrons to rest against them in a standing position (see Figure 3.8.6), while seating walls provide an area to sit that does not necessarily conform to the requirements of a bench (see Figure 3.8.7). Leaning rails and seating walls should be designed to discourage loitering or vagrancy.

The following are Broward County Transit's minimum design guidelines for leaning rails:

- Leaning rails are not regulated by ADA, but must conform to all of the ADA requirements for clearances and protrusions so that they do not impede wheelchair movements and are detectable to those with visual impairments.
- The design should minimize the number and size of any protrusions that may snag, tear, or catch clothing, or otherwise create a safety hazard.
- Leaning rails should be durable, vandal resistant, low maintenance and remain structurally sound with a minimum 10- year useable life expectancy.
- Must be able to withstand all structural and wind loads requirements as established by current codes. Leaning rails must be designed by a registered engineer licensed in the state of Florida. Anchoring method must be included in the design, and allow for easy removal and reinstallation.
- The height of the leaning rail should be between 32 and 36 inches above the surface of the sidewalk or waiting pad.

Figure 3.8.6 - Photo - Leaning Rail

Figure 3.8.7 - Photo - Seating Wall

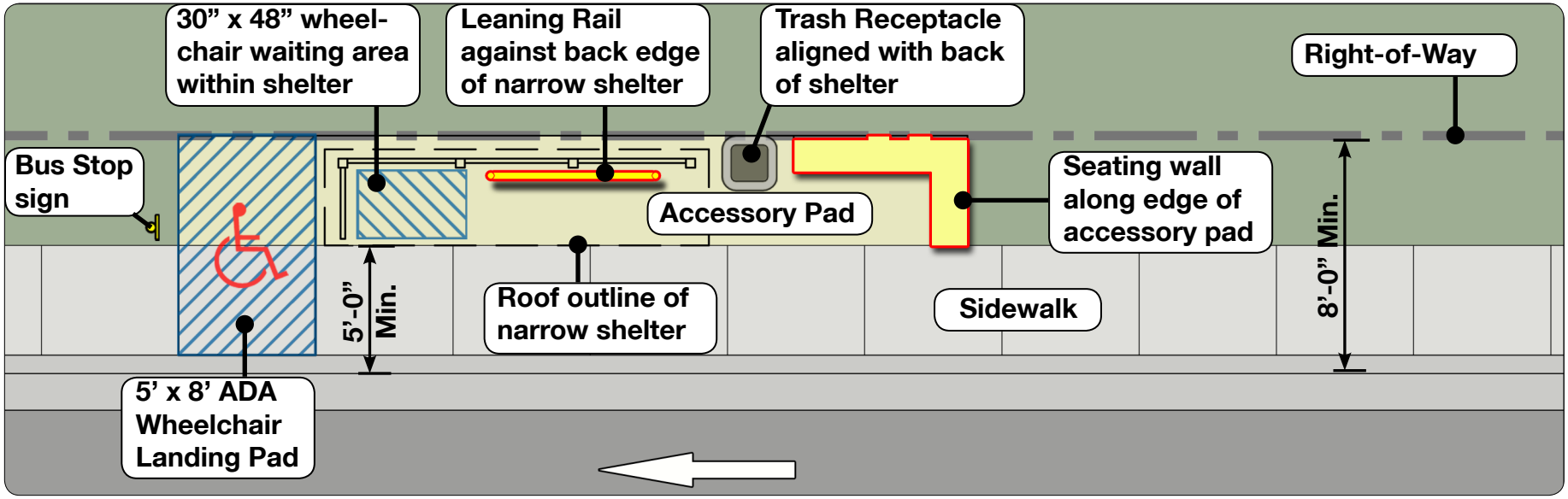



Figure 3.8.8 - Layout of Leaning Rail in Narrow Shelter and Seating Wall

Leaning rails and seating walls should adhere to the basic location and spacing requirements for benches. They must be located to conform to the set back and clear zone requirements of the state of Florida, FDOT, BCT and local municipalities. Leaning rails or walls must maintain a minimum of 3 feet clear space around all sides that are intended for passenger movements. When located on or adjacent to a sidewalk, they cannot reduce the clear width of the sidewalk to less than 3 feet, although 4 feet is recommended. They should be located near the front of the bus stop zone to reduce passenger walking distances to the bus, but cannot be located within the accessible landing pad. Similar to benches, these amenities should be oriented within the bus stop where landscaping features can aide in protecting waiting patrons from the elements. Figure 3.8.8 shows a typical bus stop layout using a leaning rail.


**Figure 3.8.9 - Bus Stop with Vending Machines**

### *3.8.4 Vending Machines*

Vending machines provide transit patrons with various amenities while they wait for the bus. However, they can be undesirable when they are not properly maintained. They can lead to the accumulation of trash, making the bus stop look unsightly and unsafe. Also, when vending machines are not properly located at bus stops, they can reduce the amount of room for mobility and waiting. Figure 3.8.9 shows a bus stop with vending machines that are not properly maintained.

Broward County Transit does not advocate or object to vending machines being located at a bus stop. However, if a private vendor or developer intends to install vending machines at a bus stop, the following guidelines must be followed:

- The location of vending machines must comply with all ADA requirements for clearances and mobility. A minimum of 36 inches clearance between vending machines and other structures must be maintained where passenger movement is intended.
- Vending machines cannot be located within the accessible landing pad.
- Where placement of vending machines is permitted within the right-of-way, they must conform to the set back and clear zone requirements of FDOT, BCT and local municipalities.
- Vending machines may not be located where they obstruct access to or movement within the bus stop waiting area. Vending machines should be located outside of the waiting pad.
- Vendor provided and maintained trash cans should be included where vending machines are installed.
- Maintenance agreements with Broward County Transit or the local municipality must be in place prior to the installation of vending machines at a bus stop.

### *3.8.5 Kiosks*

Information and advertising kiosks can be included at bus stops where space and maintenance considerations allow. These can be used in place of or in conjunction with advertisement and information panels placed directly on shelters. Kiosks are typically free standing structures but can also be a part of the shelter. Kiosks should be designed to be visually and aesthetically similar to the shelter, so that they are easily recognized as a transit structure (see Figure 3.8.11).

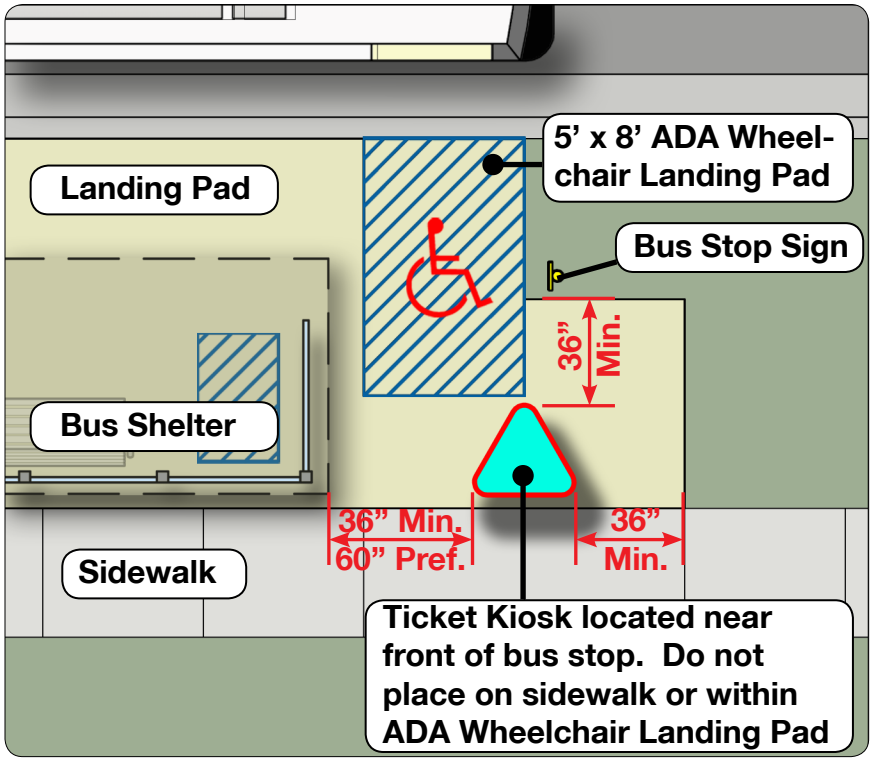



**Figure 3.8.10 - Recommended Layout for Information Kiosk at Bus Stop**

The following are minimum Broward County Transit design guidelines for transit kiosks:

- Kiosks must comply with all applicable regulations of ADA, including but not limited to clearances, obstructions, accessible routes and signage.
- The foundation surface shall be stable, firm and slip-resistant in full compliance with section 4.5 of the ADAAG, providing a minimum of 36 inches clear space at all sides where the panels are intended to be readable.
- Kiosks must be durable, vandal resistant, low maintenance and remain structurally sound with a minimum 20-year useable life expectancy.
- Free standing, with a maximum side panel width of 5 feet. The maximum dimensions for side panel displays are 6 feet high by 4 feet wide.
- For kiosks with three or more sides, the structure should include a roof conforming to the guidelines for shelter design to protect patrons from the elements.
- Kiosks that are incorporated into the shelter must adhere to the standard design guidelines for shelters.
- Kiosks must be designed to meet all wind area velocity load requirements established by the current code. Must be designed by a registered architect or engineer licensed in the state of Florida. The anchoring method must be included in the kiosk design and shall allow for ease of removal and reinstallation.

Kiosks should be located at the down stream end of the bus stop zone, and must be oriented in a way that does not block the visibility of oncoming buses or other forms of vehicular traffic from persons waiting on the acces-

sible bus landing pad. A minimum of 36 inches clear space must be maintained around all sides. Sides where panel displays are intended to be read should maintain a minimum clear width of 48 inches. Figure 3.8.10 shows a typical bus stop layout with an information kiosk.

Kiosks should be considered at existing or proposed bus stops with at least one of the following conditions:

- Tri-Rail Station
- Designated Park-and-Ride
- Transfer points
- Major transit generators (malls, hospitals, schools, shopping centers, major commercial or governmental centers)
- Terminal stations or scheduled recovery locations
- Special consideration facilities (senior citizen centers, clinics, nutritional centers, welfare facilities)
- Any “major” bus stop or stop near identifiable points of interest


**Figure 3.8.11 - Photo - Information Kiosk**

### *3.8.6 Lighting and Security*

Lighting and security at transit facilities are interrelated as lighting can play an important role in patron's perceptions of safety and security at a bus stop. The safety of its transit patrons is one the most important focuses for Broward County Transit; therefore, making lighting and security important considerations when designing bus stops.

Lighting can impact more than just a person's perception of safety and security at a bus stop; it can impact the actual safety at the bus stop by deterring or encouraging certain activities by non-bus patrons. Proper lighting can enhance a waiting passenger's sense of comfort and security; poor lighting may encourage unintended activities by non-bus patrons, especially after dark.

Adequate lighting at a bus stop should consist of between 2 and 5 foot-candles (at the floor), evenly dispersed across the entire bus stop. Lighting design should take into consideration concerns about "over lighting" and "spotlighting" which can make it difficult for patrons to observe their surroundings. Where adjacent pedestrian paths are illuminated, the lighting design should achieve a smooth transition between illumination levels.

The costs of installation, maintenance and operations, along with the availability of power are important concerns when determining how to provide lighting at bus stops. Broward County Transit recommends coordinating bus stops with existing street lighting to alleviate the need for separate lighting. When coordinating the location of shelters, benches or other amenities with existing street lighting, all ADA clearance requirements for wheelchair accessibility must be followed. Bus shelters should be located within 30 feet of existing light fixtures.

At bus stops where direct lighting is required to achieve minimum desirable lighting levels, the fixtures should be vandal-resistant, durable and easily maintained. The use of exposed bulbs or elements that can be easily vandalized or tampered with should be avoided.

Any new lighting installed at transit facilities should take into consideration environmental concerns regarding lighting. All new fixtures and bulbs


**Figure 3.8.12 - Recommended Lighting Level Plan**

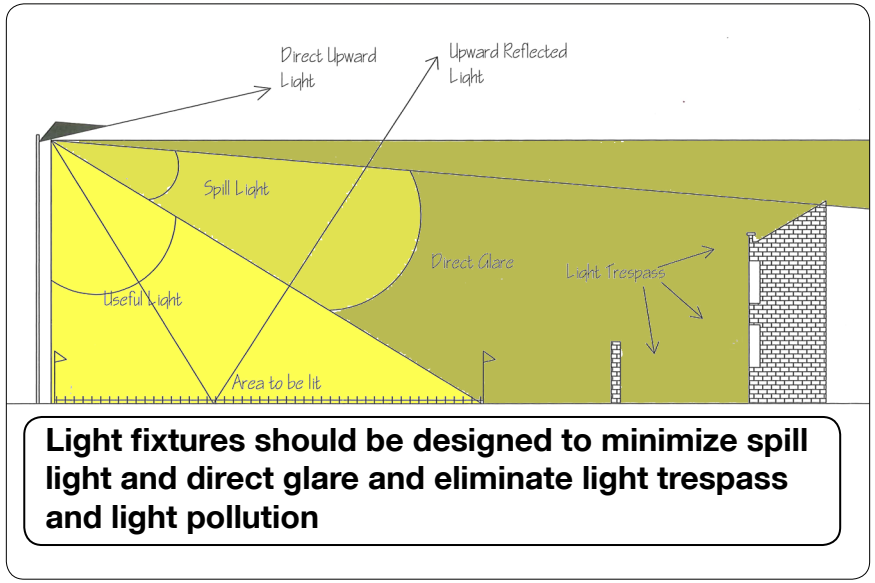



**Figure 3.8.13 - Lighting Reflectancy Sketch**

Chapter 3

# Bus Stop Design

should be energy efficient. Proper lighting direction and lamp shielding should be implemented to minimize night sky light pollution and unwanted off-site lighting. The use of solar energy as a power source for lighting is strongly encouraged by BCT.

Where separate lighting is provided for bus shelters, the lighting should be designed to minimize the amount of harsh shadows created, which can create security concerns for waiting passengers.

Security is a major concern in bus stop design and location, because it can influence the rider's perception of that bus stop, and their decision to use transit. From the perspective of security, landscaping, walls, advertising panels, and solid structures can restrict sight lines and provide places for people to hide. Each of these items can be an integral part of the bus stop, either by design or by proximity to existing land uses. Therefore, the selection of infrastructure to be used at each bus stop must be thought out with consideration given to the impact that each amenity may have on security. Broward County Transit must be included in the decision making, design and selection process for bus stops and amenities in order to ensure that proper precautions are taken with regard to security.

Other sections of this manual have discussed some of these concepts and should be referenced. Several guidelines regarding security at bus stops include:

- Shelters should be constructed of materials that allow for clear, unobstructed visibility to and from patrons waiting inside.
- Bus stops should be located at highly visible sites that permit approaching operators and passing vehicular traffic to see the bus stop clearly.
- Landscaping elements that grow to heights that might reduce visibility into or out of the bus stop should be avoided. Low growing shrubbery, ground cover and shade trees are preferred vegetation at bus stops. Evergreen trees create a visual barrier and should be avoided.
- Where possible, bus stops should be coordinated with existing street lighting to improve visibility.
- Bus stops should be located adjacent to or near land uses such as stores or businesses to enhance surveillance of the site.

Chapter 4

# Curb Side Factors

## 4.1 Accessible Route

The ADAAG establishes set rules for the physical dimension required at bus stops and other transit facilities; however, the intention of the ADA extends beyond the facility itself. The ADA strives to develop accessibility for the entirety of the trip, from the point of origin to the final destination.

When designing a bus stop, or other transit facility, the accessible route is a continuous path of travel between an accessible origin or destination point and the bus stop that complies with all ADA requirements for accessible routes. Accessible routes may include sidewalks, ramps, curb ramps, crosswalks and access aisles through parking lots. Accessible route design must take the following into consideration:

- Clear Width and Turning Widths
- Passing Areas
- Changes in Grade
- Obstacles and Obstructions
- Surfaces

The ADAAG states that accessible routes must maintain a minimum of 36 inches clear width along the continuous path of travel, with an allowable 32 inches clear at points along the path, see Figure 4.1.1. In order to allow for the passage of one pedestrian and one wheelchair, sidewalks must maintain a minimum width of 48 inches, with a recommended minimum width of 60 inches to allow for the passage of two wheelchairs, see Figure 4.1.2. Passing areas measuring at least 60 inches by 60 inches must be provided along accessible routes where the continuous width is less than 60 inches. These passing areas must occur at intervals of no more than 200 feet.

Changes in grade are an important consideration along accessible routes. Variations in grade up to ½ inch may be resolved with a simple bevel consisting of a 1:2 maximum ratio, see figure 4.1.4. Any change in grade greater than ½ inch along an accessible route must be resolved through the use of a ramp that complies with section 4.8 of the Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG) or with a slope not exceeding 1:20. Any slope greater than 1:20 (5%) shall be considered a ramp, and must also comply with section 4.8 of the ADAAG. Slopes greater than 1:12 are not permitted along accessible routes.

`Section 4.7 of the ADAAG outlines the requirements for curb ramps, which are required wherever an accessible route crosses a curb. This section illustrates the requirements for

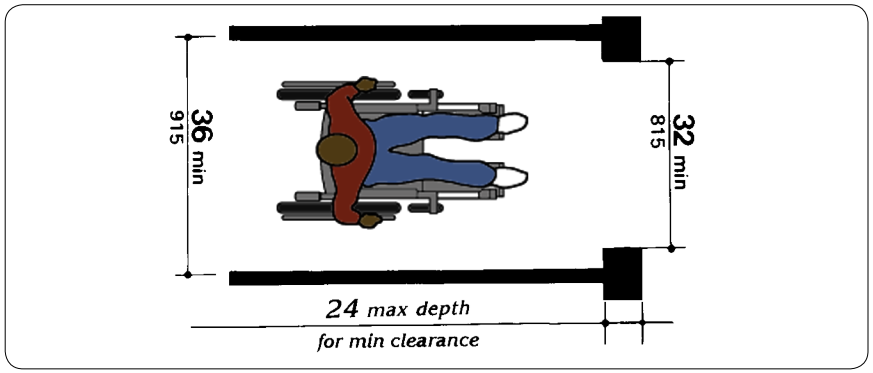



Figure 4.1.1 - Minimum Clear Width for Single Wheelchair

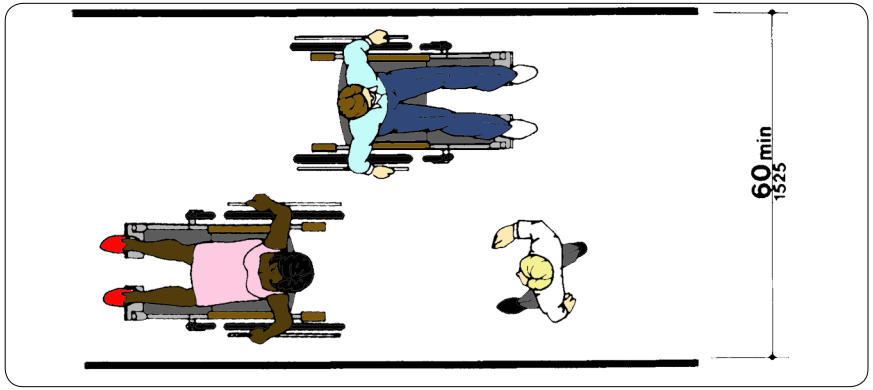



Figure 4.1.2 - Minimum Clear Width for Two Wheelchairs

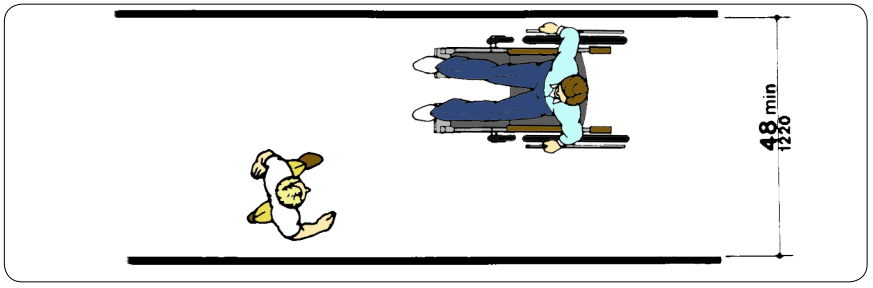



Figure 4.1.3 - Minimum Clear Width for One Wheelchair and One Pedestrian

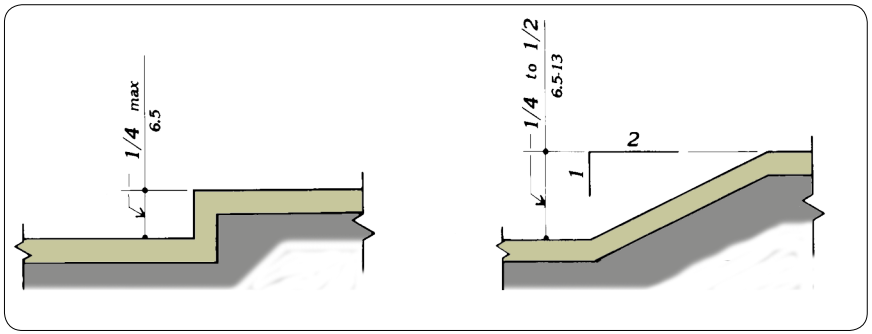



Figure 4.1.4 - Allowable Level Changes

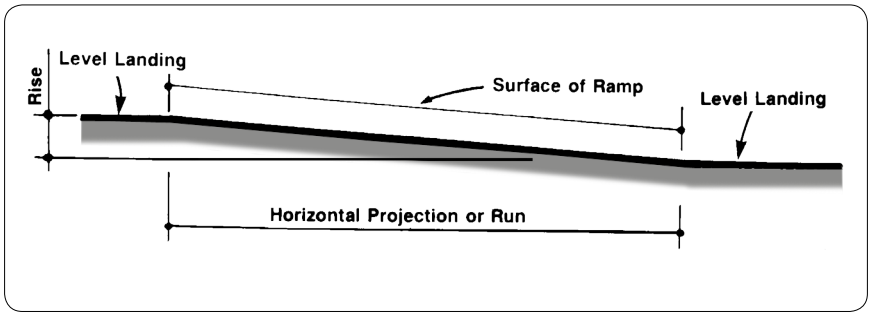



Figure 4.1.5 - Accessible Ramp

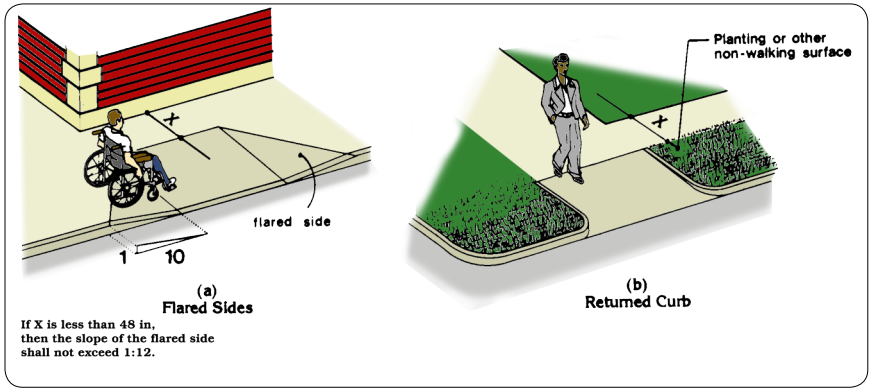



Figure 4.1.6 - Curb Ramps

width, slope, surface and areas surrounding curb ramps. The requirements for accessible routes are fully detailed in section 4.3 of the ADAAG.

