ACCESSING TRANSIT

Design Handbook for Florida Bus Passenger Facilities

Florida Planning and
Development Lab
Florida State University

STATE OF FLORIDA • DEPARTMENT OF TRANSPORTATION

Comments and Suggested Revision

The Public Transit Office at the Florida Department of Transportation and the Florida Planning and Development Lab at Florida State University welcome your comments and suggestions for revisions to this handbook. Please use this form and mail it to:

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Florida Department of Transportation
Public Transit Office

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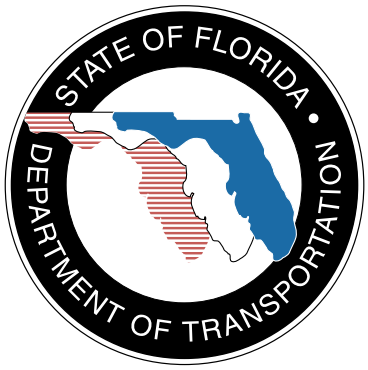

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Acknowledgements

The Florida Department of Transportation (FDOT) has requested that Florida State University (FSU) provide small Florida transit agencies design guidelines for bus passenger transit facilities. Beyond identifying the minimum standards, the purpose of this study is to provide transportation agencies with feasible alternatives when developing bus passenger facilities that focus on the interaction of transit facilities with transit operations and the built environment.

The following FSU staff and students participated in conducting the research, analysis, design, and preparation of this report:

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Users Guide

This handbook can be used for a variety of purposes. Transit agency directors and planners can customize these guidelines to provide specific physical design criteria within their agencies' identity programs, capital resources, and operations.
Land use planners and growth managers, traffic engineers and transportation planners, and bicycle-pedestrian coordinators can work with their local transit agencies and Metropolitan Planning Organizations to integrate the standards and guidelines with local comprehensive plan policies, land use and concurrency ordinances, pedestrian plans, and street design guidelines. The design guidelines could also be used by a developer or builder who is interested in developing a project that is transit friendly or who is seeking to conform transportation concurrency requirements through transit provision.

Transit agencies will want to use the handbook as a basis for planning access improvements to transit facilities and for working with local jurisdictions to comply with transit concurrency levels of service in existing and proposed transit service areas.

Some agencies will want to use the handbook when attempting to plan a bus passenger facility in tandem with street improvements. Others will want to integrate them into the broader policies of the local government and everyday practices. Although the various parts of the handbook have been developed to be used together, they have also been designed for individual use by section and within sections by individual guidelines or standards.

The handbook is divided into four chapters:

1. Curb-Side Guidelines

This chapter presents guidelines for improving the accessibility to buses and bus mobility in the right of way. It is appropriate information for transit planners, for transit agency officials involved in shelter siting and advertising programs, and for transportation and civil engineers and architects who provide for bus passenger facility site layouts and circulation in the right of way and on private property.

2. Streetside Guidelines for Bus Passenger Facility Elements

This chapter presents guidelines for improving the bus passenger experience at the street level including the configuration of bus stops and the coordination of bus stop elements like seating and shelter, way finding, safety and security, connections to pedestrian and bicycle circulation, landscaping, and the design of bus stops. It is appropriate information for transit planners, transportation and civil engineers and architects who provide for bus passenger facility site layouts and circulation in the right of way and on private property. Developers responsible for initial site selections, programming and project development, and agency staff involved with local jurisdictions who review such proposals to ensure transit needs are being met are also a prospective audience for this chapter. Individual property owners already accommodating transit and wishing to improve conditions on their site will also find this chapter useful.

3. Facility Prototypes

Bus passenger facilities meet different operational and passenger needs, come in an array of sizes, and are located on both private and public land. Yet all facilities share the important function of providing access to and from the bus transit network and to and from other modes of transportation. This section provides prototypical designs of bus passenger facilities in development contexts that are typical for Florida. The facilities considered include:

- On-line Bus Stops
- Primary Stops
- Transit Malls
- Transfer Centers
- Park-and-Rides

Each type of facility is accompanied by development guidelines for location, required site areas, pedestrian connections and connections to other modes of transportation, and an inventory of the individual design elements that are combined to create that facility.

This chapter also contains appropriate information for transit planners, transportation and civil engineers, and architects who provide for bus passenger facility site layouts and circulation in the right of way and on private property. Developers responsible for initial site selections, programming and project development, and agency staff involved in local jurisdictions who review such proposals to ensure transit needs are being met are also the prospective audience for this chapter. Individual property owners already accommodating transit and wishing to improve conditions on their site will also find this chapter useful.

4. Land Use Guidelines

This chapter describes methods for creating transit supportive development. Different examples are provided for typical types of development and development standards supportive of transit and a multi-modal transportation network are provided. This chapter is appropriate for elected officials, land use planners, growth management planners and transit planners as a reminder of key issues and relationship between different disciplines that will result in a stronger transit environment.

Agencies planning to locate facilities on State of Florida rights of way should consult the Florida Department of Transportation's *Plans Preparation Manual (PPM)* for criteria that apply to the state highway system. Local roadway design is governed by the *Manual of Uniform Minimum Standards for Design and Maintainance for Streets and Highways* (the *"Florida Greenbook"*), but some municipalities may have adopted the *PPM* as their minimum standards. Additional local ordinances, especially regarding signage and landscaping may also apply. State of Florida manuals are available at *www.dot.state.fl.us/rddesign/Publications/pub.htm*.

1. Curb-Side Guidelines

1.1 Introduction

A transit agency's goal should be to provide all transit patrons with comfortable facilities that provide shelter from the sun, rain and other elements. Transit patrons should be provided with waiting areas that are outside pedestrian flows yet connected to pedestrian infrastructure and separated and secure from automobile traffic. Bus stop pads should be provided at all bus stops and connectivity to sidewalks should be considered when selecting bus stop locations.

Designing facilities with Florida's climate in mind, using renewable energy technologies, and reducing potable water consumption, further enhances bus transit's environmentally friendly profile.

Most transit agencies' resources for providing passenger facilities are limited. Transit agencies are forced to make choices. Some agencies adopt a point system in order to decide which stops to prioritize for shelter placements or the location of other facility elements like benches, trash receptacles or bike racks.

A typical point system based on one used by HARTline in Hillsborough County, Florida appears below.[1] Such a system might provide shelters at bus stops with 10 or more points and unsheltered benches and trash receptacles bus stops with 6 points using the criteria in the Table 1.1.

Additional information on transit quality service can be found in the second edition of *TCRP Report 100: Transit Capacity and Quality of Service Manual*, available from the Transportation Research Board. American Public Transit Association members can obtain free copies of the report at: http://www.tcrponline.org/index.cgi.

Points	Criteria	Variable	Measurement
7 points or 3 points	High boarding or transfering	Number of patrons getting on the bus	7 points for 20 boardings per day; 3 for 10 boardings per day
4 points	Special needs	Concentration of patrons with special mobility needs	Adjacency to and uses like senior centers, medical offices, libraries, hospitals and schools of the deaf or blind or mentally challenged
4 points	Activity locations	High potentials for ridership	Adjacency to land uses with high densities of occupation like apartment buildings, office buildings, malls, shopping centers, schools and universities, and convention centers
2-4 points	Weather exposure	Absence of other kinds of shelter	Absence of landscaping or buildings for sun and rain protection
3 points	Wait time	Bus headways	Stops at which patrons must typically wait 20 minutes or more for a bus
2 points	Distribution	Spread of improvements	Locations in areas where very few of the bus stops are sheltered or where benches are provided
2 points	Demand	Requests for improvements	Patrons requesting improvements

Table 1.1

1.2 Bike Racks at Bus Shelters

Purpose

Transit agencies are increasingly recognizing the needs of the intermodal bicyclist-passenger. While an increasing number of buses accommodate bicycles with racks mounted at the front of the bus, less has been done to accommodate bicycles at bus passenger facilities. Some bicycle storage facilities offer more security to bike owners than others. See Figures 1.1 and 1.2. For instance, the traditional "comb" bicycle racks do not provide the support for the bicycle's frame or adequate space to secure bikes with a security cable and a "U" lock.

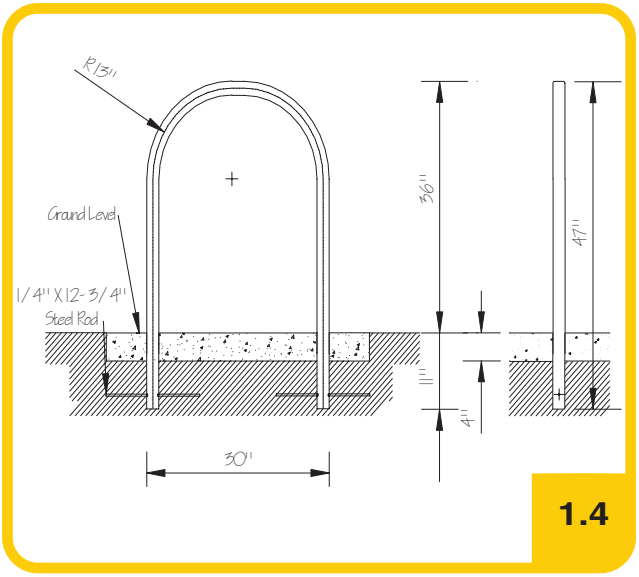
Location Factors

- Bike racks should be placed at bus stops along routes where bus mounted bike racks are at capacity and cannot accommodate more bike passengers without having those passengers wait for the next bus.
- Bicycle storage areas should be placed in defensible spaces that are physically and visually accessible. Placement along heavily trafficked streets and walkways protects bicycles from theft and vandalism.
- Do not locate bike racks and lockers in the corner of a parking garage or in other areas with low visibility.
- Bike lockers and racks should be located near streets with high vehicle and foot traffic to improve visibility.
- To avoid unnecessary water damage to bicycles, do not place bike racks near sprinkling systems.

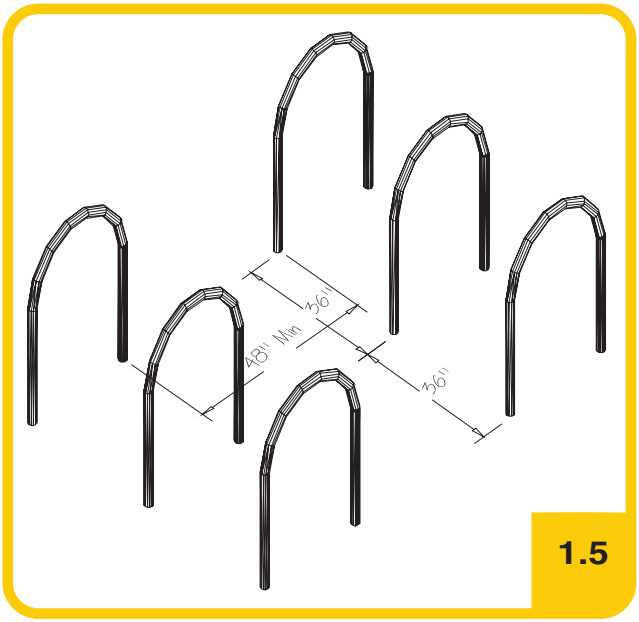
A typical bike rack for multiple bikes.

Typical bike racks for single bikes.

Sheltered bike racks protect bikes from inclement weather.



Critical dimensions for installing an inverted "U" bike rack.



Spacing for inverted "U" bike racks.

Design Factors

- Where possible, bicycle racks should be kept underneath a covered area to protect the bikes from exposure to the weather. See Figure 1.3.
- If the bike rack is covered, it should be designed so that a bomb can not be hidden in the bike rack area.
- Bike racks should support bikes by their frames at two points (as opposed to supporting them by the wheel as common in comb and toast racks).[2] An inverted "U" is a simple effective design to do this. See Figures 1.3 through 1.5.
- Bike racks should provide 48-inch aisles, measured from tip to tip of bike tires across the space between racks or between the tip of the tire and an adjacent obstacle. One person should be able to walk one bike through the aisle.[2] See Figure 1.5.
- Seventy-two inches of depth (6-feet) should be allowed for each row of parked bicycles.[2]
- Racks should be located no less than 24-inches from walls.[2]
- Inverted "U" racks should be placed no less than 36-inches apart widthwise.[2] See Figure 1.5.

1.3 Bus Stop Signs

Purpose

Signs are usually placed to provide references for bus operators and passengers. Important aspects to be considered in placing transit signs are passenger convenience, public safety and bus stop visibility.

Location Factors

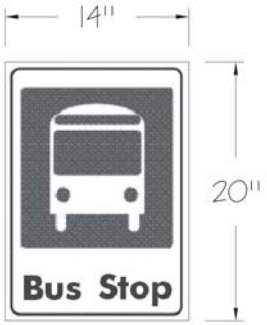
- Bus stop signs should be posted at all bus stops and bus passenger facilities.
- Proper horizontal clearance to signposts should be provided. In urban areas the minimum distance from the face of the curb to the bus stop sign is 4-feet. In rural areas the minimum distance is 6-feet.
- Signposts should be located no more than 8-feet from the face of curb in order to be visible to the bus operator as illustrated in Figure 1.11.[3]
- Bus stop signs must comply with all the applicable requirements set forth in the Manual on Uniform Traffic Control Devices. The sign dimensions depicted in Figure 1.8 are typical, but not mandatory, dimensions for rectangular bus stop signs.
- See Figures 1.6 and 1.7 for typical bus stop signpost installation.

1.6

A bus stop sign placed between the sidewalk and the travel lane near a sheltered bus stop.

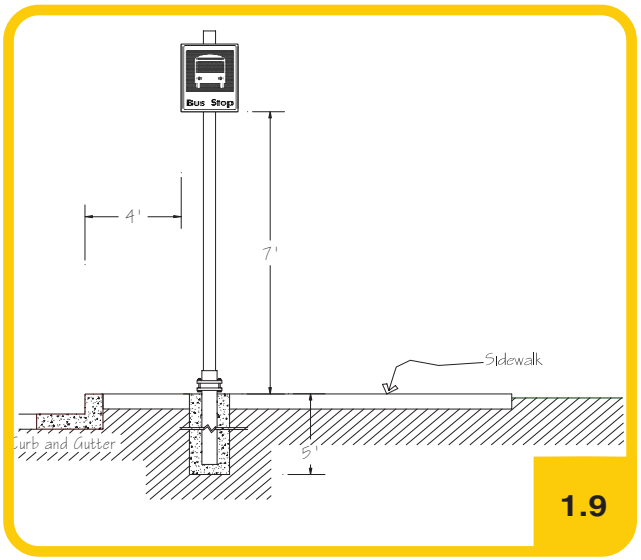
1.7

This solar-powered bus stop signpost provides busflagging capability and security lighting.

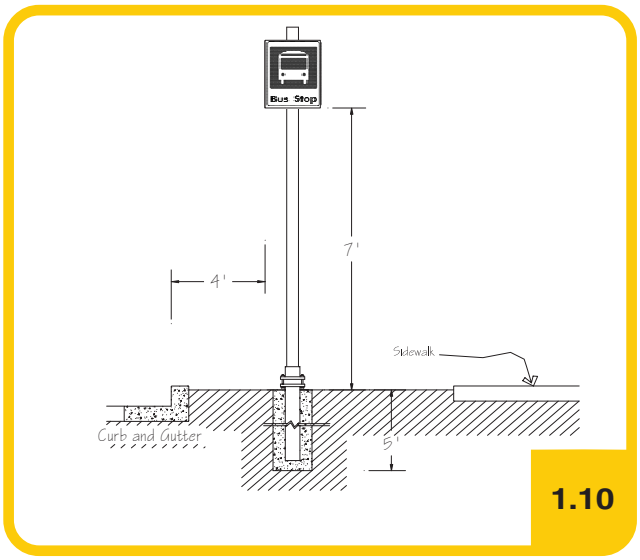


1.8

Typical, but not mandatory, bus stop dimensions for a rectangular bus stop sign.



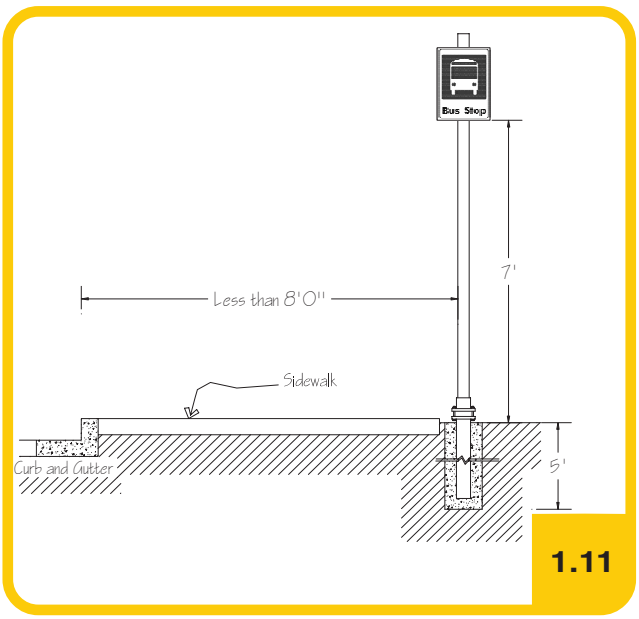
Dimensions for a bus stop sign placed between the sidewalk and the travel lane.



Dimensions for a bus stop sign placed in a planting strip adjacent to the travel lane.

Design Factors

- Bus stop signs should be designed with a uniform size and shape and coordinate with the agency's identity package. See Figure 1.8 for suggested dimensions. Other configurations are possible.
- Signs should clearly display information. When possible, easily understood symbols should be used in lieu of written information.
- Signpost placement should conform with the Americans with Disabilities Act (ADA) clearance requirements for height, sidewalk width, visibility, and other design criteria.
- Signposts at strategic locations, such as those with high passenger volumes or those that act as transfer points between routes, should contain expanded information including schedules in a format that is easy to update and system maps with the bus stop location highlighted. See Figures 1.9, 1.10 and 1.11 for critical dimensions regarding bus stop signpost location.



Dimensions for a bus stop sign placed the far side of a sidewalk adjacent to the travel lane.

- Self-contained, solar-powered bus stop signposts can be retrofitted with existing schedule displays and signs while providing bus-flagging capability, security lighting, and on-demand sign illumination with a renewable energy source.[4] See Figure 1.7 for an example.

1.4 Bus Benches

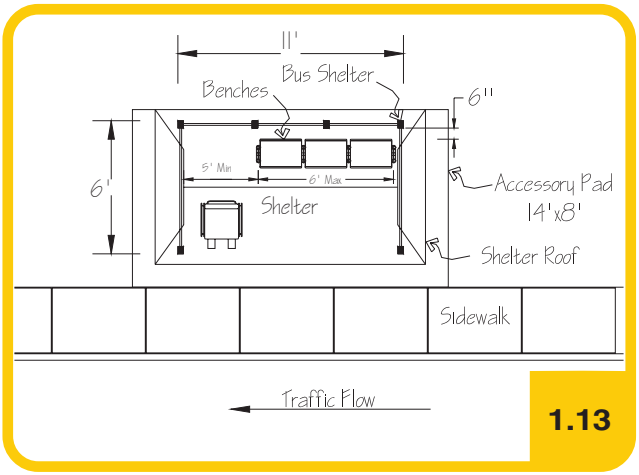
Purpose

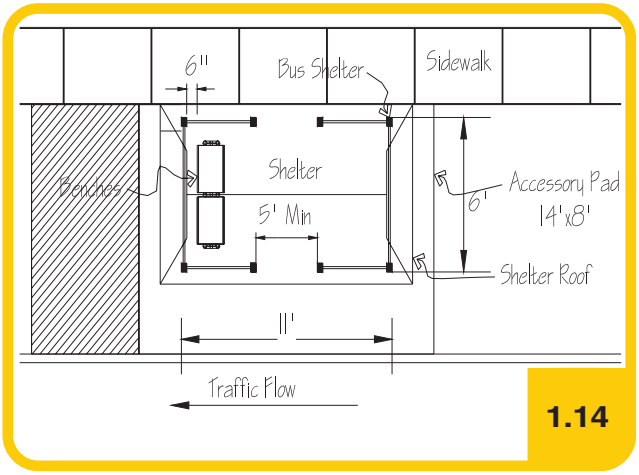
Seating, most often in the form of benches, is a very important component in the provision of amenities at the facility site. Benches may be sheltered or unsheltered. Traditionally, many transit agencies have relied on private advertising vendors to supply unsheltered benches, but as more cities and counties have adopted restrictive sign ordinances, the use of these benches has become problematic if not forbidden.

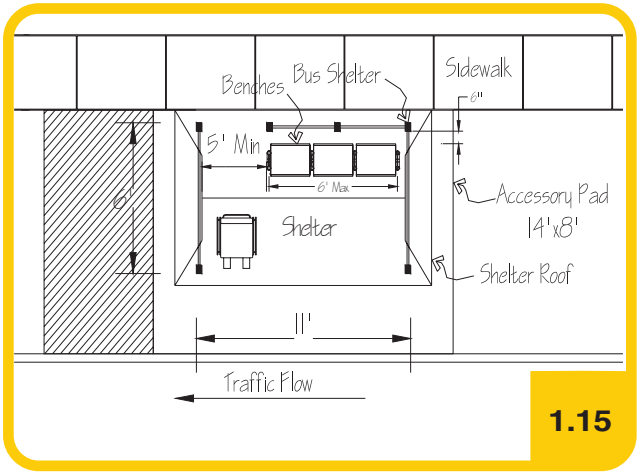
Correct placement of a bus bench outside of a sheltered bus stop.

Location Factors

- Benches should be provided at bus stops used by elderly and disabled persons.
- Benches should be provided at bus stops and transfer locations where either route has headways exceeding 20 minutes.
- Benches should be provided at bus stops located adjacent to properties with features attracting riders to use them for seating (e.g., retaining walls, stairs, low fences). See Figure 1.12.
- Benches should not be placed near an area where someone could hide or could harm or rob the waiting transit patron.
- Unsheltered benches may be provided in locations where the regular number of riders does not warrant a shelter.
- Benches may be provided in high ridership locations that have weather protection but no seating.
- Unsheltered seating may be provided in high-use areas that are unsuitable for shelters because of high levels of pedestrian movement in a small area.







Figures 1.13, 1.14 and 1.15 illustrate the different locations of bus benches within a bus shelter given a variety of side panel and opening configurations.

- Benches should be kept clear of passenger loading and unloading areas, placed no closer than 5-feet and no further than 12-feet from the forward end of any bus stop.[5]
- Proper horizontal clearance to benches should be provided. In urban areas, the minimum distance from the face of the curb to the bench is 4-feet. Bench placement should accommodate passengers' legs and feet without placing them too close to traffic. In rural areas the distance will vary according to the design speed of the road; the higher the roadway speed the further the bench should be placed from the lane.
- Benches should have a minimum clearance of 5-feet at the side and rear to allow persons in wheelchairs to access the bus stop and should not be located on the wheelchair landing pad.
- Benches should allow transit patrons a clear view of the transit.
- If a sidewalk is provided, allow a minimum 3-foot sidewalk clearance for passing pedestrians.[1]
- Benches may not be placed on medians or on limited access roadways.[1]
- Figures 1.13 to 1.15 provide critical dimensions for sheltered bus benches.
- Figure 1.16 shows custom benches designed for a downtown intermodal transit center in St. Petersburg, Florida. Figure 1.17 shows a typical sheltered bus bench.

Divided bus bench seating at an intermodal bus passenger facility in downtown St. Petersburg, FL.

Design Factors

- Benches should be placed on concrete pads. See Figure 1.12 on page 6.
- Benches should suggest sitting patterns and number of participants. See Figures 1.16 and 1.17.
- According to Florida law, benches shall not exceed 74-inches in length, 28-inches in depth and 44-inches in height [Florida Administrative Code (FAC), Chapter 14, Rule 14-20.0032 "Placement of Transit Bus Benches"].[6] See Figures 1.18 and 1.19.
- At stops with unsheltered benches, additional waiting room near the bench, sheltered by landscaping, should be provided for standing passengers.
- Benches should not be placed in completely exposed locations. Landscaping should shield customers from the weather.
- Benches should be placed so that streetlights or other objects do not obscure the visibility of waiting passengers or oncoming buses.[1]
- Two-person benches (4-feet, 2-inches long) can be placed at bus stops with medium ridership levels. These are usually placed inside shelters but can also be freestanding.
- Freestanding, three-person benches can be placed at bus stops with high ridership levels and/or high visibility.
- Benches should discourage opportunities for sleeping or reclining.

Bus bench within a bus shelter that allows sitting patrons a clear view of on-coming buses.

- Benches should be located upstream of where the bus will stop, outside the ADA-mandated landing pad.[1]

- Seating should incorporate a platform height of 18-inches to 24-inches. See Figures 1.18 and 1.19.

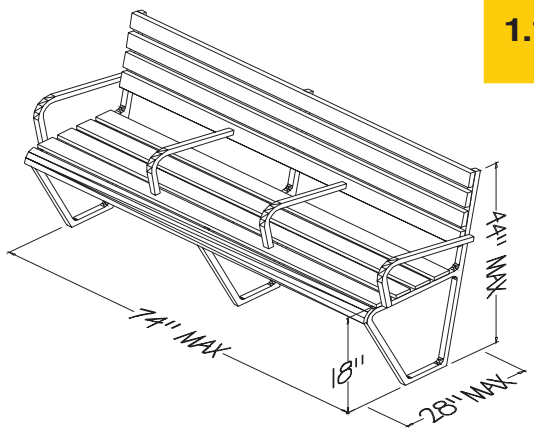
- Benches without backs allow more flexible double-sided seating arrangements.

Possible Materials for Use

- Bench materials should be weather resistant, discourage vandalism, vagrancy and require little maintenance.[6]

- Agencies should consider bus benches composed from recycled materials including high density polyethylene, one of the most popular types of recycled plastic, and rapidly renewable materials like wood. See Figure 1.20.

1.18



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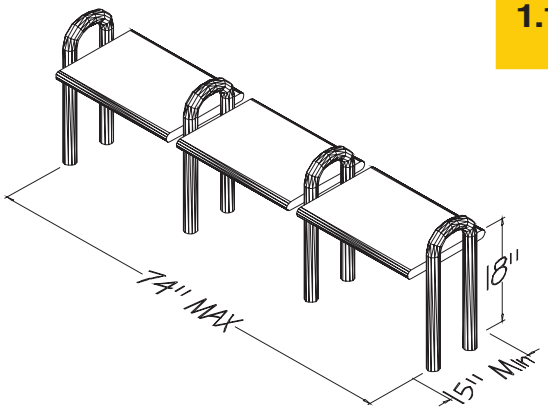


Figures 1.18 and 1.19 show the required dimensions for divided bus benches with and without backs.

1.20

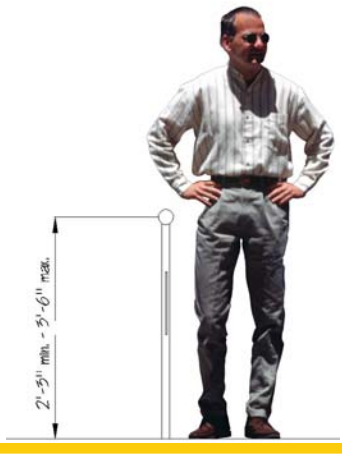
Durable bus benches constructed from recycled plastic are increasingly available to agencies.

1.5 Bus Stop Leaning Rails

Purpose

A number of passengers prefer leaning to sitting while waiting at bus stops. Leaning rails also provide a place to shelve objects passengers may carry. Agencies that have placed leaning rails at their bus shelters claim that they are inexpensive to install and are heavily used by passengers.[7]

1.21

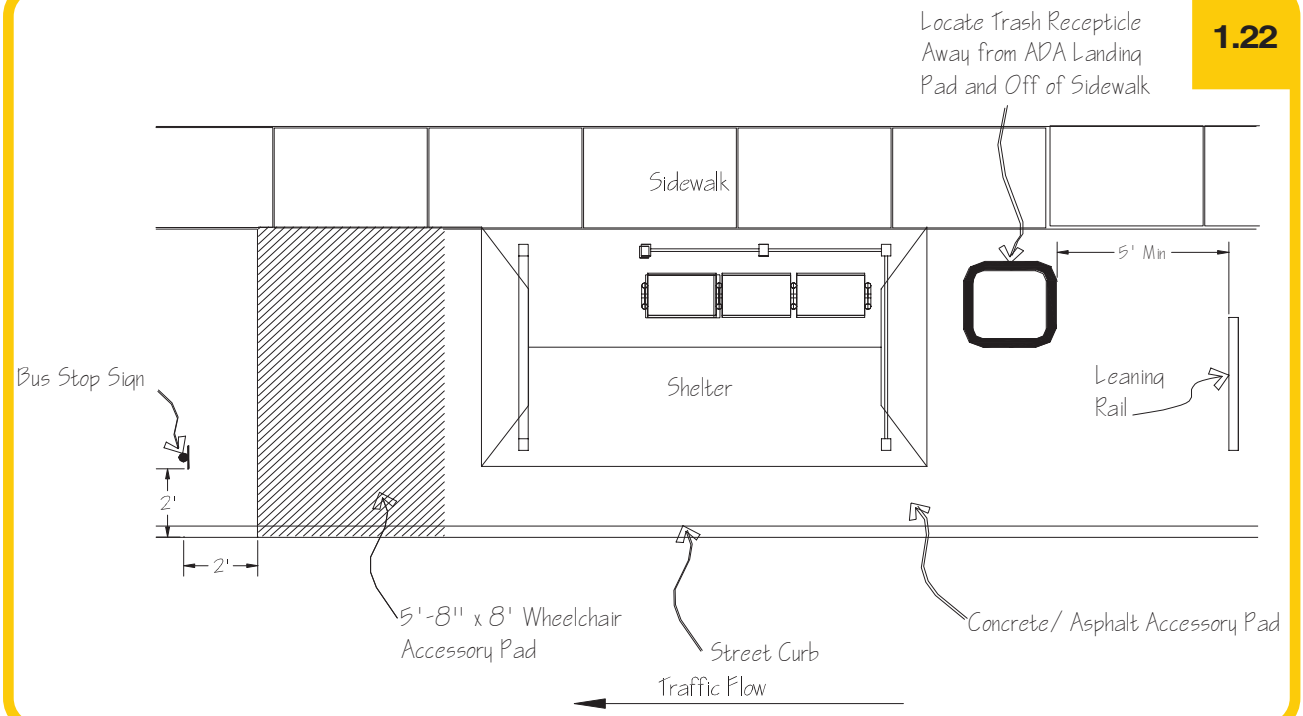


Correct height dimensions for bus stop leaning rails.

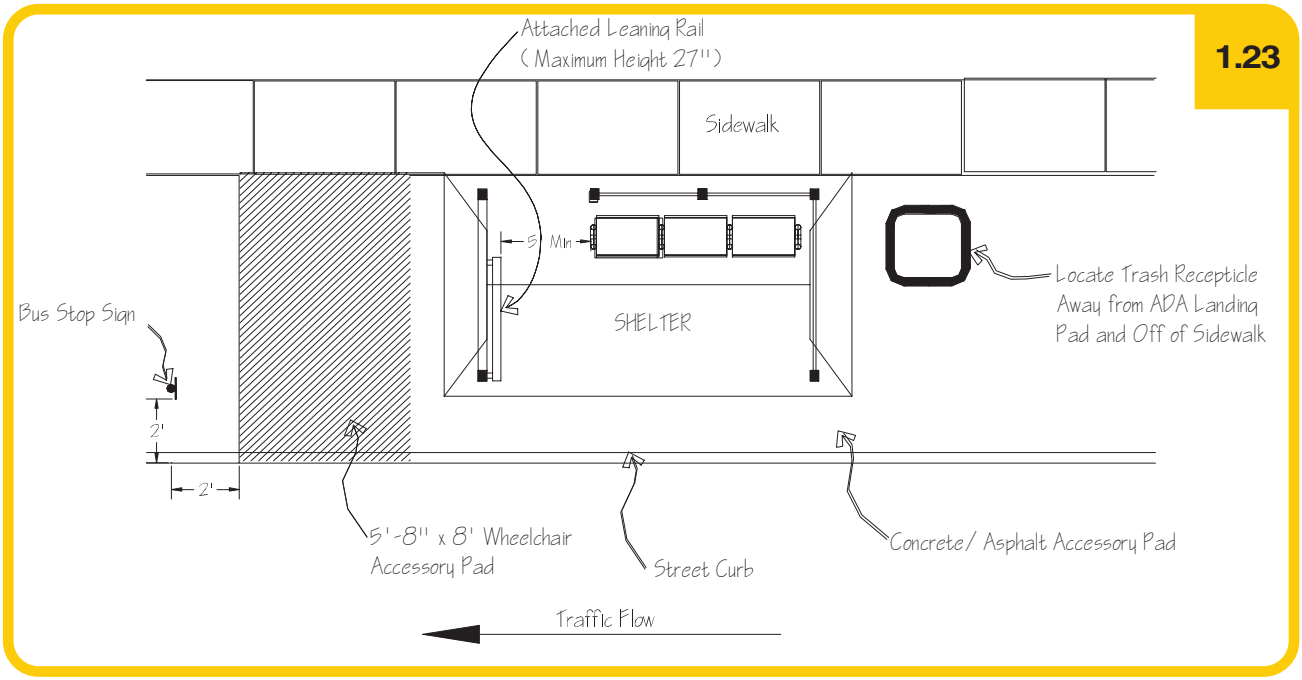
Location Factors

- Leaning rails can be located within shelters mounted on walls, be free standing or can be built into the landscape. See Figures 1.22 and 1.23.

1.22



Correct location of a leaning rail located outside a shelter at a bus stop.



Correct location of a leaning rail located inside a shelter at a bus stop.

Design Factors

- Leaning rails should have a round as opposed to square or rectangular section with a diameter of 1 ½- to 2 ½-inches.[7]
- Freestanding leaning rails should be between 27- and 42-inches in height. See Figure 1.21.[7]
- Leaning rails attached to bus shelters should be no more than 27-inches in height.
- Leaning rails can be sheltered or unsheltered. When unsheltered, landscaping should be provided to shield customers from the weather.

Possible Materials for Use

- Leaning rails should be constructed of anodized aluminum in order to enhance their durability.[7]

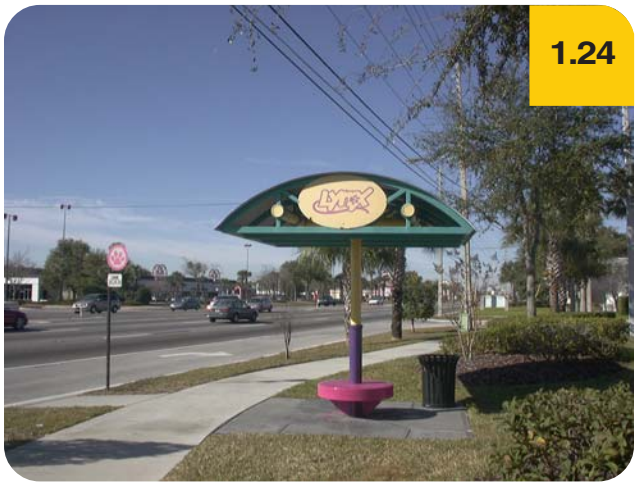
1.6 Bus Stop Trash Receptacles

Purpose

Trash receptacles should be treated as normal parts of most bus passenger facilities. Maintenance of trash receptacles and trash pick-up is an important consideration when receptacles are provided.

Location Factors

- Trash receptacles cannot be placed on wheelchair landing pads and should be placed in the manner outlined below to comply with the Americans with Disabilities Act.[1] See Figures 1.25 and 1.26.
- Trash receptacles should be located at least 4-feet back from the face of the curb.

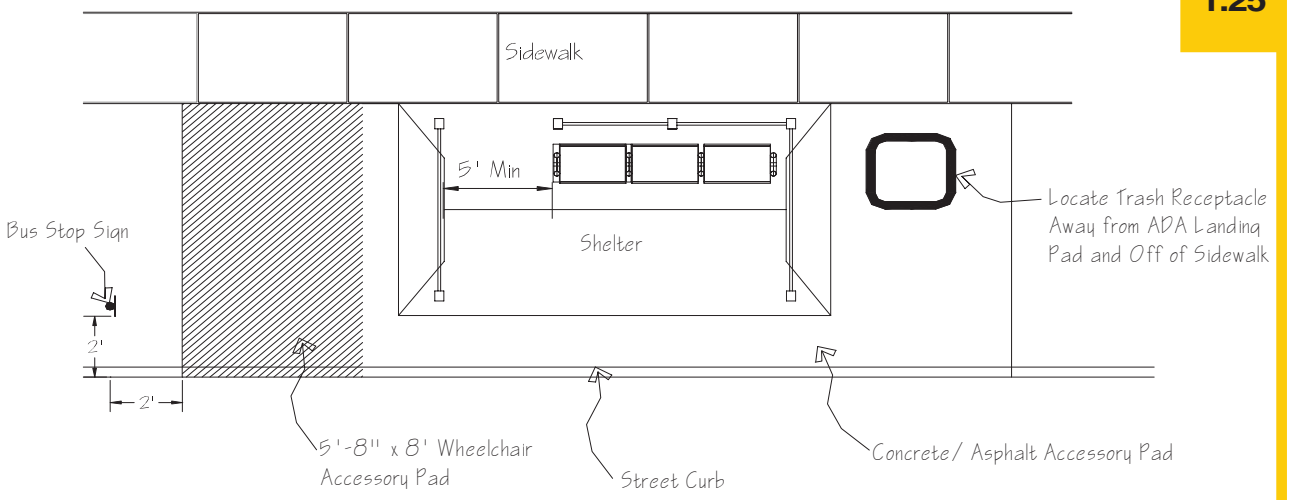


1.24

Correct location of a trash receptacle at a bus stop in Orange County, FL.

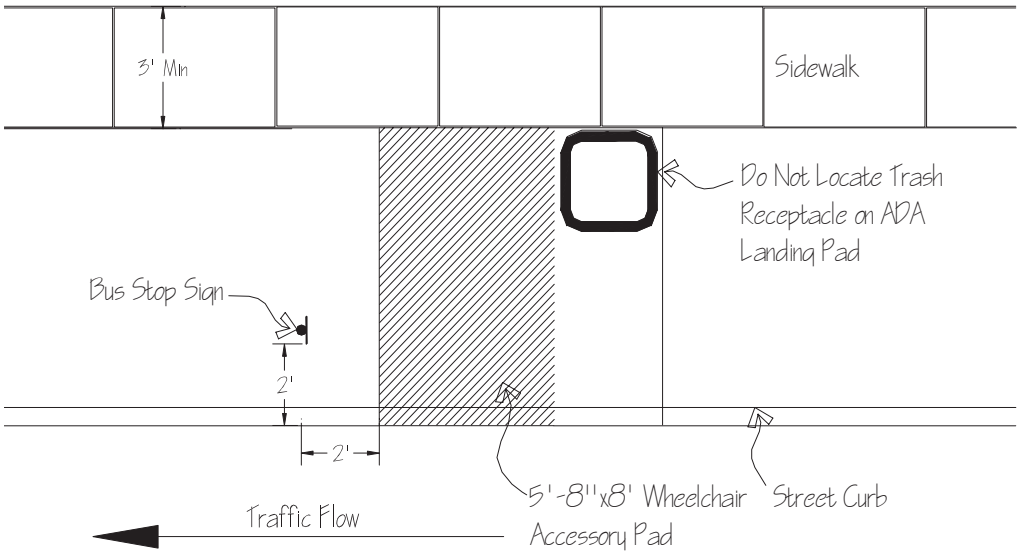
Design Factors

- The receptacles should be anchored to the pavement or landing pad in order to prevent unauthorized movement.[1]
- The receptacles should be placed so that they do not obstruct a driver's vision while turning. See Figure 1.24.



1.25

Correct location of trash stop receptacle at a curbside sheltered bus stop.



1.26

Correct location of trash stop receptacle at a curbside sheltered bus stop.

- If possible, trash receptacles should not be placed in direct sunlight. Direct sunlight exposure may result in odors.[1]
- If vandalism is a concern, agencies should consider trash receptacles with lockable lids or other anti-vandal features. See Figure 1.27.
- Trash receptacles could be subject to storing explosive devices. If the bus stop or transfer center is going to be used by a large number of people, the transit agency should consider placing explosive containment trash receptacles in the facility.
- If possible, trash receptacle designs should coordinate with benches and other furniture at the bus stop or transfer center in regard to material and finish color.

Possible Materials for Use

- Trash receptacles should be made out of steel with a powder-coat paint finish.
- Receptacles made out of steel are capable of handling a certain amount of explosives; agencies should ensure that container itself does not become shrapnel.

1.27

Trash receptacle with a lockable lid.

1.7 Bus Stop Pads

Purpose

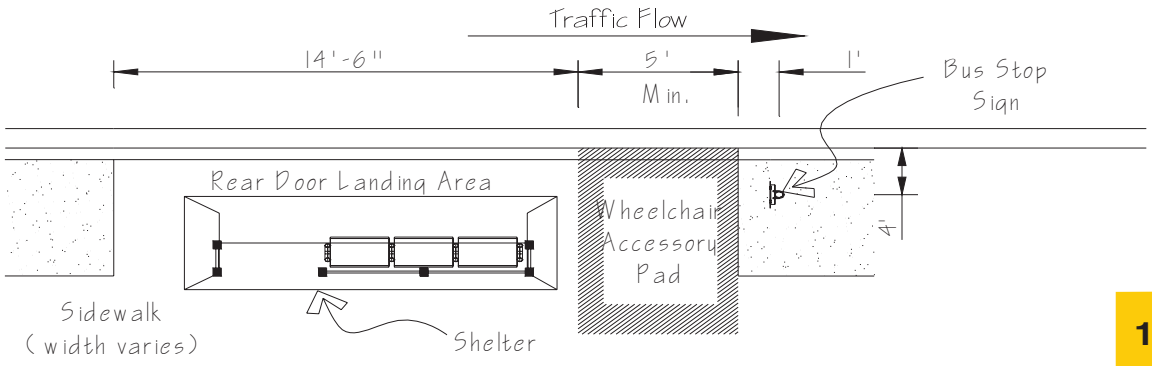
Bus stop pads provide a well-drained, non-slippery surface with adequate space for amenities and passenger movement on and off buses.

Location Factors

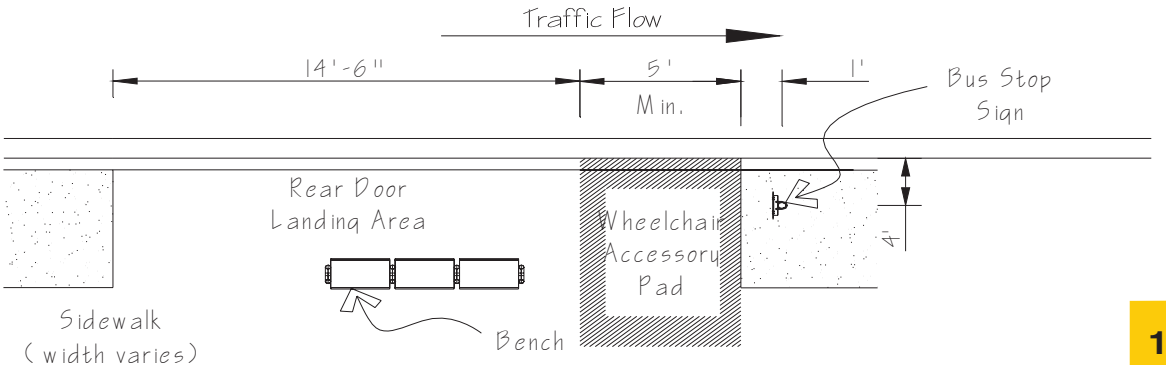
- Bus stop pads should be placed at all bus stops with shelters. It is preferable to provide pads at unsheltered bus stops with benches.

Design Factors

- The ideal bus stop pad size is 10-feet by 30-feet. See Figures 1.28, 1.29, 1.30 and 1.31 for alternative stop pad designs.
- When the available space for a pad is less than 10-feet by 30-feet, the pad should be as large as possible. Pads may be sized according to the dimensions of the shelter if a shelter is planned for the location. The pad should extend 6-inches beyond the area under the shelter canopy in order to prevent soil erosion caused by runoff.
- Any easement obtained for installing a pad should extend 2-feet beyond the pad.
- Pads for sheltered stops may include conduits and junction boxes for utilities.

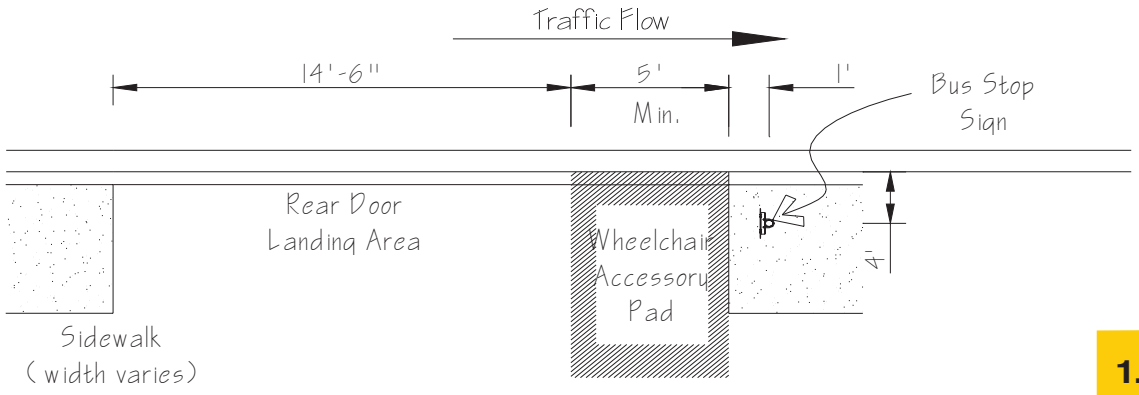


1.28



1.29

Figures 1.28 and 1.29 depict alternative configurations of bus stop waiting areas and required ADA landing areas.



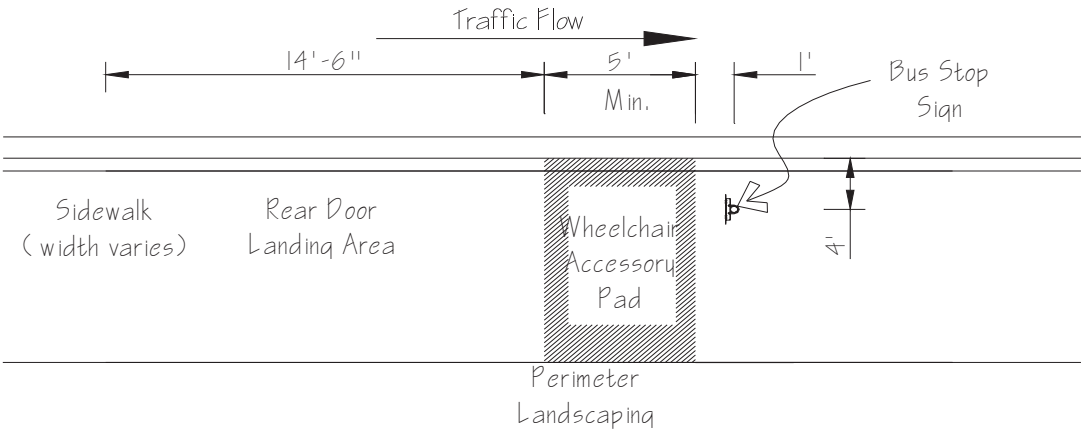
1.30

Another possible landing pad configuration.

Possible Materials for Use

- Bus stop pads should be constructed of reinforced concrete over an aggregate base. The thickness will vary according to the design of the anchoring required for various bus stop elements as affected by expected wind loads.[8]

- Free edges of pavement should be strengthened with reinforcement.



1.31

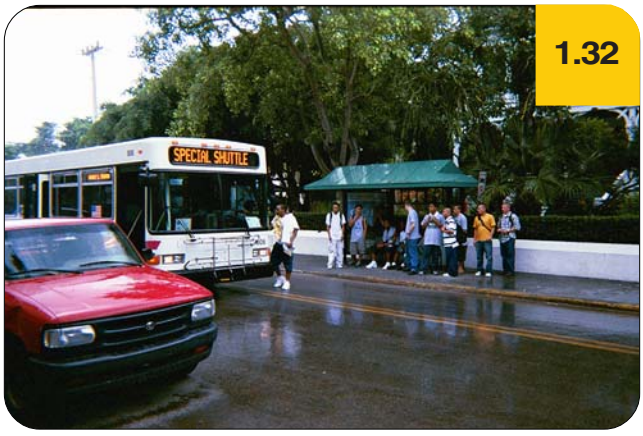
Landing pad configuration when the sidewalk is directly adjacent to the curb.

1.8 Bus Stop Shelters

Purpose

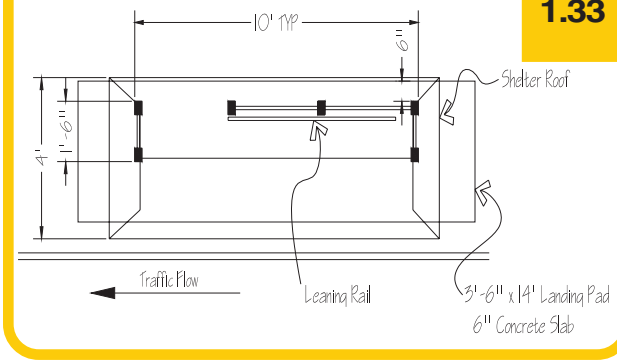
Shelters protect waiting passengers from exposure to the sun and rain. The minimal form of a shelter is an overhead canopy beneath which passengers wait for the bus. See Figure 1.32. Optional side enclosures for shelters and the provision of other amenities under or near the shelter enhance the image of the transit service and offer a comfortable and convenient transit trip for patrons. In Florida it is of particular importance to design with the climate in mind.[9] Solar radiation, heavy precipitation, and high relative humidity make waiting for the bus, especially in summer, extremely uncomfortable for passengers. As a result, allowing for shading, shelter, and ventilation are important considerations.

Opportunities also exist for agencies to incorporate recycled or renewable materials into shelters and their components. Renewable energy technology, including wind and solar power, can be adapted by transit agencies to provide shelters with electricity for illumination and cooling.



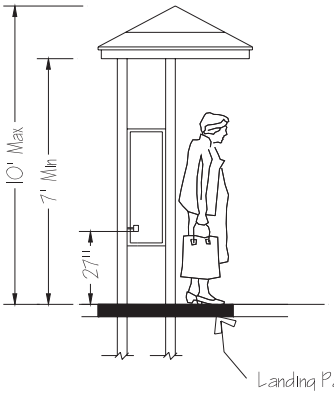
1.32

Patrons waiting at a sheltered bus stop in Key West, FL.



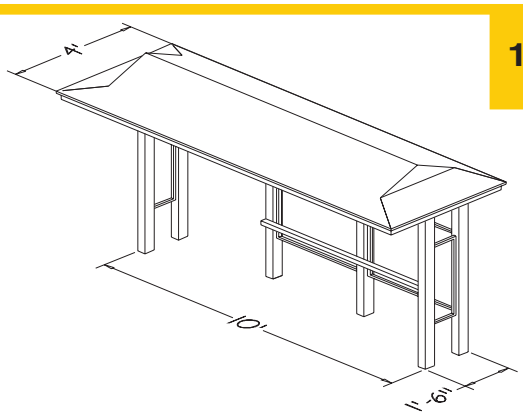
1.33

Typical dimensions of a small bus shelter with a leaning rail but no seating, applicable to stops with limited right of way width.



1.34

Cross section of a small bus shelter with a leaning rail but no seating with typical vertical dimensions.



1.35

Small bus shelter with a leaning rail but no seating shown in plan in Figure 1.33 in three dimensions.

Location Factors

Operations Factors

- Bus shelters should be provided at any stop with at least 25 boardings a day.
- Bus shelters should also be provided at stops that are major generators of peak hour transit ridership or are major transfer points between routes. Stops that attract large concentrations of the young or elderly, such as schools, recreation centers, or senior citizen housing facilities, should be sheltered. [3]

Right of Way Factors

- The open side of a shelter should be placed toward oncoming traffic and should be grade separated from the travel lane.
- Bus shelters should not be placed on medians or on limited access roads.[1]
- Shelters should be located upstream of the bus zone without interfering with passengers boarding and alighting in order to maximize the visibility for approaching buses, passing traffic, and waiting passengers. The location of bus shelters should minimize walking distances for waiting passengers. Shelters should be located at least 5-feet from the front door of the bus along the direction of travel in order to provide adequate circulating space for persons in wheelchairs.
- Proper horizontal clearance to shelters should be provided. In urban areas, the minimum distance from the face of the curb to the bus stop sign is 4-feet. In rural areas the distance will vary according to the design speed of the road.[3] See FAC, Chapter 14, Rule 14-20.003 and FDOT Design Standards Index 700.
- Shelters should not be placed on sidewalks where they could obstruct the movement of pedestrians. A minimum 3-foot pedestrian pathway should be maintained on three sides of the shelter. In areas with high pedestrian volumes, a 6-foot pathway on one side of the shelter is preferred.
- Do not place shelters on the wheelchair landing pad area required by ADA. The ADA landings must also be completely outside of the shelter interior.[1]
- Shelters should not be located within 15-feet of a fire hydrant or a parking space for the disabled.[1]

Defensible Space Factors

- Shelters also should provide a clear opening at their bottoms in order to allow for cleaning and increased security.
- Shelters should not be placed in front of store windows of adjacent properties.[1]
- When a shelter is located in front of a building, a minimum 12-inch space should remain between the building and the shelter to allow for cleaning.[1]

Environmental Factors

- Orient shelters so that they provide as much protection as possible from sun, wind and rain.

Design Factors

General Factors

- Access entry points should not have less than 36-inch wide clearance.
- The shelter should have provisions to accommodate elderly and disabled people in order to meet ADA standards. A shelter that is accessible to people in wheelchairs must have a minimum clear floor area 30-inches wide and 4-feet deep entirely within the perimeter of the shelter.
- Shelters should be designed to incorporate benches and/or leaning rails and may also include route maps, transit service literature, telephones, newspaper vending and trash receptacles.
- Shelter designs should allow for additional site furnishings as the need arises.
- When available right of way is limited, it is better to provide a smaller shelter than not to provide a shelter at all.

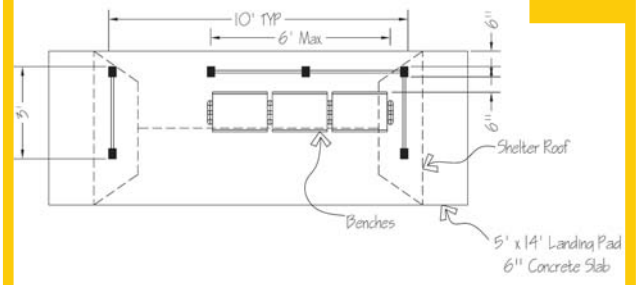
Sizing Factors

- The size and design of shelters varies with the number of boardings at a bus stop and with space availability. Dimensions for shelters of various sizes are given in Figures 1.33 through 1.38 and 1.42 through 1.45.

Defensible Space Factors

- As the first image of the transit system, the shelter should speak to the security of the system.
- Advertising panels should be located in a manner that does not limit visibility, preferably downstream of bus traffic.[6]

1.36

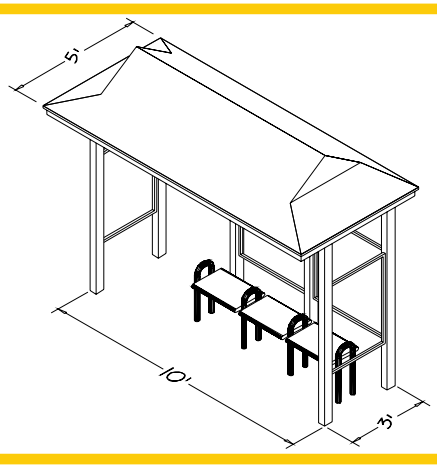


Typical dimensions of a small bus shelter with seating.

1.37

Cross section of a small shelter with seating with typical vertical dimensions.

1.38



Bus shelter with seating shown in plan in Figure 1.36 in three dimensions.

- Shelters should allow for unobstructed views into and out of structures. The design of the shelter should not create blind spots or hiding places in order to protect the facility and its patrons from crime.

- The shelter should be designed with adequate illumination for security at night.

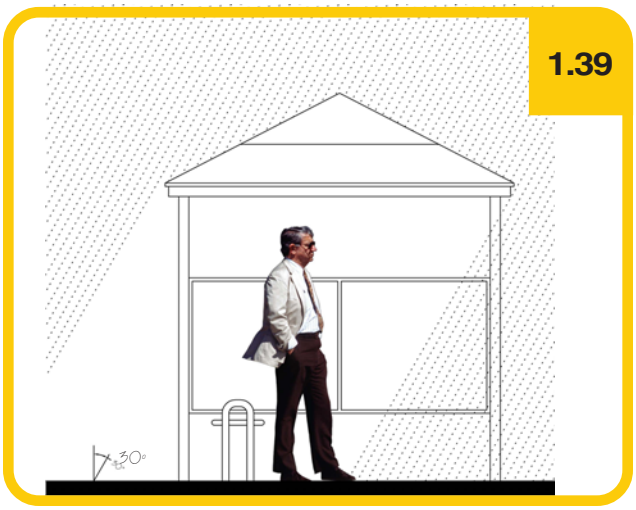
Environmental Factors

- If an agency is going to employ a variety of shelters, the architecture of the shelter should be indicative of nearby land uses; it should provide the rider with a means of orientation within the community. See Figure 1.41.