### *4.1.1 Surfaces*

Surfaces must be stable, firm and slip-resistant in conformance with section 4.5 of the ADAAG. Additionally, surfaces should be pitched to shed water and reduce ponding. The cross slope (perpendicular to the direction of travel) shall not exceed 1:50 (2%). Broward County Transit recommends a minimum cross slope of 1:200 (0.5%) for the removal of water.

Anywhere that gratings are used in an accessible route, or at a bus stop, they must comply with section 4.5.4 of the ADAAG.

All surfaces must be coordinated to achieve the criteria of the ADAAG as well as conforming to the standards established by FDOT, BCT and local municipalities.

### *4.1.2 Detectable Warning Strips*

Detectable warning strips are required at all curb ramps and all locations where the walking surface is not separated from the vehicular way by a curb, railing or other element.

The detectable warning strips shall consist of raised truncated domes with a diameter of 0.9 inches, height of 0.2 inches and a center-to-center spacing of 2.35 inches, as specified in section 4.29 of the ADAAG.


**Figure 4.1.7 -Cross Slope**

Detectable warnings at curb ramps shall extend the full width and depth of the curb ramp. At dangerous vehicular ways, or areas where the walking surface is not separated from the vehicular way, the detectable warning strip shall be a minimum of 36 inches wide.

Detectable warnings shall visually contrast from the adjoining surfaces, either dark-on-light or light-on-dark.

**Figure 4.1.8a - Photo - Detectable warning strip at bus stop with no curb.**

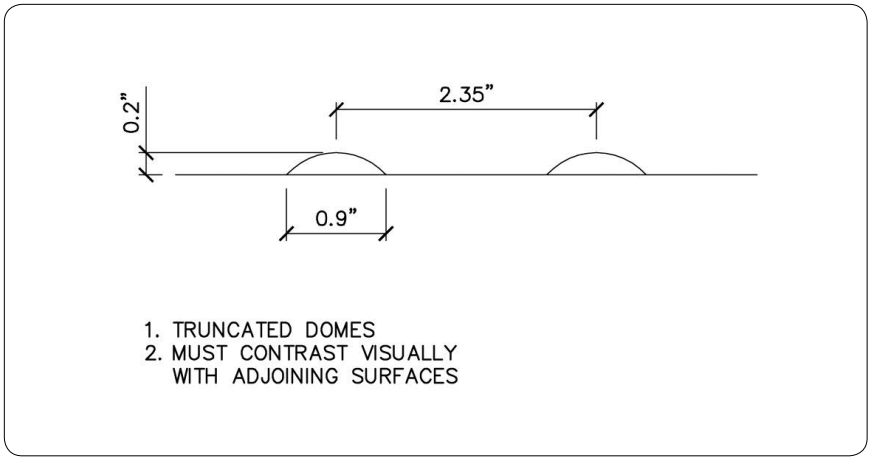



**Figure 4.1.8b - Detectable Warning - ADA guidelines**

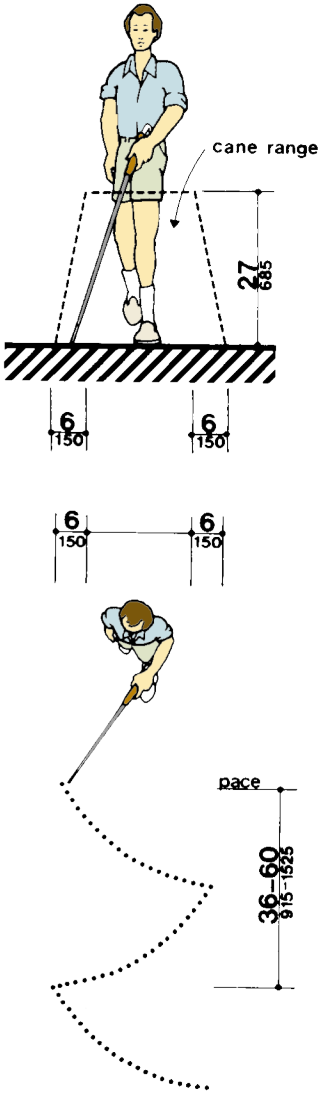



**Figure 4.1.9 - Detectable Area for Visually Impaired**

### *4.1.3 Obstacles*

All designated accessible routes from a bus stop to an anticipated destination point should be evaluated to ensure that they are clear of any obstacles, obstructions or protruding objects that would impede wheelchair movements or may not be detectable to persons with visual impairments. Where obstructions are present, they must be detectable by a visual impaired person at a height of 27 inches or lower above the surface, or must be located more than 80 inches above the surface.

Phone booths, signs and utility boxes mounted to phone or light poles are typical protruding objects that might be located at bus stops or along an accessible route.

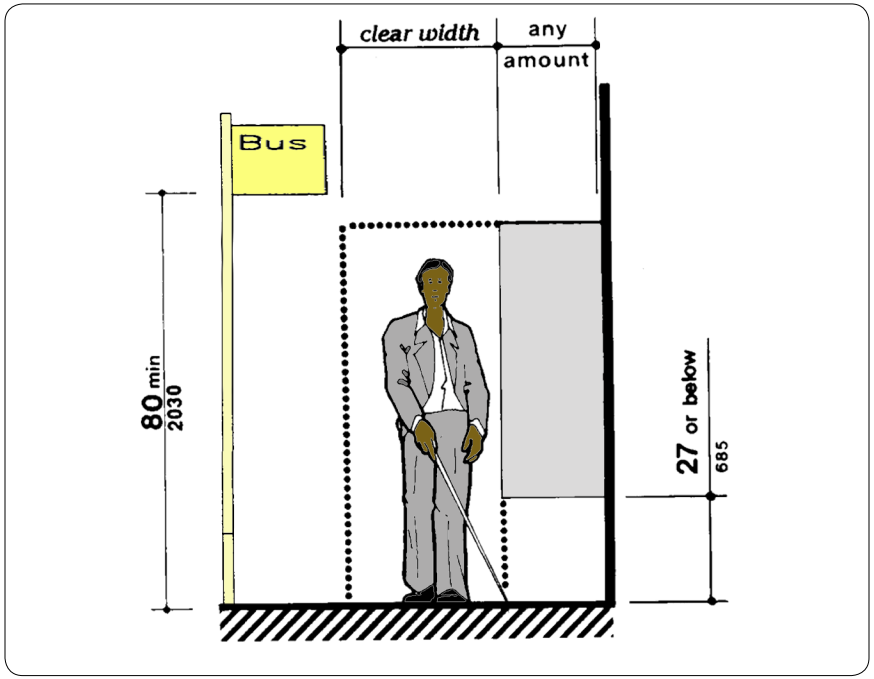



**Figure 4.1.10 - Allowable Protrusions**

## 4.2 Curbside Zones

Curbside zones are the most common type of bus stop. They are also the simplest and most convenient bus stops. Curb-side bus stops are located adjacent to the travel lane providing easy access for bus drivers, typically resulting in minimum delays.

Curb-side stations require minimal design, usually being designated by a simple bus stop sign; making them inexpensive and easy to install or relocate. Typically, only a single stopping position is designated; additional buses simply wait or queue behind the preceding bus.

Several possible disadvantages that should be considered are:

- Potential queues behind buses causing congestion.
- Encouraging drivers to make unsafe lane maneuvers to avoid delay behind stopped buses.
- Required parking restrictions and enforcement.

The following factors should be considered before selecting a location for a curb-side bus stop:

- Bus Operational requirements
- Traffic signalization
- Passenger origin and destination points
- ADA-accessible paths to and from the bus stop
- Space in the right-of-way for improvements such as the inclusion of shelters and benches
- Necessary curb length to accommodate the bus stop zone requirements
- Required parking restrictions
- Available street lighting, so passengers feel safe waiting for and alighting the bus

Curb-side zones can be further broken down into:

- In-line bus stops
- Bus Bulb or Nubs

### *4.2.1 In-Line Bus Stops*

In-Line curbside bus stops are by far the most frequently used and easily recognized (see FIGURE 4.2.1 – Photo – Typical In-Line Bus Stop). They create no impact on the travel lane or roadway, with the exception of parking restrictions. The required lengths for the bus stop zone are dependent upon the bus stop's location in relation to the intersection, the end of adjacent intersection curb radius and the presence of any cross walk or stop bars. See Figure 4.2.2 for typical minimum dimensions for In-Line bus stops.

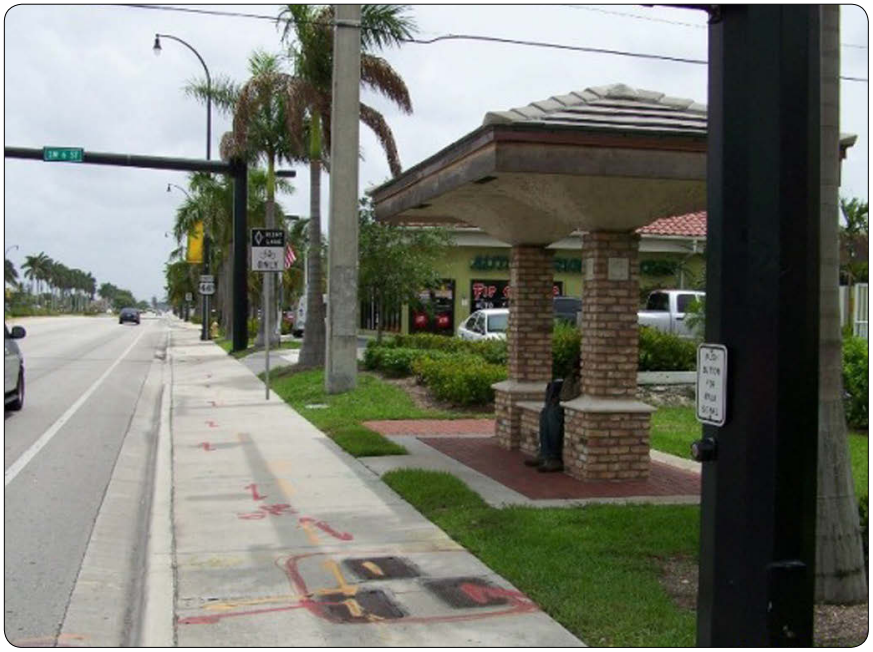


**Figure 4.2.1 - Photo - Typical In-Line Curbside Bus Stop**

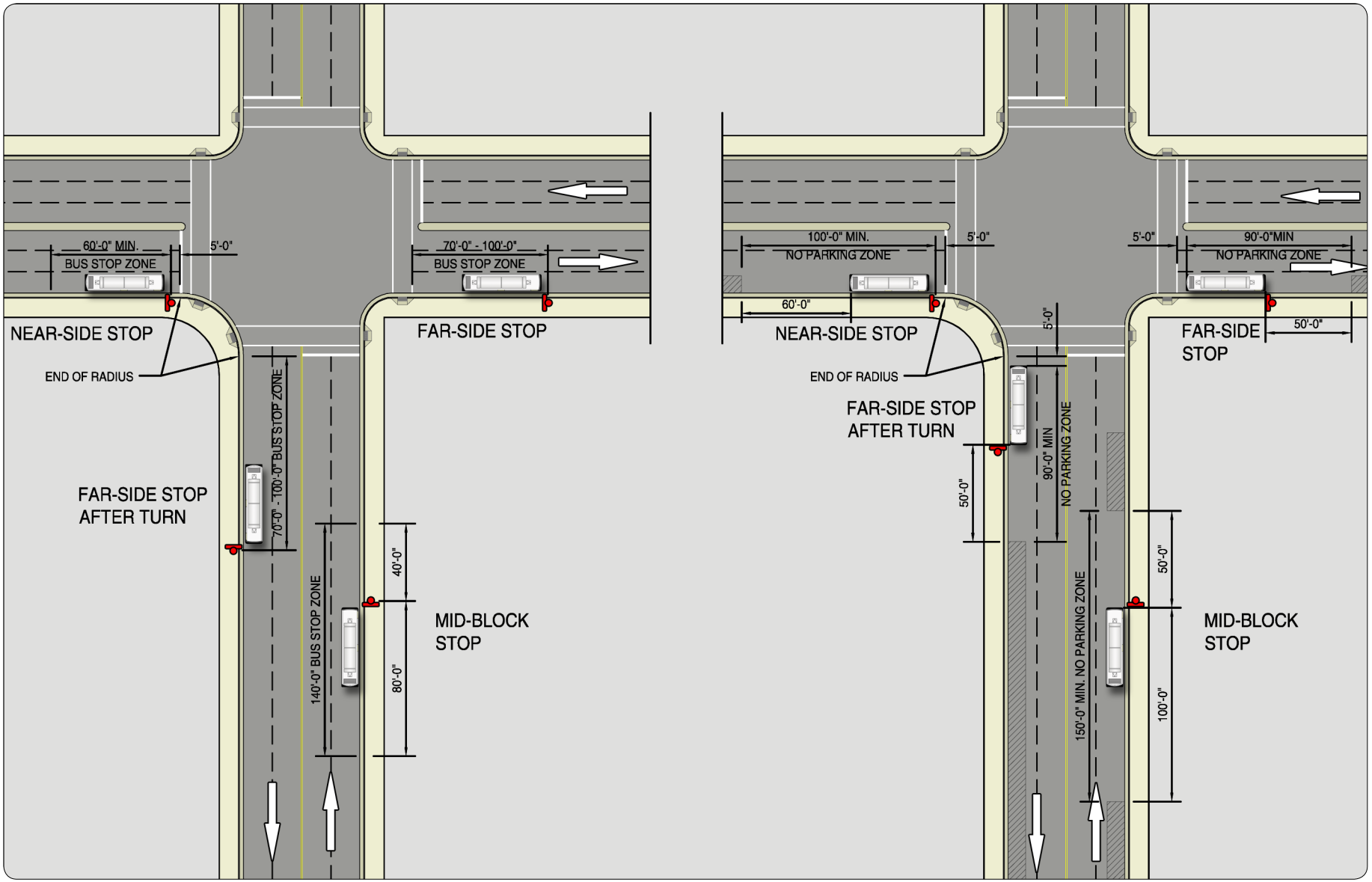



**Figure 4.2.2a - Typical Dimensions for In-Line Curbside Bus Stops without On-Street Parking**

**Figure 4.2.2b - Typical Dimensions for In-Line Curbside Bus Stops with On-Street Parking**

### *4.2.2 Bus Bulbs or Nubs*

Bus Bulbs, also referred to as “nubs” or “curb extensions”, are an extension of the sidewalk from the curb line of a parking lane to the through-lane (see Figure 4.2.5). They have been used as traffic-calming devices, pedestrian safety measure and bus stops. Bus Bulbs operate similarly to In-Line bus stops in that the bus stops at the curb line; however, the bus stops in the travel lane without having to weave through the parking lane. Typically, bus bulbs are located at corners, at far or near-side bus stops, but they can also be used at mid-block stops.

Bus bulbs can be used to solve the problem of how to locate patron amenities on busy or narrow sidewalks. Where space limitations prevent the inclusion of amenities at a bus stop, nubs can provide the additional space necessary for shelters, benches and other passenger improvements, without impacting the general pedestrian flow. The nub thus becomes the wait-

**TABLE 4.2.1 - TYPICAL SITE CHARACTERISTICS FOR BUS BULBS**

| Site Characteristics |
|---|
| High Pedestrian activity |
| Crowded Sidewalks |
| Narrow Sidewalks |
| Lane adjacent to curb is not a through lane (i.e. parking lane) |
| Reduced pedestrian crossing distances is desirable |
| Multiple travel lanes, or low-traffic-volumes |
| Bus stopping in travel lane is acceptable |

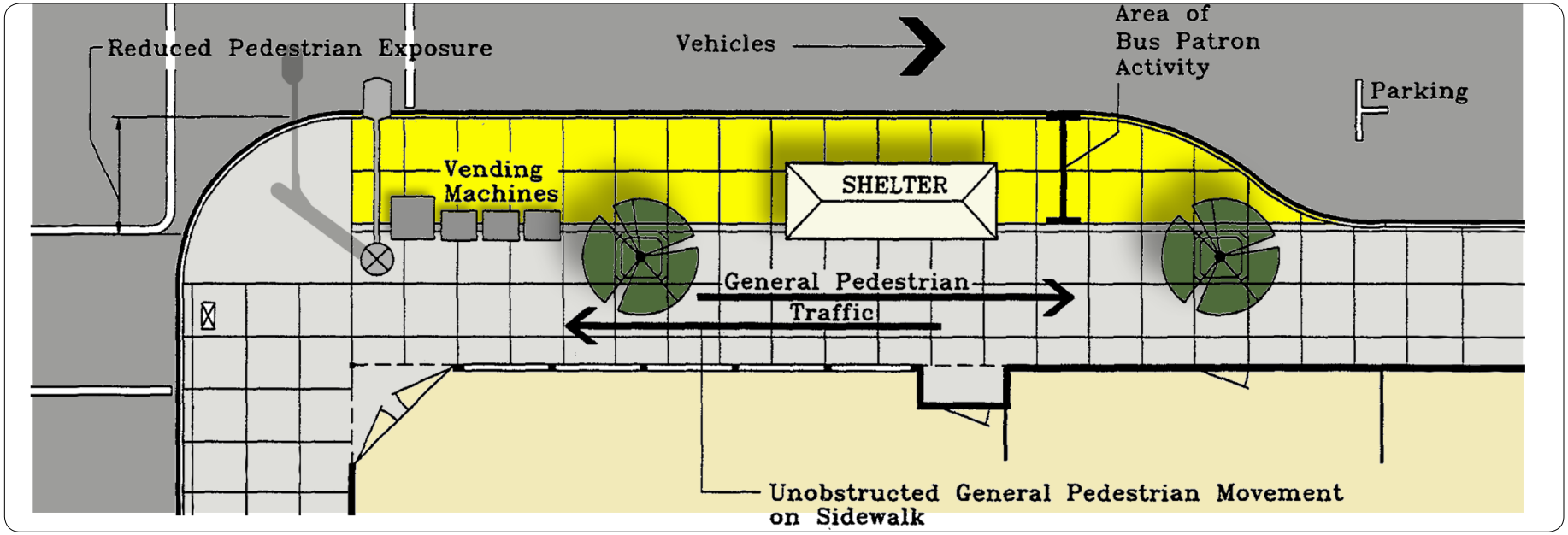



**Figure 4.2.3 - Landing Pad and Accessories Located on Bus Bulb**

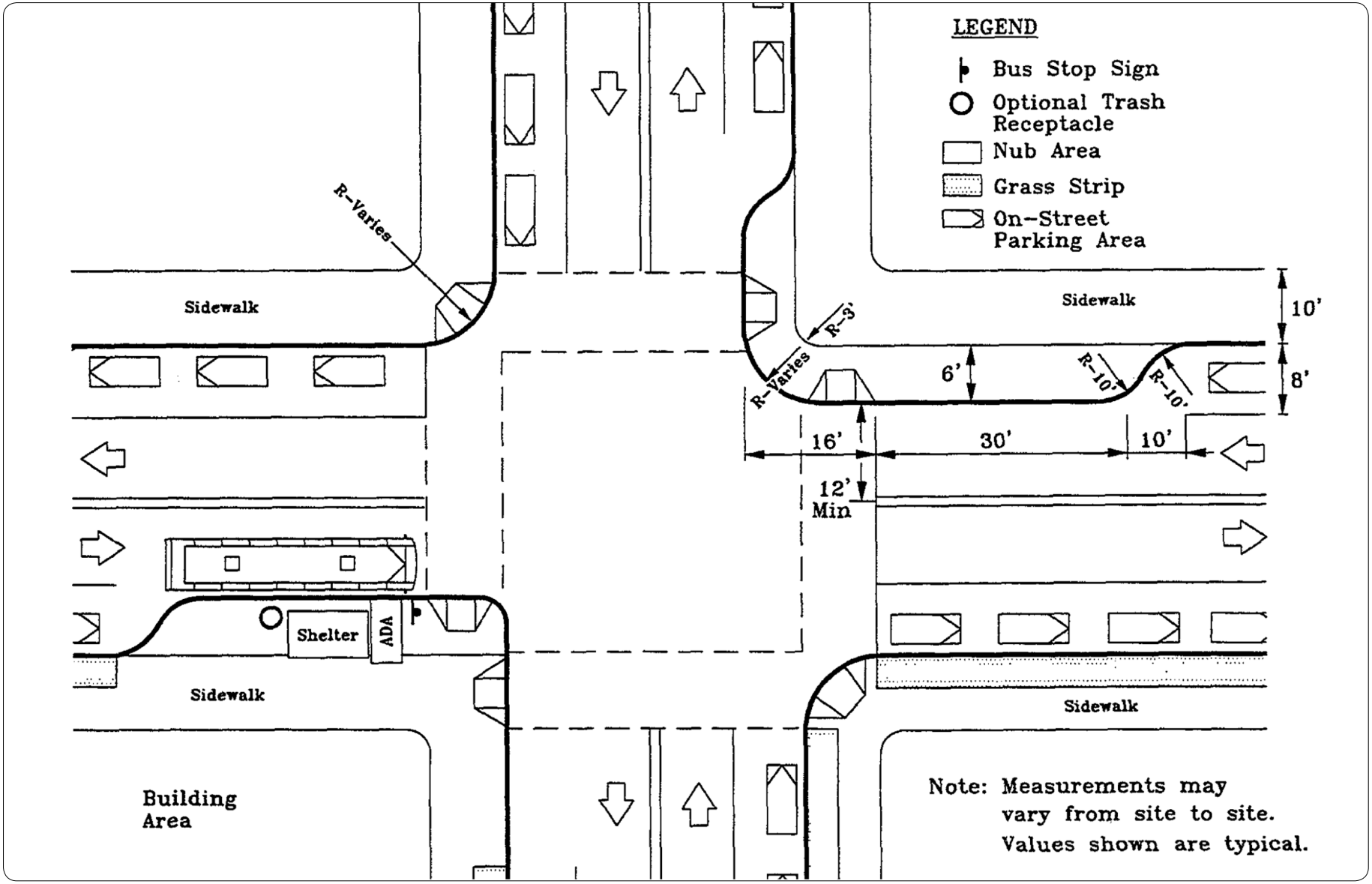



**Figure 4.2.4 - Typical Dimensions for Bus Bulbs**

ing pad, and must conform to all of the spatial and layout requirements of other waiting pads. Figure 4.2.3 shows a typical layout of amenities at a nub.