- Shelter canopies should take into account sun and rain protection. Shelters oriented to the southeast and southwest may be uncomfortable for passengers if adequate shade is not provided. See Figures 1.39 and 1.40.

- Shelters should be designed to maximize shading and to encourage cooling air movement. Sun shade protection should exist on all sun-exposed sides of the shelter.

- Impervious side panel materials are poorly suited to Florida's climate. Pervious side panels allow for ventilation.

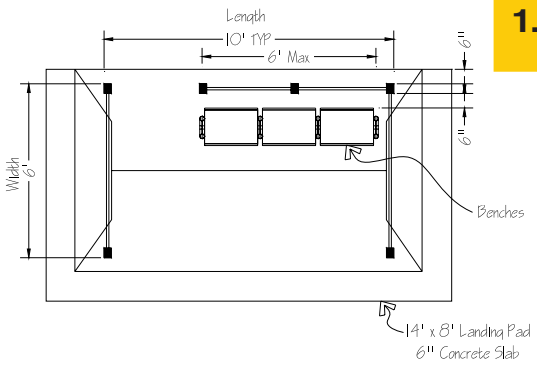


Typical angle (30°) of falling rain in Florida and the related bus shelter canopy depth required for protection.

Approximate angle (41°) of the sun during late afternoon peak commuting hours in mid-summer in central Florida for a southwest facing bus shelter.

1.41

A custom designed shelter at the downtown transit mall in Tampa, FL.



1.42

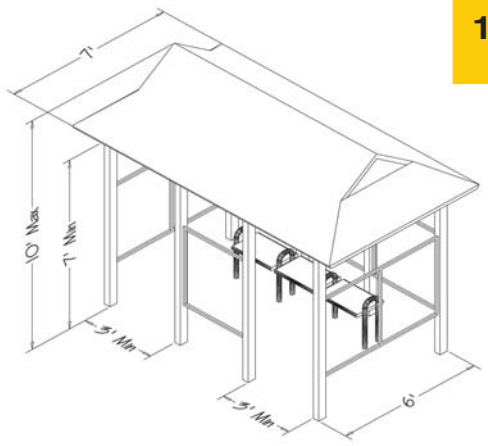
Typical dimensions of a mid-sized bus shelter with three openings.

Possible Materials for Use

- Shelters should be designed to require low levels of maintenance. It should be easy to clean the shelters and the concrete landing pad beneath and around the shelters.
- The shelter should be made out of materials that are durable and vandal-resistant.
- Agencies should consider re-using existing bus shelters when possible.
- Agencies should also identify opportunities for incorporating local, recycled or renewable materials into bus shelter designs. See Figure 1.47.
- Agencies should investigate opportunities for using renewable energy technologies. See Figures 1.45, 1.46 and 1.47.
- Agencies should consider constructing bus passenger facilities surfaces (e.g., shelter canopy, landing pad, and sidewalks) from light-colored, high-albedo materials in order to reduce heat absorption.

1.43

Cross section of a mid-size shelter with typical vertical dimensions.



1.44

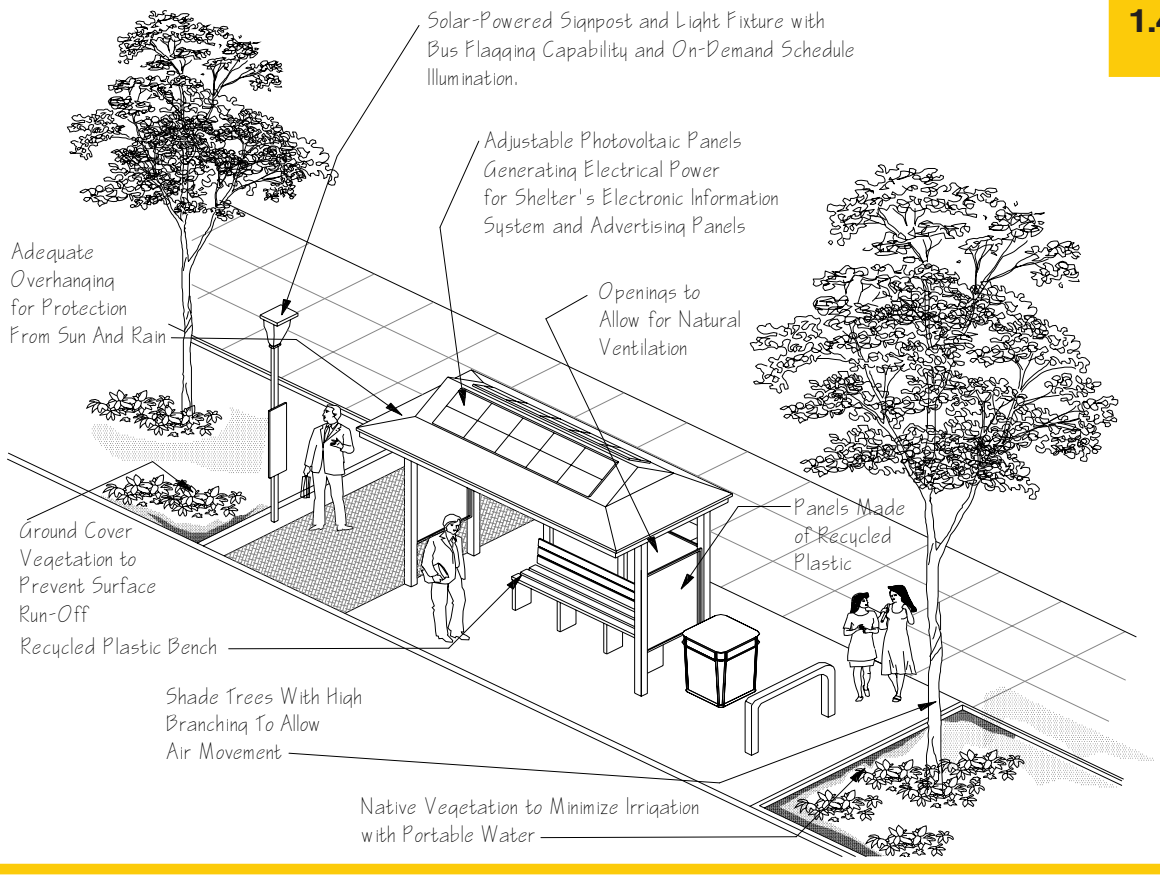
A typical mid-sized bus shelter shown in three dimensions.

1.45

A solar powered bus shelter in Hong Kong.

The solar powered bus shelter illuminates its information systems and advertising panels with power generated by photovoltaic panels, independent of the electricity grid.

1.47



A bus stop designed according to 'green building" design principles.

1.9 Bus Stop Information and Way-Finding Devices

Purpose

Providing system maps and fare information at bus passenger facilities is both useful to passengers and provides the transit agency an opportunity to educate passengers and potential passengers about bus transit services.

A system information panel incorporated into a bus shelter panel.

A free standing transit system information panel.

Location Factors

- System maps and information should be provided at all bus stops with high passenger volumes and at stops that serve as transfer points between routes. Figure 1.48 shows fixed information display in a bus shelter.
- Fixed maps should be sheltered from inclement weather and should be easily visible by passengers.

Design Factors

- Fixed information displays should contain expanded information including schedules in a format that is easy to update. System maps should highlight bus stop locations.
- Route maps should be easily understandable to transit passengers.
- System-wide maps may highlight activity centers in order to assist passengers with trip planning.
- Figures 1.48 through 1.53 depict different types of free-standing information displays.

One of several devices used to portray route information for patrons.

- The overall design of maps and schedules should also consider the needs of sight and hearing impaired passengers. Bus brochures, bus schedules and other transit literature should be easily obtainable at stops and on buses or other transit services.

- Maps and schedules should adopt uniform graphic standards, sizes and color codes.

- Maps and schedules should be as intelligible as possible to an international audience in areas where there is a significant visitor population.

- Solar or wind-powered on-demand illumination is suggested for bus stop information and wayfinding devices.

1.51

One of several devices used to portray route information.

1.52

A digital reader board displaying real-time information about bus arrivals and departures at an intermodal facility.

1.53

This self-contained, solar-powered transit stop provides busflagging capability, security lighting and on-demand schedule illumination.

1.10 Shopping Cart Storage at Bus Shelters

Purpose

Bus stops usually do not have facilities for shopping cart storage but they are a necessity at stops near retail centers. Abandoned shopping carts are a nuisance to passengers and to shopping center managers and are a hazard to pedestrians and vehicles.

Location Factors

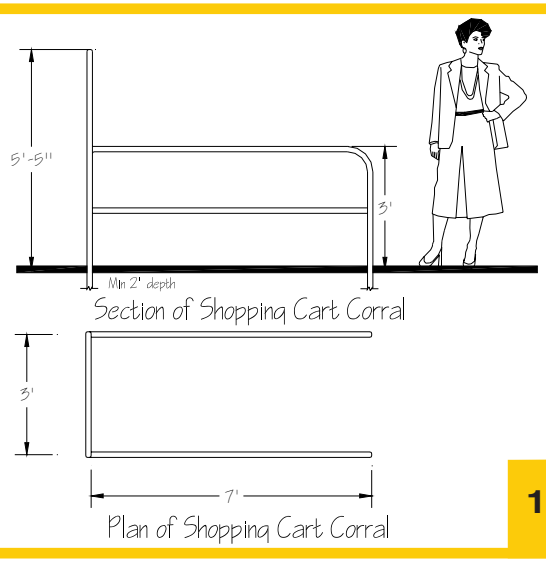
- Shopping cart storage should be provided at bus stops adjacent to retail centers.
- Shopping cart storage cannot be placed on wheelchair landing pads to comply with the Americans with Disabilities Act. See Figure 1.55.
- Shopping cart storage should be located at least 4-feet back from the face of curb.
- Shopping cart storage should remain clear of sidewalks.

Design Factors

- The frames for shopping cart corrals should be constructed from steel pipe.
- Surface mounted flanges should be constructed from flat steel bars.
- Figure 1.54 provides dimensions for a typical shopping cart corral.

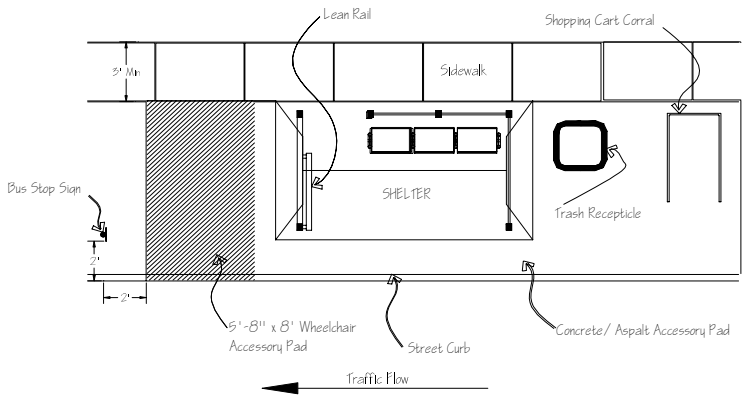
Possible Materials for Use

- Standard hot-dipped galvanized steel pipes should be used to resist corrosion and rust.



1.54

Typical vertical and horizontal dimensions for shopping cart corrals.



1.55

Appropriate location of a shopping cart corral at a sheltered bus stop.

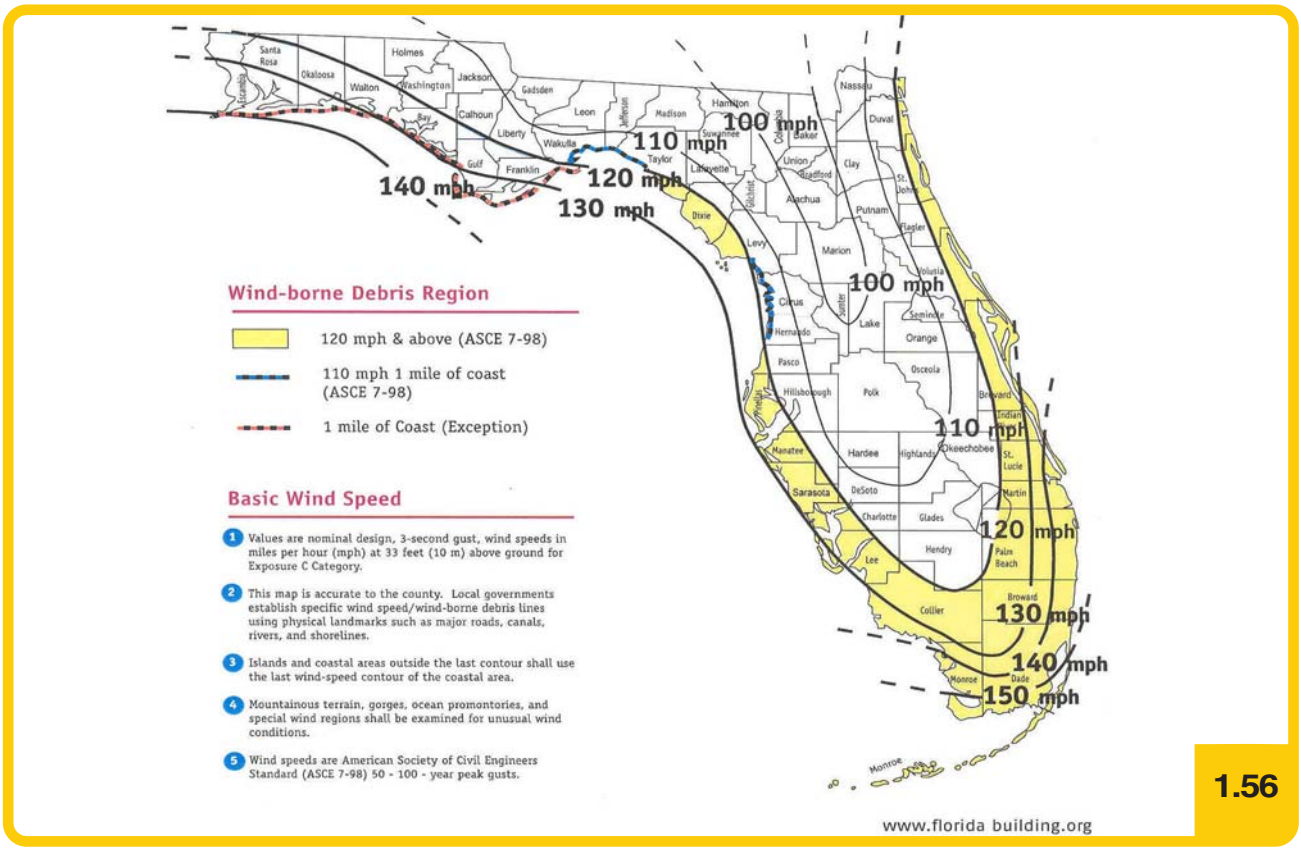
1.11 Bus Stop Shelter Hurricane Wind Loads

Purpose

In areas that experience hurricanes, bus shelters are prone to damage and may become sources of flying debris if they are not adequately anchored, sized and fabricated to resist high wind speeds (see Figure 1.56). The Florida Building Code has minimum requirements to ensure that bus shelters in hurricane-prone areas can withstand high winds and the impacts of wind-borne debris.[10]

Design Factors

- As defined in the Florida Building Code, bus shelters must be properly anchored to the ground. Designers must consider uplift against the force of gravity by hurricane force winds.[10]
- The Florida Building Code also indicates that bus shelters must be fabricated to withstand exterior wind pressures. In wind-borne debris regions (areas of 120 mph and above), all exterior coverings must be made of shatter-resistant materials.[10]
- Some Florida counties may have stricter design and construction standards than those in the Florida Building Code. Transit agencies should check local regulations before starting plans and designs.[10]



1.56

Design wind speeds for wind-loads and wind-borne debris regions used in different areas of Florida as established by the Florida Building Code.

1.12 Landscaping

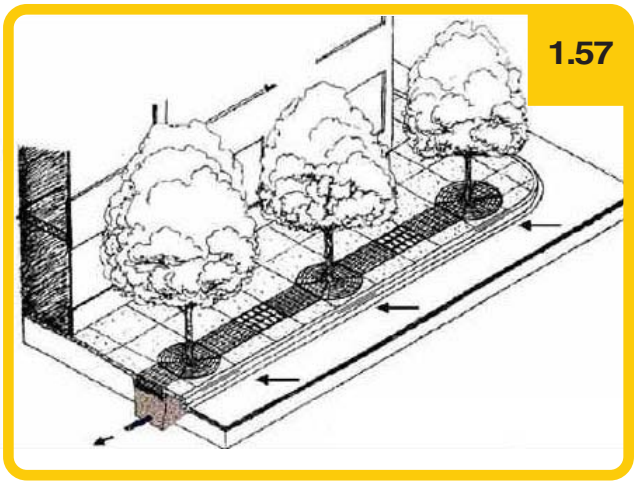
Purpose

Landscaping at bus stops promotes transit ridership by enhancing its image. Landscaping also contributes to the safety, security, and comfort of passengers. Landscaping can be use to reduce heat islands (thermal gradient differences between developed and undeveloped areas), minimizing the facilities impact on the microclimate. Transit agencies should limit or eliminate the use of potable water for landscape irrigation in order to conserve potable water resources.

Location Factors

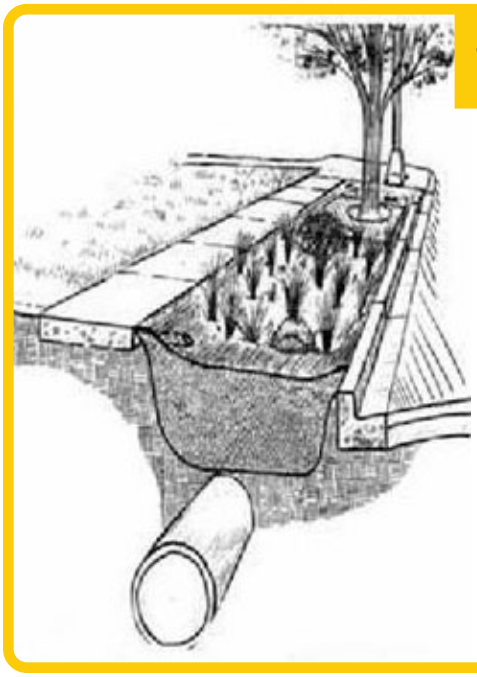
- Landscaping should be located so that it buffers waiting passengers from traffic and provides them some degree of protection from the weather.

- Landscaping should not block the view of patrons from outside the bus stop.



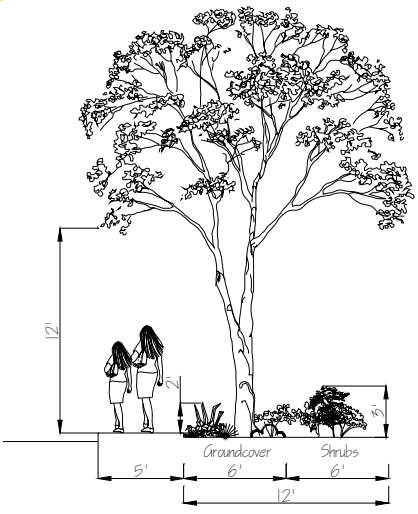
1.57

Runoff is directed to the tree box, where it is cleaned by vegetation and soil before entering a catch basin. The runoff collected in the tree-boxes helps irrigate the trees.



1.58

Manufactured tree box filters are effective in controlling storm water runoff.



1.59

Appropriate locations and vertical dimensions for landscaping adjacent to a sidewalk.

Design Factors

- In order to maintain a defensible space, the height of groundcover plants should not exceed 2-feet at maturity so that visibility is preserved for patrons. See Figure 1.59.
- Also in order to maintain a defensible space, the height of shrubs should not exceed 3-feet at maturity, so that visibility is preserved for patrons. See Figure 1.59.
- In combination with groundcovers and trees pruned up to 6-feet above ground, shrubs should be used between 6-feet and 12-feet from the edge of walkways requiring visual surveillance. See Figure 1.59.
- When river-rock and other masonry materials are used, the material should be grouted to prevent removal by hand. River-rock should be grouted so that only one-third of the rock is exposed above ground.
- In order to ease maintenance and to ensure the longevity of plant materials use native plants and wild flowers. In landscapes installed in coastal areas plants should also be salt tolerant. Avoid the use of exotic plant species.
- All landscaping along FDOT rights of way must comply with the latest edition of the *Plans Preparation Manual (PPM)* and the *Florida Highway Landscape Guide* (http://www.dot.state.fl.us/emo/beauty/landscap.pdf), and the FDOT Design Standards Index 546 and 700.[6]
- Transit agencies should coordinate landscape installation with the state or local agency assigned the responsibility of maintaining the landscaping.
- Efforts should be made to shade all constructed surfaces. Shade trees should be high branching so that they do not interfere with breezes. Low vegetation should not block air movement beneath the shelter.
- Whenever possible, agencies should minimize the use of potable water in landscape irrigation through the use of high efficiency irrigation systems, low-water use native plants, or the reuse of storm water or gray water for irrigation. See Figures 1.57 and 1.58.

1.13 Bus Stop Shelter Lighting

Purpose

The purpose of lighting is to enhance the safety of patrons at facilities by illumination and to illuminate passenger information and advertising where applicable. In order to reduce light pollution, the transit agencies should eliminate light trespass from the bus passenger facility, improving night sky access, and reducing nuisance glare on adjacent properties and within the roadway.

Location Factors

- Bus passenger facilities along routes that offer nighttime or after dark services should have optimum levels of lighting incorporated in the design of the facility. Adequate lighting greatly influences actual safety and passengers' perception of safety, especially at off-street facilities.

1.60

A solar powered bus shelter illuminates its information systems and advertising panels.

- Lamps at bus passenger facilities should maintain safe light levels while avoiding off-site lighting and night sky light pollution.

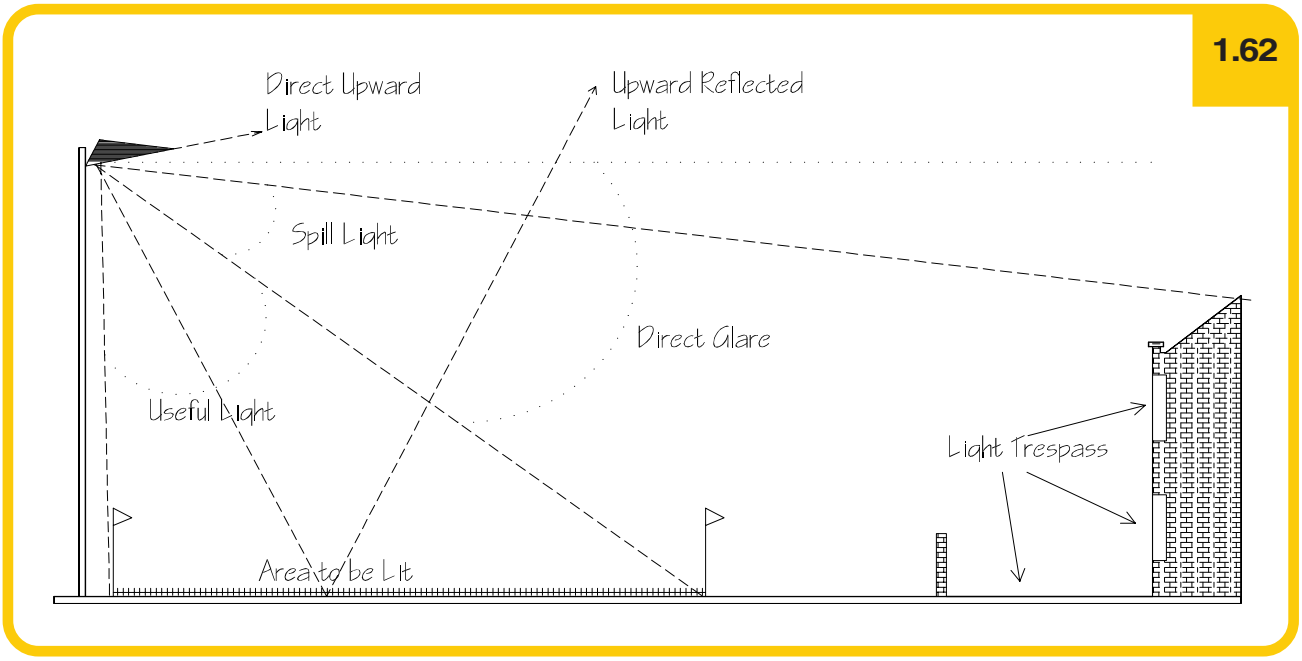
Design Factors

- All bus stops require adequate lighting levels to increase transit customer safety. Lighting levels must be sufficient to provide customers with a sense of security while they wait for buses. Adequate lighting also enables the bus driver to see waiting passengers and to safely approach and depart from a bus stop.
- The minimum level of lighting at shelter pavement should be 2.0-foot-candles but "over" lighting should also be avoided.[11]
- Local transit stops should be located within 30-feet of an overhead light source.
- Light fixtures should be visually non-obtrusive so as not to attract the attention of vandals.
- Light patterns should concentrate light at the shelter while minimizing overthrow of glare onto street. For road lighting installations, light near and above the horizon should be minimized to reduce glare and visual intrusion. See Figure 1.62.
- If pedestrian paths adjacent to transit stops are illuminated, the height of the light fixture should be appropriately scaled.
- Use specifically designed lighting equipment that minimizes the upward spread of light near to or above the horizon.[11]

Possible Materials for Use

- The fixtures should be vandal-resistant and durable.
- Lamp compartment and electrical access areas should be secured with a recessed hex head screw or equal means.
- If possible, electrical services should be low voltage to reduce the risk of electrical shock.
- Cutoff luminaries, low–reflectance surfaces, and low-angle spotlights can be employed to reduce light pollution.[11]
- Solar lighting is suggested in areas where there is currently no utility service or as a temporary measure until utilities can be established for the shelter or stop. Portable solar lighting may be used when transit service is detoured during construction projects. See Figures 1.60 and 1.61.

At a bus stop in West Palm Beach, Florida, this solar-powered safety light offers riders an illuminated area as they sit in comfort waiting for their transportation.



Light pollution is wasteful of energy resources and causes dangerous glare to spread into the right of way.

1.14 Bollards

Purpose

Bollards separate pedestrian and vehicular areas in order to protect people, buildings and site elements. They are sometimes illuminated in order to provide path lighting. They are especially important in areas where errant buses may conflict with waiting passengers or pedestrians.

Location Factors

- Bollards should be installed at bus parking spaces where errant buses may “jump” the curb and collide with pedestrians.
- When used to separate pedestrians and vehicles, bollards should be spaced sufficiently close to clearly define the desired separation of space and to prevent intrusion of automobiles but not so close that passage of wheelchairs is impeded. See Figure 1.63.

1.63

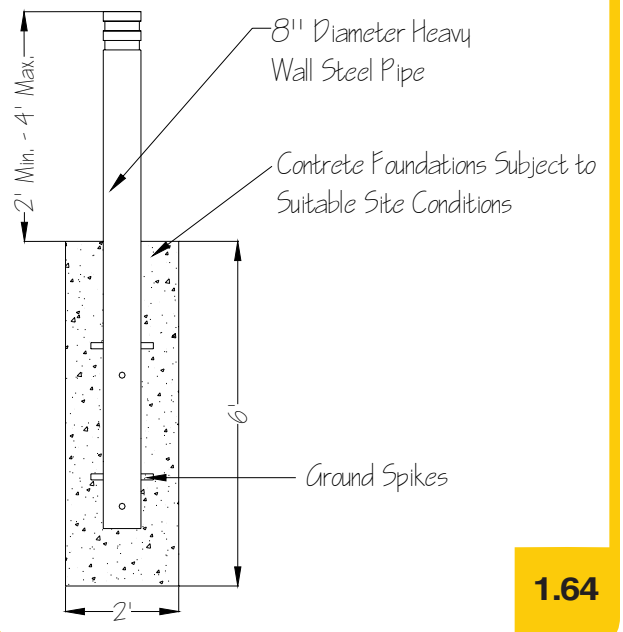
Planters and bollards to separate pedestrian and vehicular areas.