Because bus bulbs are an extension of the sidewalk, they create more space for pedestrians and additional area for bus patron amenities, such as shelters and benches. Bus bulbs also reduce pedestrian crossing distances, the number of parking spaces lost at bus stops, and the amount of delays due to buses merging with traffic. However, bus bulbs can cause vehicles to stack behind stopped buses. See Table 4.2.1 – Typical Site Characteristics for Bus Bulbs, for a list of site conditions that should be reviewed before considering the installation of a bus bulb. Figure 4.2.4 – Typical Dimensions for Bus Bulbs illustrates the typical and minimum recommended bus bulb dimensions.

Bus bulbs must be designed to accommodate vehicle turning movement to and from side streets. Refer to TCRP Report 65: Evaluation of Bus Bulbs for further guidelines related to bus bulb design.


**Figure 4.2.5 - Photo - Typical Bus Bulb**

Chapter 4
# Curb Side Factors

## 4.3 Public Right-of-Way

Current ADA guidelines address certain features that are common to public right-of-ways, such as accessible routes, curb ramps, surfaces and bus stops and shelters, but there are no guidelines that cover specific conditions of right-of-ways. However, the United States Access Board is in the process of developing a set of guidelines similar to the ADAAG that will address requirements that are specific to public right-of-ways. The latest draft of these guidelines was published in 2005 and is currently being reviewed for impact analysis.

The pubic right-of-way establishes the available space that a bus stop can utilize for various infrastructure and amenities. Florida state, Broward County and local municipality regulations for the use and location of items within the right-of-way must be followed when selecting locations and designing the layout for bus stops.

The Florida state regulations are described in Florida Statute 337.408 Regulation of benches, transit shelters, street light poles, waste disposal receptacles, and modular news racks within rights-of-way.

In order to provide adequate recovery areas for vehicles that accidentally leave the roadway and necessary minimum safety to pedestrians, clear zones and other set backs have been established. The following are general set back guidelines for the placement curbside infrastructure:

- Curbside infrastructure must be placed outside the clear zone as shown in the Florida Greenbook and FDOT District 4, Transit Facilities Guidelines.
- Bus stops should be avoided at curved highway alignments, as these locations require additional clear zone widths.
- Developer designed infrastructure shall not be installed within FDOT, Broward County or local municipality right-of-ways without the plan approval and issuance of all necessary permits.
- Approved infrastructure may be installed within the right-of-way, as long as it does not reduce sidewalk widths below 36 inches (48 inches minimum recommended).
- Concrete slabs for infrastructure such as benches or shelters shall be installed flush with the sidewalk or bus stop landing pad so that the infrastructure is accessible from the sidewalk.
- Separate agreements with private property owners and local jurisdictions are required in order to install infrastructure outside of the right-of-way.

## TABLE 4.3.1 FDOT CLEAR ZONE WIDTHS

| | Urban | Suburban (No Curb and Gutter) - Measured from Edge of Travel lane | | | | |
|---|---|---|---|---|---|---|
| Design Speed (MPH) | Curb and Gutter (From Curb Face) | Local | Collector | Arterial | ADT < 1500 | ADT > 1500 |
| <25 | 1'-6" | 6'-0" | 6'-0" | 6'-0" | N/A | N/A |
| 30 | 4'-0" | 6'-0" | 10'-0" | 14'-0" | N/A | N/A |
| 35 | 4'-0" | 6'-0" | 10'-0" | 14'-0" | N/A | N/A |
| 40 | 4'-0" | N/A | 10'-0" | 14'-0" | N/A | N/A |
| 45 | N/A* | N/A | N/A** | N/A** | 14'-0" | 18'-0" |
| 50 | N/A* | N/A | N/A** | N/A** | 14'-0" | 18'-0" |
| 55 | N/A* | N/A | N/A** | N/A** | 18'-0" | 24'-0" |
| >60 | N/A* | N/A | N/A** | N/A** | 18'-0" | 30'-0" |

ADT = Average Daily 2-way Traffic Volume
* Curb and gutter not to be used on facilities with design speed > 45mph
** For Suburban Roadways with design speeds > 40 MPH, refer to the clear zone for the appropriate ADT.

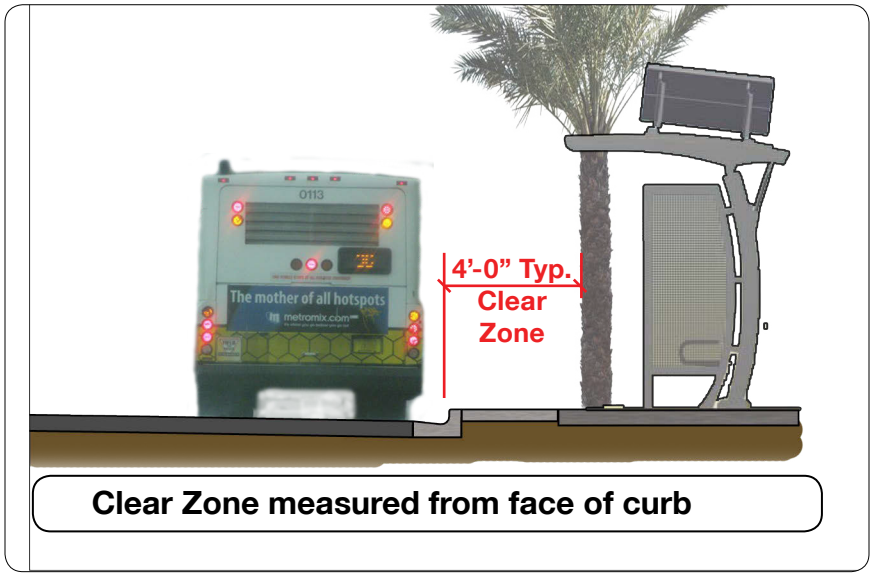



**Figure 4.3.1 - Typical Urban Setbacks**

## 4.4 Guardrails

Where guardrails run parallel to the roadway, a bus stop must be located behind the guardrail with an opening a minimum of 5 foot wide to allow for passenger access, while maintaining protection for both passengers and vehicles. An accessible landing pad is required at the opening in the guardrail to comply with ADA regulations. See Figure 4.4.1a.

The bus stop and associated opening in the guardrail must connect to an accessible route to a curb ramp at a cross walk or signalized intersection.

Guardrails are typically used to protect vehicles from steep drop-offs, such as those found at canals. Bus stops at these locations must be designed with appropriate protective measures (railings, fences) to ensure the safety of passengers.


**Figure 4.4.1a - Photo - Guardrail at Bus Stop - Recommended Layout. University Blvd and Taft St.**

**Figure 4.4.1b - Photo - Guardrail at Bus Stop - Undesirable Layout. Sheridan St. and NW 70th Terrace**

## 4.5 Curbside Enhancements

### *4.5.1 Landscaping*

In the design of a bus stop, the addition of landscaping can contribute to passenger safety and comfort. Careful landscape design can help prevent crime in the vicinity of the bus stop by defining the territory and the ownership of the bus stop.

Landscaping enhances the passenger waiting experience by providing a buffer from traffic and climate control. Landscaping must not block the view of the riders from outside of the bus stop as this limited view can create an environment conducive to crime. To ensure nighttime security, landscaping at transit stops should be planned so as to not create shadows at the waiting area of the bus stop.

To limit maintenance and enhance the degree of survival, landscaping should employ native plants to the greatest extent possible. Landscaping plans should consider such factors as salt, sun, shade and drought tolerance, and wind exposure. Only plants that are well-suited for Florida's natu-

**Figure 4.5.1 - Photo - Landscaped Bus Stop**


**Figure 4.5.2 - Bus Stop Layout with Landscaping - Landscape Plan**

**Figure 4.5.3 - Landscaped Bus Stop**

ral environment should be used. Installation of landscaping at a bus stop must be coordinated with BCT and the local maintaining agency to assign responsibility for the maintenance of the bus stop landscaping.

The installation of trees and other landscaping elements at bus stops can enhance environmental comfort as well as visual appearance of the stop. Landscaping should be coordinated with the placement of other infrastructure as mentioned in other sections of this manual. The use of shade trees to protect patrons waiting at a bus stop from the sun is a necessity in the South Florida climate.

The location of landscaping items must comply with the ADA requirements for clearances, accessible routes and obstacles. Landscaping should also be avoided where it blocks access and/or visibility to and from the bus stop. Where this cannot be avoided, the landscaping should be trimmed regularly. Landscaping must also comply with applicable local ordinances.

Maintenance agreements are required for any and all landscaping elements to be installed at a bus stop. Considerations should be made for the use of drought tolerant plants and techniques. BCT encourages the use of local species of plants wherever possible.

### *4.5.2 Pavement, Materials and Finishes Options*

Alternative paving materials such as stamped asphalt, colored asphalt, patterned concrete and pavers may be used in and around bus stops for accents. Motorists awareness of bus stops is increased by changes in pavement color and texture. Alternate paving materials can be applied to emphasize the existence of a crosswalk and for traffic calming. If decorative pavers are installed they must be designed to resist the vehicular traffic loads. All pavers must meet ADA requirements and are restricted to medians and islands, curb extensions, sidewalks and borders. Alternative pavement materials are often maintained by local agencies through agreements with the FDOT and Broward County Public Works Department.

Bus stops can be constructed from numerous materials; however, materials selected should be durable, easily maintained, cost effective, vandal resistant and environmentally responsible. The most common materials used in bus stop design are metal, wood, glass, plastic and concrete.

Wood can be used for structural elements or more commonly, benches. Care must be taken to select species of wood that is durable, weather resistant and from sustainable sources. Wood is susceptible to vandalism and weathers poorly.

Concrete is used at bus stops for paving, curbs and occasionally furniture. Concrete is not ideal for structure as it does not lend itself to the light and airy nature of bus shelter design. Surfaces made of concrete provide excellent traction and durability and it is the material of choice for waiting pads and accessory pads. Concrete can be colored and patterned to add visual interest.

Shelters, benches, bike racks, and trash receptacles are often constructed in metal. Aluminum, although fairly inexpensive and easy to work with, is soft and easily scratched. Its high recyclability makes it desirable from a sustainable design standpoint but can also leave it vulnerable to theft. Care should be taken, as with any material in a public place, to properly secure objects to prevent unauthorized removal. Steel, galvanized, painted or stainless is more durable than aluminum and often more vandal resistant. Steel can also be sourced with a high recycled content and can be recycled when the useful life is complete. Steel prices vary depending on finish, grade and current trade rates.

Plastics can be used for paneling and roofing on shelters. The material is lightweight and can be easily installed. Plastic deteriorates over time and can discolor from exposure to the sun and/or chemical cleaners. Plastics should be used sparingly.

Tempered glass can be used in shelters; however, it is not preferred. Visually, the material is more pleasing than plastic and withstands environmental demands better than plastic. Unlike plastic, the material is not damaged by repeated cleaning; broken glass, however, can create a hazard for waiting passengers. Transparency of surfaces is a key element in providing a sense of security at bus stops and should be maximized as much as possible.

Chapter 4

# Curb Side Factors

BCT encourages the use of materials that compliment the selected shelter type at each stop location. Variations in material selections should be approved by BCT.

Chapter 5

# Street Side Factors

## 5.1 Street Side Accessibility

Since pedestrians often have to cross streets to reach bus stops from their points of origin, or to get to their final destinations, it is important to maintain accessible street crossings at all locations where the roadway intersects pedestrian traffic. Curb ramps and pedestrian cross walks are the two major elements that should be incorporated in order to provide accessible street crossings. It is recocommended that these two elements be included at all intersections.

In addition to crosswalks and curb ramps, additilonal components such as signage are encouraged at intersections, especially at major roadway crossings. Pedestrian crossing signals should be included at all signalized intersections where pedestrian crossing is allowed (See Figure 5.1.2).

In order to create a cohesively accessible street-scape, the roadway must be coordinated with the sidewalk and right-of-way. When this is not the case, roadways sometimes are incorrectly used as the accessible route (see Figure 5.1.1).

**Figure 5.1.1 - Photo - Wheelchair using the roadway**

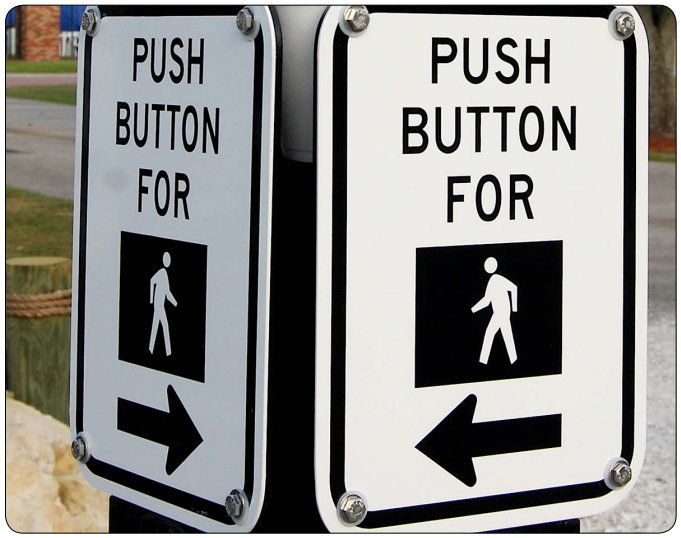



**Figure 5.1.2 - Photo - Typical Signalized Crosswalk Sign**

## 5.2 Roadway

It is important that street designs take into account the impact that public and mass transit vehicles have on traffic. Buses should be given greater priority over automobiles and trucks, because they have the capacity to carry more passengers. Preferential treatment towards public transportation vehicles, such as roadway widths, turning lanes and traffic signal timing, should be considered, as long as they are not detrimental to the overall flow of traffic.

New roadway construction in Broward County is regulated by the agency with jurisdiction / ownership of that particular roadway. Developers should contact these agencies early in the design process to ensure that all applicable standards are met.


**Figure 5.2.1 - Photo - Bus Bay and Sidewalk**

### *5.2.1 Roadway Design*

Roadway designs for streets and intersections where bus traffic or bus stops will be present should accommodate the size, weight and turning requirements of the buses, as well as pedestrian and bicycle activities. The incorporation of these elements into the roadway design will help improve the safety as well as daily operations along the roadway.

### *5.2.2 Pavement*

Roadway pavements, shoulders, turnouts or other off-street facilities need to have sufficient strength to accommodate repetitive bus axle loads of the bus type anticipated to be using the stop. Soil conditions and the anticipated number of buses and bus movements for a specific site will effect the exact pavement design. Bus movements, such as starting, stopping and turning, create additional loading on the pavement. Areas where these movements are anticipated require additional pavement design considerations. The use of reinforced concrete pavement (see FIGURE 5.2.1 – Photo – Bus Bay & Sidewalk) is recommended at these locations to help prevent the pavement failures that are common with asphalt pavements.

In order to reduce long-term maintenance costs at bus stops and bus bays, FDOT District 4 Transit Facility Guidelines recommend the use of a concrete (“rigid”) pavement section. The recommended pavement design is a 9-inch concrete slab with a 12-inch sub-base, which is based on the criteria provided in the AASHTO Guide for Design of Pavement Structures (1993). Refer to the FDOT Pavement Design Manuals for additional pavement design criteria.

All paving materials and thicknesses must be coordinated with FDOT and Broward County Highway Construction and Engineering Division, or the proper municipality to ensure that proper pavement designs are being used. Refer to the FDOT Pavement Design Manuals for additional pavement design criteria.

### *5.2.3 Clearances*

In order to accommodate buses traveling in the lane closest to the curb, and their need to pull over to the curb to pick up and drop off passengers, the following clearance requirements must be maintained:

- Overhead obstructions should be a minimum of 12 feet above the street surface;
- Curbside obstructions should be located a minimum of 2 feet away from the face of curb to prevent being hit with the bus mirror;
- All horizontal clearances shall comply with all applicable FDOT requirements for Clear Zones;
- The recommended travel lane for buses is 12 feet
  - » 12 feet required for arterials.
  - » 11 feet minimum for collector roadways.
  - » 10 feet minimum for local roadways.
  - » Minimum width of curbside travel lanes does not include the width of the curb and gutter, if present.

Figure 5.2.2 – Minimum Clearances for Buses show the relationships of these clearance requirements.

The minimum and recommended travel lane widths take into account the width of a bus, including its mirrors, in an attempt to minimize the impact of the various design elements which may affect the safety and efficiency of bus operations.

### *5.2.4 Intersections*

Intersection design plays a major role in ensuring that transit is accessible, safe, convenient and well circulated. Intersections must balance the needs of pedestrian crossings, traffic flow and vehicle turnings.

The two most critical considerations when designing intersections are:

1. Curb Radii
2. Pedestrian Crossing Distance

These two considerations are related, in that larger curb radii equal greater pedestrian crossing distances.

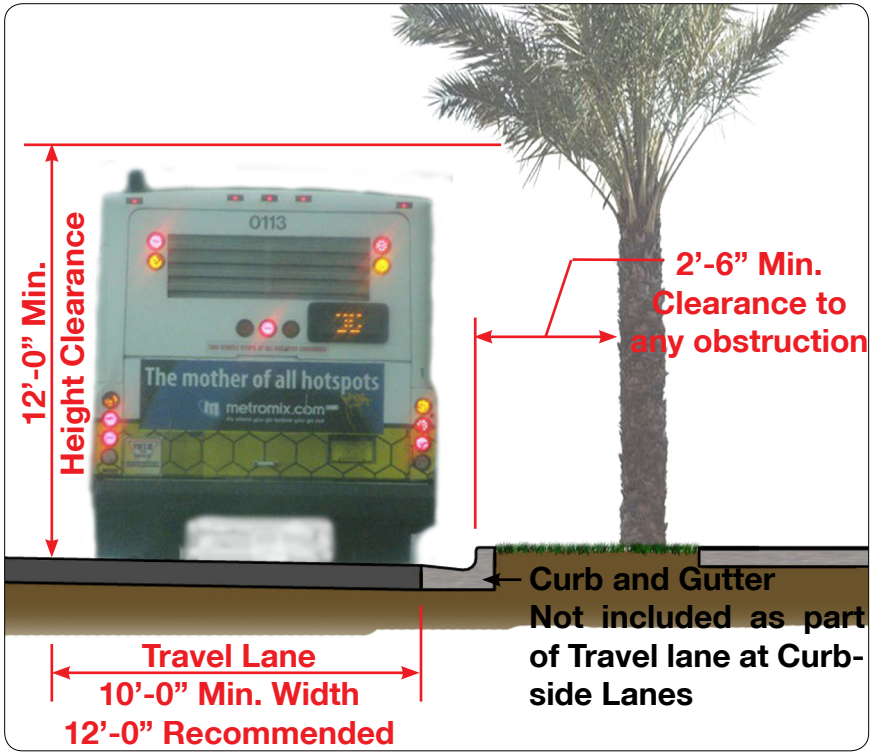



**Figure 5.2.2 - Minimum Clearances for Buses**

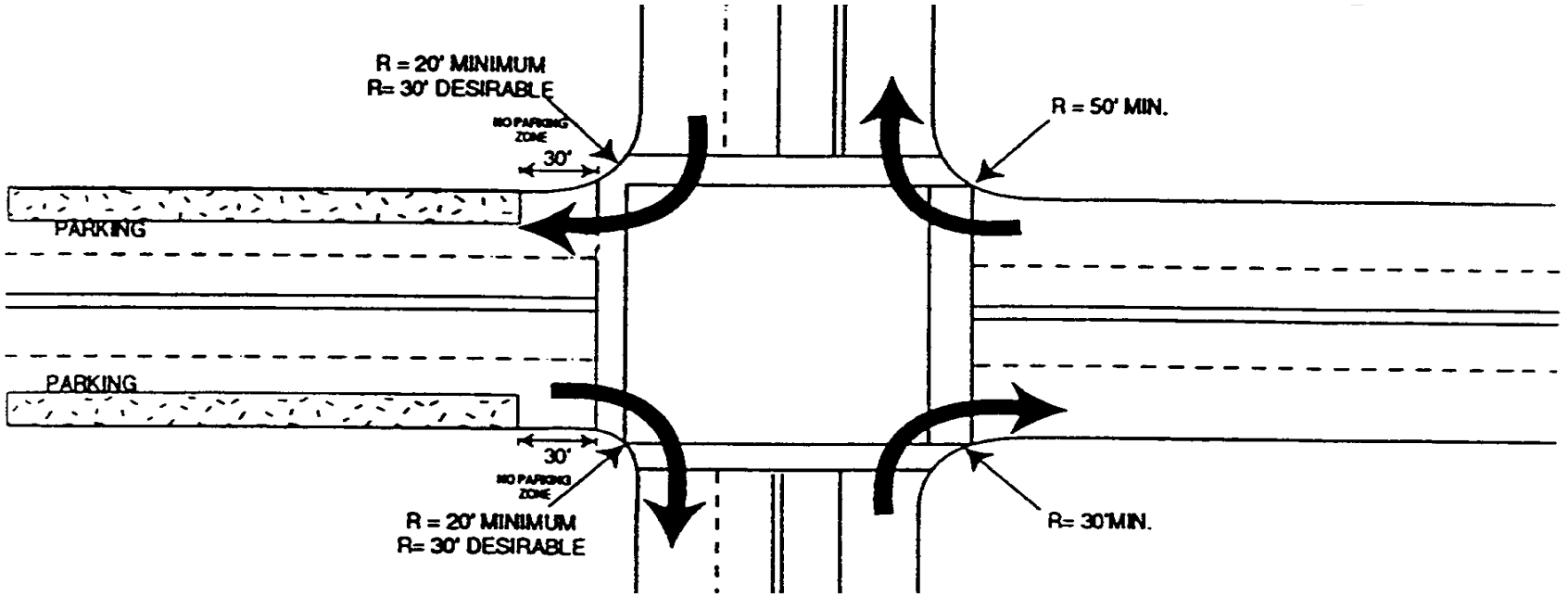



**Figure 5.2.3 - Intersection Design Detail**

## TABLE 5.2.1 - CURB RADII DESIGN

| Approach Width (FT) | Entering Width (FT) | Curb Radii (FT) |
|---|---|---|
| 12 (1 lane) | 12 | 50 |
| | 16 | 45 |
| | 20 | 40 |
| 16 | 12 | 45 |
| (1 lane with 4-ft | 16 | 40 |
| shoulder) | 20 | 30 |
| 20 | 12 | 40 |
| (1 land with parking) | 16 | 35 |
| | 20 | 30 |

*Assumes no street parking and minimum encroachment into adjacent lanes

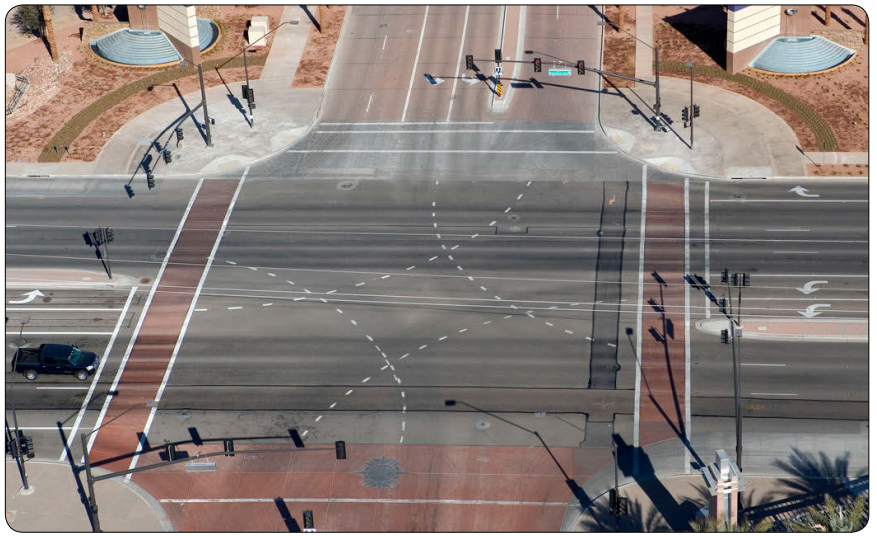


**Figure 5.2.4 - Photo - Intersection**

### *5.2.5 Curb Radii*

The radius of the curb at intersections can impact bus operations when making right turns. Proper design of curb radii can prevent buses from encroaching into adjacent lanes or mounting the curb as they make turns. See Figure 5.2.3 – Intersection Design Detail.

Some advantages of properly designed curb radii include:

- Decreased conflicts between buses and other traffic at heavily used intersections.
- Increased allowable bus operating speeds through turns.
- Reducing travel time.
- Minimized bus encroachments into other lanes.
- Reduces / eliminates need for hold lines in opposing traffic lanes.
- Improves bus patron comfort.

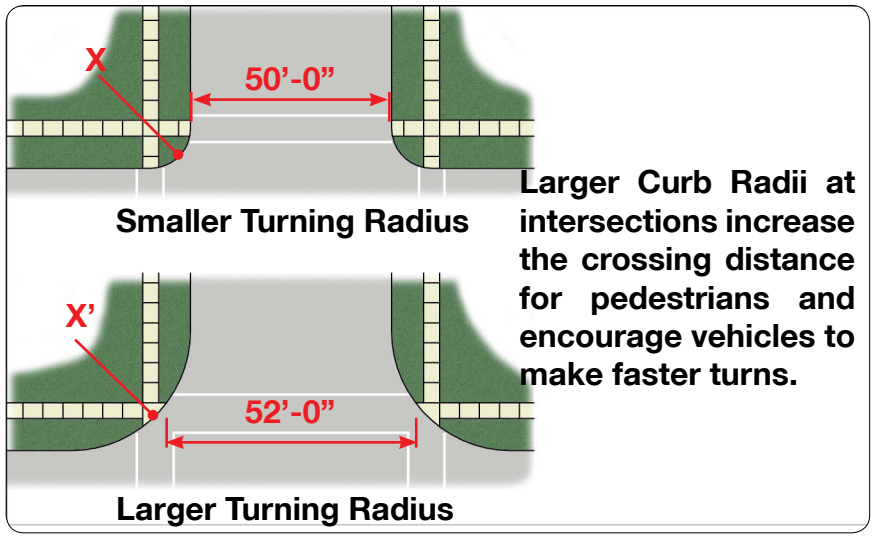



**Figure 5.2.5 - Pedestrian Crossing Distances**

When designing curb radii, the following items should be taken into consideration:

- Design vehicle characteristics, including turning radius;
- Width and number of lanes on the intersecting street;
- Allowable bus encroachment into other traffic lanes;
- Location of on-street parking;
- Angle of the intersection;
- Operating speed of the bus;
- Pedestrian safety, including crossing distances.

All of these factors must be looked at together when designing a curb radius. On-street parking should be prohibited for a minimum of 30 feet from the end of the curb radius at both the approach and cross streets. Enforcement of parking regulations is important to maintain smooth turning movements and to avoid conflicts between buses and parked cars or opposing traffic.

The allowance for buses to encroach on other lanes may reduce the minimum curb radius that is required. However, when bus encroachment into opposing lanes of travel is anticipated, the use of an advanced stop bar for the opposing lanes of traffic should be designed.

See TABLE 5.2.1 – CURB RADII DESIGN for minimum required and recommended curb radii for various conditions.

It is important to keep in mind that designing larger curb radii increases the pedestrian crossing distance. Greater crossing distances increase the exposure of pedestrians to vehicular traffic. Signal timing and median treatments should be designed to accommodate the needs of pedestrians.

-

### *5.2.6 Crosswalks and Curb Ramps*

The design of all pedestrian crossings and parallel pathways within the right-of-way shall be considered an integral part of the overall design of a street or urban highway. The development of protection at any remaining crossings or conflict points must be adequate to achieve a total pedestrian transportation mode that is reasonably safe.

Curb ramps meeting the requirements of ADA Accessibility Guidelines (as described in the Federal Register) and the Florida Accessibility Code for Building Construction (Rule 9B-7.0042), shall be constructed at crosswalks at all intersections where curbs and sidewalks are constructed in order to give persons with disabilities safe access.

The design of pedestrian crossings should be based on the following requirements:

- Crossings should be placed at locations with ample sight distances.
- At crossings, the roadway should be free from changes in alignment or cross section.
- The entire length of crosswalk shall be visible to drivers at a sufficient distance to allow a stopping maneuver.
- Stop bars shall be provided adjacent to all signalized crosswalks to inform drivers of the proper location to stop. The stop bar should be well separated from the crosswalk, but should not be closer than 4 feet. All crosswalks shall be easily identified and clearly delineated, in accordance with Manual on Uniform Traffic Control Devices (MUTCD) (Rule 14-15.010).

**Figure 5.2.6 - Photo - Crosswalk**

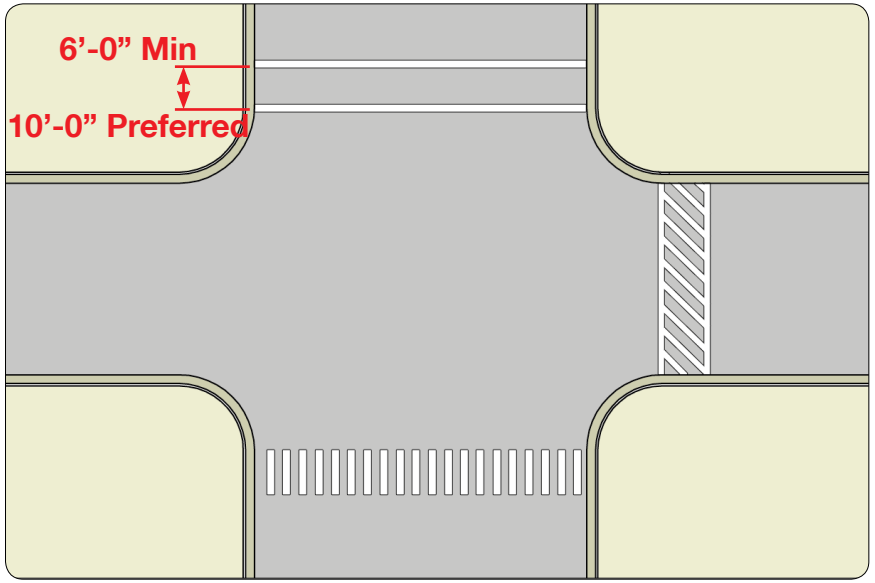



**Figure 5.2.7 - Crosswalk Patterns**

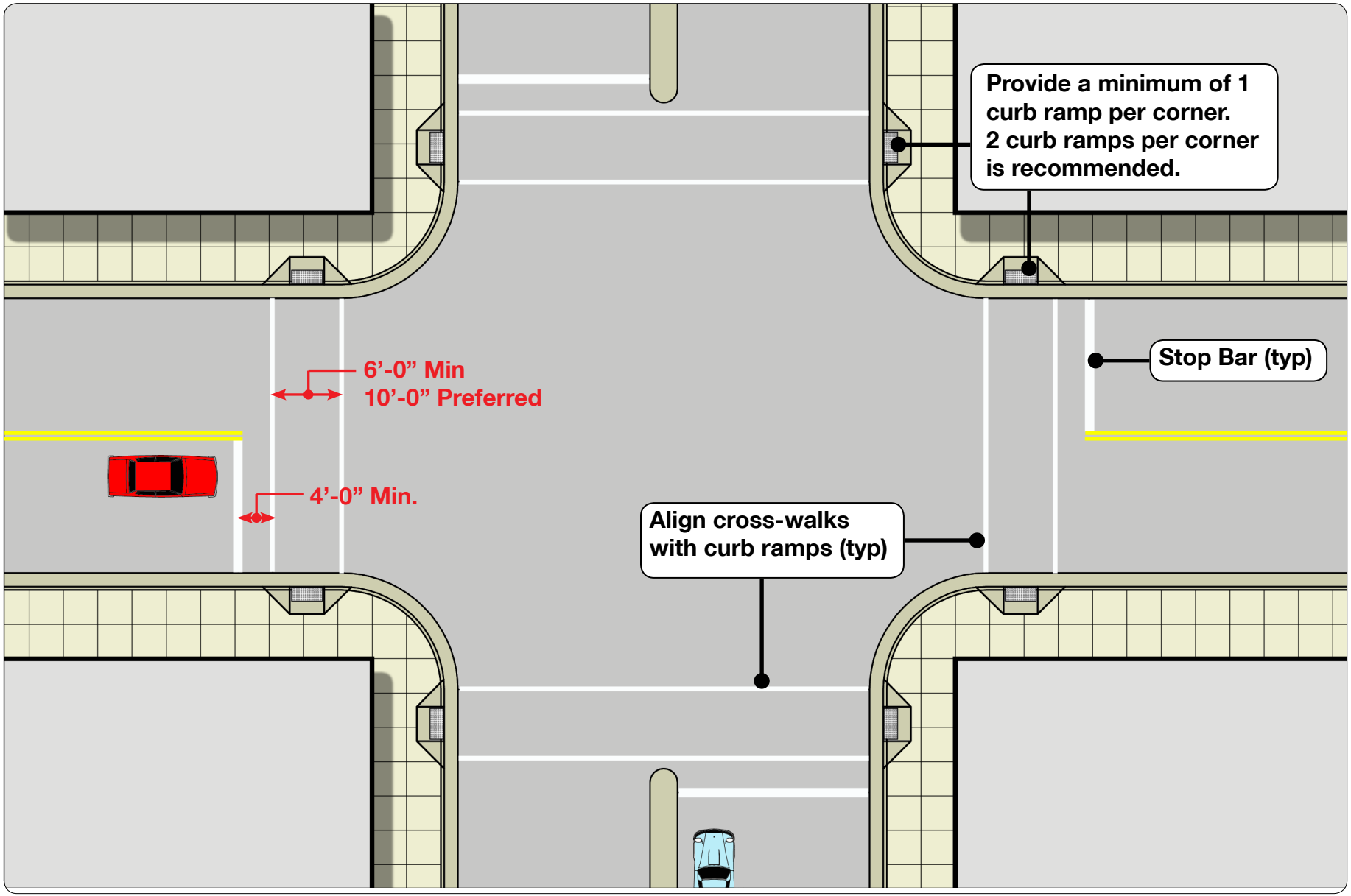



**Figure 5.2.8 - Typical Crosswalk Design**

In areas with sidewalks, curb ramps must be incorporated at locations where crosswalks adjoin the sidewalks. The basic curb ramp type and design application depends on the geometric characteristics of the intersection or other crossing location.

Typical curb ramp width shall be a minimum of 3 feet with 1:12 curb transitions on each side when pedestrians must walk across the ramp. Ramp slopes shall not exceed 1:12 and shall have a slip resistant surface texture. Ramp widths equal to crosswalk widths are encouraged.

Curb ramps at marked crossings shall be wholly contained within the crosswalk markings excluding any flared sides.

If diagonal ramps must be used, any returned curbs or other well defined edges shall be parallel to the pedestrian flow. The bottom of diagonal curb ramps shall have 48-inch minimum clear space within the crosswalk. If diagonal curb ramps have flared sides, they shall also have at least a 24-inch long segment of straight curb located on each side of the curb ramp and within the marked crossing.

It is important to visually-impaired persons using the sidewalk that the location of the ramps be as uniform as possible. A contrasting surface texture should be used. On sections without curb and gutter, a contrasting surface texture should be used on the approach to crosswalks.

The Florida Department of Transportation's Design Standards, Index 304, which addresses the design of curb ramps, may be considered. Designers should keep in mind there are many variables involved making each street intersection a special problem. For this reason, standard guidelines will not fit all situations and cannot replace the need for the use of sound engineering judgment in the design of curb ramps.

Two ramps per corner are preferred to minimize the problems with entry angle and to decrease the delay to people in wheelchairs or visually impaired pedestrians entering and exiting the roadway.

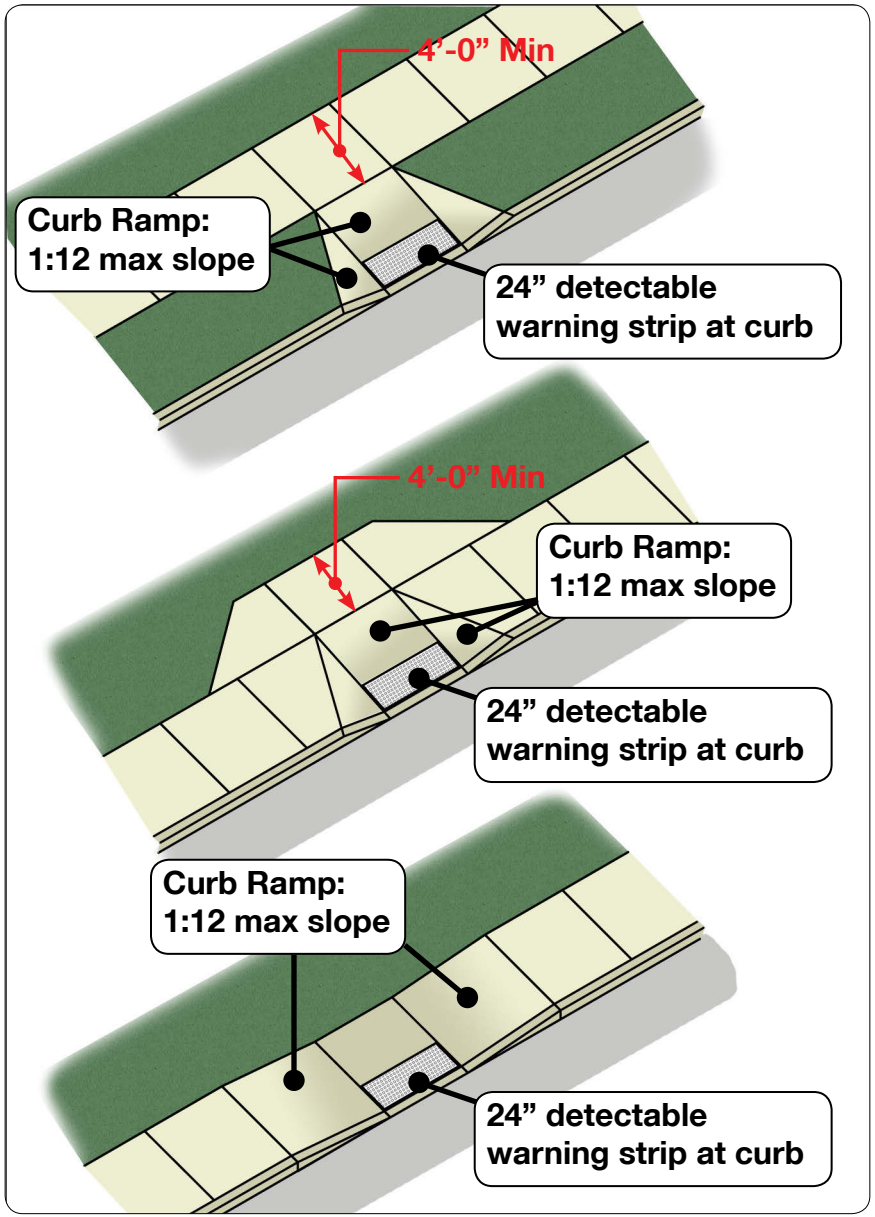



**Figure 5.2.9 - Curb Ramp Designs**

### *5.2.7 Grades*

The grade of a road is the measure of the road's incline or decline for a section along its route. Grade is calculated as the percentage of the vertical distance (rise) over the horizontal distance traveled (run). See Figure 5.2.10a.

The roadway grade should be designed to minimize its impacts on bus planning and operations. Typically a 40-foot bus can handle grades between 6% - 8%, but the maximum recommended grade should not exceed 6%.

Roadway grades can also refer to the cross-slope of the road, or its sectional profile from curb to centerline to curb, which is an important consideration for drainage.

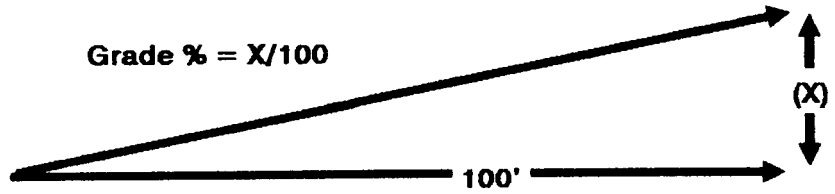



**Figure 5.2.10a - % Grade / Slope Diagram**

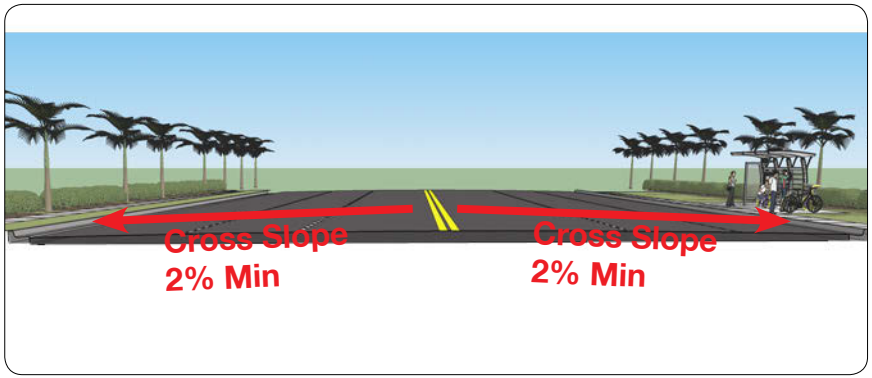



**Figure 5.2.10b - Street Cross Slope Sketch**

### *5.2.8 Drainage*

Drainage at bus stops and stations is an important consideration for pedestrian accessibility and passenger comfort. It is important that neither the location nor the design of a bus stop allows for ponding. See Figure 5.2.13 – Photo - Ponding at Bus Stop. This applies to the accessible path, passenger waiting and boarding areas and the bus stop or bus bay.

At bus stop locations where curb and gutter design is present; the bus pad surface should be pitched towards the curb & gutter, which directs the run-off to a drainage structure located outside of the bus stop area. See Figure 5.2.11 – Typical Drainage at a Curb Side Bus Stop.

At bus stops where curb and gutters are not used, the bus pad surface should be pitched away from the roadway to carry run-off to drainage ditches located away from passenger waiting / loading areas. See Figure 5.2.12 – Typical Drainage at a Bus Bay.

In order to achieve proper drainage, cross slopes of bus bays should be a minimum of 2%, or they should match the cross slope of the adjoining roadway. Where ever possible, it is also recommended to direct run-off to adjacent native landscaped areas.

At crosswalks and other locations where pedestrian traffic is included in the street design, all slopes and cross-slopes shall comply with the ADA requirements for accessible paths. Cross-slopes shall not exceed 2%. Drainage at crosswalks should be designed to minimize the amount of storm water run-off that flows across the crosswalk, especially in front of any curb cuts. Roadway design should provide for sufficient drainage to prevent ponding at curb cuts.

BCT encourages the use of sustainable solutions to help reduce the effects of rain water run-off, especially at bus stops. The use of permeable pavement materials at roadway bus pads, bus bays and at the bus stop waiting area should be considered. Additional considerations should be made for the inclusion of bio-swales and storm water retention ponds.