Design Factors

- A single bollard should be designed to stop a 36,000-pound vehicle traveling at 4 mph.[12]
- At bus parking areas, three bollards of concrete-filled, 8-inch diameter, heavy-wall steel pipe should be located ahead of the bus. The pipes should be set vertically in a 6-foot, auger-drilled hole, and retained by reinforce concrete.[12] See Figure 1.64 and 1.65.
- They should be spaced at 5-feet on center across major walk/road intersections.
- The design of bollards should respond to the character of the site.
- Bollards may be pre-manufactured or custom designed in a style that compliments the bus stop architecture and other site furniture.
- Bollards should be tall enough to discourage vehicle access (standard height of 24- to 48-inches) but spaced far enough apart to allow bicycle and pedestrian access.[13]
- Bollards should be small enough to be unobtrusive (standard height of 24- to 48-inches).[13]

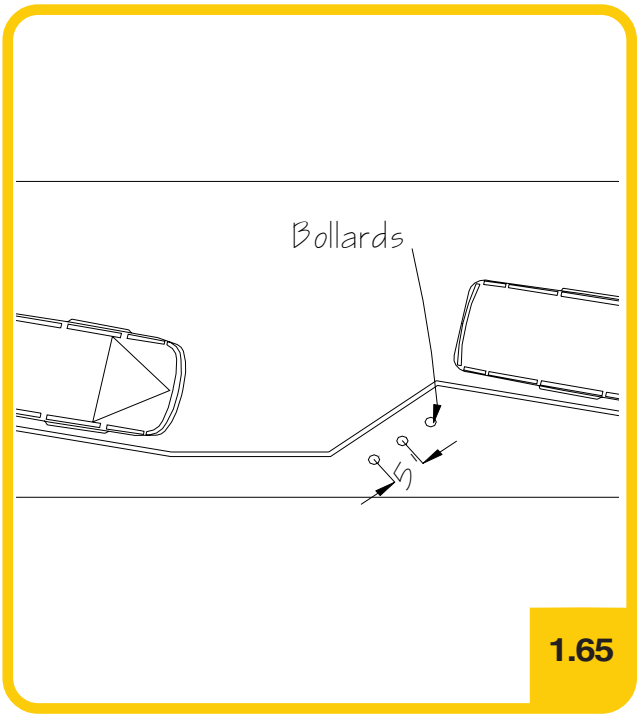
Possible Materials for Use

- Bollards can be permanently installed by embedding.[13]
- Bollards may be made removable through the introduction of an in-ground sleeve or receiver, in order to provide temporary service and emergency access.[13]
- Bollards should be solid for durability and stability.[13]
- Some bollards can be equipped to accommodate chains (e.g. eyebolts). If chain barriers are used in conjunction with bollards, care should be taken to assure that the chain is easily visible and not a hazard.



1.64

Detailed section of a typical bollard.



1.65

Plan showing bollards in a off-street half sawtooth bus bay.

1.15 Notes

Text References

[1] Hillsborough Area Regional Transit. (1995). *Transit friendly planning and design handbook and technical manual*. Tampa, FL: Hillsborough Area Regional Transit.

[2] Association of Pedestrian and Bicycle Professionals. (n.d.). *APBP Bicycle Parking Guidelines – DRAFT [Electronic Version]*. Retrieved on Nov. 18, 2002, from http://vtpi.org/bikerack.pdf

[3] Tri-County Metropolitan Transportation District of Oregon. (1996). *Planning and design for transit handbook: Guidelines for implementing transit supportive development*. Portland, OR: Tri-County Metropolitan Transportation District of Oregon.

[4] Text retrieved on Jan. 12, 2004, from http://www.carmanah.com/

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2 Streetside Guidelines

2.1 Introduction

Purpose

The following guidelines are intended to accommodate all modes of travel but are focused on the needs of bus operators and bus passengers in the road right of way. As such, the guidelines view the road as a multimodal facility. A wide variety of street design characteristics increase multimodal access in the following ways:

- treating public transit preferentially,
- clearly marking transit stops,
- slowing vehicle speeds,
- providing automobile drivers with reminders that other users are present,
- buffering pedestrians from traffic flow, and
- clearly marking pedestrian crossings.

In Florida, multimodalism and good transit provision are challenged by discontinuous street patterns and the absence of sidewalks in many places. These conditions make pedestrian travel difficult. Nevertheless, road widening and improvement projects (including "walk to school" initiatives for sidewalk provision) present transit agencies with opportunities for enhancing transfers between different modes of travel. The following guidelines provide basic support for buses, pedestrian travel and bicycling.

Buses

Proper planning for bus facilities should be a major part of multimodal road design. Adequate right of way widths and curb radii are necessary for the convenient and safe circulation of buses. Right of way designs can deliver different degrees of priority treatment for buses and reduce conflicts between buses and other vehicular traffic.

Pedestrians

In order to make buses service-efficient, pedestrian facilities should be given high priority in the design of multimodal streets. Properly designed pedestrian walkways and the clear demarcation of pedestrian crossings enhance pedestrian mobility and access to transit. Whenever possible, crossing delays and out-of-direction pedestrian travel should be minimized. Safety is the most important consideration in planning for pedestrian facilities linking bus stops to passengers' origins and destinations. Pedestrian facilities characterized by good visibility, adequate lighting, grade separation, clear demarcation and surface differentiation are likely to reduce conflicts between pedestrians and other travel modes.

Bicycles

Priority treatments for bicyclists include providing separate bike lanes and adequate bike storage at destinations. Bicycles ideally should have separate access to the road network in order to minimize potential conflicts among them, buses and other vehicles. This may not be possible, however, due to financial and other constraints. The design should also maximize a bicyclist's access to transit.

2.2 Vehicle Characteristics

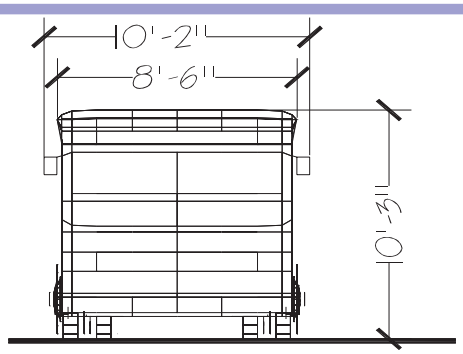
Purpose

The actual dimensions of bus vehicles should be used to establish minimum functional street-side standards for transit operations. Vehicle lengths, widths, heights, as well as operating characteristics, should be coordinated with roadway and facility designs. Bus turning radii requirements are equally important. Two types of buses are commonly used in Florida: standard buses (used for most local bus transit service) and mini buses (used most commonly in providing paratransit and in limited cases local transit services).

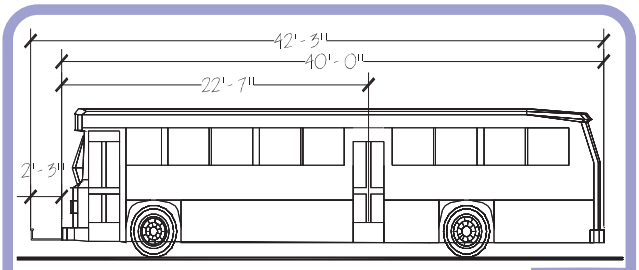
Design Factors

Typical bus dimensions are provided in Figures 2.1 through 2.4.

- Roadway dimensions must take into account the minimum space in which buses can turn in order to ensure safe roadway turning movement by buses. The minimum radius required for 40-foot-long coach (the standard bus) is illustrated in Figure 2.6 on page 38.
- The desirable minimum width for traffic lanes used by buses is 12-feet. See Figure 2.5 and Table 2.1.
- Roadway grades should be based on bus performance characteristics for grade ascents or descents under fully loaded conditions.

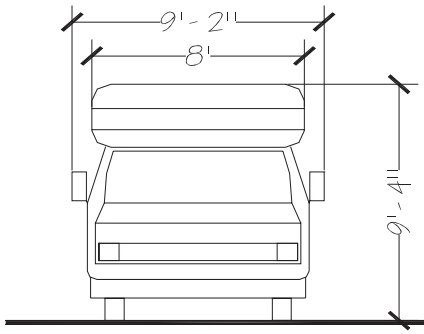


2.1



Seating Capacity= 43
Standing Capacity= 64

2.2



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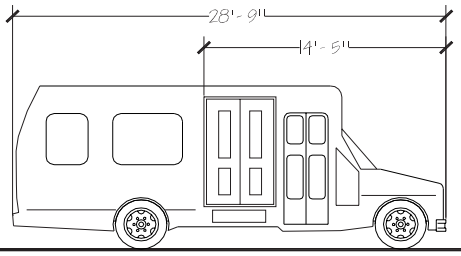


Seating Capacity : Paratransit = 9 to 11, Fixed Route = 15
No Standing Allowed

2.4

Figures 2.1 through 2.4 depict the critical dimensions of bus transit vehicles. Figures 2.1 and 2.2 illustrate a standard 40-foot bus, 2.3 and 2.4 a mini bus.

- Roadway grades should be based on bus performance characteristics for grade ascents or descents under fully loaded conditions.

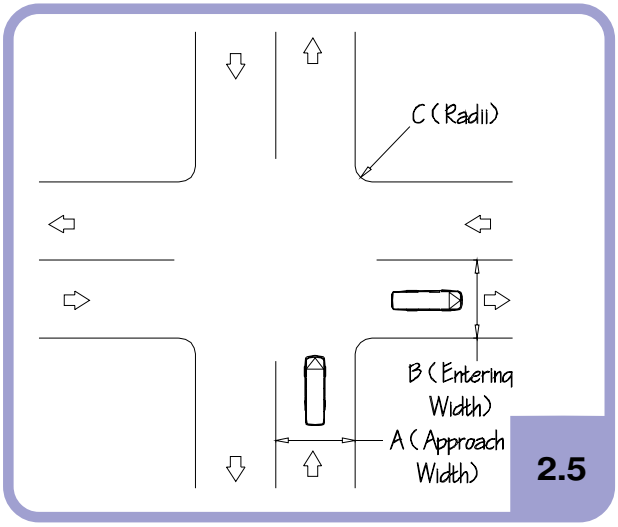
- Turning radii requirements for a standard 40-foot-long city transit bus are as follows:
  - minimum interior radius = 24½-feet,
  - minimum outer radius = 42-feet.[1]

- Additional turning radii will be required under the following conditions:
  - buses turning at speeds greater than 10 mph,
  - buses making reverse turns,
  - turns in areas with sight distance limitations,
  - turns involving changes in pavement grade,
  - turns in areas which restrict the movement of the bus overhang, and
  - buses equipped with bike racks.

- Low or absent curbs make boarding and alighting more difficult for passengers. Higher curbs may interfere with wheelchair lifts.[2]

Possible Materials for Use

Additional consideration should be given to pavement design in areas where buses start, stop and turn; or along roadways with higher bus volumes; or in areas with special soil conditions. Typical asphalt roadways may be subject to additional wear and tear. At bus stops accomodating very high bus volumes, reinforced concrete pads should be provided.

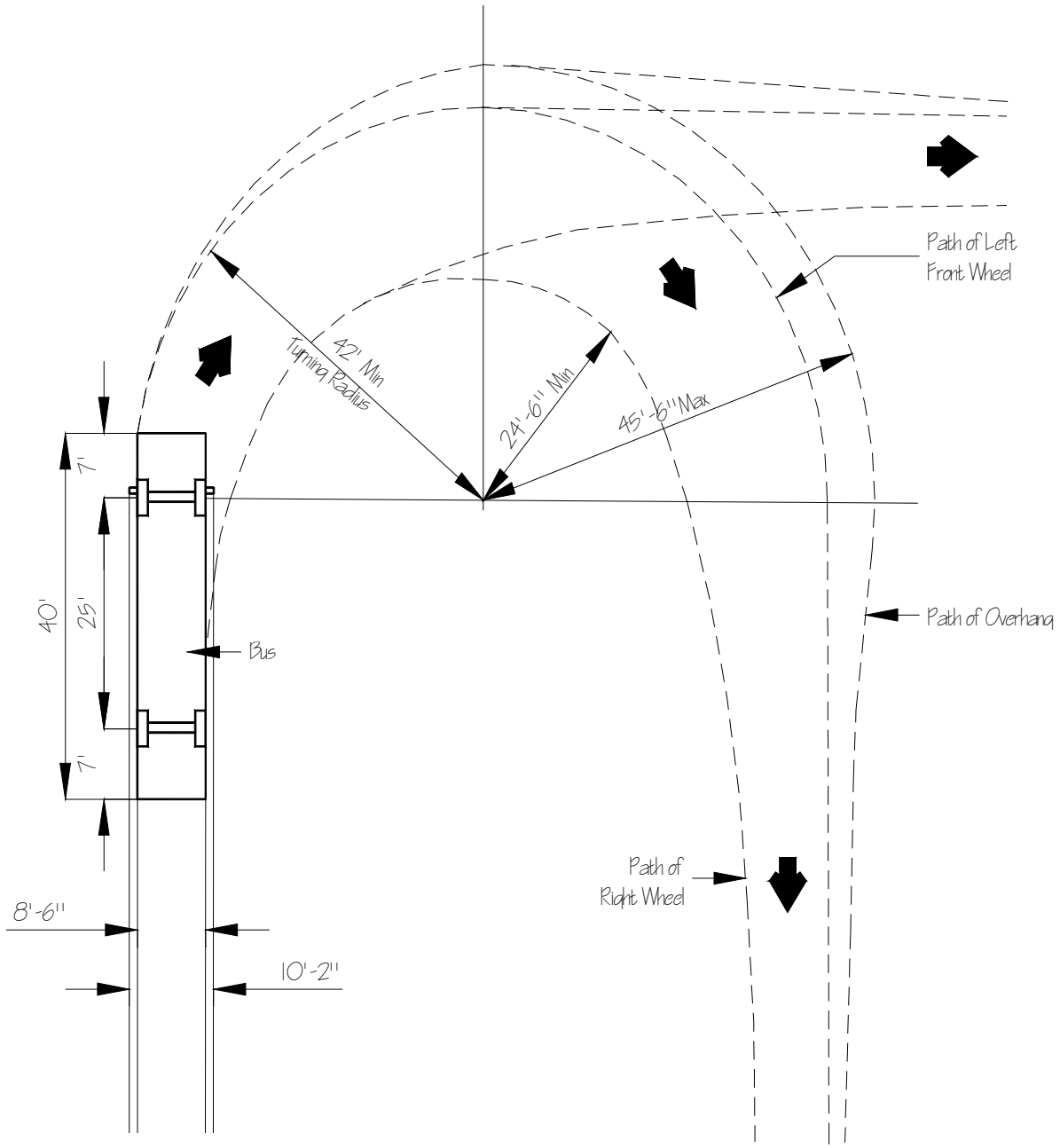


2.5

Important measurements related to bus turning movements.

A Approach Width (feet)	B Entering Width (feet)	C Radii [1] (feet)
12 (1 lane)	12	50
	16	45
	20	40
	24	35
16 (1 lane with 4-foot sholder)	12	45
	16	40
	20	30
	24	25
20 (1 lane with parking)	12	40
	16	35
	20	30
	24	25

Table 2.1



2.6

Template of bus turning movement geometry for a 40-foot bus.

2.3 Bus Stop Location

Purpose

Bus stop locations are generally defined in relation to intersections. They are described as follows:

- at the “far-side” (downstream of the intersection),
- at the “near-side” of the intersection (upstream of the intersection), or
- “mid-block” (halfway between intersections).

Figure 2.7 provides typical dimensions required for each type of stop.

Location Factors

Table 2.2 on page 41 identifies the advantages and disadvantages of various bus stop locations.[3]

Far-Side Stops
Far-side bus stops are generally preferred to near-side stops because they result in fewer traffic delays, provide better vehicle and pedestrian sight distances, and cause fewer conflicts among buses,cars, pedestrians and bicyclists. They are recommended for use under circumstances noted as follows:

- in areas where the right of way permits cars to pass the bus and especially in areas where a near-side stop will impede other motorists,
- where a route alignment requires the bus to turn left before stopping, and
- at complicated intersections with multiphase signals.

Near -Side Stops
Where far-side stops cannot be provided, near-side stops should be located at least 100-feet in advance of the intersection in order to avoid conflicts with vehicles. Use near-side stops on two-lane roads, where vehicles are restricted from going around the bus, in order to prevent the stacking of vehicles in the intersection. Near-side bus stops are also appropriate:

- at prioritized signalized intersections,
- when the bus must stop in the travel lane because of curb-side parking in order for the front door of the bus to access an intersection and crosswalk,
- in combination with curb extensions or bus bulbs to provide direct access from the bus to the sidewalk, and
- in a right turn lane if a queue jump signal is provided to allow the bus to merge back into the travel lane and if accompanied by a sign.[2]

Avoid near-side stops at intersections with dedicated right-hand turn lanes where right-on-red turning is permitted.

Mid-Block Stops
Mid-block stops are generally to be avoided. They are only appropriate when:

- route alignments require a right turn and the curb radius is short,
- the distances between intersections is unusually long,

- major transit generators are located mid-block and cannot be served at the nearest intersection, and

- a marked mid-block pedestrian crossing is present.

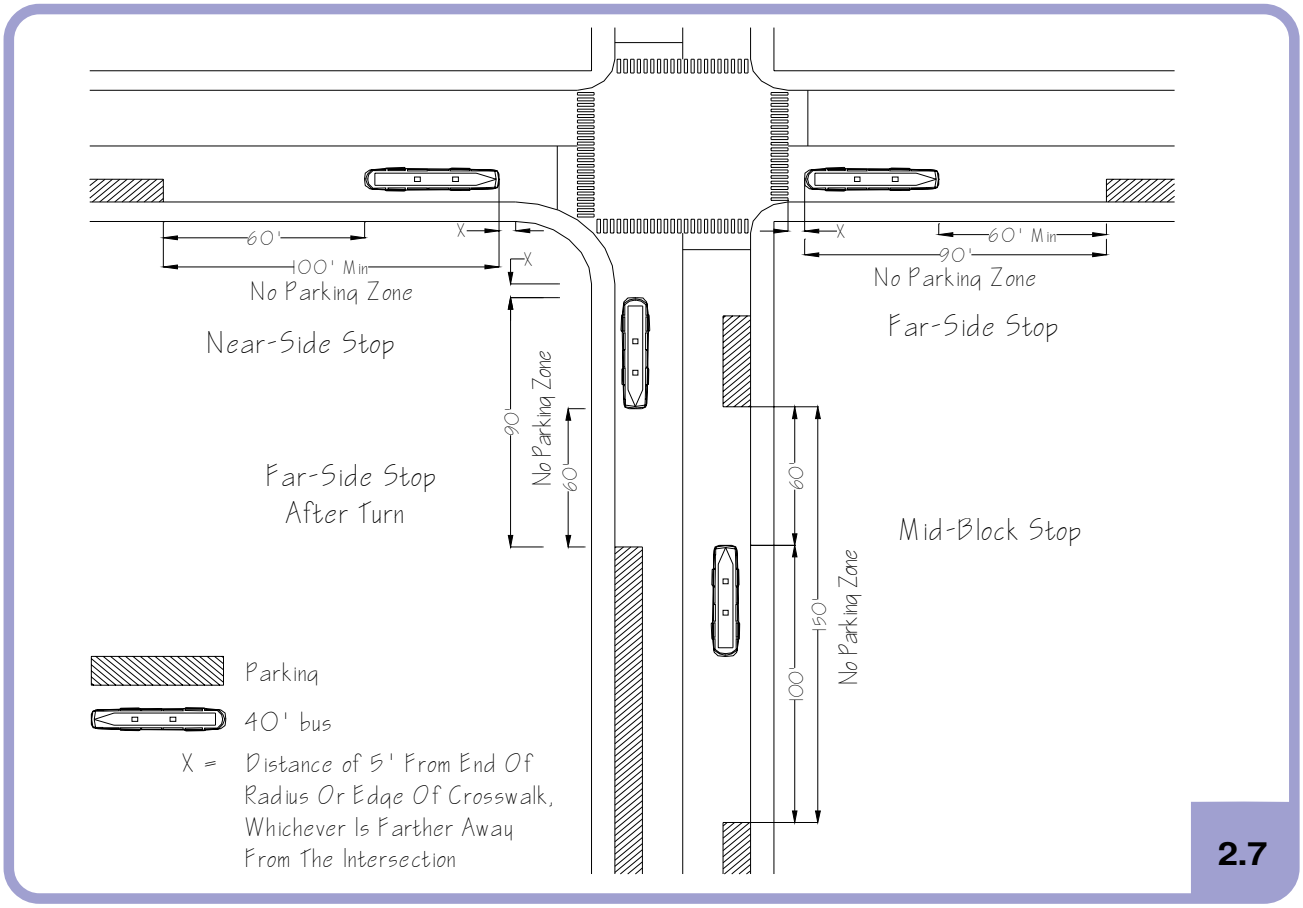
Design Factors

- The bus stop location should minimize the need for buses to change lanes before intersections and before approaches to left-hand turns.[4]

- Bus stops should be clearly identified with signs to indicate that transit vehicles have exclusive use in the stop area.

- The selected location of a bus stop should be chosen to minimize having the stopped buses block driveways. Whenever possible, bus stops should be located beyond driveways to minimize conflicts between buses and other vehicles leaving or entering driveways.[4]

- Bus stops should not be located within 30-feet of a rail crossing if no layover period is planned, and within 50-feet of rail crossings if a layover does take place, in order not to obscure railroad warning pavement markings.



Dimensions associated with bus stops located at different points with reference to the intersection.

Bus Stop Locations

Advantages and Disadvantages of Location Relative to Street Intersections

Near-Side		Far-Side		Mid-Block	
Advantages	Disadvantages	Advantages	Disadvantages	Advantages	Disadvantages
Minimizes interfaces when traffic is heavy on the far side of the intersection. Passengers access buses closest to crosswalk. Intersection available to assist in pulling away from curb. No double stopping. Buses can service passengers while stopped at a red light. Provides driver with opportunity to look for oncoming traffic including other buses with potential passengers.	Conflicts with right turning vehicles are increased. Stopped buses may obscure curbside traffic control devices and crossing pedestrians. Sight distance is obscured for cross vehicles stopped to the right of the bus. The through lane may be blocked during peak periods by queuing buses. Increases sight distance problems for crossing pedestrians. Pedestrians may cross the street in front of the bus, unseen by traffic in the left lane.	Minimizes conflicts between right turning vehicles and buses. Provides additional right turn capacity by making curb lane available for traffic. Minimizes sight distance problems on approaches to intersection. Encourages pedestrians to cross behind the bus. Requires shorter deceleration distances for buses. Gaps in traffic flow are created for buses re-entering the flow of traffic at signalized intersections.	Intersections may be blocked during peak periods by queuing buses. Sight distance may be obscured for crossing vehicles. Increases sight distance problems for crossing pedestrians. Stopping far-side after stopping for a red light interferes with bus operations and all traffic in general. May increase number of rear-end accidents since drivers do not expect buses to stop again after stopping at a red light.	Minimizes sight distance problems for vehicles and pedestrians. Passenger waiting areas experience less pedestrian congestion. Passengers access buses closest to crosswalk.	Requires additional distance for no-parking restrictions. Encourages patrons to cross street at mid-block. Increases walking distance for patrons crossing at intersections.

Table 2.2[2]

2.4 Curb-Side Bus Stop

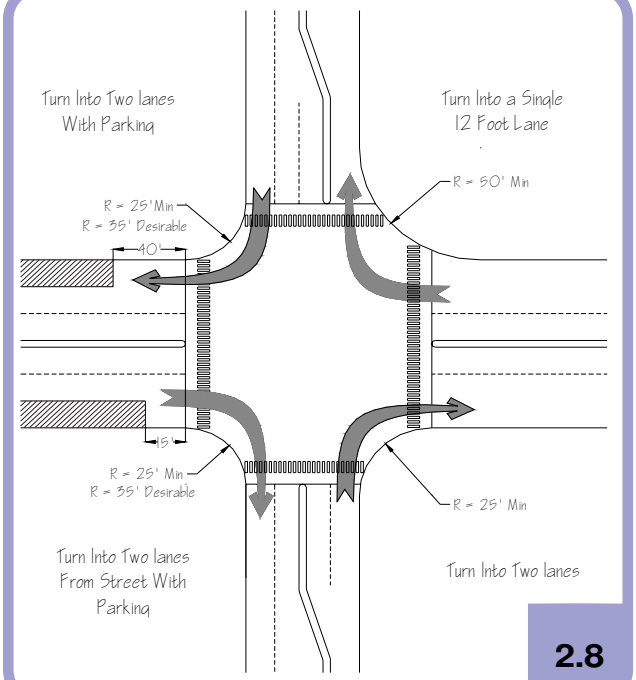
Purpose

Curb-side stops are the most frequently used street-side bus stop facilities. They provide easy access for drivers and result in minimal delays to service. They require minimum design and are easily relocated. In areas with high traffic volume they can result in conflicts with other traffic.

Location Factors

Ideally curb-side stops are provided in locations where:

- there is adequate space in the right of way for improvements like shelters or benches.
- access can be provided for passengers with disabilities,
- major trip generators are nearby,
- connections exist to pedestrian facilities,
- nearby intersections are signalized,
- street lighting exists for nighttime routes, and
- adequate curb length is present to accommodate the bus stop zone.



Geometry and dimensions for buses turning before or after stopping.

Design Factors

Figure 2.7 illustrates typical curb-side bus stop dimensions and Figure 2.8 illustrates turning radii for a bus turning before and after stopping. The following can be noted by these illustrations:

- Far-side curb-side bus stops should be a minimum 90-feet in length.
- Near-side curb-side stops should be a minimum 100-feet in length.
- Mid-block curb-side stops should be a minimum of 150-feet in length.

2.5 Bus Bay

Purpose

Bus bays allow buses to pick up and discharge passengers outside travel lanes. This allows other traffic to flow freely while the bus is stopped, giving priority to non-transit vehicles. Nevertheless, bus bays also increase safety for passengers by increasing the distance between them and moving traffic, and they lessen the chances of a stopped bus being rear-ended by another vehicle.

Location Factors

The following areas are ideal for bus bays:

- areas characterized by high traffic volumes and high traffic speeds (where the actual speed is more than 40 miles per hour),
- areas where other vehicles are prone to colliding with the rear ends of stopped buses,
- areas where a high volume of passengers embark or alight from the bus or where dwell time exceeds 30-seconds during peak hours,
- areas where there are extended layover times to accommodate transferring passengers, and
- areas where there are high volumes of buses at peak hours.

Bus bays at far-side stops should be placed at signalized intersections so that the signal provides gaps in traffic that permit bus re-entry into the travel lane.[2] Near-side bus bays should be avoided because of conflicts with right-hand turning vehicles and delays in service resulting from the difficulty associated with bus re-entry into the travel lane. Bus bays may be appropriate at mid-block stops associated with destinations that are major transit trip generators.

Design Factors

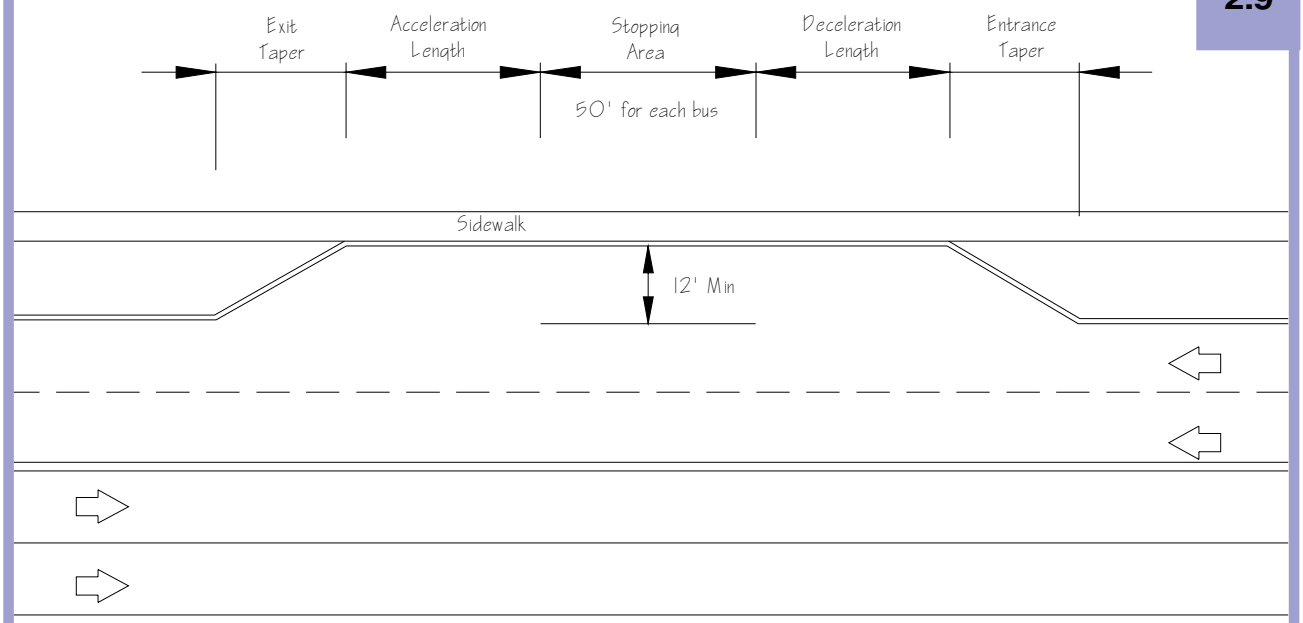
- The design of bus bays should aim to reduce automobile-bus conflict, provide greater separation between traffic and pedestrians waiting for the bus, and allow the bus to quickly regain its travel speed upon its re-entry into traffic.
- Bus bays should be placed in a recessed curb area of the roadway separated from moving lanes of traffic.
- Total length of the bus bay should allow for an entrance taper, a deceleration length, a stopping area, an acceleration length, and an exit taper. See Figure 2.9.

Possible Materials for Use

- The installation of specialty pavement for the bus bay is an effective approach to ensuring safe conditions for passenger activity and entry and exit movements for buses.

- The bus bay pavement may require materials strong enough to sustain the wear and tear associated with accelerating and decelerating buses. Concrete is more resistant than asphalt to wheel rutting and erosion from dripping diesel fuel, and its application may result in reduced maintenance costs.

2.9



Through Speed (mph)	**Entering Speed** (mph)	**Length of Acceleration Lane** (feet)	**Length of Deceleration Lane** (feet)	**Length of Taper** (feet)
25 or less (urban)	15 or less (urban)	80 (desired) 60 (minimum)	80 (desired) 60 (minimum)	-
35	25	250	184	170
40	30	400	265	190
45	35	700	360	210
50	40	975	470	230
55	45	1,400	595	250
60	50	1,900	735	270

Critical dimensions related to bus bays.

2.6 Queue Jumper Bus Bay

Purpose

A queue jumper bus bay, sometimes with signal prioritization, is ideal at traffic signals allowing buses to move ahead of other vehicles or in combination with a right turn only lane at which buses are excepted. Giving buses priority at intersections speeds up overall traffic flow. The buses move in a bus-only lane and get a head start of several seconds over other traffic. See Figure 2.10. For dimensions at various speeds of travel see Figure 2.9.

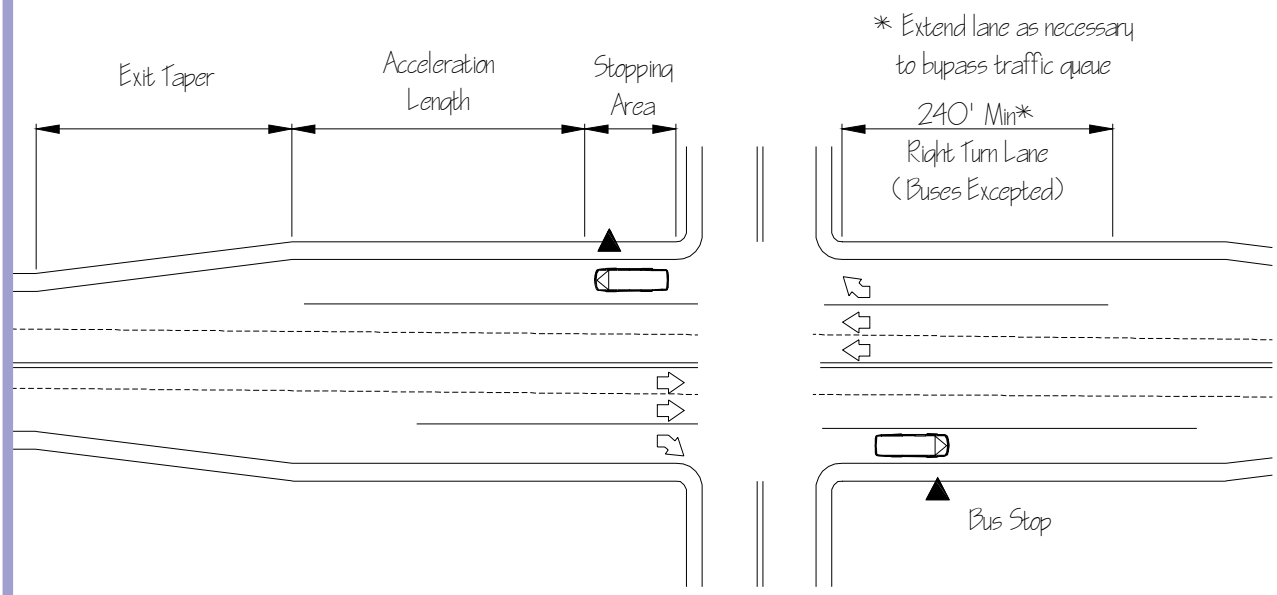
Location Factors

When using a queue jumper bus bay, the bus stop should be at the far-side of an intersection. Near-side stops increase bus dwell time complicating, if not precluding, signal prioritization and preventing effective use of the queue jumper lane.

Design Factors

When designed in combination with a right turn lane, these bus stops consist of a near-side right turn lane and a far-side open bus bay. Buses are allowed to use the right-turn lane to bypass traffic congestion and proceed through the intersection. The right turn lane should be marked with signs. [2]

2.10



Typical configuration and dimensions for a queue jumper bus bay.

2.7 Bus Bulb

Purpose

Bus bulbs, also called curb extensions or nubs, are extensions of the sidewalk into the parking lane. In areas where there are high volumes of pedestrian traffic (such as in traditional downtown areas), bus bulbs allow buses to make curbside stops without weaving in and out of the travel lane. They also provide additional space for bus shelters, benches, and signage, and allow passengers to directly access sidewalks without having to cross between parked cars. Bus bulbs have a positive effect in reducing delays associated with buses re-entering traffic lanes. On the other hand, they can also result in vehicles sometimes stacking behind stopped buses. Usually these queues are relatively short.[7] Figure 2.11 describes bus bulb dimensions.

Location Factors

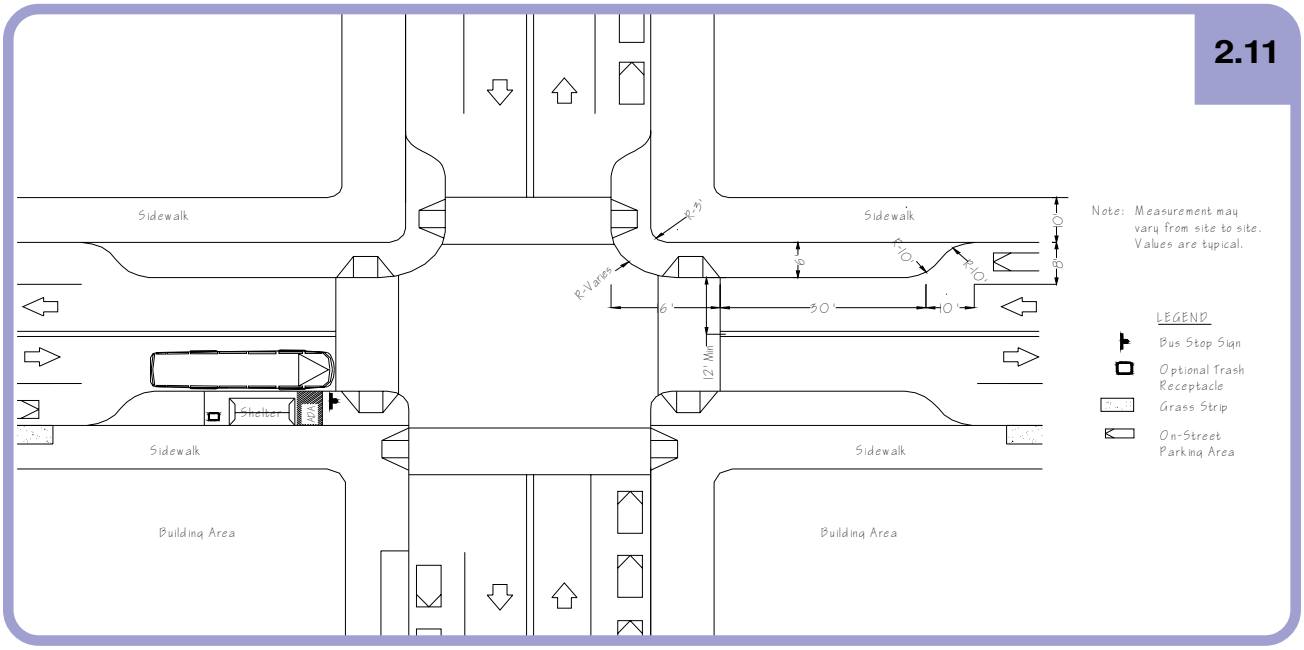
Bulbs should be located:

- in areas where buses experience delays in re-entering the traffic lane,
- in areas where traffic calming is desired,
- on streets that are perceived to be pedestrian friendly,
- on the near-side of signalized intersections, and
- in low traffic volume areas or on streets with diagonal or parallel parking.

Bus bulbs should not be located:

- on high-speed or high-volume facilities,
- where vehicle stacking behind a stopped bus is viewed as problematic,and
- at stops where the bus route requires the bus to make a right hand turn.[7]

2.11



Dimensions for a bus bulb.

2.8 Off-Street Half-Sawtooth Bus Bay

Purpose

Half-sawtooth bus bays are used in areas where space is limited in order to provide the optimum number of bus loading areas. The bay configuration allows buses to pull in and out of bays without having to wait for buses ahead of them to exit and without having to travel in reverse gear.

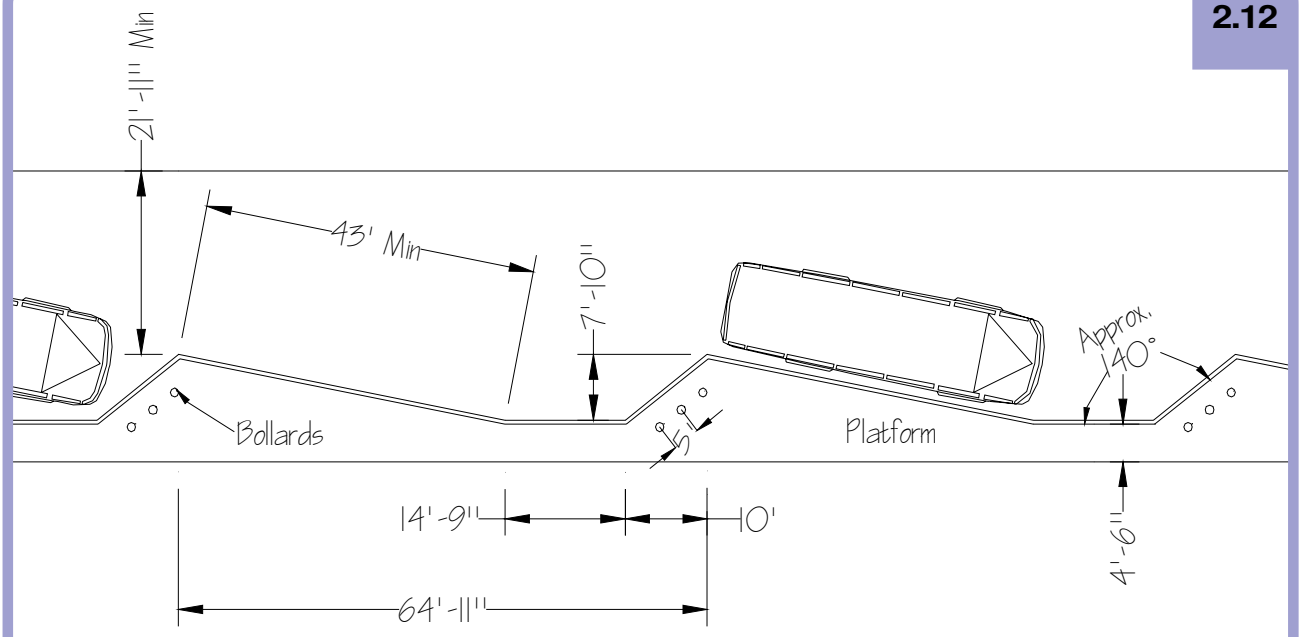
Location Factors

Compared to parallel bus bays, half-sawtooth bus bays require greater station width but allow for shorter stations. Half-sawtooth bus bays should be used at off-line transfer centers where the length of the site is limited but where the depth of the site is adequate to accommodate bus movement in and out of bays. Half-sawtooth bus bays are also preferred at locations where parallel buses may result in delays caused by more than two buses stopping at one time.

Design Factors

- The loading lane width shown in Figure 2.12 is the minimum berth length required for 40-foot buses with bus-mounted bike racks. The bus berth lengths must be increased for articulated buses.

2.12



Dimensions for an off-street half sawtooth bus bay for a 40-foot bus equipped with a bike rack .

2.9 Bike Lanes

Purpose

Bike lanes are portions of the right of way set aside for exclusive or preferential use by bicyclists. They are designated by striping, signage and surface treatments. If properly designed, bike lanes provide a viable transportation network in a balanced transportation system.

Additional information on bicycle facilities can be found in the *Guide for the Development of Bicycle Facilities* published by the American Association of State Highway and Transportation Officials.

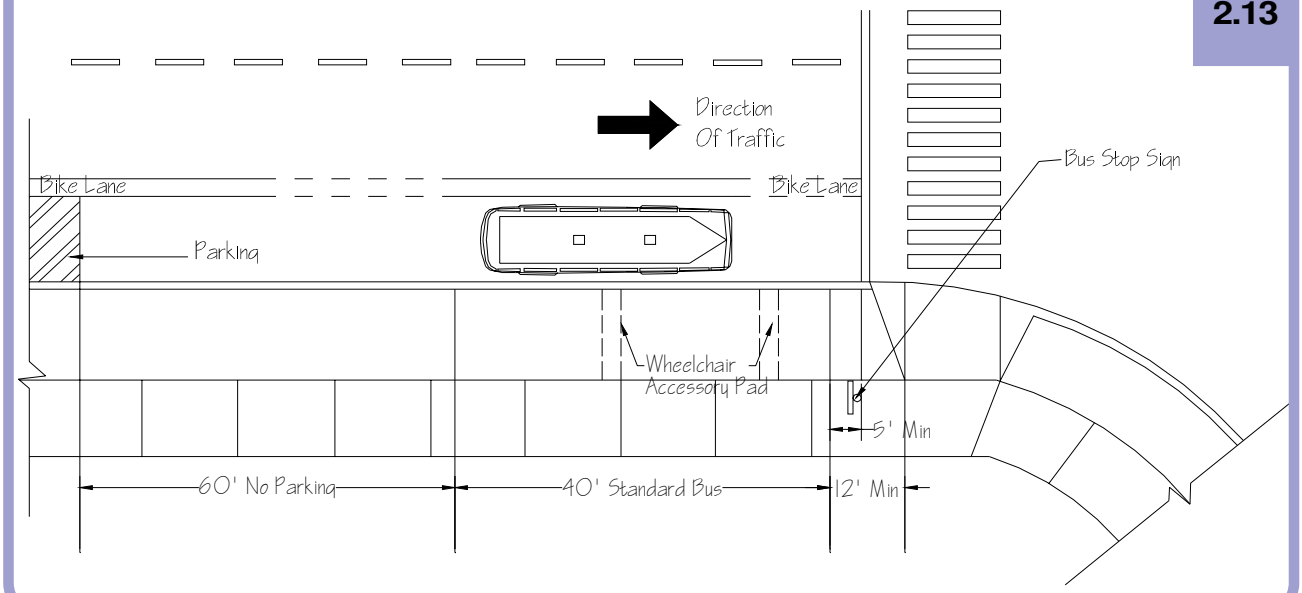
Location Factors

Bike lanes are generally portions of the roadway or provided on alternative paths. Cyclists are discouraged from using sidewalks in order to reduce conflicts with pedestrians.

Design Factors

- In designing bike lanes, conflict with other modes of transportation should be minimized.
- When conflict is inevitable, the shared area should be marked for visual attention. For example, when a bus stop is located in a bus bay, a potential conflict results between bicycles and transit vehicles. Dashed line pavement markings should be used to insinuate such potential conflicts. Figure 2.13 shows a recommended bike lane treatment for such cases.
- Bike networks should connect with other modes of transportation. Use of bikes in combination with public transit ensures improved low-density suburban public transportation.

2.13



A typical bike lane-curb side bus stop configuration.

2.10 Pedestrian Crossings

Purpose

Pedestrian systems and vehicle systems overlap at intersections, posing conflicts between different modes of travel. Marked crosswalks guide pedestrians to walk at the safest location and alert vehicle operators to pedestrians' presence. Crosswalks are essential to bus passengers who may have origins or destinations on either side of the roadway. All streets that are directly served by transit, therefore, should also be designed or retrofitted to serve crossing pedestrians. Streets within an area that is walkable to and from a transit stop should be designed to accommodate pedestrians as well.[3]

Location Factors

Pedestrian crossings should be provided minimally at the following locations:

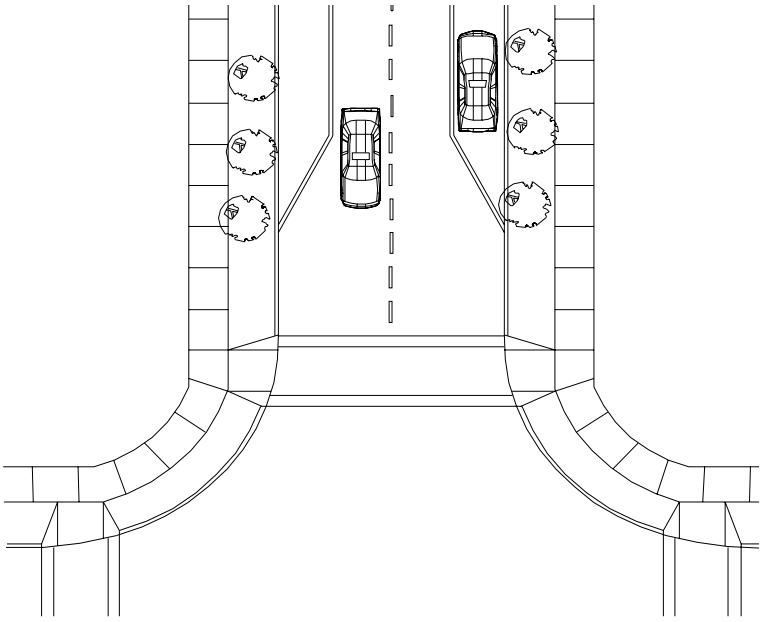
- intersections where bus passengers are required to cross streets to transfer between routes,
- signalized intersections in urban areas should have marked crosswalks on all four legs unless there is a specific reason to direct pedestrians to alternative crossing locations,
- where a marked crosswalk can channel pedestrians to a single crossing location,
- where there is a need to delineate an ideal crossing location due to confusing street geometries,[4] and
- unsignalized intersections where there are no signalized crossings within 600-feet.

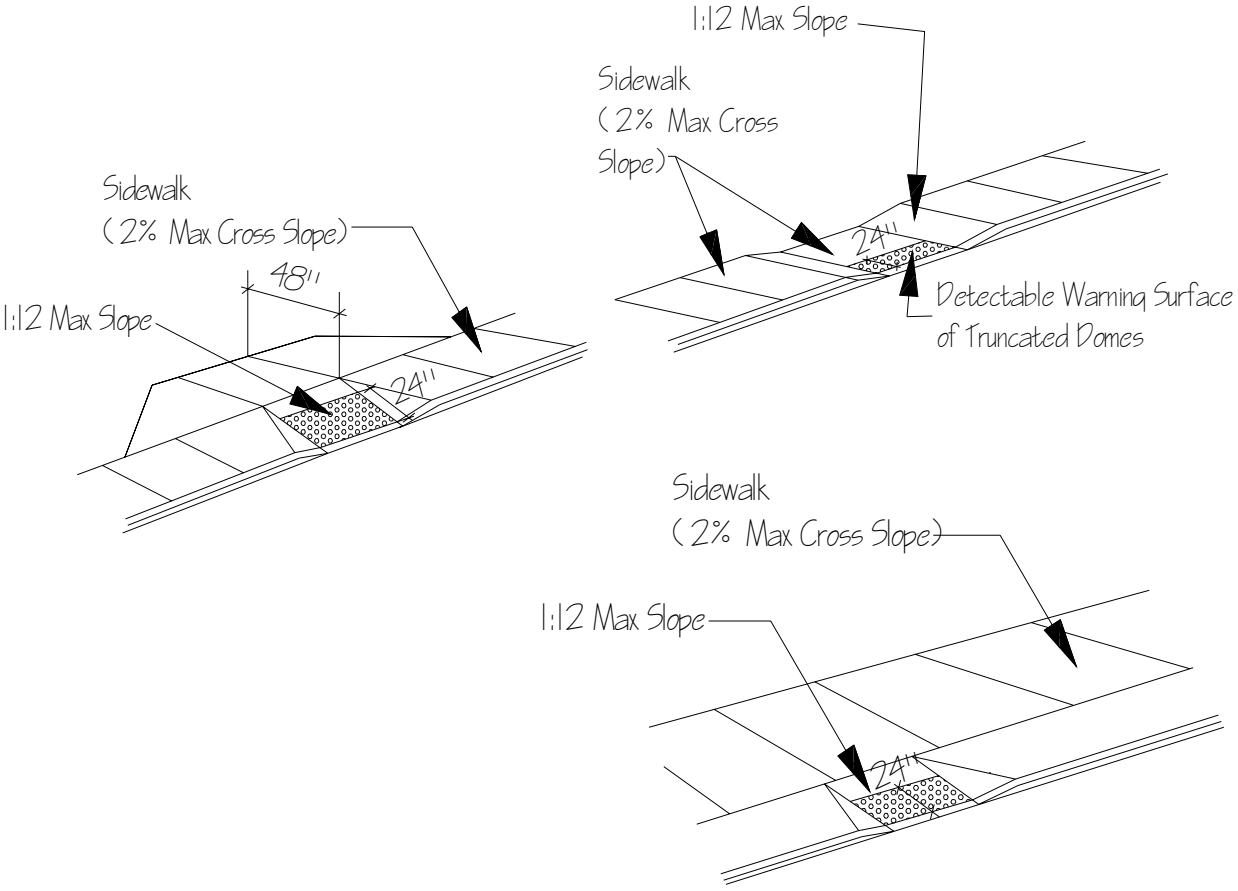
Crosswalks should not be located at unsignalized intersections or:

- where the speed limit exceeds 45 miles per hour,
- on a roadway with four or more lanes without a raised median or crossing island that has (or will soon have) an average daily traffic of 12,000 vehicles per day or greater, or
- on a roadway with four or more lanes with a raised median or crossing island that has (or will soon have) an average daily traffic of 15,000 vehicles per day or greater.[7]

Design Factors

- Ideally, the number of delineated crossing points should be maximized in order to prevent streets from becoming barriers and to dissuade pedestrians from crossing at unpredictable places.
- Crosswalks should be no less than 6-feet wide. Crosswalks of at least 10-feet are preferred. Greater widths may be necessary where the volume of pedestrian traffic is high.
- Special crosswalk markings and pavements increase the visibility of the crosswalk. Too much texturing, however, negatively impacts wheelchair and cane users.
- ADA-compliant wheelchair ramps (two per corner preferred) should be provided at all crosswalks. See Figure 2.14.
- If a raised central median extends into the crosswalk, an ADA compliant channel must be provided through the median.[9]





Some alternatives for accessible curb ramps.

2.11 Intersection Nubs

Purpose

Intersection nubs are extensions of the sidewalk, usually into the parking lane, that reduce pedestrians' crossing distances and that make pedestrians more visible to drivers. They should be designed to allow for bus turning movement and can be incorporated into bus bulbs. They also have a traffic calming effect.

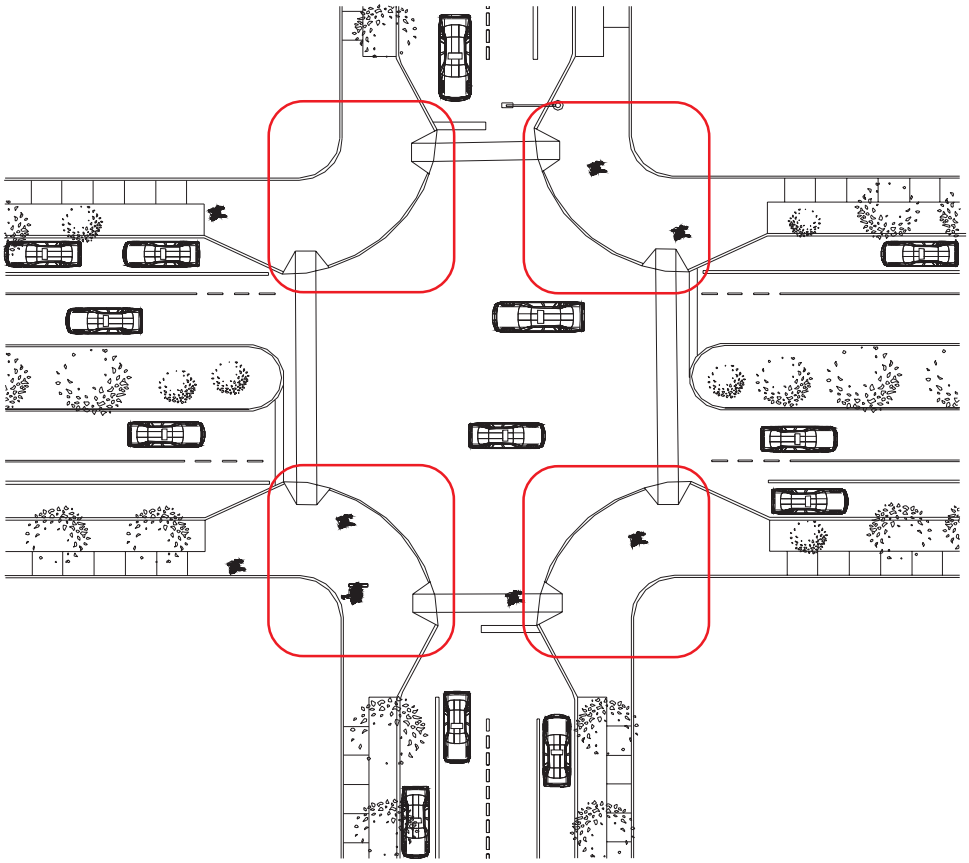
Location Factors

- Nubs are appropriate in areas where there are significant volumes of pedestrian traffic and at intersections with roads that have parallel or diagonal on-street parking. See Figure 2.15.
- Nubs should be avoided at intersections where the bus route requires the bus to make a right turn.

Design Factors

- Nubs should extend into the street for the width of a parking lane.
- Nubs should be used on mid-block crossings where feasible.

2.15



A street intersection improved with pedestrian nubs.

2.12 Raised Pedestrian Crossing/Speed Table

Purpose

Speed tables promote the smooth flow of traffic at slow speeds at pedestrian crossings. They raise the surface of the road over a short distance.[9]

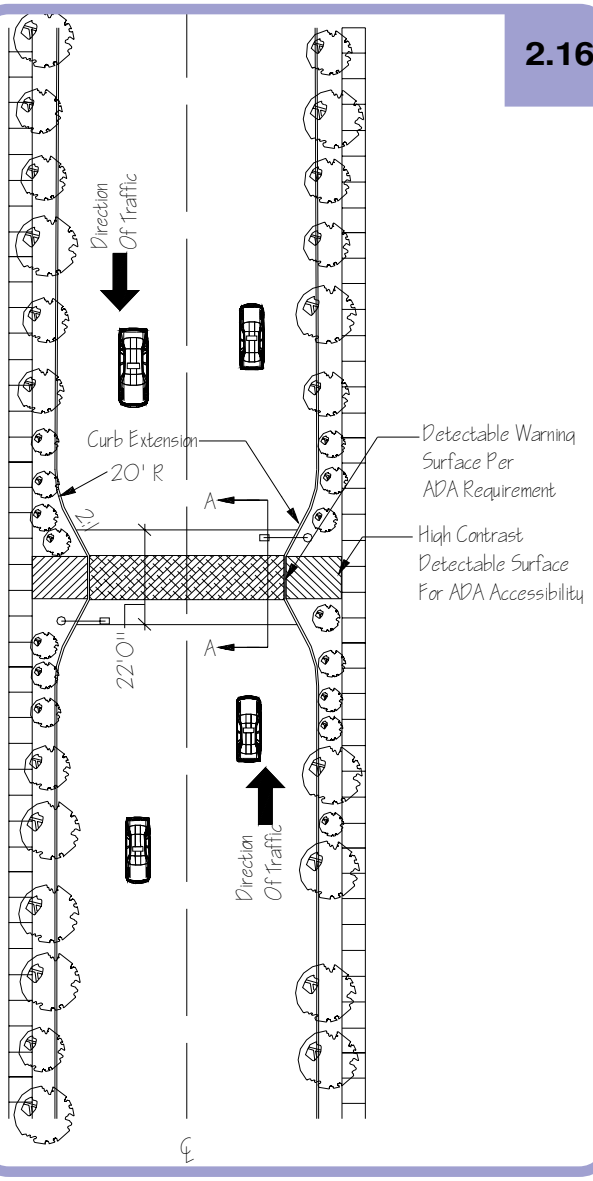
Location Factors

- Speed tables are useful in central business districts or in other areas where there is a high volume of pedestrians.[9] See Figure 2.16.
- Speed tables are not appropriate for high speed or high volume roadways.[9]

Design Factors

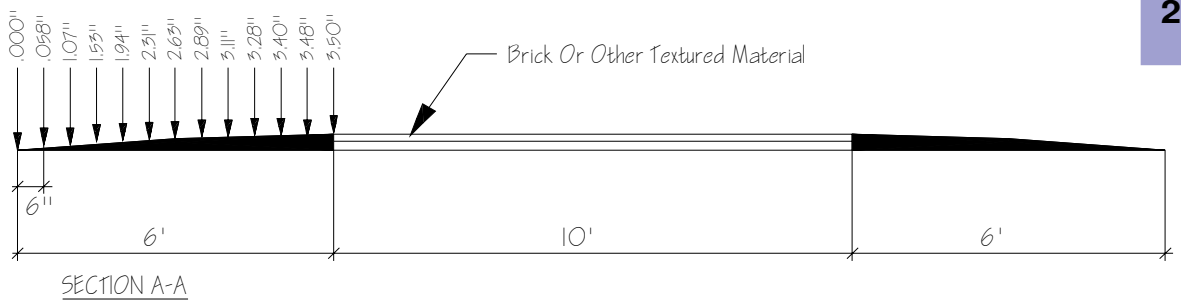
- The most common type of speed table is 3- to 4-inches high and 22-feet long in the direction of travel. It has 6-foot ramps at the ends and a 10-foot field on top. This design generally produces an 85th percentile speed of 25 to 30 miles per hour. Varying dimensions achieve desired target speeds for given applications.[9] See Figure 2.17.