All drainage design is site specific, and is completed in the civil engineering design. Engineering departments and drainage districts review site plans

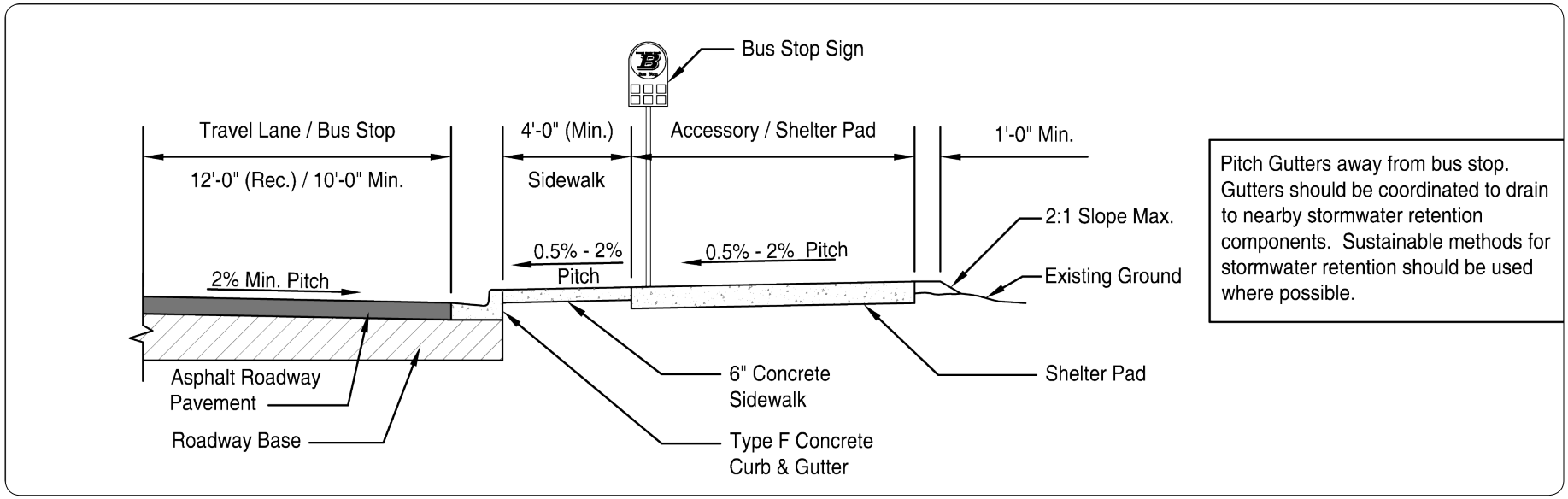



**Figure 5.2.11 - Typical Drainage at a Curbside Bus Stop (Derived from Figure 1-8 in FDOT-District 4 "Transit Facility Guidelines")**

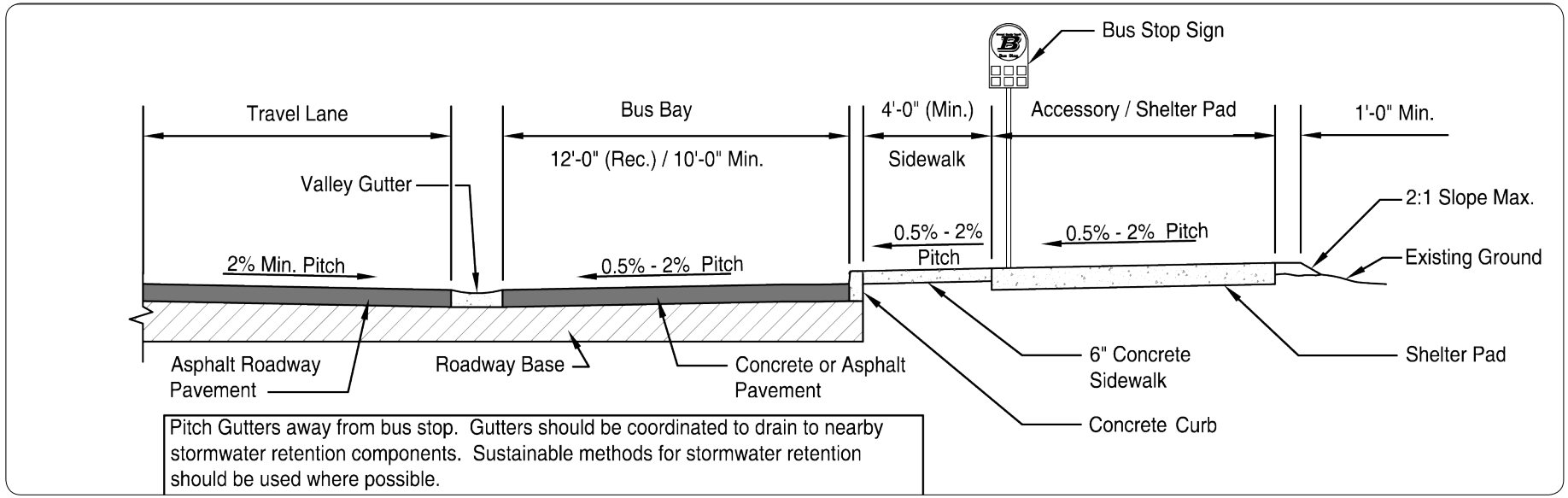



**Figure 5.2.12 - Typical Drainage at a Bus Bay (Derived from Figure 1-8 in FDOT-District 4 "Transit Facility Guidelines")**

for compliance with specific area regulations. Engineers follow FDOT Green Book and FDOT, District 4, Transit Facility Guidelines for State right-of-ways. Broward County Minimum Standards are used for County right-of-ways. The engineering department of each municipality selects the standard (either FDOT or County requirements) to follow for city right-of-ways.

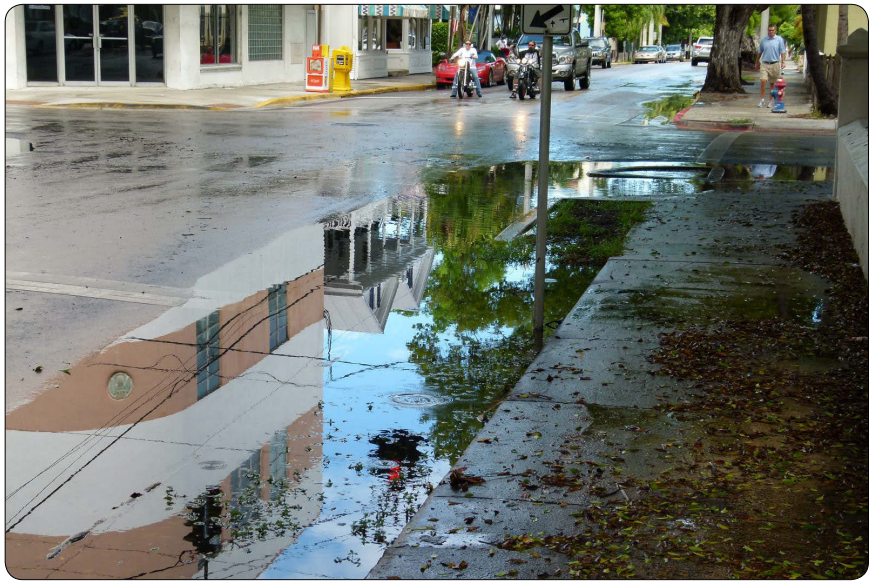


**Figure 5.2.13 - Ponding at a Corner**

### *5.2.9 Recovery Locations*

Recovery locations or layover sites are areas where buses can stop and wait between scheduled trips. Occasionally, recovery locations can be located in the middle of a longer route, so the bus can be slowed to maintain its schedule.

When designing a recovery location, consideration for the impact on the local area must be given. Impacts such as visibility, effects on traffic flow and environmental concerns (noise, air and ecosystem) should be investigated during the site selection process. Recovery locations should be within bus pullout bays or other off street locations that will not obstruct the travel lane.

### *5.2.10 Traffic Signals and Signage*

Generally, the preferred location for bus stops is at signalized intersections. Traffic signals at these intersections should be designed to accommodate the needs of the buses and bus passengers. See Figures 5.2.14 and 5.2.15

**Figure 5.2.14 - Photo - Signalized Intersection**

for images of signalized intersection. The following should be considered when designing new or redesigning existing traffic signal systems:

- Bus stop locations should be coordinated with traffic signal poles and signal head locations so that they do not restrict the visibility of the traffic signals from other vehicles.
- Far-side bus stops at signalized intersections can cause vehicles stopping behind a bus to queue into the intersection, therefore, proper distance from the intersection must be considered when placing these stops.
- Since all bus passengers become pedestrians upon exiting the bus, it is important to have “WALK” and “DON’T WALK” indicators at all signalized intersections where buses are present.
- Near-side bus stops are usually located between the advanced detectors and the traffic signal. At these stops, placement of the advanced detector is critical to allow for the bus to activate the detector and the signal controller in order to obtain or extend the green light. Otherwise, the bus is forced to wait for other same direction traffic to activate the signal controller.
- The timing of the traffic signals should be designed to accommodate the specific needs of buses using the intersection. Higher speed roadways with significant bus traffic may require longer clearance intervals. Adequate time must be provided for buses to accelerate from a bus stop through the intersection. Additional considerations for timing and detection should be taken at intersections with railroad crossings.

**Figure 5.2.15 - Photo - Signalized Intersection**

Another consideration is for Traffic Signal Prioritization (TSP) for buses. TSP is an ITS (Intelligent Transportation System) where buses are given preferential signal timing once it is detected approaching an intersection. See Figure – 5.2.16 – Signal Prioritization. TSP’s can work either unconditionally (i.e., always give buses priority at intersections when they arrive) or conditionally (i.e., buses are given priority during certain periods of the day, or when they are behind schedule). Conditional TSP’s typically require a secondary ITS on board the bus, such as automatic vehicle location (AVL) to determine if priority is required.

Broward County is developing TSP as a conditional response to help reduce bus delays and help maintain schedules. BCT already uses AVL systems in most of their fleet. Coordination with BCT to determine their system requirements is essential.

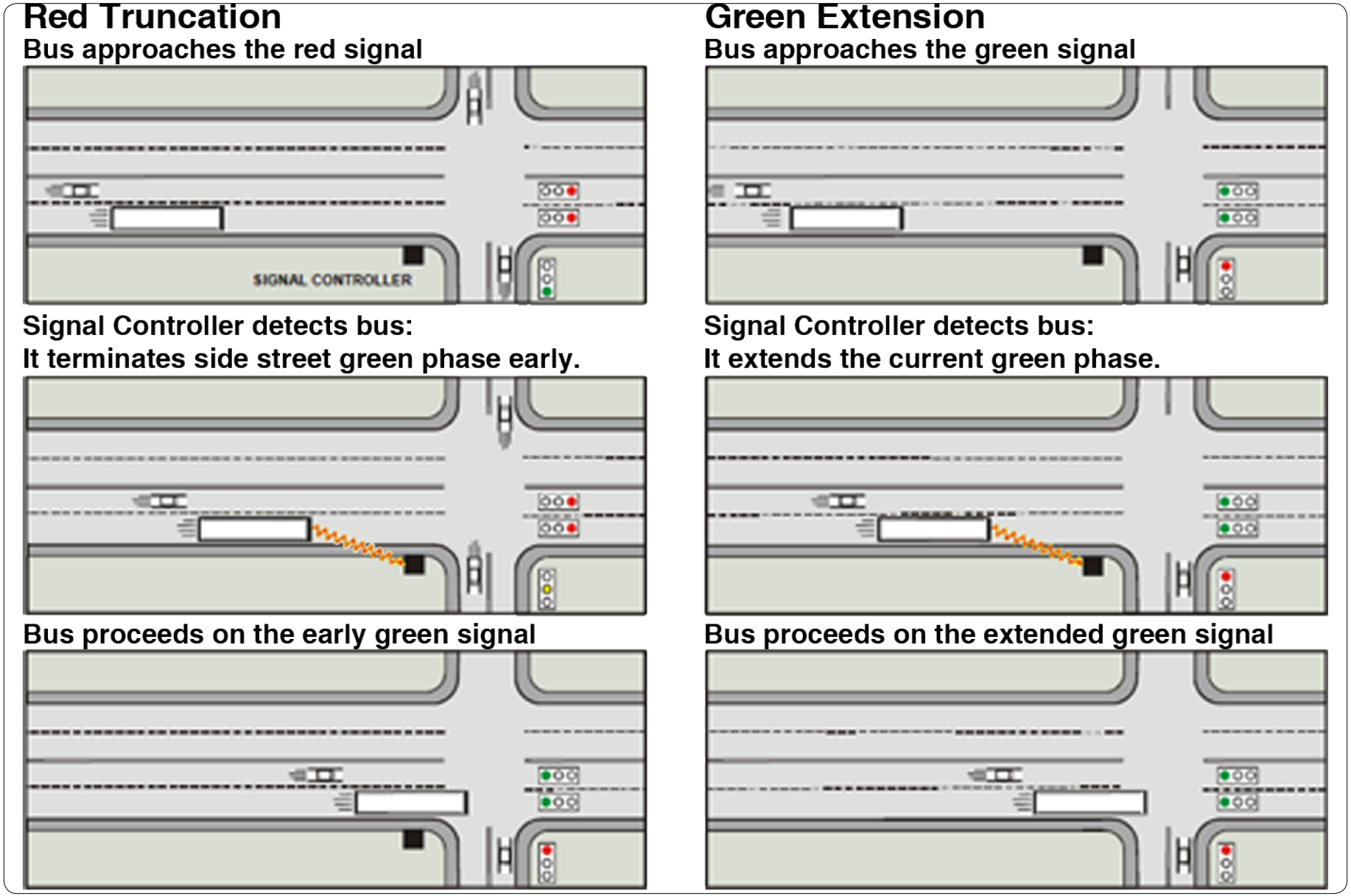



**Figure 5.2.16 - Signal Prioritization (TPS)**

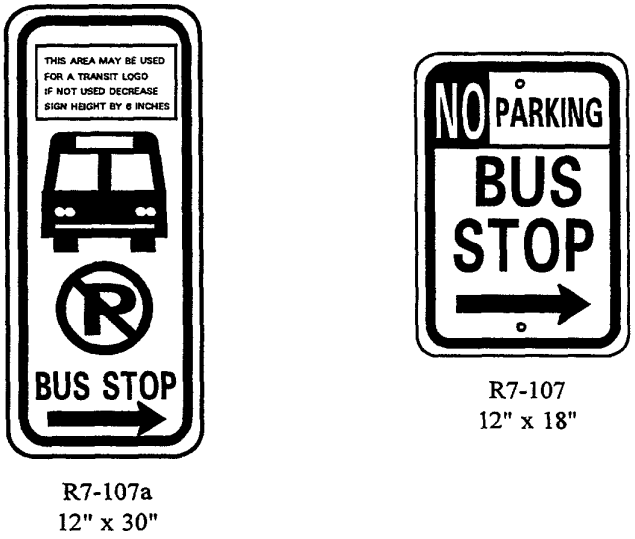



**Figure 5.2.17 - MUTCD No Parking Bus Stop Signs**


**Figure 5.2.18 - Photo - No Parking Sign at a BCT Bus Stop**

### *5.2.11 Traffic Controls*

Broward County Transit advocates the enactment and enforcement of traffic regulations, laws and ordinances that prohibit the parking, standing or stopping at officially designated and marked bus stops. Allowances for certain passenger vehicles, such as car or van pools or Paratransit vehicles, to serve riders at bus stops may be considered.

The Manual on Uniform Traffic Control Devices (MUTCD), which is developed and maintained by the Federal Highway Administration, included general specifications for no parking signs at bus stops. (See Figure 5.2.17– MUTCD No Parking Bus Stop Signs) The MUTCD also includes guidelines for the placement of these signs. See Figure 5.2.18 – Photo – No Parking Sign at a BCT Bus Stop.

In addition to bus stop signs, the MUTCD also provides recommendations for the use of pavement and curb marking at bus stops to indicate the parking restrictions.

### *5.2.12 Utilities*

All underground public utilities in the public right-of-way are located by contacting 811 Sunshine State One Call of Florida, Inc. (SSOCOF). They can be reached by calling 811 on any landline phone, or 800.432.4770 on any landline or cellular phone. SSOCOF also provides additional information on their website. www.callsunshine.com

SSOCOF contacts all of the utility providers that provide service in the specified right-of-way area, and has them mark their locations. Some providers will not mark the private connections made to the public system. Other providers may mark the private connections from the public right-of-way up to the meter.

It is important to know that SSOCOF only contacts utility providers that are members of SSOCOF. Situations may occur where a smaller, or rare, utility provider may have underground services that SSOCOF is not aware of. Private utilities and other buried items, such as irrigation lines, will also need to be located by a private utility locator or survey company.

Private underground facilities, or utilities located on private property, are located by hiring a private utility locator or survey company.

### *5.2.13 Traffic Calming Schemes*

Traffic calming schemes are considered physical features installed on roadways to reduce the speed of motor vehicles in an effort to improve the safety and comfort for pedestrians and other users on local and residential streets. (See figures 5.2.19, 5.2.20 and 5.2.21) Many of these methods have negative impacts on transit vehicles, and in some cases do not allow for the use of BCT vehicles.

BCT vehicles cannot operate on streets that do not meet the minimum operating design standards as outlined in this design manual. Often traffic calming schemes such as speed bumps, choke points (i.e. bulb outs) and roundabouts do not meet BCT minimum operating design criteria, preventing BCT service from reaching these areas. BCT wishes to cooperate with developers and local municipalities to ensure that the best possible service is provided to the transit passengers of Broward County. To ensure that this can happen, BCT recommends:

1. Any proposed traffic calming schemes on existing or proposed transit routes must be reviewed and approved by BCT;
2. The introduction of new or rerouted transit service on streets with existing traffic calming schemes that do not meet BCT operating standards is conditional upon the removal of such features;
3. Where traffic calming schemes that do not meet BCT operating standards are necessary on existing transit routes for safety related issues, BCT should be contacted immediately to coordinate the necessary route modifications.

**Figure5.2.19 - Photo - Speed Bump**

**Figure 5.2.20 - Photo - Choke Point (Bulb Outs)**

**Figure 5.2.21 - Photo - Roundabout**

## 5.3 Bus Stop Zones

Bus stop zones are the area of roadway designated for use by a bus while loading or unloading passengers. Bus stop zones include everything on the street side of the bus stop associated with transit operations, including acceleration/deceleration distances and lane treatments. Typically, bus stop zone dimensions will be affected by the travel lane design speed and the number of buses anticipated to be stopped at a bus stop at a given time.

Generally, bus stops can be broken down into three major zones:

- **Curbside** – shared space with travel lane and typically require minimal special lane treatments (do require parking restrictions)
- **Bus Bays** – separate lane segment adjacent to the travel lane ("turnouts" or "pullouts")
- **Off-Street Facilities** – specialized designated areas, separated from the travel lane with their own entrances and exits from the travel lane (Park-&-Rides or Transit Centers)

Figures 5.3.1, 5.3.2 and 5.3.3 illustrate typical examples for curbside zone, bus bays and off-street facilities. See Table 5.3.1 for a list of advantages and disadvantages of the various bus stop types in both curbside and bus bay zones.

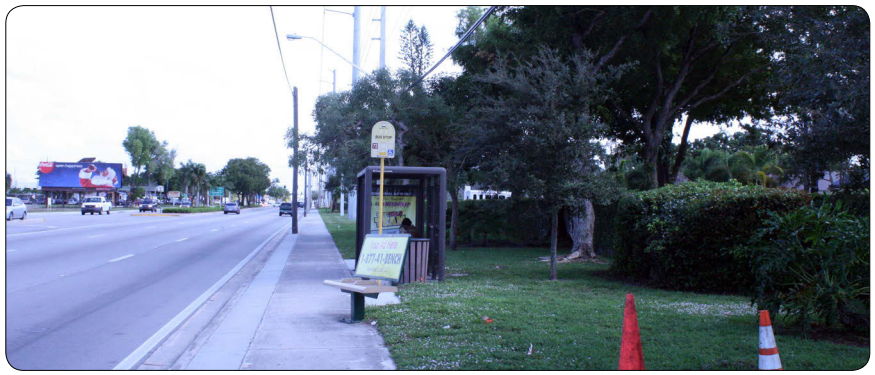


**Figure 5.3.1 - Photo - Typical Curbside Bus Stop**

**Figure 5.3.2 - Photo - Typical Bus Bay**

**Figure 5.3.3 - Photo - Off-Street Facility - Aerial View-Lauderhill Mall Terminal**

## TABLE 5.3.1 - ADVANTAGES AND DISADVANTAGES OF BUS STOP TYPES (ZONES)

| Bus Stop Type | Advantages | Disadvantages |
|---|---|---|
| Curbside Stop | Provides easy access for bus drivers and results in minimal delay to bus<br>Is simple in design and easy and inexpensive for a transit agency to install<br>Is easy to relocate | Can cause traffic to queue behind stopped buses, thus causing congestion<br>May cause drivers to make unsafe maneuvers when changing lanes in order to avoid a stopped bus |
| Bus Bulb (Nub) | Removes fewer parking spaces for the bus stop<br>Decreases the walking distance (and time) for pedestrians crossing the street<br>Provides additional sidewalk area for bus patrons to wait<br>Results in minimal delays for buses | Costs more to install compared to curbside stops<br>See curbside disadvantages |
| Bus Bay | Allows patrons to board and alight out of the travel lane<br>Provides a protected area away from moving vehicles for both the stopped bus and bus patrons<br>Minimizes delay to through traffic | May present problems to bus drivers when they attempt to re-enter traffic, especially during periods of high roadway volumes<br>Is expensive to install compared to curbside stops<br>Is difficult and expensive to relocate |
| Open Bus Bay | Allows the bus to decelerate as it moves through the intersecton<br>See Bus Bay advantages | See bus bay disadvantages |
| Queue Jumper Bus Bay | Allows buses to bypass queues at a signal<br>See open bus bay advantages | May cause delays to right turning vehicles when a bus is at the start of the right turn lane<br>See bus bay disadvantages |

## 5.4 Bus Bays

Bus bays, also referred to as turnouts or pullouts, are specially constructed areas that are separate from the travel lanes (see Figure 5.4.1). This design helps reduce many of the conflicts between through traffic and stopped buses, thus giving priority to non-transit vehicles. Bus bays are typically used on high-volume or high-speed roadways and at congested areas where large quantities of passengers might board and alight.

Some factors that should be evaluated at locations considering bus bays include:

- Signalized Intersections
- Areas with high-volume traffic (curb lane traffic exceeds 250 vehicles during peak hour)
- High-speed roadways (actual traffic speed is greater than 40 MPH)
- Bus volumes of 10 or more per peak hour
- High passenger volume locations (exceeds 20 to 40 boardings per hour)
- Locations with extensive dwell times (exceeds 30 seconds per bus during peak hour)
- Locations with extended layovers to accommodate transferring passengers (Transfer points)
- Locations with history of repeated traffic / pedestrian accidents
- Adequate right-of-way for construction of bus bay without adversely affecting sidewalk pedestrian movement
- Areas where improvements (i.e. street widening) are planned, such that a bus bay could be included as part of the improvement


**Figure 5.4.1 - Photo - Typical Bus Bay**

BCT recommends that bus bays be placed at the far side of signalized intersections only. The consideration of installing a bus bay at locations other than that must be coordinated and approved by BCT at the on-set of the design.

One concern of transit operators is that it is difficult to reenter travel lane at locations where traffic-volumes exceed 1,000 vehicles per hour per lane. Although Florida Statute (FS 316.0815) recognizes the right-of-way should be yielded to buses reentering the traffic flow, it does not relieve public transit operators from their responsibility to the safety of all persons using the roadway. The proper design of acceleration lanes, inclusion of signal priority and far side placement of bus bays, can help reduce these issues.