2.16



A raised pedestrian crosswalk in plan.

2.17



A raised pedestrian crosswalk in cross section.

2.13 Pedestrian Islands

Purpose

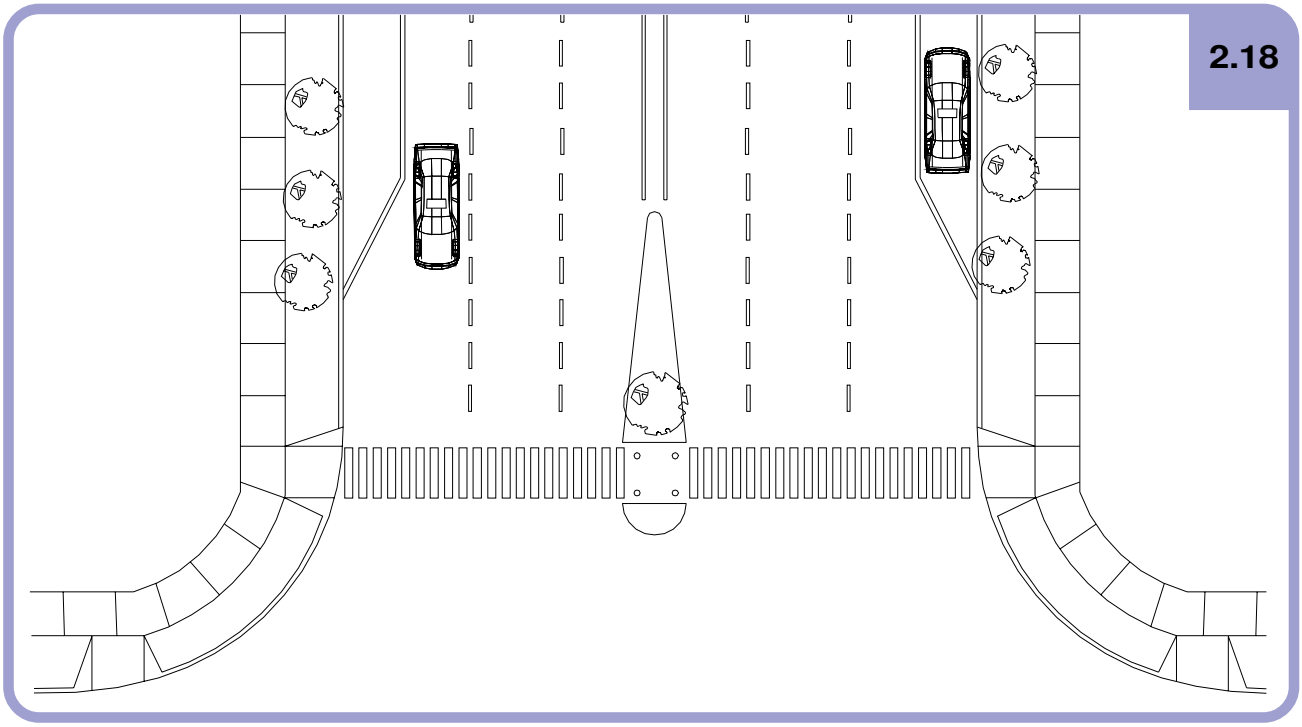
Pedestrian islands are extensions of the median into the crosswalk area in order to improve safety for pedestrians and vehicles. They provide an area within an intersection where pedestrians may safely wait until vehicular traffic clears, allowing them to cross streets. These islands are particularly helpful for older and disabled pedestrians unable to cross the street during the available signal time. See Figure 2.18.

Location Factors

- Pedestrian refuge islands work well on multi-lane streets and where long pedestian crossing distances exist.

Design Factors

- Refuge islands should be a minimum of 4-feet wide by 8-feet long.
- Pedestrian refuge islands should be well illuminated by curb-side street lighting.
- If a raised central median extends into the crosswalk, an ADA compliant channel must be provided through the median.[9]



2.18

A street intersection improved with a pedestrian island.

2.14 Notes

Text References

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[5] Science Applications International Corporation. (1999). *Transit friendly design guidelines*. St. Petersburg, FL: Pinellas Suncoast Transit Authority.

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3 Facility Prototypes

3.1 Introduction

This chapter provides transit agencies and others with facility prototypes that show different combinations of the elements described in the first two sections. Those elements have been developed as a "kit of parts" that can be assembled by agencies in different ways. Specific combinations depend on the site, the facility function, the transit agency's operational plans, land availability, and the available budget. The handbook places an emphasis on relatively low-cost facilities with interchangeable elements to allow for easy maintenance.

The development pattern represented in the handbook is typical of Florida's relatively low density, auto-oriented urban and suburban fabric. This development pattern, like most of the urban contexts faced by transit agencies, poses specific mobility and accessibility challenges for bus passengers and bus operators. Care has been taken to identify feasible methods of enhancing accessibility and mobility within these contexts.

Hierarchy of Bus Stops

Most transit systems consider their bus passenger facilities within a hierarchy based on the number of passengers or bus routes served. The hierarchy used here includes local on-line bus stops, primary bus stops, transit malls, transfer centers, and park-and-rides.

Each prototypical facility in this section is accompanied by a description of the facility and the site, the required site area, a description of pedestrian connections and connections to other modes of transportation, and an inventory of the individual design elements that are combined to create that facility.

When adding parking spaces (including in park-and-ride facilities), it is advised that agencies consult the Florida Department of Transportation's *Project Development and Environment (PD&E) Manual* and its *Plans and Preparation Manual (PPM)*.

Other kinds of facilities also exist. The most common of these is the simple unsheltered bus stop without a bench. The standards for these stops can be found in the design guidelines in the first section of the handbook. At the other end of the spectrum are intermodal centers and transit terminals, significant facilities that accommodate passengers transferring between local and intercity buses or local buses and taxis, passenger vehicles, and other transportation modes. Because their construction almost always involves the hiring of an architect and/or structural engineer, and because they represent a significant capital outlay (often achieved through a partnership among local governments, the state department of transportation, and the Federal government), we have not attempted to reproduce in this handbook the complex process of design, architectural programming, and transit planning necessary to build these facilities. The handbook does, however, provide direction to agencies seeking to write requests for proposals (RFPs) for architectural design services. (See Appendix F for sample language for a request for proposal for a bus stop evaluation program).

3.2 On-Line Bus Stop

On-line bus stops provide access to transit in a variety of locations. They may be located in the rights of way of arterial roadways or collector streets and, in some cases, along local roads. They may also be adjacent to a variety of land uses. The facility should serve to connect pedestrian ways with bus loading areas, and sidewalks should provide connections to nearby destinations. A prototypical site plan is depicted in Figure 3.1. Figure 3.2 shows a detailed plan with an Americans with Disabilities Act (ADA) compliant landing area. Figures 3.3 and 3.4 depict on-line stops in Volusia County and Hillsborough County, Florida.

Adjacent Land Use:
Commercial district.

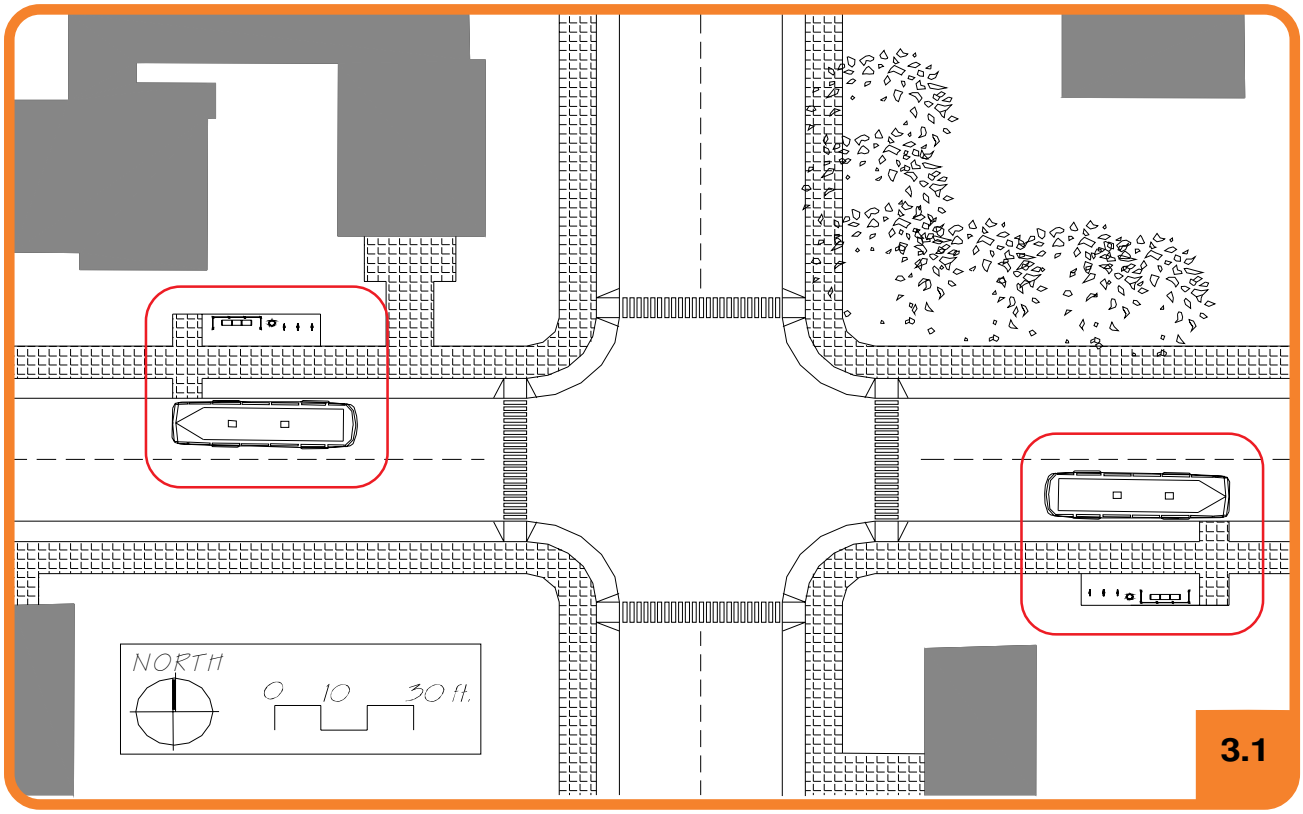
Approximate Site Area:
200-square feet each.

Street Characteristics:
Collector street with stop signs, sidewalks on both sides of the street, no streetside parking.

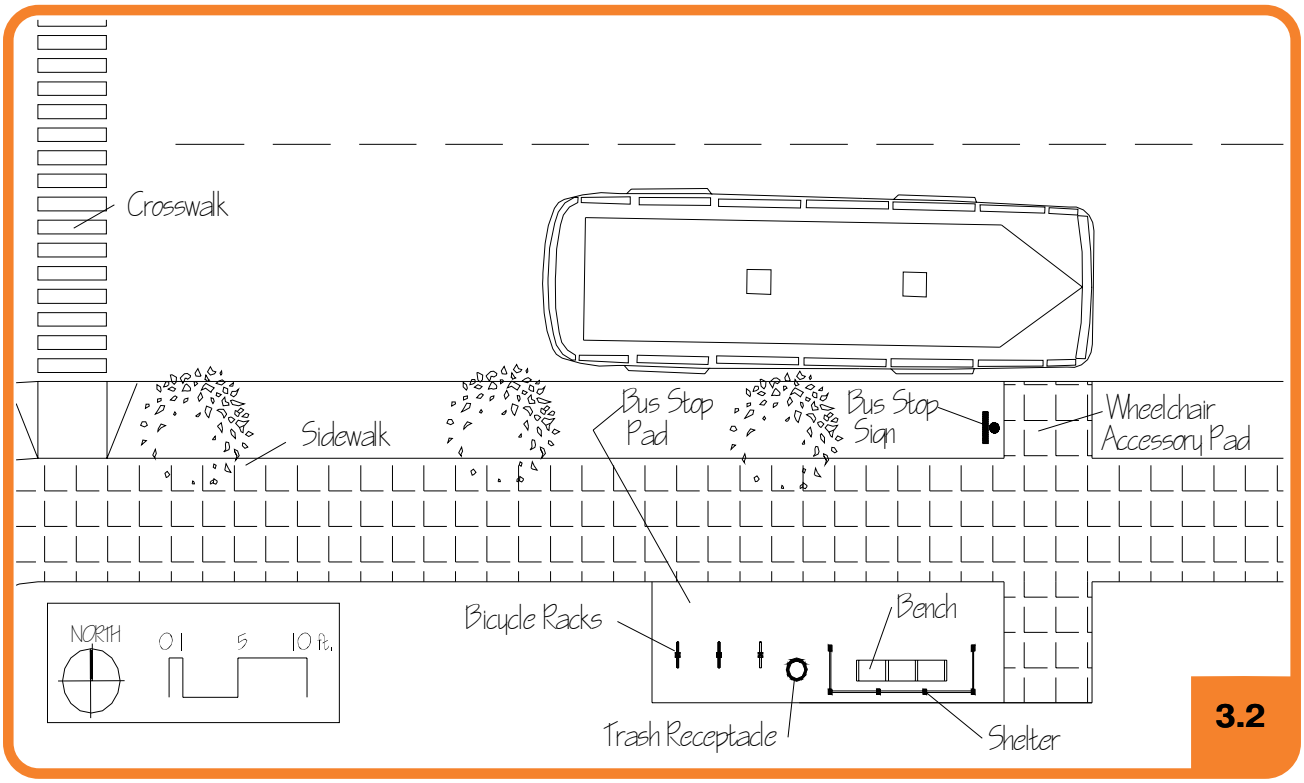
Bus-side Elements:
Far-side, curb-side bus stop.

Curb-side Elements:
Sheltered bus stop with bench, trash receptacle, bike racks on transit landing pad.

Pedestrian Connections:
Sidewalk connections to landing pad and bus loading area connected across streets with crosswalks.



Typical curb-side, on-line sheltered bus stops located at the far-side of an intersection.



A detailed plan of an on-line curb-side bus stop.

An on-line curb-side bus stop in Volusia County, FL.

An on-line curb-side bus stop in Hillsborough County, FL.

3.3 Primary Stop

Primary bus stops provide transit access to important destinations whose density of employees or residents results in either high peak hour use or regular use several times a day. The facility may also serve as a transfer point for passengers transferring between routes. A raised crosswalk functions not only to alert drivers of pedestrian movement but acts as a traffic calming speed table. Figure 3.5 depicts a typical employment center site while 3.6 shows a detailed plan and 3.7 shows a view of the primary stop proptype facility.

Adjacent Land Use:
Office park employment center.

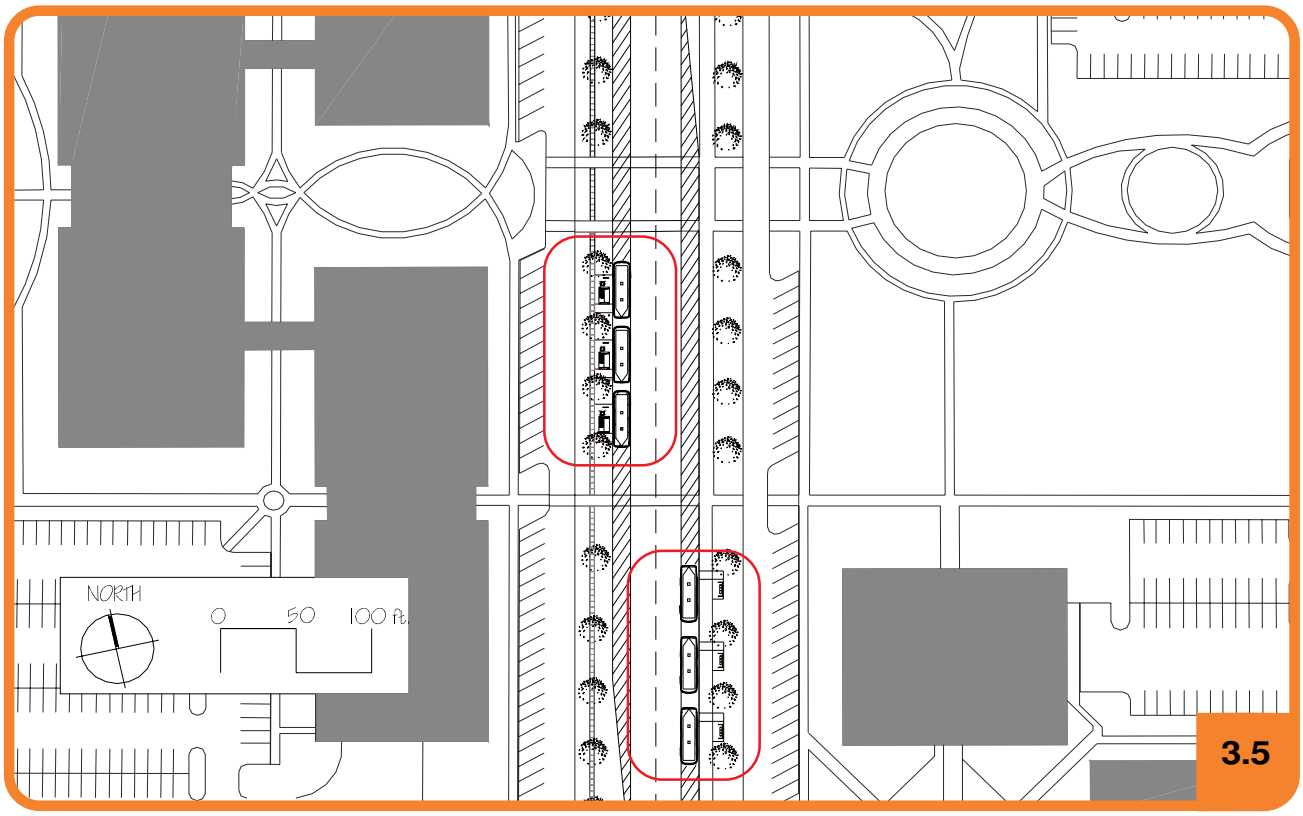
Approximate Site Area:
600-linear feet per side by 40-feet deep.

Street Characteristics:
Limited access arterial with signalized intersections, sidewalks on both sides, no streetside parking.

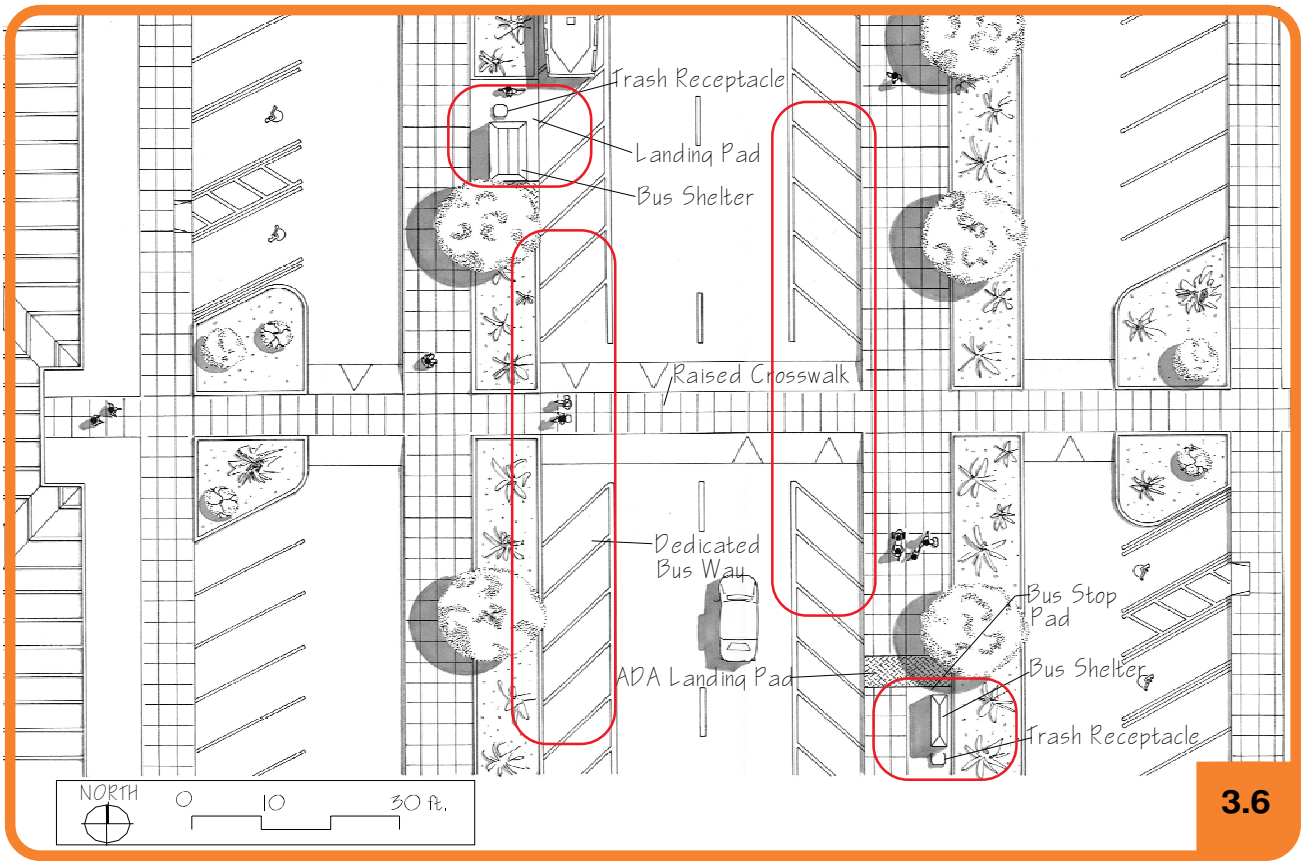
Bus-side Elements:
Bus bay.

Curb-side Elements:
Sheltered bus stop with bench, trash receptacle on transit landing pad.

Pedestrian Connections:
Sidewalk connections to landing pad and bus loading area connected to building entrances.

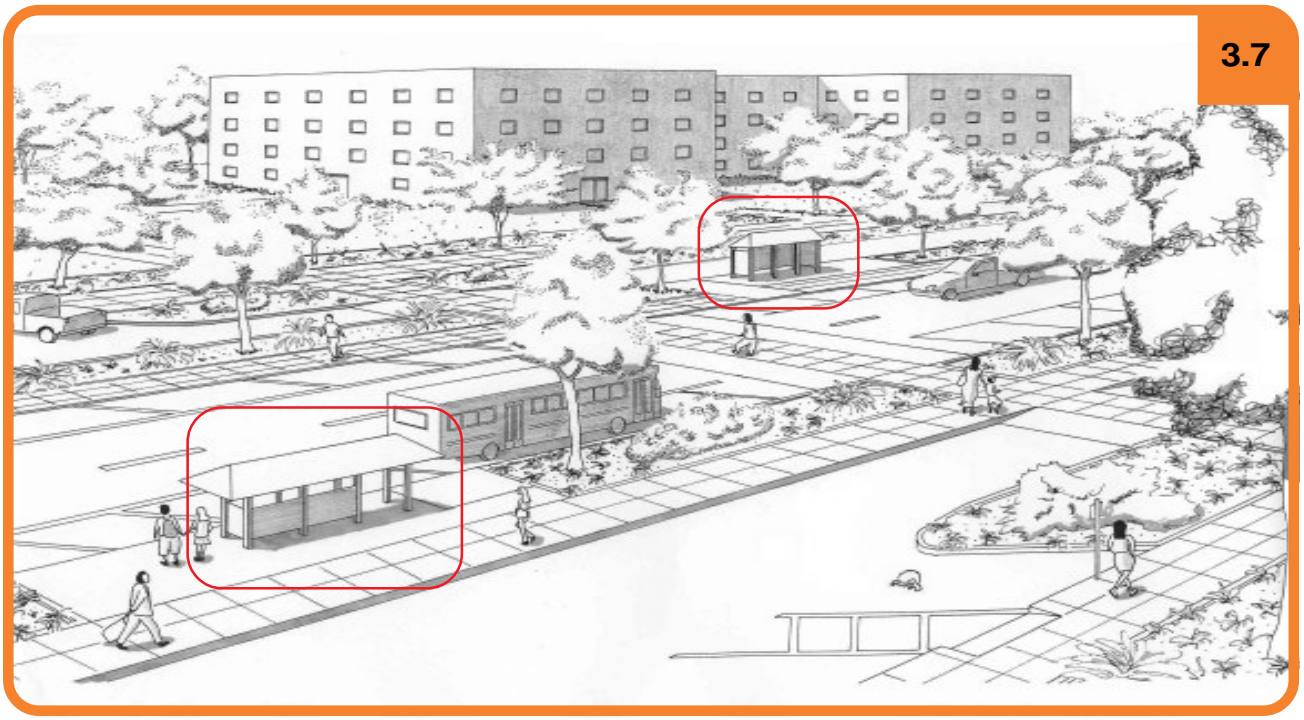


A primary bus stop serving three routes located near an employment center.



3.6

A detailed plan of a primary bus stop.



3.7

A view of a primary bus stop.

3.4 Transit Mall

Transit malls provide transit access to traditional downtowns and centers and serve as a base for local circulator service, express routes, and other special modes of bus transit. The facility may also serve as the first element in a Bus Rapid Transit (BRT) mode of service provision. Figure 3.8 shows a transit mall site. Figure 3.9 shows a typical road section for a transit mall. Figure 3.10 shows a detailed plan of the intersection. A stop along HARTline's downtown Tampa transit mall is depicted in Figure 3.11. A view of the prototype transit center is shown in Figure 3.12.

Adjacent Land Use:
Mixed uses in a traditional dowtown or center.