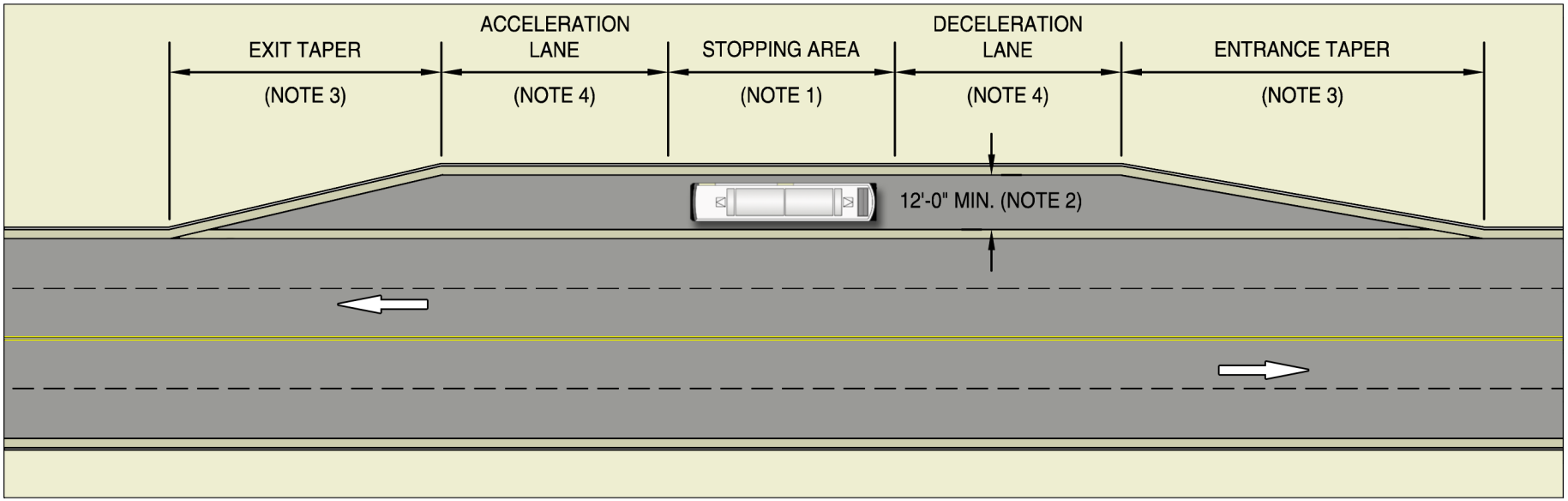



**Figure 5.4.2 - Typical Bus Bay Dimensions (from TCRP 19) Including Optional Deceleration and Acceleration Lanes**

**Notes:**
**1) Stopping area length consists of 50 feet for each standard 40-foot bus and 70 feet for each 60-foot articulated bus expected to be at the stop simultaneously.**
**2) Recommended bus bay width is 12 feet, not including the width of the gutter.**
**3) Recommended taper lengths are related to the anticipated travel speeds of the bus, which is less than 45 MPH.**

## TABLE 5.4.1 - RECOMMENDED BUS BAY DIMENSIONS

| | Length (for One Bus) | Length (for Two Buses) | Entrance Taper | Exit Taper |
|---|---|---|---|---|
| FDOT | 60 FT | 100 FT | 80 FT | 60 FT |
| Broward County | - | 100 FT | 60 FT | 36 FT |
| BCT (Preferred) | 70 FT | 120 FT | 80 FT | 60 FT |

### *5.4.1 Bus Bay Dimensions (from TCRP 19)*

The total length of a bus bay should include the following:

- Entrance Taper;
- Deceleration lane (recommended but not required);
- Stopping area;
- Acceleration lane (recommended but not required); and
- Exit Taper

In certain situations, it may be acceptable to use the through lane for acceleration and deceleration, constructing the bus bay with only the entrance and exit tapers at either side of the stopping area.

Deceleration and acceleration distances are directly related to the design speeds of the adjacent travel lanes but must also take into consideration site specific conditions, the traffic volumes, and service and passenger needs (see Table 5.4.1). All bus bay designs should be coordinated through BCT early in the process to ensure proper deceleration and acceleration distances are provided for transit operations.

Broward County Transit and FDOT recommend the following guidelines for locating bus bays:

- Far-side bus bays should be placed at signalized intersections so the signal can create gaps in traffic for the bus to re-enter the travel lane.
- Near-side bus bays should be avoided because of conflicts with right-turning vehicles, delays to transit service as buses attempt to re-enter the travel lane, and obstructions of traffic control devices and pedestrian activities. If a bus bay is to be placed at a near-side stop, traffic signal priority (TSP) options must be considered.


**Figure 5.4.3 - Photo - Mid-Block Bus Bay**

- Mid-block bus bays may be used when they are associated with key pedestrian access to major transit-oriented activity centers (see Figure 5.4.3).

Mid-block bus bays will vary greatly in dimensions and style, depending on traffic design speeds, roadway characteristics, site specific conditions, level of service, bus types (standard or articulated) and the number of buses anticipated.

Bus bays should be clearly differentiated from travel lanes with signing and pavement markings, including striping and lettering (“BUS ONLY”). Typically a 6-inch broken white stripe (2-feet by 4-feet skip) should be used at the entrance (deceleration taper) and exit (acceleration taper) of the bus bay. The remainder of the bus bay should be delineated with a 6” solid white line. See FDOT-IV Transit Facility Guidelines for more information.

**Figure 5.4.4 - Photo - Open Bus Bay**

### *5.4.2 Open Bus Bays*

Open bus bays are a variation of traditional bus bay design, in which the bus bay is a far-side stop that is open to the intersection (See Figure 5.4.4). Open bus bays utilize the full length of the cross street intersection as the entrance taper and deceleration lane. These types of stops assume that there is no dedicated right turn lane at the near-side of the intersection. See Figure 5.4.5 – Typical Layout: Open Bus Bay.

Open bus bays allow for buses to more efficiently enter the bus bay without disrupting the flow of traffic in the travel lanes. However, they can have a negative affect on pedestrians, as they increase the pedestrian crossing distance and encourage right turning cars from the cross street to use them as an acceleration lane.

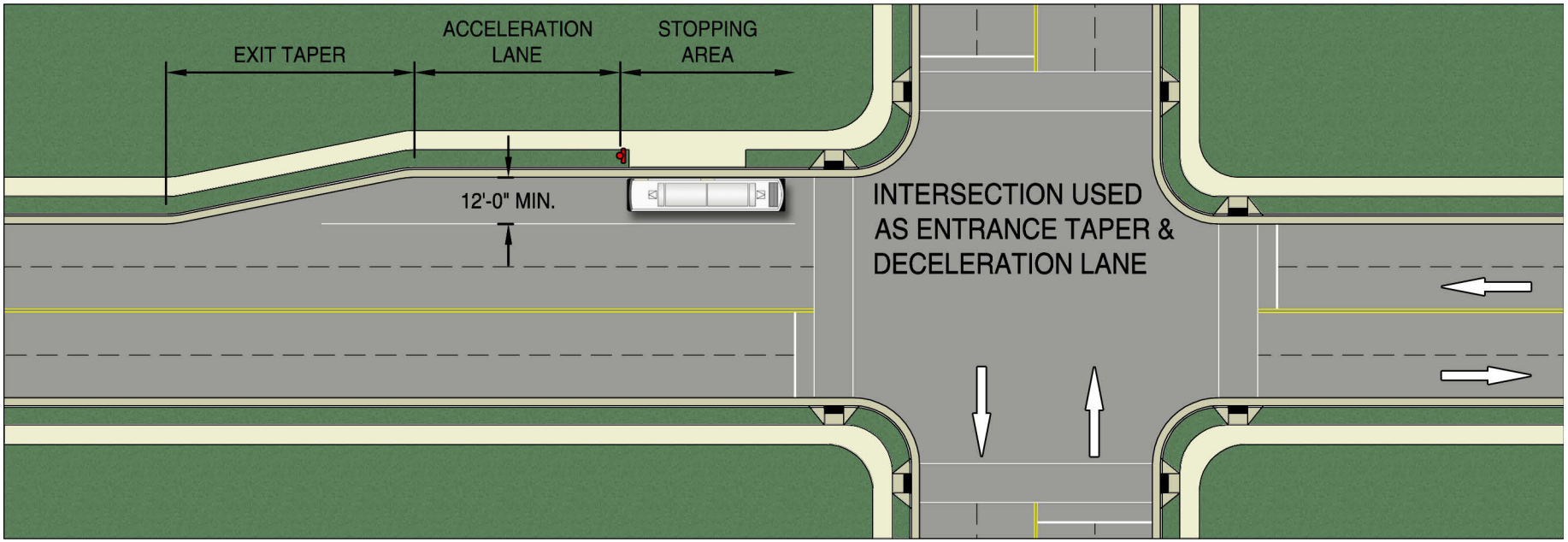



**Figure 5.4.5 - Typical Layout: Open Bus Bay**

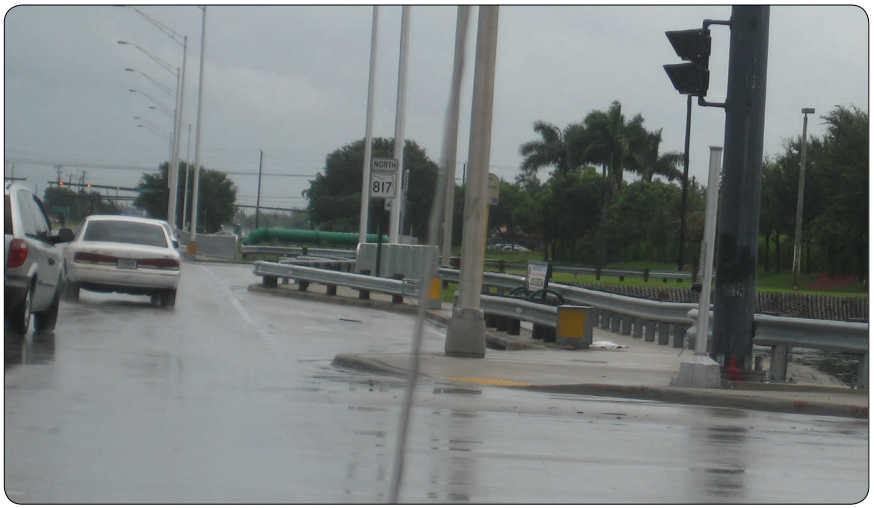


Figure 5.4.6 - Photo - Partial Open Bus Bay

### *5.4.3 Partial Open Bus Bays*

Partial open bus bays are another alternative to bus bays, which attempts to eliminate the two largest disadvantages of open bus bays, without completely disrupting the advantages. Partial open bus bays can also be referred to as partial sidewalk extensions (see Figure 5.4.6). By providing a partial sidewalk extension at the intersection, this type of bus stop minimizes the impact on the pedestrian crossing distance and prevents vehicles turning right from the cross street from using the bus bay as an acceleration lane. At the same time, it still allows buses to use the intersection for deceleration as it prepares to enter the bus bay. See Figure 5.4.7 for the typical design layout of a partial open bus bay.

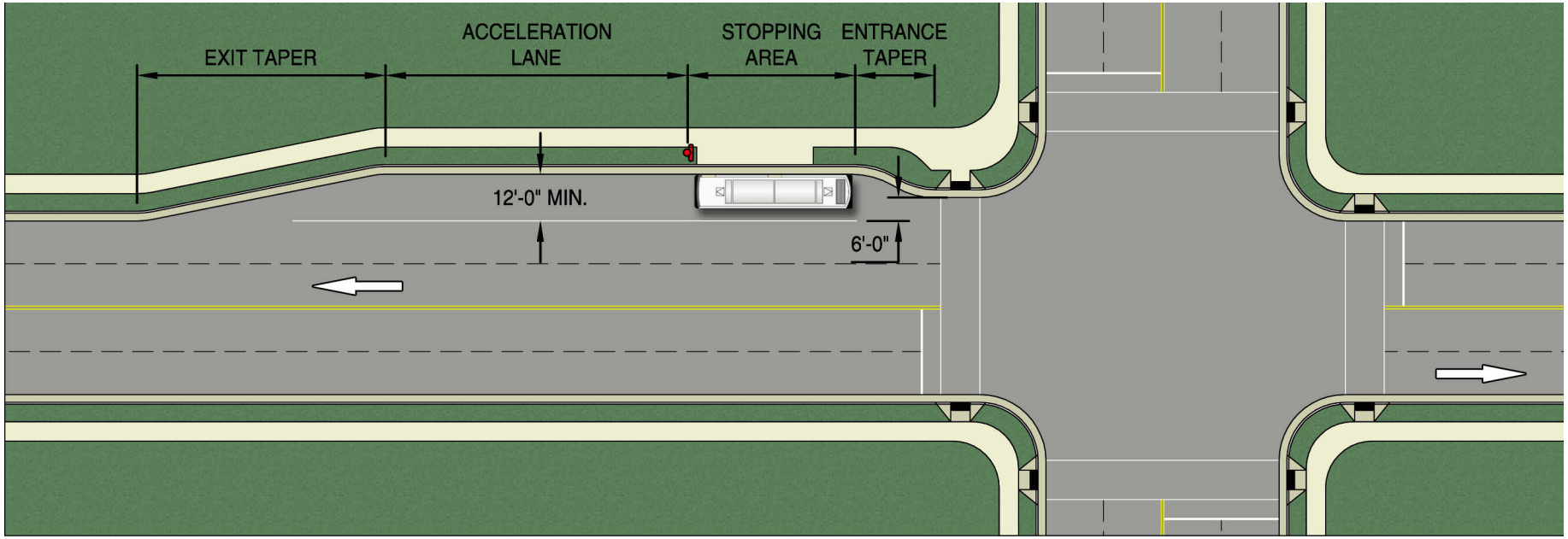



Figure 5.4.7 - Typical Layout: Partial Open Bus Bay

### *5.4.4 Queue Jumper Bus Bays*

Queue jumper bus bays give priority treatment to buses by allowing buses to bypass through queued traffic at congested intersections. These bus bays consist of a near-side right turn lane, which provides access for the bus to a far-side open bus bay (see Figure 5.4.8). Buses are allowed to use the right turn only lane to bypass congested traffic and proceed through the intersection. The right turn lane should be designated "Right Turns Only – Except Buses." Figure 5.4.9 illustrates a typical layout for queue jumper bus bays.

A queue jumper is most effective when the traffic signal provides a special "head-start" phase to the vehicles within the queue jump lane. Traffic Signal Prioritization (TPS) allows the queue jumper phase to be activated only when queue jumper buses are present at the intersection, and therefore should be utilized in order to maintain optimal signal efficiency. At locations where right turn volumes exceed 400 vehicles per hour during the peak hour, an exclusive bus lane, separate from the right turn lane should be considered.


**Figure 5.4.8 - Photo - Queue Jumper Bus Lane**

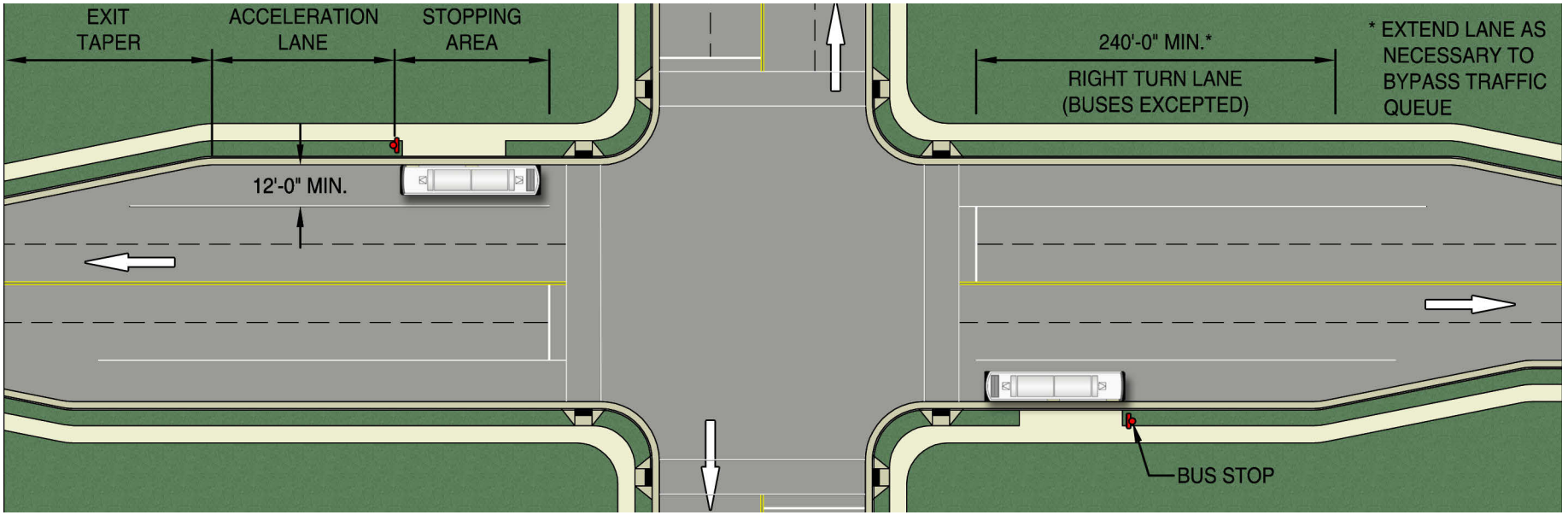



**Figure 5.4.9 - Typical Layout: Queue Jumper Bus Bay**

## 5.5 Off Street Facilities

Off-street facilities are designed to offer convenient and safe locations where bus patrons are able to be dropped off or leave their automobiles before taking transit to their final destinations. These are generally transit centers, terminals, Park-and-Rides or parking garages that serve transit. They can be designed to accommodate a wide range of passengers and parking with varying accompanying features and/or facilities. Off-street facilities can range from a parking lot adjacent to pass-by service on the street to facilities in which the buses enter to pick-up and discharge passengers. They can be as simple as off-street parking connected to a bus stop (see Figure 5.5.1), or as complex as Intermodal Transit Centers with features such as shelters, benches, bicycle storage facilities, preferential parking, and landscaping (See Figure 5.5.2).

Broward County Transit strongly encourages developers to include reserved parking for transit users, when they have large scale parking lots adjacent to existing bus routes. The benefits to transit riders taking advantage of designated parking include:

- Reduced transportation costs
- Reduced fuel consumption and expenses
- Reduced travel times
- Reduced traffic congestion
- Reduced parking demand at work sites
- Reduced long-term parking on streets

When considering off-street facilities and possible site selection, compatibility with existing bus routes, potential ridership, facility size, accessibility, convenience for passengers and patrons of the facility and safety should all be important factors. BCT should be contacted at the beginning of the process to ensure proper coordination.

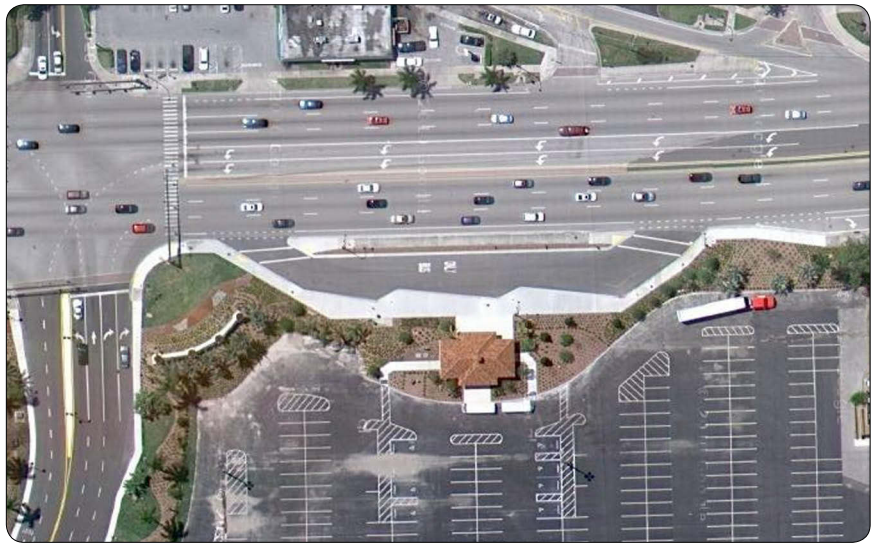


**Figure 5.5.1 - Photo - Hallandale Bus Stop (Saw-Tooth Bus Berths)**

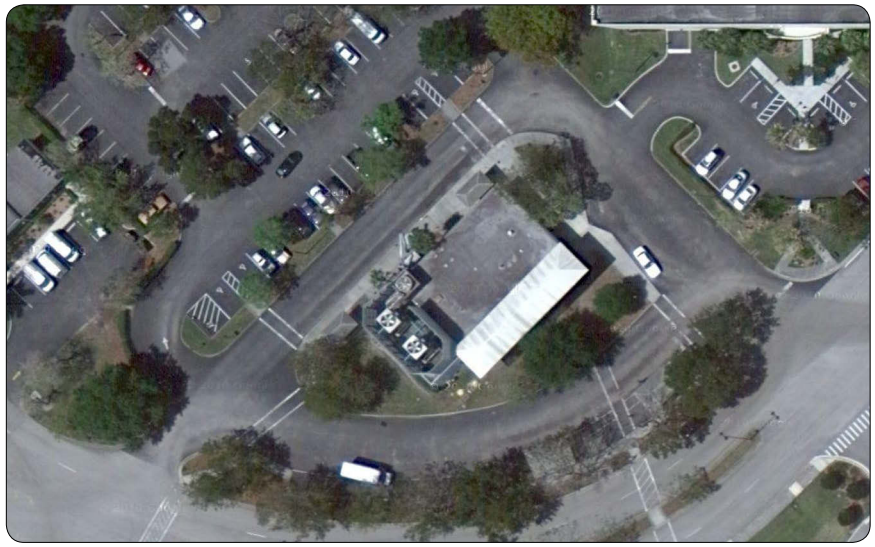


**Figure 5.5.2 - Photo - West Terminal (Parallel Bus Berths)**

**Figure 5.5.3 - Photo - Parallel Bus Berth**

**Figure 5.5.4 - Photo - Saw-Tooth Bus Berth**

### *5.5.1 Berths*

Bus berths are recessed bus stop areas designed to accommodate more than one transit vehicle, providing off-street areas for bus staging that do not interfere with traffic flow. At locations with multiple bus route, bus recovery sites and "end-of-the-line" locations, accommodations for multiple buses are typically required.

When multiple bus berths are used, clear and proper signage is required at each berth to indicate the designated bus route. Pavement markings should indicate the correct stopping position for each bus to ensure that all buses are able to reenter the travel lane.

Bus berth design typically consists of either Parallel Berths or Saw-Tooth Berths (see Figures 5.5.3 & 5.5.4).

Parallel bus berths generally have similar dimensions as curb-side bus stops, and similarly require more parking enforcement because they have the appearance of general curb-side parking areas. Figure 5.5.5 shows a typical layout for parallel bus berths. When parallel berths are located adjacent to a travel lane they require similar entrance and exit tapers as bus bays.

Saw-tooth bus berths offer the advantage of looking more like formal transit facilities, which helps discourage unauthorized parking. Generally, saw tooth berths require less horizontal space than parallel berths; however, they do require greater sidewalk depths and roadway widths. They also tend to preclude bus queuing, but do allow for buses to pull out of each bay more easily without having to wait for the buses in front of them. See Figure 5.5.6 for a typical layout using saw-tooth bus berths.

Transit facilities using any design that directs vehicular traffic in the direction of pedestrian areas, as is the case with saw-tooth berths, should provide separation methods between the roadway and pedestrian area, which are capable of keeping a bus operating at normal parking condition speeds from entering the pedestrian area. Bollards are the most common method of separation used for transit facilities. Generally, the bollards are placed at the front edge of the saw-tooth parking area, as shown in Figure 5.5.6.

Standard design consists of a minimum of three concrete-filled, 8-inch bollards consisting of heavy walled steel pipe be placed at each parking space.

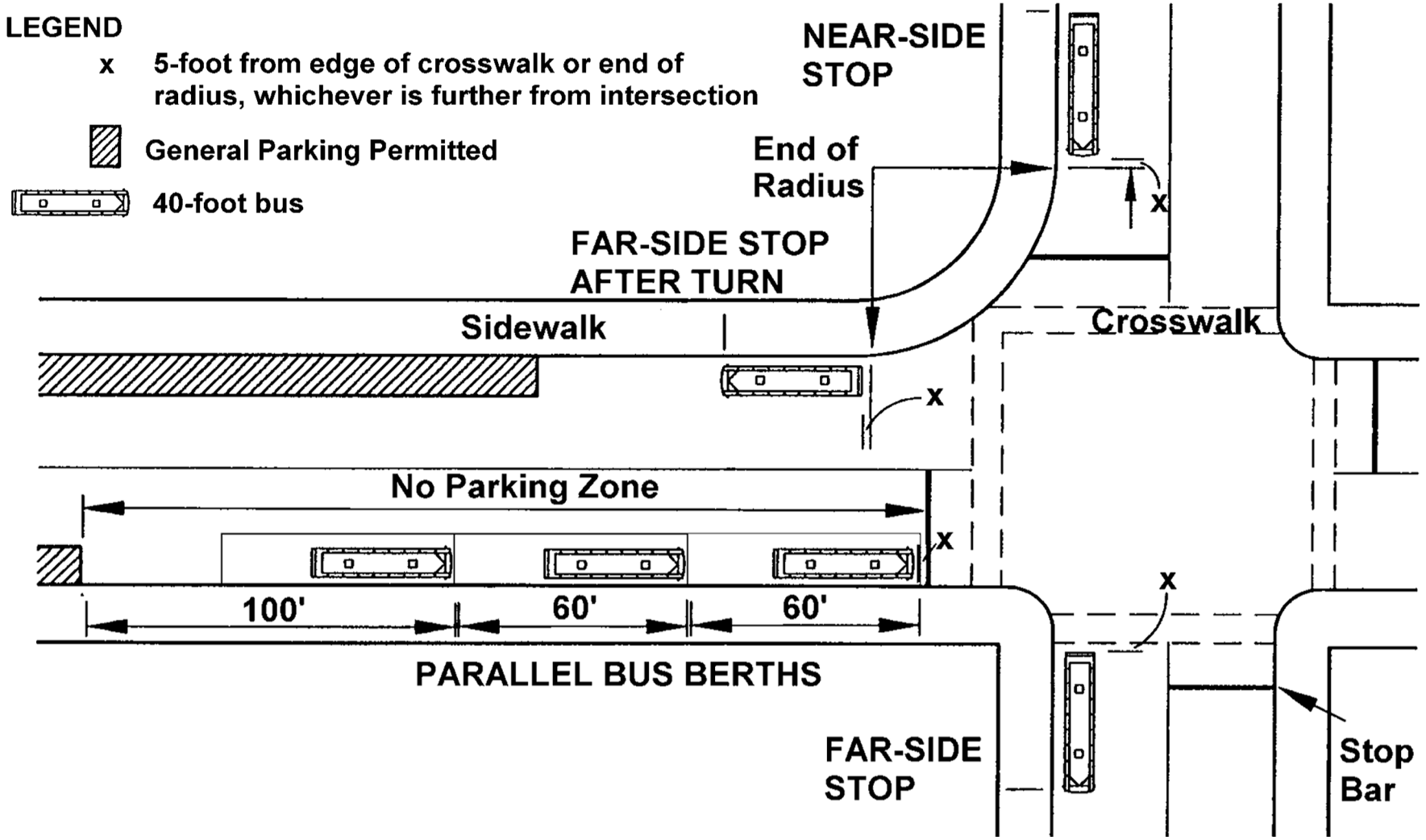



**Figure 5.5.5 - Typical Layout: Parallel Bus Berths**

**Figure 5.5.6 - Photo - Typical Bollard Placement at Bus Berth**

### *5.5.2 Bus Turnarounds*

Bus turnarounds are roadway facilities that expedite a bus return to the service route. These facilities are typically found at a route's terminus or in a development where there is only a single connection point to the transit route. Bus turnarounds provide transit vehicles with a continuous route, allowing for transit service to locations that would otherwise be considered too inefficient or prohibitive to the route schedule. Occasionally, however, the use of these circulation patterns on routes are precluded because of design restraints, trip time efficiency or cost effectiveness.

There are three main types of bus turnarounds:

1. **Cul-de-Sacs** (see Figure 5.5.8)
2. **Loops** (see Figure 5.5.9)
3. **Jug Handles** (see Figure 5.5.10)

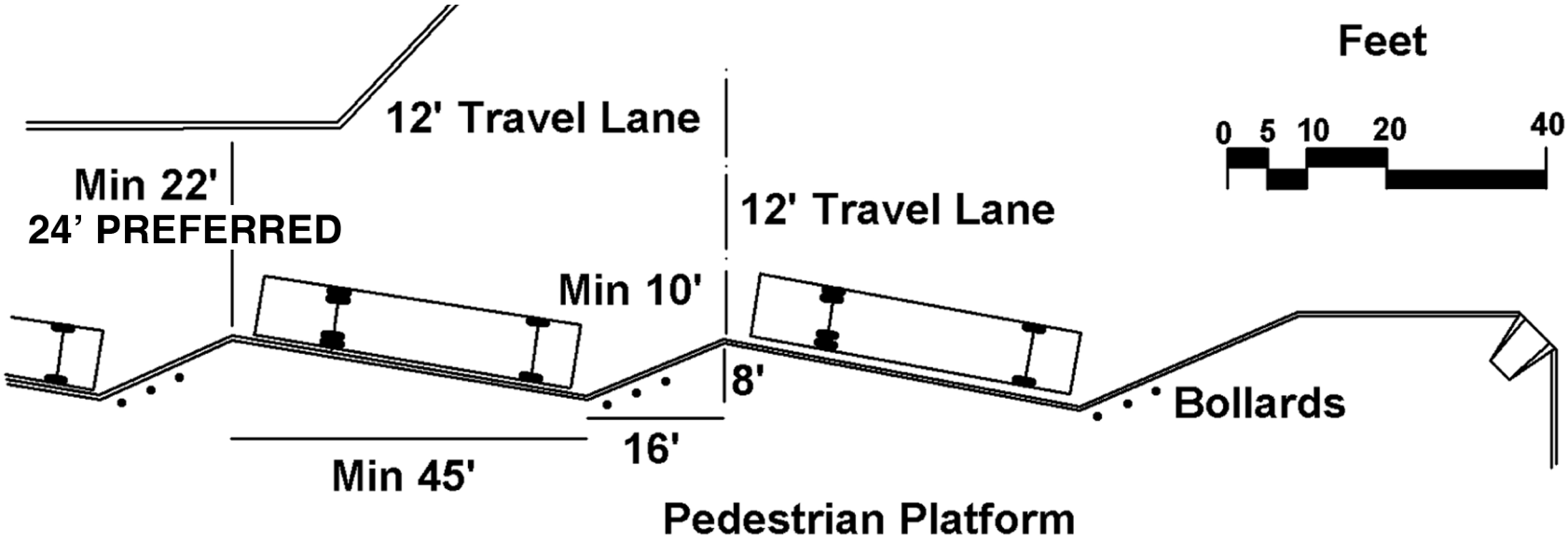



**Figure 5.5.7 - Typical Layout: Saw-Tooth Bus Berths**

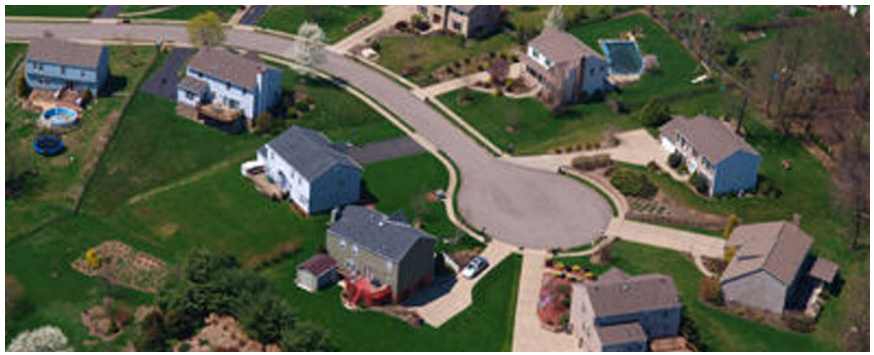


Figure 5.5.8 - Photo - Cul-de-Sac

Figure 5.5.9 - Photo - Loop

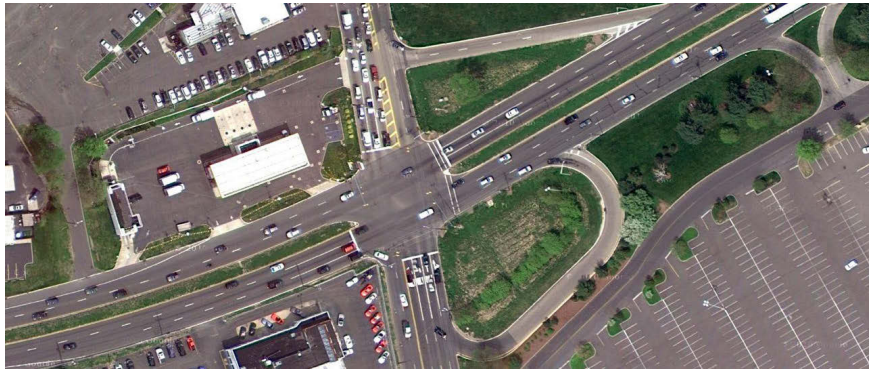


Figure 5.5.10 - Photo - Jug-Handle

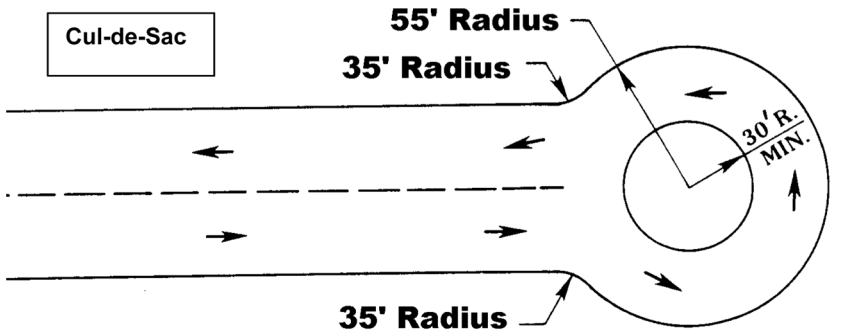



Figure 5.5.11 - Typical Layout: Cul-de-Sac

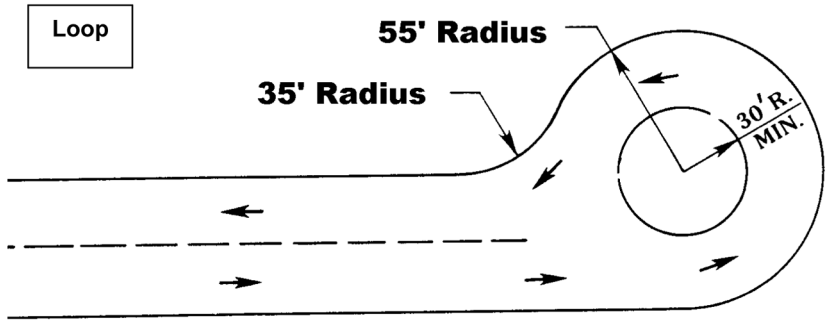



Figure 5.5.12 - Typical Layout: Loop

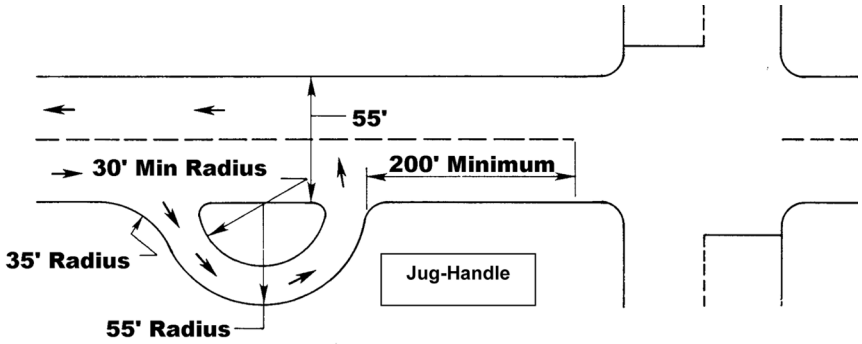



Figure 5.5.13 - Typical Layout: Jug-Handle

**Cul-de Sacs** are typically found in residential communities at "dead-ends" in an effort to allow street access to additional houses. They are also commonly used to help reduce the amount of traffic on residential streets. Because of their limited use and residential atmosphere, they are typically avoided as part of a transit route. However, if a cul-de-sac has a sufficient turning radius, it can serve as a bus turnaround (see Figure 5.5.11).

**Loops** are similar to cul-de-sacs, but typically, they are used more for transit operations than in residential settings. Loops are often used for major off-street facilities where alternate street circulation methods are prohibited by the available street network, travel times or cost effectiveness. Figure 5.5.12 illustrates the minimum dimensions for a loop bus turnaround.

**Jug-handles** are a type of ramp, or side road, that allows for left-turns or U-turns without the use of left-turn lane. Typically a jug-handle directs turning traffic off of the main street from the right lane, allowing for turning actions at the cross, or side, street. These types of jug-handles can be either near-side or far-side of the intersection. However, a third type of jug-handle, which does not connect to a cross street, curves back to the left, connecting with the main street. See Figure 5.5.13 for a typical layout of this type of jug-handle. These are usually used for making left turns at T-intersections, or for U-turns only.

BCT recommends a signal for left turn movements out of the jug-handle to allow buses to return to their routes.

### *5.5.3 Park-and-Rides*

**Figure 5.5.14 - Rendering - Park-and-Ride Lot**

Park-and-Rides are intermodal facilities that allow for passengers to change their mode of transportation from personal vehicles to public transit (see Figure 5.5.14). These facilities typically intercept traffic flowing through a commuter shed towards a major employment destination, acting as a collector site for rail or bus service.

There are no set standards for these types of facilities, and the designs are typically based on the site specific conditions of their individual location along with the type of transportation being provided at the facility. Additionally, specific ADA requirements will dictate the land use and design of Park-and-Ride facilities. These requirements include the number of accessible parking spots and the accessible route (curbs, ramps and sidewalks) from the accessible parking to the passenger waiting / boarding areas.

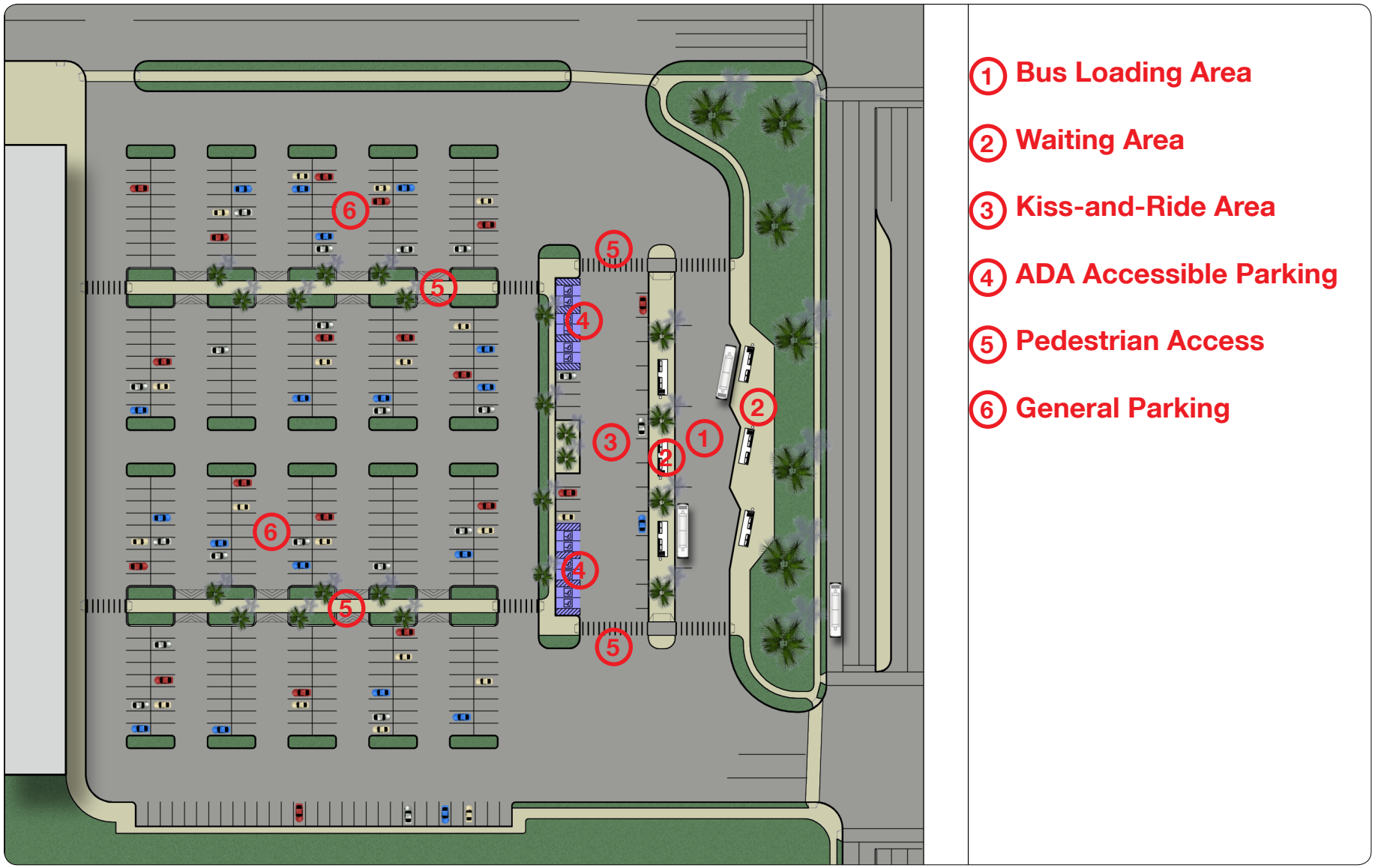



**Figure 5.5.15. - Typical Layout: Park-and-Ride Facility**

Typical kinds of park-and-ride lots include:

- Suburban park-and-ride lots: typically served by express routes, collecting passengers near their homes for long haul trips.
- Peripheral park-and-ride lots: typically located at the edge of an activity center.
- Joint-use park-and-ride lots: developments other than / in addition to transit facilities share the parking area.

Religious facilities, libraries, meeting halls, sports facilities, theaters and commercial land uses along major corridors with low daily workday usage are possible locations for park-and-ride lots. Figure 5.5.15 illustrates an example of a joint-use park-and-ride facility.

Generally, park-and-ride facilities serving express routes require larger lots and more amenities such as shelters, benches, bus idling areas and passenger drop-off areas. Bike parking areas or facilities should also be considered. Access to these lots should be from collector or access roads that connect to major arterials, and should be designed to minimize conflicts between automobiles and buses (see Figure 5.5.16). Facilities serving local routes typically can be smaller, and usually require fewer amenities.

Refer to FDOT's State Park and Ride Lot Program Planning Manual for more information on park-&-ride site location and design.

### *5.5.4 Kiss-and-Ride*

Kiss-and-Rides are generally a designated area within a park-and-ride facility or transit center for passenger drop-off and pick-up. Accessible routes are required to and from the passenger waiting / loading area. Kiss-and-Ride areas typically require parking restrictions and enforcement to ensure that they are used properly and efficiently. Additional patron waiting areas should be considered in the design of a Kiss-and-Ride, for patrons as they wait to be picked up. Figure 5.5.18 shows a typical Kissand-Ride layout as part of a park-and-ride facility.

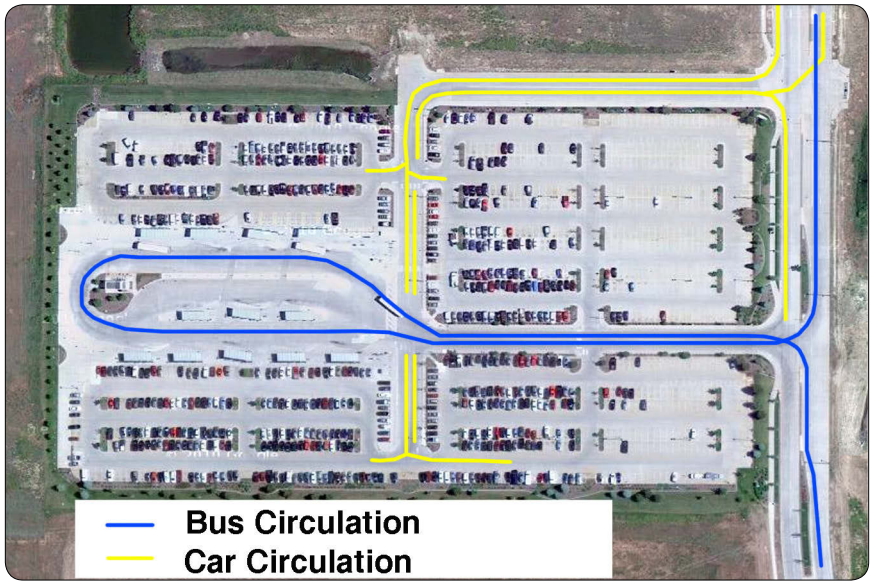



**Figure 5.5.16 - Typical Park-and-Ride Circulation**


**Figure 5.5.17 - Photo - Kiss-and-Ride Sign**

### *5.5.5 Multi-Modal Transit Center*

A multi-modal transit center (also known as an intermodal transit center) is a facility combining all of the various elements described in this manual, allowing for an easy transition between buses and other forms of transit (see Figure 5.5.20). Typically, the other form of major transportation brings passengers to the facility where they transfer to buses or automobiles to take them to their final destinations.

In order to maximize ridership and use of these stations, they should be located in more densely urbanized areas, and should serve as the entry and exit points to major centers for activity. The station types will vary greatly depending on land use, architectural characteristics and natural amenities. Figure 5.5.19 depicts a typical layout for a multi-modal transit center.