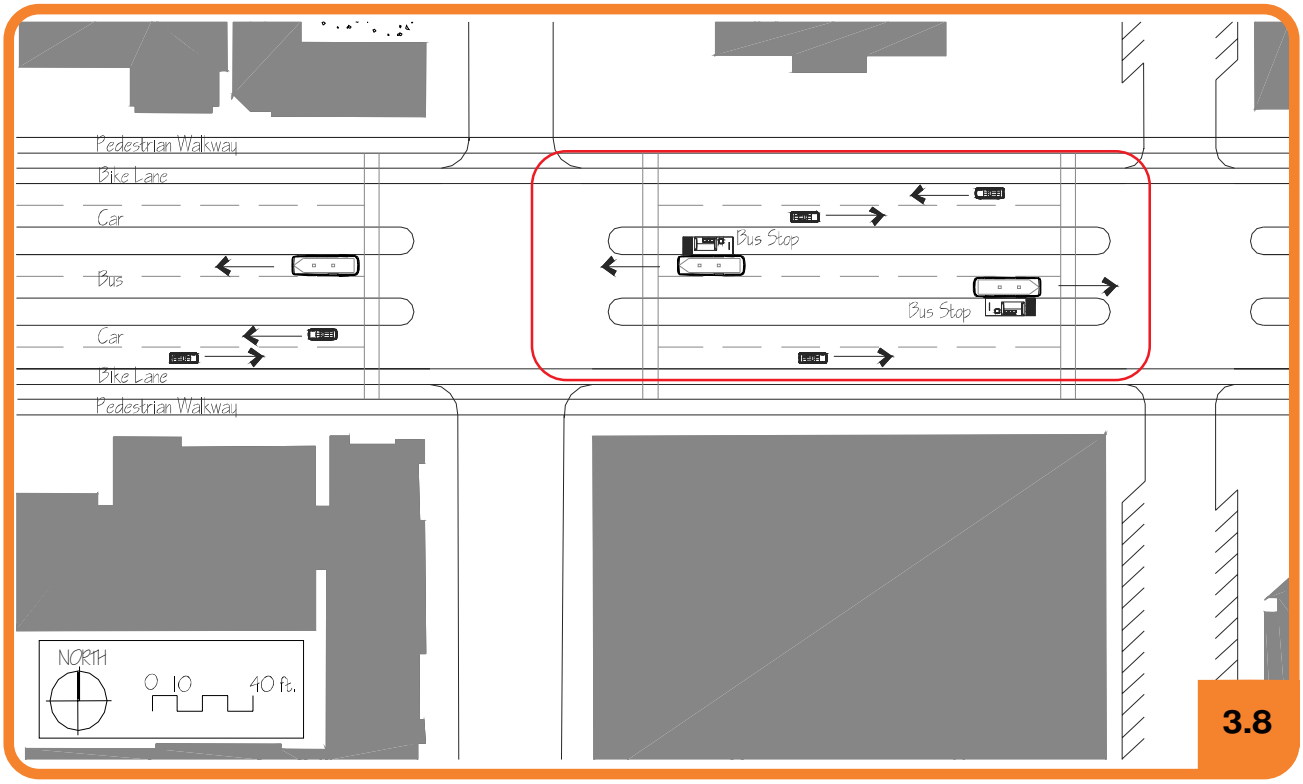
Approximate Site Area:
40-foot wide dedicatation of total right of way.

Street Characteristics:
Dedicated two-way busway located within a major arterial street.

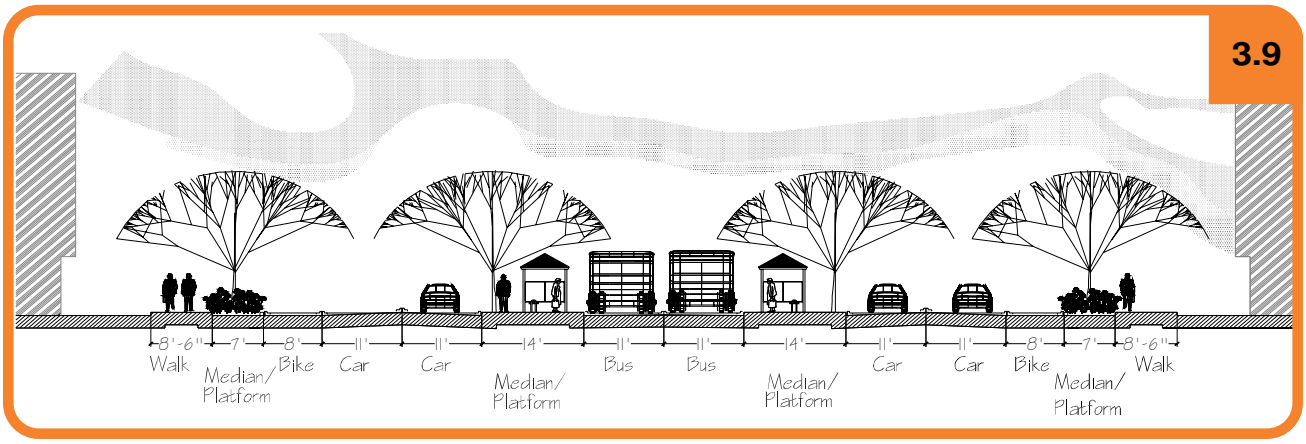
Bus-side Elements:
Curb-side stops in a dedicated busway.

Curb-side Elements:
Sheltered bus stop with benches and trash receptacles on transit landing pads.

Pedestrian Connections:
Sidewalks connect landing pads and bus loading areas at the transit station with building entrances via speed table crosswalks with pedestrian refuges.

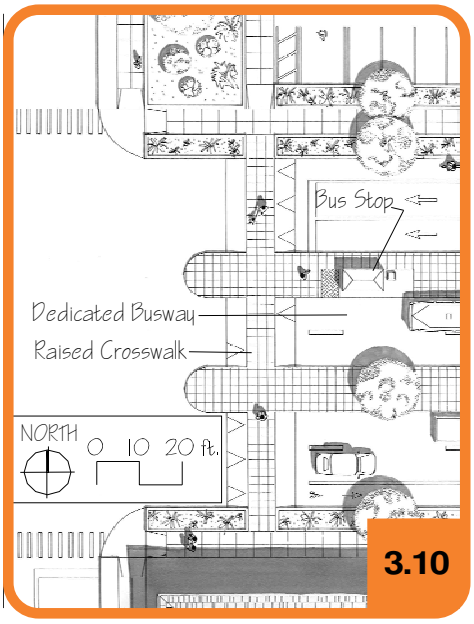


A downtown transit mall with a dedicated busway.



3.9

Cross-section of the right of way for a transit mall.

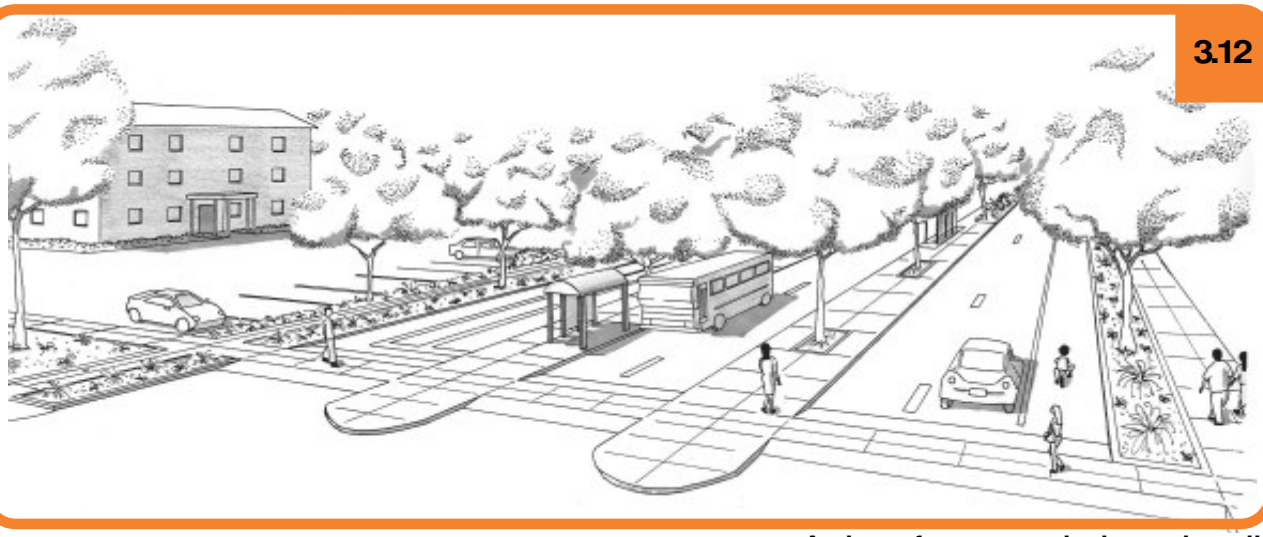


3.10

Detailed transit mall plan.

3.11

HARTLine's transit mall in downtown Tampa, FL.



3.12

A view of a prototypical transit mall.

3.5 Transfer Center

Transfer centers serve as major nodes in the transit network connecting various regional and local bus lines and express routes and circulator services. Transfer centers are designed specifically to ease transferring between bus routes and between bus transit and other travel modes. They may also work as a kiss-and-ride facility. They are often located within major activity centers. Because they accommodate transferring passengers and multiple bus routes, transfer centers will operate most successfully if good way-finding devices are in place. It is important to alert passengers to the correct bus berth with individual signposts.

Adjacent Land Use:
Commercial or mixed uses in a major retail activity center. While the building orientation depicted in this example is not optimal, it is typical of development in Florida. Optimal land use configuartions are discussed in Chapter 4 of this handbook.

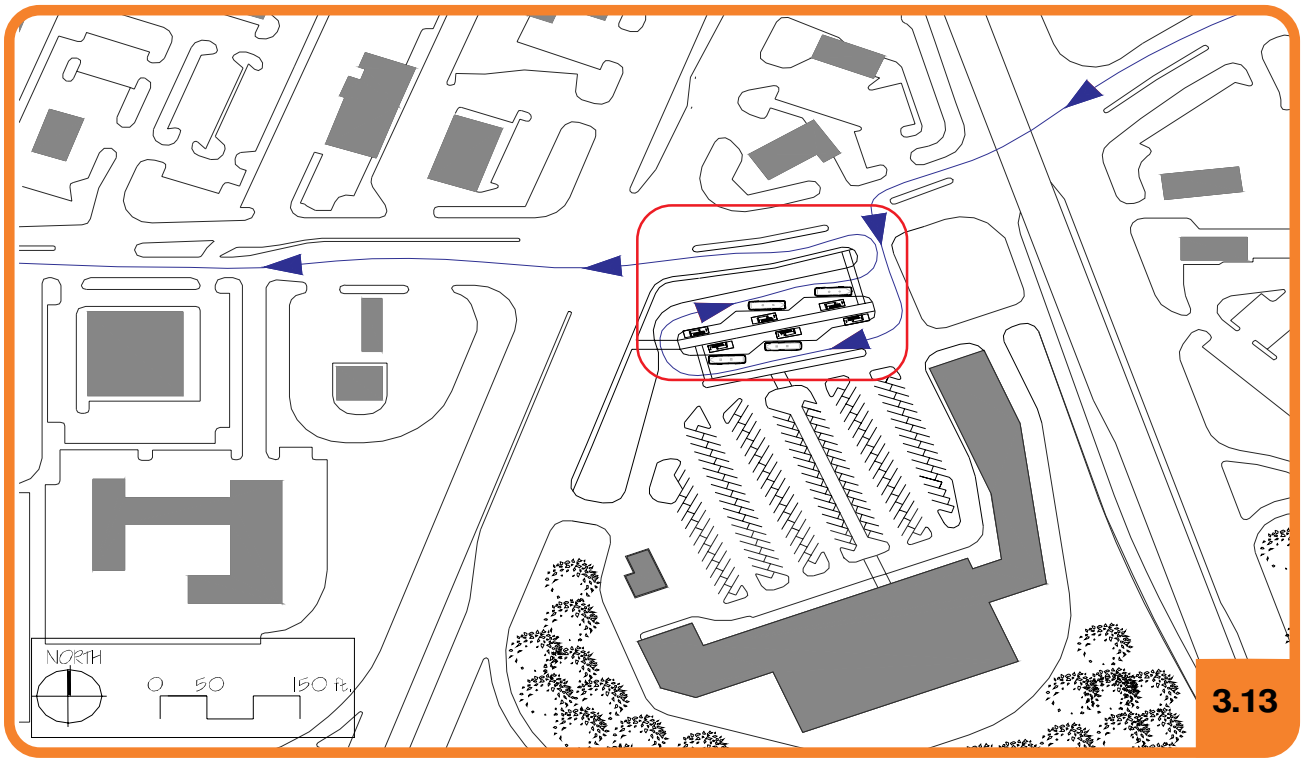
Approximate Site Area:
1¼-acres.

Street Characteristics:
Intersection of major arterials adjacent to a highway interchange. See Figure 3.13.

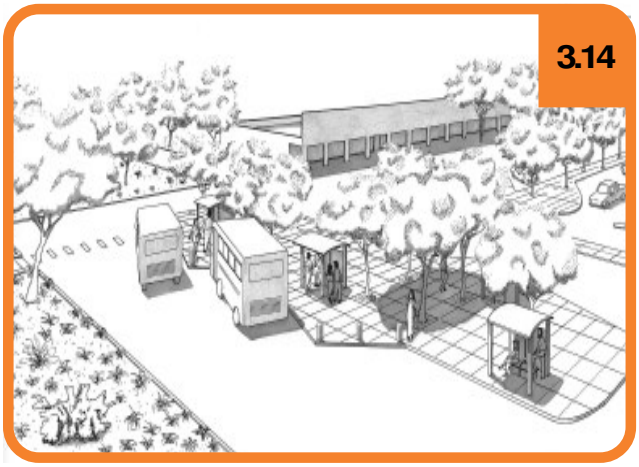
Bus-side Elements:
Off-line center with dedicated bus travel lanes and half-sawtooth bus bays. See Figures 3.14 through 3.16.

Curb-side Elements:
Sheltered bus stop with bench and trash receptacles center.

Pestrian Connections:
Sidewalks connect landing pad and bus loading area at transit station with building entrances.



A transit center located within a retail center near a highway interchange.

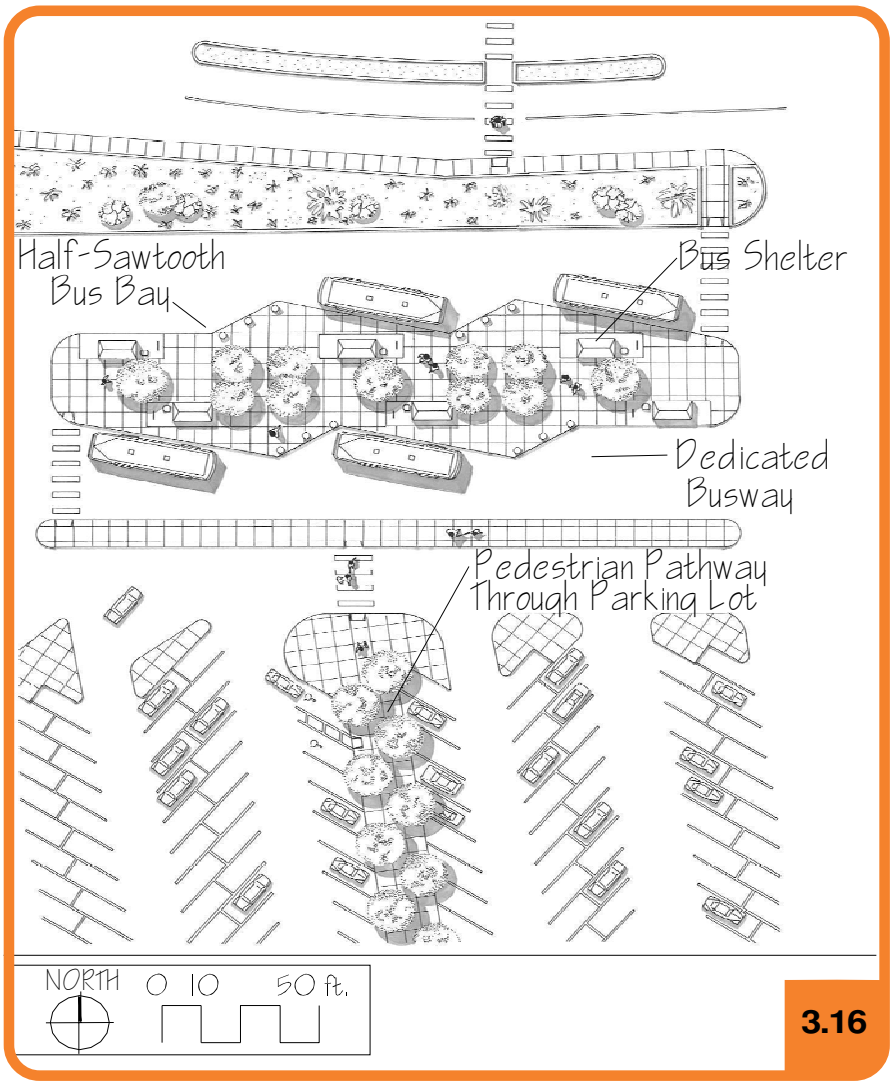


3.14

A detailed transfer center plan.

3.15

A transfer center operated by LYNX in Orange County, FL.



3.16

A view of a transfer center.

3.6 Park-and-Ride

Park-and-ride lots intercept traffic flowing through a commuter shed toward a major employment destination. They may be combined with other kinds of bus passenger facilities. Figure 3.17 depicts a park-and-ride located in the parking lot of a church that also provides day care during the work week. Other typical sites include libraries, meeting halls, and commercial land uses along major corridors used for commuting. A detailed plan of the bus passenger facility is shown in Figure 3.18, and a view of the prototypical facility is shown in 3.19.

Adjacent Land Use:
Church providing day care during the week.

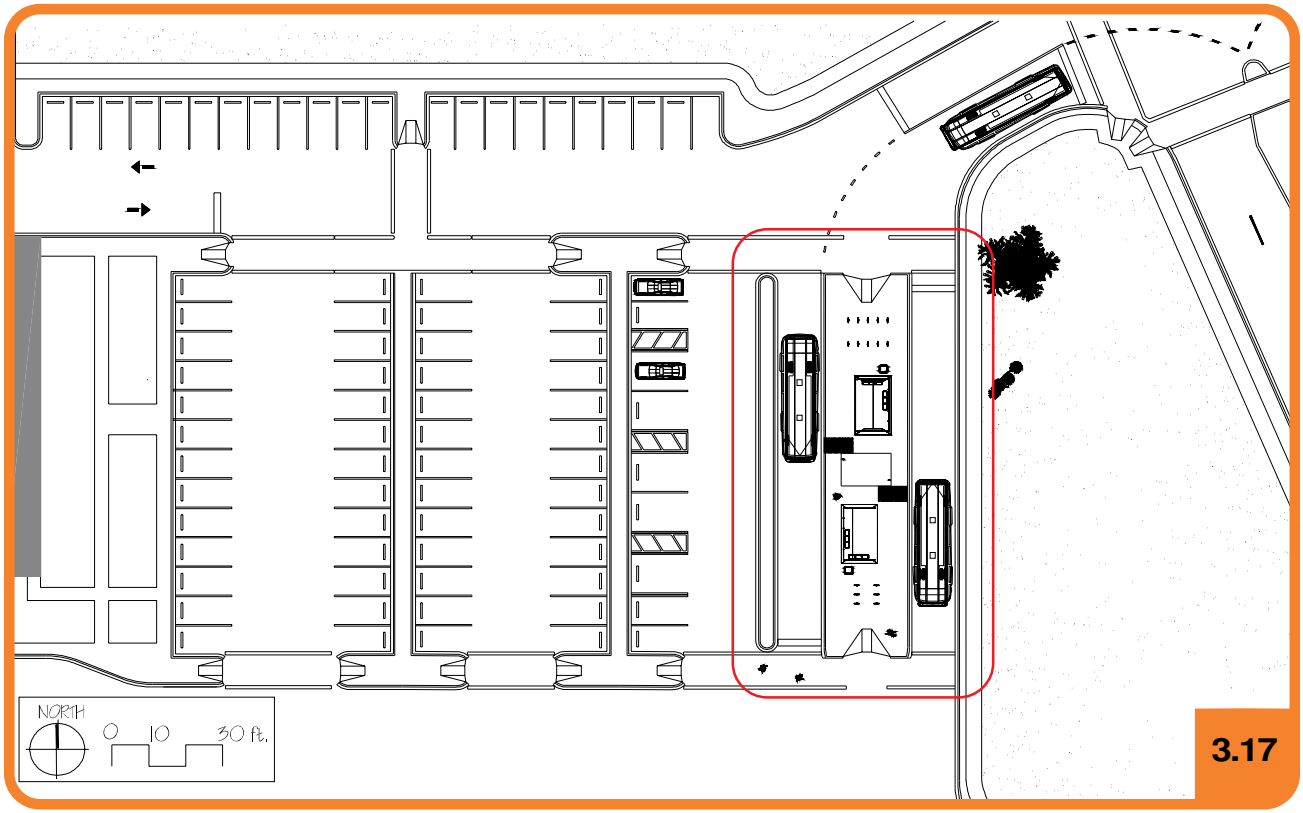
Approximate site area:
Less than ¼-acre.

Street Characteristics:
Major arterial that serves as a commuting corridor.

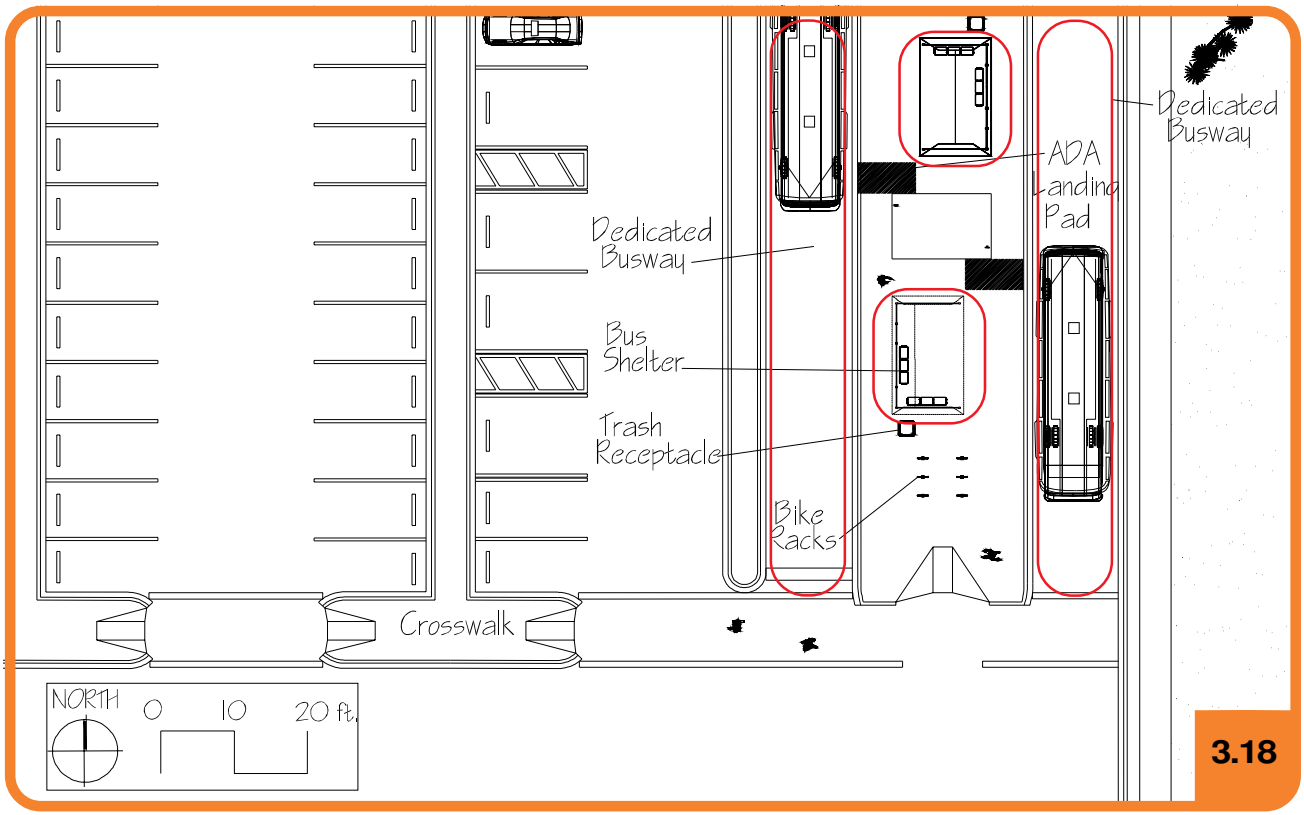
Bus-side Elements:
Off-line stop.

Curb-side Elements:
Sheltered bus stop with benches, bike racks, trash receptacles, transit landing pads on raised median accessed by dedicated busways.

Pedestrian Connections:
Pedestrian connections, crosswalks and paths are provided through the parking lot connecting with the building entrance with sidewalks at the property border.



A site plan for a park-and-ride facility.



3.18

A detailed plan for a park-and-ride facility.

3.19

A view of a park-and-ride facility.

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4 Land Use Guidelines

4.1 Introduction

Certain land use planning and site design policies make public transit a more attractive travel mode. This portion of the handbook focuses on the land use planning and site design elements that are most likely to encourage transit activity. The goal is to assist transit agency planners and their peers in land use planning and growth management departments to direct private development in order to make it more accessible to transit passengers and transit vehicles.

Transit accessibility and pedestrian accessibility are closely linked. Development that supports various kinds of accessibility balances the infrastructure needs of transit users, pedestrians, bicyclists, motorists, and freight haulers. Although individual development projects have limited impact on transit use throughout a network, the cumulative effect of projects over time has important implications for transportation modes and their associated infrastructure.

Many transit planners are aware of problems associated with rights of way with limited width and of finding appropriately sized lots for transit facilities in areas where substantial development has already taken place. Given the limited supply of land and funds for capital improvements, it is critical for transportation planners to understand the land use, site design, and development approval processes and their impacts on transit. Figures 4.1 and 4.2 depict typical development patterns oriented to transit provision.

Higher density transit-friendly development in Pensacola, FL.

Transit-friendly development in Santa Monica, CA.

4.2 Key Land Use and Site Design Principles

Density and Intensity of Use

- Along transit corridors or within ¼-mile from transit transfer or intermodal centers, land uses and development densities should support transit usage. Ideal land uses include multi-family and small-lot single-family residential projects, offices and medium intensity employment centers, institutions, and smaller retail centers.

- Development requiring large areas of land for parking, generating many vehicle trips, and characterized by low rates of employment or low residential densities should be discouraged from locating along transit corridors or within ¼-mile of a transit transfer or intermodal center.

Network Continuity

- Once they disembark from buses, passengers require continuous pedestrian infrastructure to link transit stops with off-site origins and destinations where the number of cross-traffic conflicts is minimized. The pedestrian routes to origins and destinations should be direct as possible, and routes should be closely spaced in relatively small blocks.

- Buildings not directly on the right of way should be linked to the right of way by visible and convenient walkways.

- Pedestrian crosswalks should be clearly demarcated.

- If crosswalk striping is provided, it should be maintained, especially in areas of high auto use.

Building Orientation

- Buildings should be oriented to provide transit passengers with easy access and should provide pedestrians with a visually interesting environment that reduces perceived travel distances and increases the legibility of pedestrian networks.[1]

- Building entrances should be oriented to the pedestrian and to transit networks.[1]

- Non-residential buildings should be placed as close as possible to the pedestrian network and no more than 15-feet from the sidewalk.[1]

Building Design

- The design of building façades should be oriented to the transit and pedestrian networks in order to realize the benefits of the elements discussed above. The building line should be varied in order to enhance visual interest; first story windows should be considered in non-residential buildings.[1]

- Design elements, like large, uninterrupted walls that may create wind tunnels or perceptions of unsafe environments, should be avoided.

- Awnings and arcades along building frontages provide pedestrians with weather protection.

- Residential projects should have distinguishable front yards for privacy but should also engage the street with windows and porches.

Landscaping

- Landscape buffers along rights of way enhance the comfort and safety of pedestrians and waiting transit passengers. Separating transit passengers and pedestrians from moving transit also shields them from dust, vehicle exhaust, and splashing water.

- Trees can be used to provide a continuous shade canopy along pedestrian and transit routes.

- Near transit stops, a minimum 5- to 8-foot landscape buffer is preferred where street trees are included. This buffer can be reduced to 3-feet in constrained areas through the use of tree grates.

- Landscaping with plants of varying heights, sizes, textures, and colors can also increase visual interest along the right of way and can break down the scale of large buildings or uninterrupted walls.

- Defensible space is created by using landscaping to create an environment in which a person feels safe from crime and from traffic hazards while waiting for the bus.

- Maintenance can be reduced by using native plants.

- Storm water recycling should be considered for landscaping (see Section 1.12).