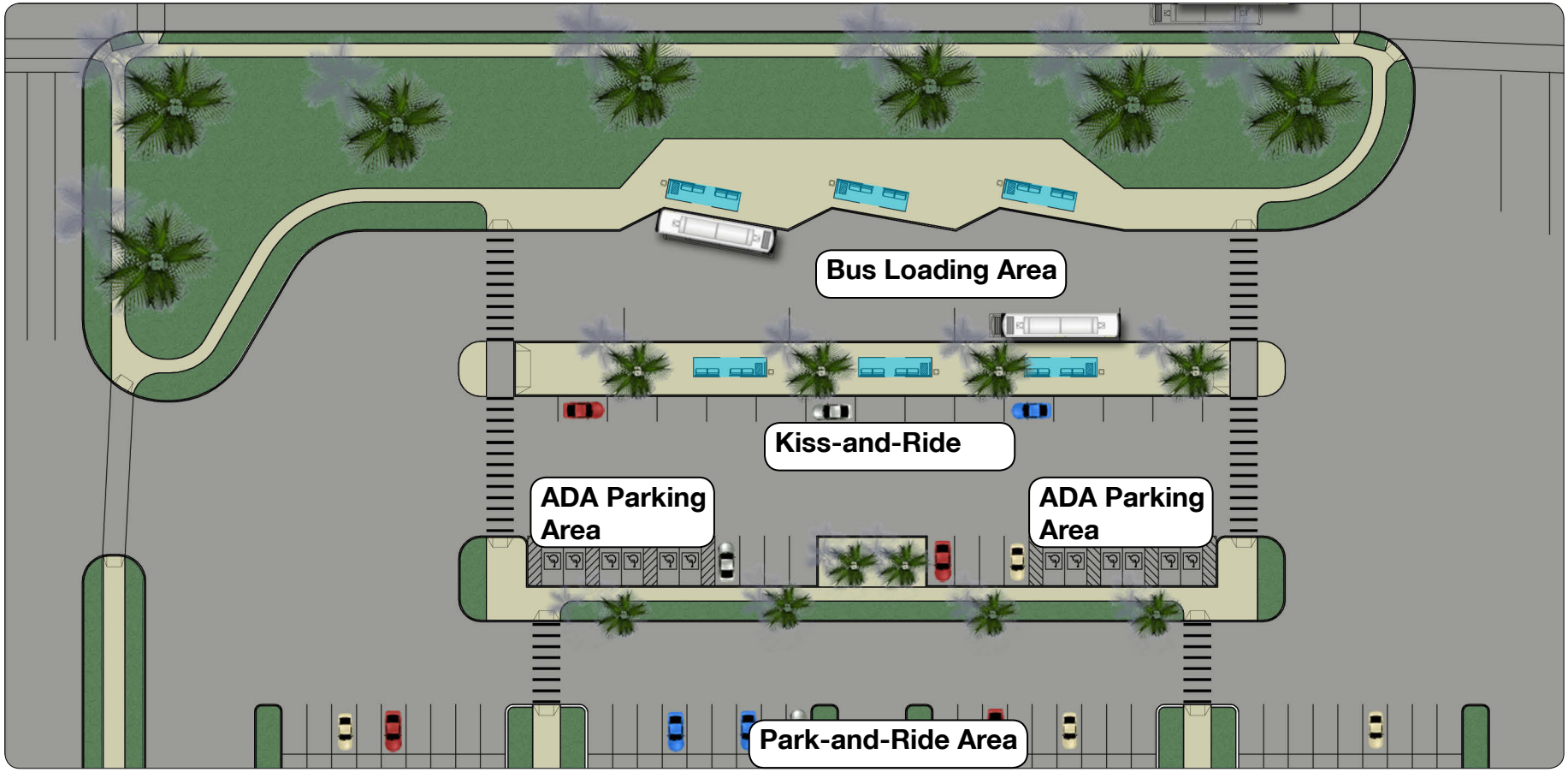
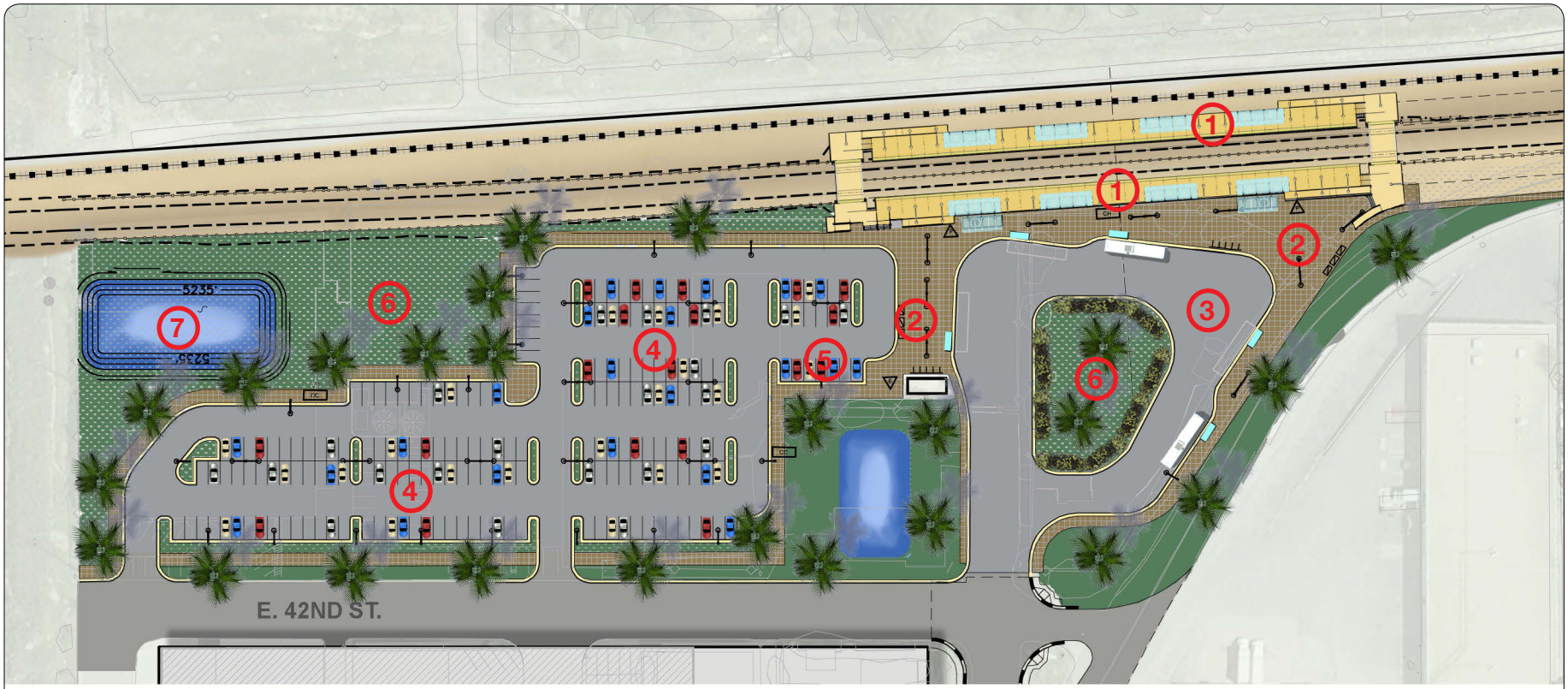



**Figure 5.5.18. - Kiss-and-Ride Typical Layout**




1. RAIL STATION PLATFORMS
2. TRANSITION PLAZAS
3. BUS TRANSFER AREA
4. GENERAL PARKING AREA
5. ADA ACCESSIBLE PARKING AREA
6. GREEN / LANDSCAPED AREAS
7. STORMWATER POND

**Figure 5.5.19 - Typical Layout: Multi-Modal Transit Center**

**Figure 5.5.20 - Rendering - Multi-Modal Transit Center**

Most multi-modal transit centers can be categorized into four types of facilities:

- **Neighborhood commercial centers**
- **Town Centers**
- **Activity Centers / Central Business Districts (CBD)**
- **Interstate Highway Stations**



# Street Side Factors

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# Design Checklists

## 6.1 BUS STOP GENERAL INFORMATION

| Identification / Location | | | |
|---|---|---|---|
| Street Name: | | Stop Identifier (Nearest Cross Street or Landmark): | |
| Nearest Bus Route #: | | Location of Nearest Bus Stop: | |
| Bus Route Direction: | | | |
| ❑ North Bound | ❑ South Bound | ❑ East Bound | ❑ West Bound |
| ❑ Other (Specify): | | | |
| Location of Bus Stop on Street: | | | |
| ❑ Far Side | ❑ Near Side | ❑ Mid Block | ❑ Highway / Freeway |
| Adjacent Property Address: | | Name of Business or Development: | |
| | | | |
| **General Document Review** | | | |
| Obtain and Review the Following: | | | |
| ❑ Broward County Transit Development Plan | | ❑ BCT Transit Design Standards and Guidelines Manual | |
| ❑ Current Bus Route Maps | | ❑ Local Municipality Rules, Regulations and / or Codes | |
| ❑ ADA Accessibilty Guidelines for Buildings and Facilities (ADAAG) | | ❑ FDOT District 4 Transit Facilities Guidelines | |
| ❑ Broward County Land Use Code | | ❑ Broward County Wide Design Guidelines | |
| ❑ Current Transit Ridership Numbers | | ❑ Bus Shelter Drawings | |
| | | | |
| ❑ Have all site specific conditions been documented? | | | |

## 6.2 TRANSIT ACCESSIBILITY CHECKLIST

| Transit Access (Bus Operating Criteria) | |
|---|---|
| ❑ All roadways where buses would travel meet the BCT standards for lane widths and clearances. | |
| ❑ All roadways where buses would travel meet the BCT standards for intersections and curb radii. | |
| ❑ All roadways where buses would travel are capable of handling the weight and stresses of BCT's vehicles. | |
| ❑ All roadways where buses would travel have sufficient drainage to prevent flooding or other obstructions to transit service. | |
| | |
| **Accessible Landing Pad** | |
| ❑ Minimum area of 8' deep by 5' wide is provided adjacent to the curb or street. | |
| ❑ Accessible landing pad is located where the bus ramp will be deployed. | ❑ Surface material is stable, firm and slip resistant |
| ❑ Surface is pitched to drain rain water, within ADA acceptable tolerances (less than 2%). | |
| ❑ No obstacles are located within the 8' by 5' area of the accessible landing pad. | |
| ❑ The accessible landing pad is connected to an accessible sidewalk or other accessible route. | |
| | |
| **Pedestrian Access** | |
| ❑ The bus stop is connected to a sidewalk or other pedestrian pathway that is at least 4' wide (no obstructions reduce width to less than 36"). | |
| ❑ Pedestrian pathways provide direct (not winding or circuitous) access between the bus stop and buildings. | |
| ❑ Pedestrian pathways are stable, firm and paved with non-slip materials. | |
| ❑ Pedestrian access and circulation around the bus stop is designed for patron safety, convenience and comfort. | |
| | |
| **Bicycle Access** | |
| ❑ The site is designed to accomodate bicycle circulation in a safe, convenient and comfortable manner. | |
| ❑ The bicycle circulation is designed in accordance with AASHTO and FDOT recommended standards. | |
| ❑ Bicycle circulation does not interfere with pedestrian circulation and access. | |
| | |

## 6.2 TRANSIT ACCESSIBILITY CHECKLIST (CONTINUED)

| Transit Infrastructure |
|---|
| ❑ The transit circulation pattern allows for convenient, direct, efficient transit service. |
| ❑ The transit circulation pattern connects with adjacent pedestrian, bicycle, and other transit networks. |
| ❑ Bus stop locations are designed for pedestrian and bicyclist convenience and comfort. |
| ❑ The location is appropriate for a bus stop, has adequate space and meets all ADA requirements. |
| ❑ All transit facilities and access from the transit facility to the development or adjacent buildings comply with all requirements of the ADAAG. |
| ❑ The bus stop is designed to be easily noticed by pedestrians and vehicular traffic. |
| ❑ The bus stop is designed to provide maximum protection from inclement weather. |
| ❑ Sufficient area at the bus stop is provided for additional transit infrastructure, such as benches, shelters, route information, bike parking, etc. |
| ❑ Transit facility provides good visibility of approaching buses and other vehicular traffic. |
| ❑ Transit facility provides good visibilty of surrounding area, preventing blind spots, where people can hide. |
| ❑ Transit facility, roadway and accessible routes have proper drainage and will be kept free of obstacles. |
| |
| **Coordination** |
| ❑ Coordination with FDOT, Broward County and local municipalities has been maintained and all necessary and appropriate approvals have been obtained. |
| ❑ Contact with BCT during the planning, design and construction phases has been maintained. |
| ❑ Proper notifications to FDOT, BCT and local municipalities have been made, providing recommended advanced notice. |
| |

## 6.3 CURBSIDE DESIGN CHECKLIST

| Location within Community |
|---|
| ❑ The location of the bus stop has been coordinated with the business community and neighborhood. |
| ❑ Clear views and open circulation in front of and around store fronts are maintained. |
| ❑ Bus Stop location has been coordinated with homeowners, if it is located in front of residential property. |
| ❑ Coordination between government agencies and businesses to determine liability and maintenance has been maintained. |
| |
| **Compatability** |
| ❑ Bus stop is located to limit conflicts between transit users, pedestrians and other activities. |
| ❑ Bus stop does not reduce the capacity of the sidewalk. |
| ❑ Benches, shelters and other transit related amenities are located where they are separated from pedestrian and bicycle areas. |
| ❑ If the bus stop is adjacent to a parking lot, raised curbs or bollards are used to prevent cars from encroaching on the bus stop zone. |
| ❑ Bus stop location provides safe separation between patrons and vehicular traffic and other land uses. |
| ❑ If bus stop is located on a road with high travel speeds, the bus stop is not located directly next to the curb. |
| ❑ All amenities included at the bus stop meet the clear zone requirements of FDOT. |
| ❑ Benches and shelters are offset a minimum of 4’ from the back face of the curb. The offset distance is increased for higher speed roadways. |
| |
| **Direct Access to Bus Stops** |
| ❑ Bus stop locations and surroundings, such as landscaping, berms, walls, parking lots and sidewalks are coordinated to minimize passenger walking times. |
| ❑ Developer has coordinated with BCT to provide direct sidewalk access from the nearest intersection or adjacent land use. |
| ❑ If direct route runs through parking lot or landscaped area, defined paths or walkways are provided. |
| ❑ The direct route to the bus stop from the nearest intersection or adjacent land use complies with all requirements of the ADAAG for accessible routes. |
| |

## 6.3 CURBSIDE DESIGN CHECKLIST (CONTINUED)

| Impervious Ground Surfaces |
|---|
| ❑ Bus stop is not located on exposed soil or grass. |
| ❑ Bus stop has a waiting pad constructed of impervious, non-slip material. |
| ❑ Bus stop waiting area is graded for proper runoff control, within the limits of ADA compliant cross slopes (2% maximum). |
| ❑ Bus stop is coordinated with existing sidewalks or other accessible walkways to provide access. |
| ❑ If the bus stop is in a developing area, its location has been coordinated with existing or proposed sidewalks through BCT and local municipalities. |
| |
| **Proper Pedestrian Circulation** |
| ❑ Bus stop is coordinated with existing and proposed utility poles, fire hydrants and street furniture to allow maximum available space for passenger movements. |
| ❑ Bus stop is not located near items that may restrict proper movement and circulation to and around the bus stop. |
| ❑ A minimum clearance of 36” is maintained between all items where passenger movement is anticipated. |
| ❑ Circulation paths for persons in wheelchairs, or with ambulatory disabilities, are not out of the way compared to those for other pedestrians. |
| ❑ A clear and accessible route is provided to the accessible landing pad from all areas of the bus stop. |
| ❑ No amenities or other items are located within the 5’ by 8’ accessible landing pad, nor do any components intrude on the clear space of the accessible landing pad. |
| ❑ Clear access is provided between all bus stop zone waiting areas and all doors of the bus. |
| ❑ No amenities or other bus stop elements are located where they reduce the clear width of the sidewalk to less than 4 feet. |
| |
| **Existing Street Furniture** |
| ❑ Bus stop site has been coordinated with existing street furniture to minimize the need for new amenities at the bus stop. |
| ❑ BCT has reviewed the condition of all existing street furniture to ensure they are properly maintained and meet BCT standards. |
| ❑ BCT has recorded the location of all existing street furniture. |
| ❑ Existing street furniture will not reduce circulation space or accessibility. |
| |

## 6.3 CURBSIDE DESIGN CHECKLIST (CONTINUED)

| Environmental Treatments |
|---|
| ❑ Bus stop has been coordinated with existing site conditions to maximize environmental comfort. |
| ❑ Shade patterns of existing vegetation are used to contribute to the comfort of waiting passengers. |
| ❑ Shelter design maximizes passenger comfort and protection from sun, rain and wind. |
| ❑ Panel locations, orientation and materials are designed to maximize passenger comfort. |
| ❑ The bus stop site is designed to provide proper drainage and eliminate / minimize ponding water. |
| |
| **Bus Stop Security** |
| ❑ Bus stop is designed to maximize the level of security. |
| ❑ Bus stop is located and oriented to maximize surveillance from nearby land uses and vehicular traffic. |
| ❑ Bus stop is located and oriented to minimize the opportunities for concealment. |
| ❑ Graffiti and trash will be regularly removed (to discourage repeat occurrences). |
| ❑ The type and location of vegetation does not obstruct site lines to and from the bus stop. |
| |
| **Lighting** |
| ❑ Bus stop is located near existing street lighting to minimize the need for new lighting. |
| ❑ All lighting elements are vandal-resistant and will be regularly maintained. |
| ❑ If bus stop is included in a new development, or within the area of major infrastructure work, pedestrian-oriented lighting is included. |
| ❑ Bus stop is located and oriented to utilize indirect lighting from adjacent land uses. |
| ❑ Bus stop zone has consistent lighting level between 2 and 5 foot candles. |
| ❑ Lighting direction and lamp shielding minimizes the amount of night sky pollution. |
| ❑ Lighting transitions between all lights, including new and existing, is coordinated to minimize harsh shadows or dim-lit areas. |
| |

## 6.3 CURBSIDE DESIGN CHECKLIST (CONTINUED)

| Sight Lines |
|---|
| ❑ The bus stop is clearly visible to oncoming buses and other vehicular traffic. The bus stop should not be obscured to passing vehicles by existing structures, vegetation or the bus stop's location in regard to the street's alignment. |
| ❑ The bus stop is clearly visible to vehicles making right turns. |
| ❑ The bus stop has been carefully inspected to detect any possible sight-related issues. |
| ❑ Sight lines for direct and indirect surveillance are preserved and unobstructed. |
| ❑ The design, location and orientation of all landscaping, walls, advertising panels, shelters, benches and other structures do not restrict sight lines to or from the bus stop, and minimize the number of potential hiding places at the bus stop. |
| ❑ Bus shelter design and materials allow for clear, unobstructed views to passengers waiting inside as well as clear views of the surrounding area from inside the shelter. |
| |
| **Maintenance** |
| ❑ The responsibilities for maintenance of the bus stop are clearly defined in order to provide proper maintenance. |
| ❑ Any maintenance agreements between BCT, the developer and / or a third party have been obtained. |
| ❑ Trash and graffiti will be removed as soon as possible to minimize additional degradation of the transit facility. |
| ❑ A database for maintenance of the facility has been created and submitted to BCT to track the condition of the facility, including pavement surface conditions, age of the faciltiy and its amenities, and history of damage. Database should be submitted to BCT for review and tracking. |
| ❑ If the bus stop is located adjacent to a convenience store, coordination between BCT and the store for trash removal and general maintenance has been developed. |
| ❑ Where the bus stop is adjacent to a commercial shopping center, agreements with the center to regularly remove shopping carts from the bus stop area have been obtained. |
| |

## 6.4 STREETSIDE DESIGN CHECKLIST

| |
|---|
| **Standardization** |
| ❑ The bus stop is designed to meet the standards for BCT stops, consistent with other stops in the system. The bus stop should be easily recognizable as a BCT bus stop by riders, bus drivers and other motorists. |
| ❑ Any deviations from the standard design is directly related to site specific conditions, such as traffic, parking lots, turning volume, community preference or political concerns. |
| ❑ Any deviations have been coordinated and approved by BCT. |
| |
| **Periodic Review** |
| ❑ A periodic review of the bus stop conditions has been coordinated with BCT. |
| ❑ A means for reporting missing bus stop signs or poor pavement conditions has been established with BCT. |
| |
| **Near-side / Far-side / Mid-Block Placement** |
| ❑ The bus stop has been individually evaluated to determine the best placement. |
| ❑ The bus stop placement has been reviewed and approved by BCT and all necessary local jurisdictions. |
| |
| **Visibility** |
| ❑ The bus stop location, design and orientation allows it to be easily seen by bus operators and other vehicles, as well as pedestrians. |
| ❑ Nearby trees, utility poles and buildings do not block the view of the bus stop from the road or sidewalk. |
| ❑ Passing vehicles have clear visibility of pedestrians at the bus stop, as well as coming to and from the bus stop. |
| ❑ Pedestrian crossings have clear visibility of on-coming traffic from all directions, especially for right-turning traffic. |
| |
| **Bicycle Lanes** |
| ❑ Where bike lanes are present at the bus stop, clear visibility is provided for the bus driver to see cyclists in both directions while approaching the stop. |
| ❑ Sufficient sight lines are provided for the cyclist to stop safely at stopped buses. |
| ❑ Sufficient room is provided for cyclists to safely wait for stopped buses. |
| ❑ Bicycle lanes comply with all FDOT and AASHTO standards. |
| |

## 6.4 STREETSIDE DESIGN CHECKLIST (CONTINUED)

| Traffic Signals and Signs |
|---|
| ❑ Bus stop location, design and orientation do not obstruct the visibilty of traffic signals or signs, including when a bus is stopped. |
| ❑ If there is an intersection near the bus stop, the intersection has pedestrian crossing signals. |
| |
| **Roadway Alignment** |
| ❑ Bus stop is not located along a curve in the roadway. |
| ❑ Bus stop is located on relatively straight and flat section of roadway. |
| ❑ Bus stop is not located where existing trees or utility poles obstruct the bus driver or other vehicles view of waiting passengers, pedestrian movements or crossing traffic. |
| |
| **Driveways** |
| ❑ Bus stop is located as far away from existing or proposed driveways as practicable. |
| ❑ If the bus stop is located near the driveway, a stopped bus does not block all entrances to the driveway. |
| ❑ Bus stop waiting area is not located within the limits of the driveway. Passengers should not wait in driveways. |
| ❑ Bus stop is located to minimize conflicts between buses and vehicles using the driveway. |
| |
| **Pedestrian Crosswalks** |
| ❑ A minimum clearance of 5’ is provided between the front or rear of the bus stop and the nearest pedestrian crosswalk. |
| ❑ Crosswalk widths are designed to meet all FDOT and local municipality regulations. |
| ❑ Where crosswalks are used with curbs, ADA compliant curb cuts are provided. Curb cuts will include detectable warnings. |
| ❑ Where no curbs are present at crosswalks, detectable warnings shall be used for the full width of the crosswalk. |
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## 6.4 STREETSIDE DESIGN CHECKLIST (CONTINUED)

| Location at Curb |
|---|
| ❑ Bus stop is located where the curb height is 6 inches. |
| ❑ If the bus stop is located where there is no curb, the bus stop design should account for longer stopping time to allow elderly and passengers with mobility impairments additional time to board and alight from the bus. |
| ❑ If the existing curb is damaged, it will be repaired as part of the bus stop design and installation. |
| |
| **Street Grades** |
| ❑ If the bus stop is in a residential area, the bus stop is not located on an upgrade. |
| ❑ Bus stop is not located on steep grade to minimize accidents by pedestrians slipping, or vehicles unable to stop. |
| |
| **Road Surface Conditions** |
| ❑ Bus stop is not located in areas where the roadway is in poor condition, such as areas with broken pavement, potholes, ruts or where storm drains are located, to minimize passenger injuries as they exit the bus. |
| ❑ The drainage at the bus stop has been evaluated and is sufficient to prevent ponding at the bus stop. |
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