4.3 Transit-Discouraging Mixed-Use District

Density and Intensity of Use

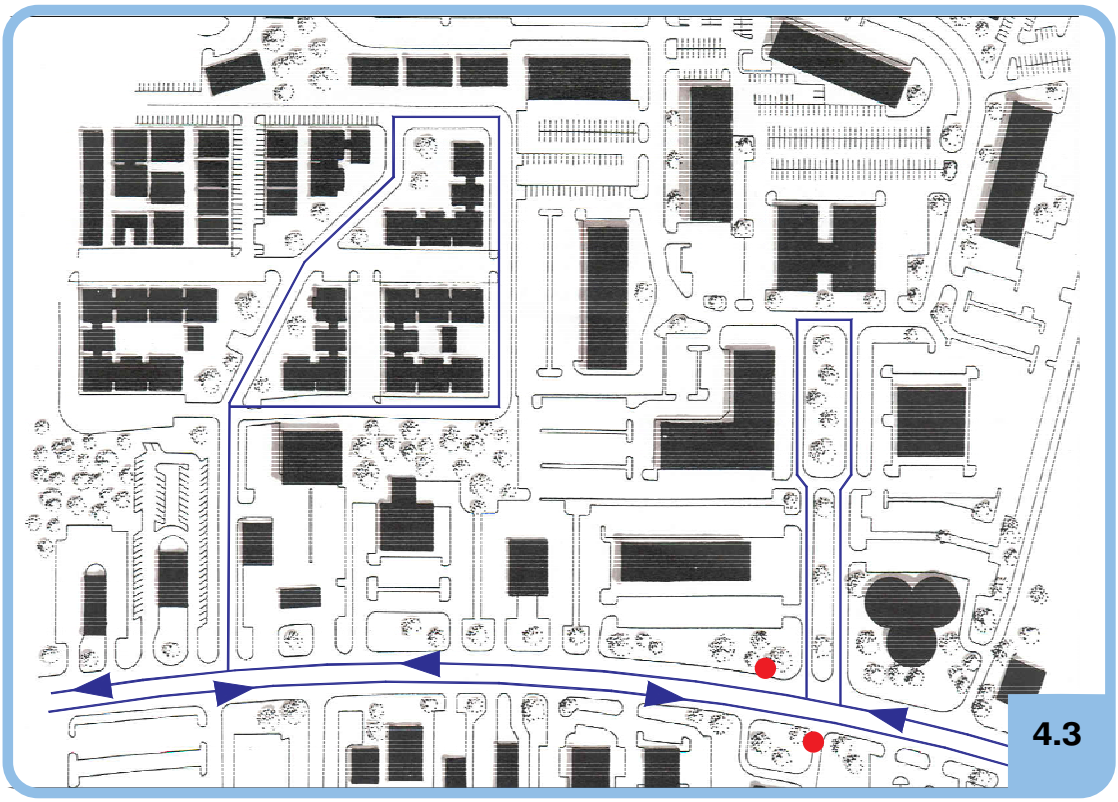
Auto-oriented mixed-use districts are characterized by a floor area ratio (the total area of building floor space per site area) of less than .25 in commercial areas and multi-family housing developed at 6 to 8 units per acre.[1] See Figure 4.3.

Network Continuity

Cul-de-sacs maximize out-of-direction travel. Through traffic is restricted. There is limited access to transit stops. No connections are made between complementary buildings or destinations. All trips are directed towards the arterial roadway. There is limited, sporadic sidewalk provision.

Block Orientation and Design

Blocks are very large. The average block perimeter is 2,000-to 3,000-feet. Each development has its own access from the arterial and is separated from adjacent developments.



4.3

Mixed-use districts along many arterials are often characterized by multiple curb cuts, large block sizes, and poor connectivity between land uses, making them less accessible to both transit rider and pedestrians. Bus stop locations are indicated in red dots in plan. Bus routes are shown in blue.

4.4 Transit-Oriented Mixed-Use District

Density and Intensity of Use

Transit-oriented mixed-use districts are pedestrian friendly centers with a floor area ratio of no less than .25 in commercial areas but preferably in the range of .5 to 1, and multi-family housing is developed at no less than 6 to 8 units per acre but preferably approaching 12 to 16 units per acre.[1] See Figure 4.4.

Network Continuity

A continuous street network minimizes out-of-direction travel. The negative effects of through traffic are mitigated through traffic calming. Access to transit stops is provided through a continuous sidewalk network. Some trips are executed on collector and local roads providing alternatives to the arterial roadway.

Block Orientation and Design

Blocks are scaled to pedestrian travel. The average block perimeter is 1,600-feet. Development is accessed through collector streets that connect with the arterial roadway and the local street network.[1]

Mixed-use districts along arterials can be made more accessible to transit by reducing the block size and the need for out of direction travel. Bus stop locations are indicated in red dots in plan. Bus routes are shown in blue.

4.5 Transit-Discouraging Retail Shopping Center

Density and Intensity of Use

Auto-oriented commercial centers have a floor area ratio of less than .25.[1] See Figure 4.5.

Network Continuity

No connections are made to complementary buildings or destinations off-site. Connections between building entrances and pedestrian facilities in the right of way are usually absent, requiring pedestrians to negotiate conflicts with vehicles in parking lots. Large block perimeters and separation from nearby developments extend the length of walking trips.

Building Orientation

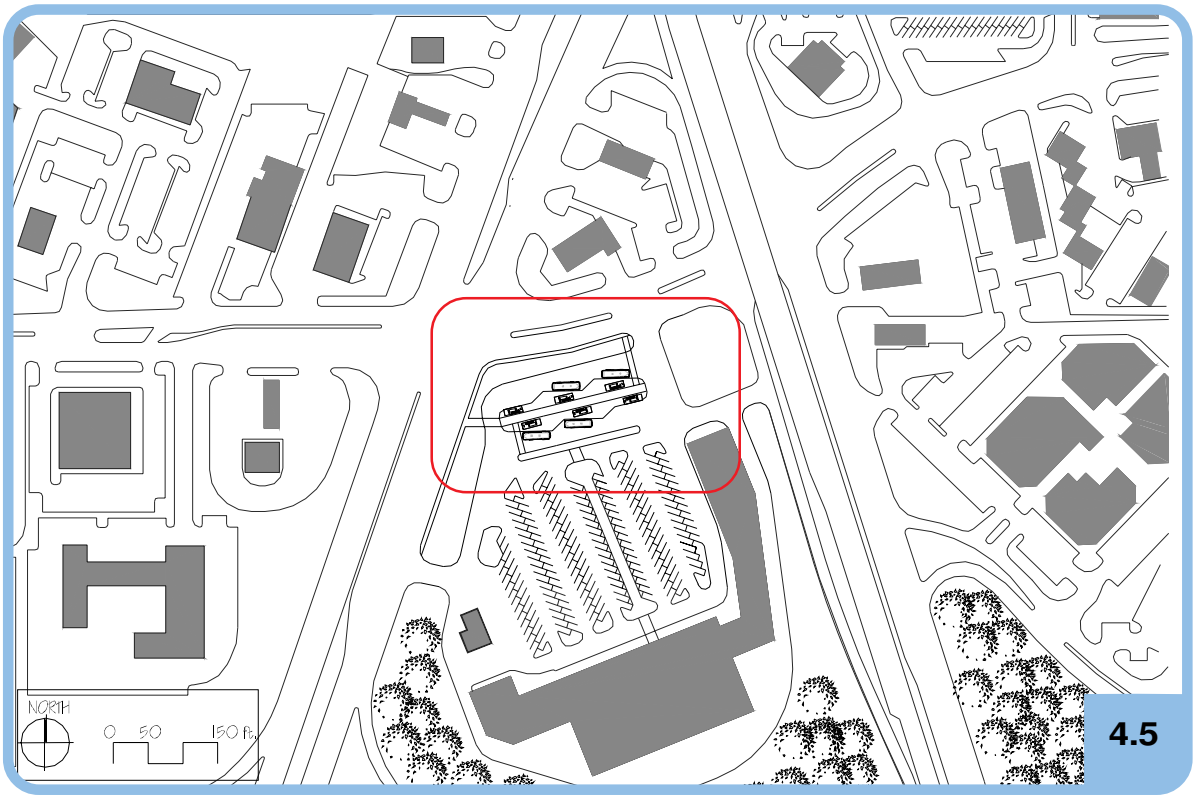
Building entrances may or may not be oriented to transit routes. Buildings are separated from surrounding uses by fences and are separated from transit routes and stops by large parking lots. Building entrances are often several thousand feet from the right of way.

Building Design

Many buildings have large blank walls. Weather protection is provided only at the entrances of buildings.

Landscaping

Perimeter sidewalks are usually not buffered from auto traffic. Low maintenance landscaping is limited to groundcover, shrubs, and isolated trees.



Many shopping centers are separated from the street by large parking lots, causing transit riders and pedestrians to negotiate possible conflicts with automobile traffic.

4.6 Transit-Oriented Retail Shopping Center

Density and Intensity of Use

Transit- and pedestrian-oriented commercial centers, if completely realized, could approach a floor area ratio of .5.[1] See Figure 4.6.

Network Continuity

Pedestrian crossings are provided between buildings, at intersections, and access points on-site. Transit riders have safe and comfortable access to multiple destinations. Interior walkways connect to sidewalks at property boundaries. Transit facilities are taken into account, designing the roadway network with a dedicated busway.

Building Orientation

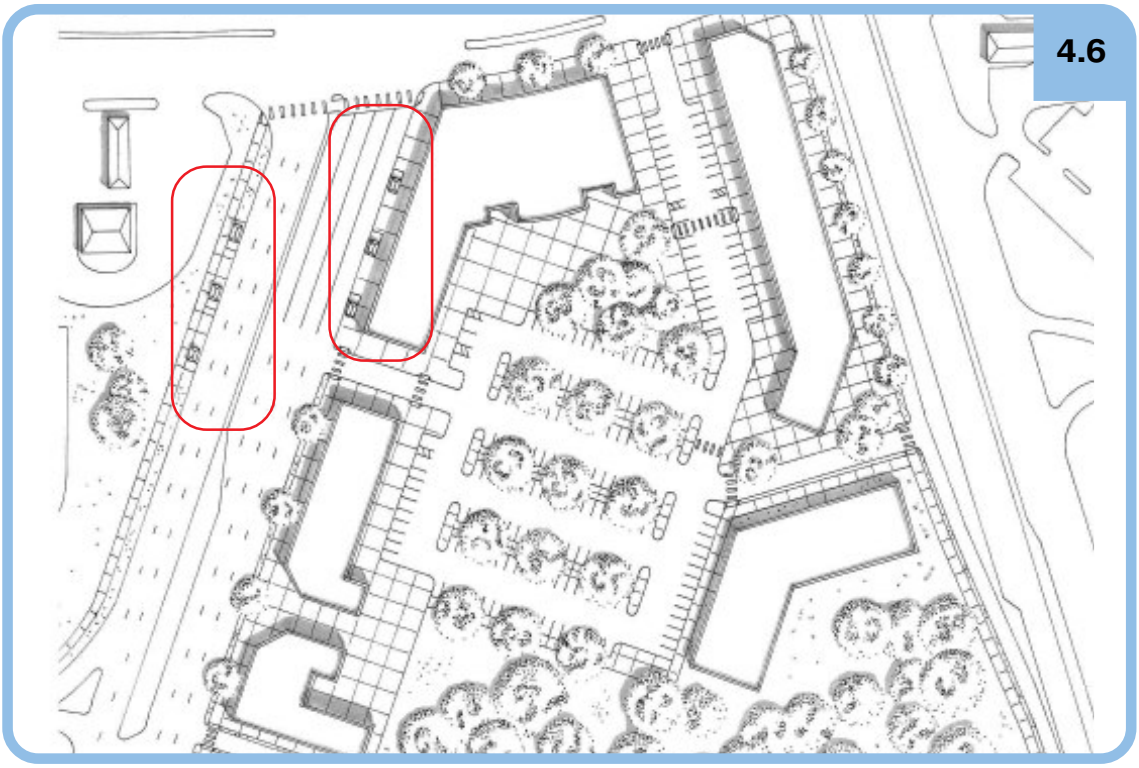
Buildings are oriented to the street and to transit corridors. Building entrances are oriented to the pedestrian network. Parking is located at the center of the site.

Building Design

All building façades facing the transit corridor and pedestrian network have windows or displays. Awnings and arcades along the pedestrian network provide protection from the weather.

Landscaping

Landscape buffers are provided and plants of varying heights, sizes, textures, and colors can also increase visual interest along the right of way. The use of public art may also give the community a feeling of ownership that tends to reduce vandalism.



Shopping centers can be made more accessible to transit riders and pedestrians by locating parking at the center and providing primary transit stops along high-traffic corridors (highlighted here in red).

4.7 Transit-Discouraging Office Building

Density and Intensity of Use

Auto-oriented employment zones have floor area ratios of less than .25 and 4 to 5 parking spaces per 1,000 square feet of building. See Figure 4.7.

Network Continuity

No connections are made to complementary buildings or destinations. On-site walkways do not extend to perimeter pedestrian network beyond the boundaries of the property.

Building Orientation

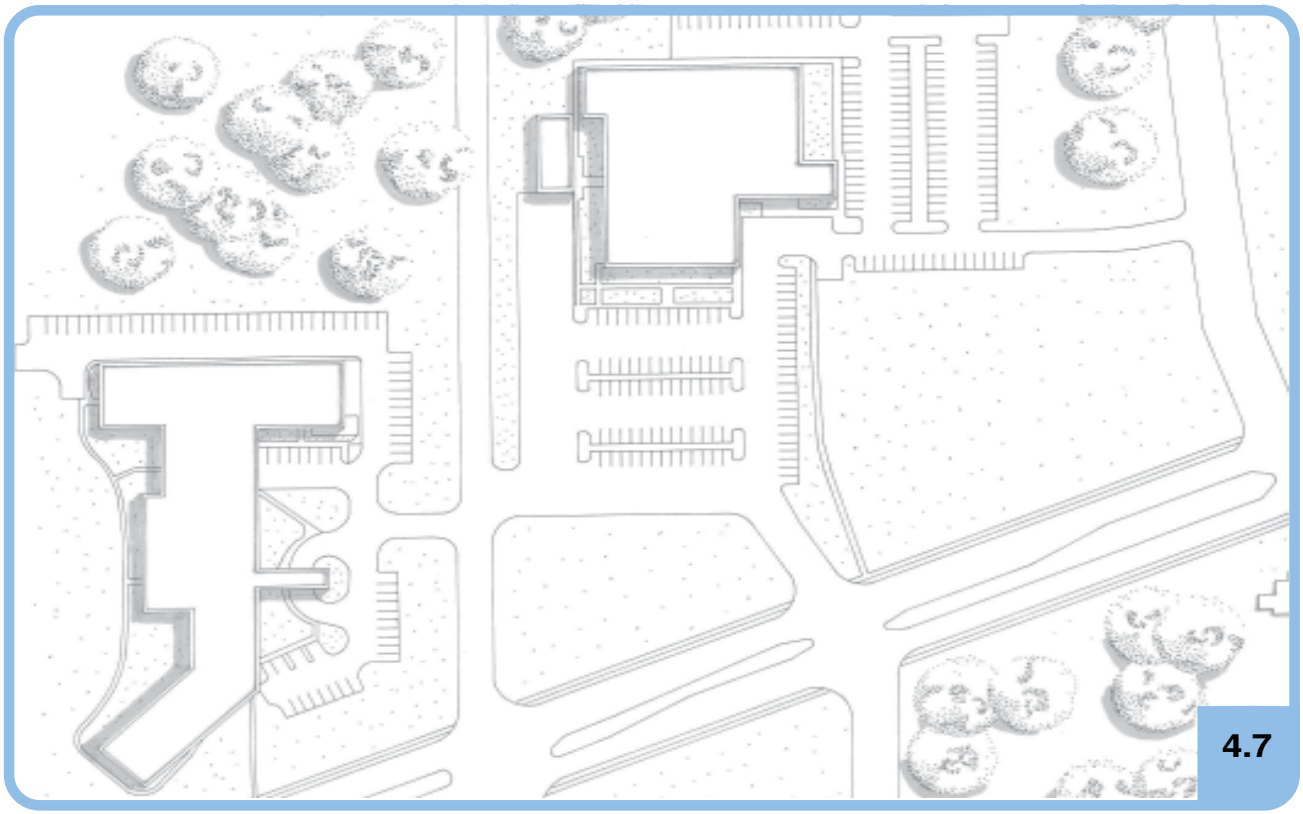
Buildings are oriented to the parking lot.

Building Design

Windows are oriented to parking lots. Weather protection is provided only at the entrances of buildings.

Landscaping

Perimeter sidewalks are usually not buffered from auto traffic. Parking lots are unshaded. Landscaping at auto entrances and building entrances may be of varied quality.



Many office buildings are set back from the right of way, causing increased trip-length and reduced accessibility for transit riders and pedestrians.

4.8 Transit-Oriented Office Building

Density and Intensity of Use

Transit- and pedestrian-oriented office buildings are designed to allow for the future intensification of development. See Figure 4.8.

Network Continuity

Perimeter sidewalks are provided and building locations enhance accessibility for pedestrians and transit patrons. Pedestrian travel lanes are articulated across driveway aprons.

Building Orientation

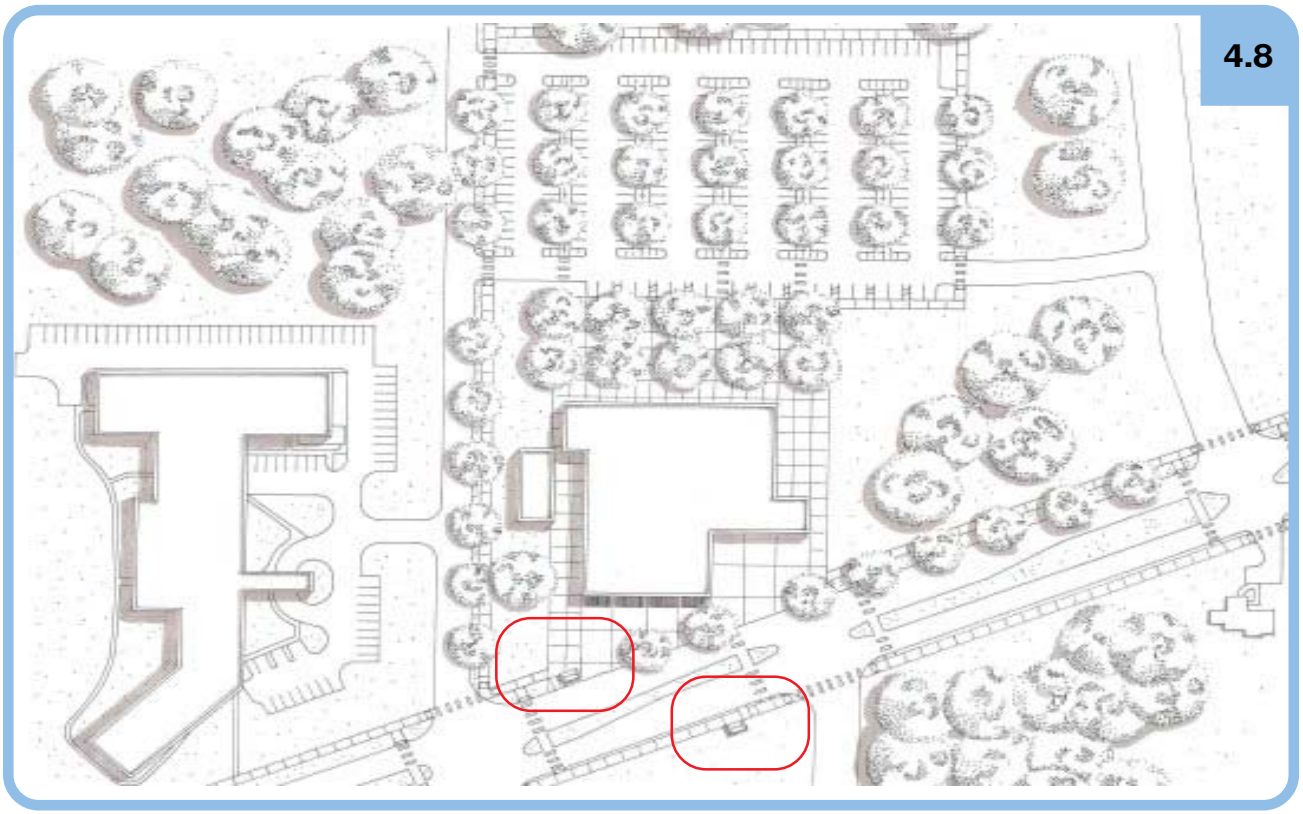
Buildings are oriented to the street and to transit corridors. Building entrances are oriented to the pedestrian network.

Building Design

All building façades facing the transit corridor and pedestrian network have windows or displays. Awnings and arcades along the pedestrian network provide protection from the weather.

Landscaping

Landscape buffers are provided. Trees provide a shade canopy along pedestrian and transit routes.



Simply locating the building closer to the right of way greatly enhances an office building's accessibility to transit riders and pedestrians. Bus stops are highlighted in red.

4.9 Notes

Text References

[1] Tri-County Metropolitan Transportation District of Oregon. (1996). *Planning and design for transit handbook: Guidelines for implementing transit supportive development*. Portland, OR: Tri-County Metropolitan Transportation District of Oregon.

Appendix A[1]

Glossary

A

AASHTO – American Association of State Highway and Transportation Officials; see *organizations, American Association of State Highway and Transportation Officials.*

ADA – Americans with Disabilities Act of 1990; see *legislation, Americans with Disabilities Act of 1990.*

APTA – American Public Transit Association; see *organizations, American Public Transit Association.*

AVL – automatic vehicle location system.

access, limited – in transportation, to have entry and exit limited to predetermined points, as with rail rapid transit or freeways.

accessibility – **1.** A measure of the ability or ease of all people to travel among various origins and destinations. **2.** In transportation modeling and planning, the sum of the travel times from one zone to all other zones in a region, weighted by the relative attractiveness of the destination zones involved. **3.** In traffic assignment, a measure of the relative access of an area or zone to population, employment opportunities, community services, and utilities.

accessibility, disabled – the extent to which facilities are free of barriers and usable by mobile physically disabled people, including wheelchair users. Also known as full accessibility.

accessible transportation facilities – transportation facilities that are barrier-free, allowing their use by all travelers, including mobile physically handicapped, elderly, and transportation disadvantaged persons.

accessway – a paved connection, preferably non-slip concrete or asphalt, that connects the bus stop waiting pad with the back face of the curb.

adaptive use – an individual's spontaneous, creative use of a facility or structure in ways that differ from or go beyond the intended use or the formal design.

advertising shelter – a bus shelter that is installed by an advertising agency for the purpose of obtaining a high visibility location for advertisements. By agreement, the bus shelter conforms to the transit agency specifications but is maintained by the advertising company.

alight – to get off or out of a transportation vehicle.

alignment – in transportation, the horizontal and vertical ground plan of a roadway, railroad, transit route, or other facility as it would appear in plan and profile. The alignment is usually described on the plans by the use of technical data, such as grades, coordinates, bearings, and horizontal and vertical curves, see also *roadbed*.

amenities — things that provide or increase comfort or convenience.

area, coverage – in transit operations, the geographical area that a transit system is considered to serve, normally based on acceptable walking distances (e.g., ¼ mile, 0.4 km) from loading points. For suburban rail transit that depends on automobile access (park-and-ride or kiss-and-ride), coverage may extend several kilometers. See also *area, service.*

area, service – **1.** The jurisdiction in which the transit property operates. **2.** The geographic region in which a transit system provides service or that a transit system is required to serve. See also *area, coverage.*

area, urbanized (UA) – as defined by the Bureau of the Census, a population concentration of at least 50,000 inhabitants, generally consisting of a central city and the surrounding, closely settled,contiguous territory *(suburbs).* The boundary is based primarily on a population density of 1,000 people/mi^2 but also includes some less densely settled areas, as well as industrial parks and railroad yards if they are within areas of dense urban development. The boundaries of UAs, the specific criteria used to determine UAs, or both may change in subsequent censuses.

articulated bus or articulated trolleybus – an extra-long, high-capacity bus or trolleybus that has the rear body section or sections flexibly but permanently connected to the forward section. The arrangement allows the vehicle to bend in curves and yet have no interior barrier to movement between the two parts. The *puller* type features a powered center axle while the *pusher* type features a powered rear axle. Articulated buses with powered centers and rear axles are rare. Typically, an articulated bus is 16-18 m (54-60 ft) long with a passenger seating capacity of 60 to 80 and a total capacity of 100 to 140.

automatic vehicle location system (AVL) – a system that determines the location of vehicles carrying special electronic equipment that communicates a signal back to a central control facility. AVLs are used for detecting irregularities in service and are often combined with a computer-aided dispatch system. These can be used to communicate to the passenger when the next bus is anticipated to arrive.

B

barrier-free – containing no obstacles that would prevent use by any other person including the mobile physically disabled.

bicycle locker – a lockable, enclosed container used for storing a bicycle. Typically provided at major transit stops and stations and rented on a monthly basis.

bicycle rack – **1.** A fixed post or framework to which bicycles may be secured and locked, typically provided on a first-come, first-served basis. **2.** A device mounted to a transit vehicle that allows bicycles to be transported outside the passenger compartment. Typically provided on a first-come, first-served basis; many transit operators require that passengers obtain a permit to use them.

bollard – an upright fixed block (usually concrete) used to prevent the unauthorized or unintended entry of vehicles into an area.

bus – a self-propelled, rubber-tired road vehicle designed to carry a substantial number of passengers (at least 16, various legal definitions may differ slightly as to minimum capacity), commonly operated on streets and highways. A bus has enough headroom to allow passengers to stand upright after entering. Propulsion may be by internal combustion engine, electric motors or hybrid. Smaller capacity road transit vehicles, often without full headroom, are termed vans.

bus, low floor – a bus without steps at entrances and exit. The low floor may extend throughout the bus or may use a ramp or steps to access the raised rear portion over a conventional axle and drive train. Wheelchair access is provided by a retracting ramp.

bus, small – bus that is less than 6 m (20 ft) long.

bus, standard urban (transit coach, urban transit bus) – a bus for use in frequent-stop service with front and (usually) center doors, normally with a rear-mounted engine and lowback seating. Typically 10-12 m (35-40 ft) long.

bus bay – **1.** A branch from or widening of a road that permits buses to stop without obstructing traffic while laying over or while passengers board and alight; also known as a *blister, bus duckout, bus turnout, pull-off* or *lay-by.* As re-entry of the bus into the traffic stream can be difficult, many agencies discourage their construction. **2.** A specially designed or designated location at a transit stop, station, terminal, or transfer center at which a bus stops to allow passengers to board and alight; also known as a *bus dock* or *bus berth*. **3.** A lane for parking or storing buses in a garage facility, often for maintenance purposes.

bus bay, angled – a bus bay design similar to an angled parking space that requires buses to back up to exit; allows more buses to stop in a given linear space. Typically used when buses will occupy the berth for a long period of time (e.g., at an intercity bus terminal).

bus bay, drive-through (pull-through) – a bus bay design providing several adjacent loading islands between which buses drive through, stop, and then exit. Allows bus stops to be located in a compact area. Sometimes used at intermodal transfer centers, as all buses can wait with their front destination signs facing the direction from which passengers will arrive (e.g., from a rail station exit).

bus bay, linear – a bus bay design where buses stop directly behind each other; requires the bus in front to leave its bus bay before the bus behind it. Often used when buses will use the bus bay only for a short time (e.g., at an on-street bus stop).

bus bay, sawtooth – a bus bay design where the curb is indented in a sawtooth pattern, allowing buses to enter and exit bus bays independently of other buses. Often used at transit centers.

bus bulb – an extension of the sidewalk into the roadway for passenger loading giving priority to buses and eases re-entry into traffic, often landscaped and fitted with bus shelters and other passenger amenities.

bus lane – see *lane, bus and nub*.

bus stop spacing – the distance between consecutive stops.

bus stop zone length – the length of a roadway marked or signed as available for use by a bus loading or unloading passengers.

busway – a special roadway designed for exclusive use by buses. It may be constructed at, above, or below grade and may be located in separate rights of way or within highway corridors.

C

CBD – central business district.

capacity, design –**1.** For highways, the maximum number of vehicles that can pass over a given section of a lane or roadway in one or both directions during a given time period under prevailing environmental (e.g., weather, light), roadway, and traffic conditions. **2.** For transit, the maximum number of passengers that can be transported over a given section of a transit line in one direction during a given time period (usually 1 hr) under prevailing traffic conditions and design comfort standards. **3.** For vehicles, the total number of spaces or people a vehicle can accommodate.

capital cost – non-recurring or infrequently recurring costs of long-term assets, such as land, guideways, stations, buildings, and vehicles. These costs often include related expenses, for example, depreciation and property taxes.

central business district (CBD) – defined by the Bureau of the Census, an area of high land valuation characterized by a high concentration of retail businesses, service businesses, offices, hotels, and theaters, as well as by a high traffic flow. A CBD follows census tract boundaries; that is, it consists of one or more whole census tracts. CBDs are identified only in central cities of metropolitan statistical areas and other cities with populations of 50,000 or more.

central city – as defined by the Bureau of the Census, the largest city, or one of the largest in the metropolitan statistical area.

corridor – in planning, a broad geographical band that follows a general directional flow or connects major sources of trips. It may contain a number of streets and highways and transit lines and routes.

curb-side factors – factors that are located off the roadway that affect patron comfort, convenience, and safety.

curb-side stop – a bus stop in the travel lane immediately adjacent to the curb.

controlled access – see *right of way*.

D

DOT – Department of Transportation; see *organizations, department of transportation;* and *U.S. Government, Department of Transportation.*

deceleration – decrease in velocity per unit time; in transit practice, often measured in m/s^2 (ft/s^2) or, in the United States, mph/s. Also referred to as retardation or braking rate.

defensible space – a concept in architecture and urban design that precludes designs resulting in dark alleys, corners, or spaces where visibility and openness to other people is severely limited.

design capacity – see *capacity, design*.

destination – **1.** The point at which a trip terminates. **2.** In planning, the zone in which a trip ends.

disabled – people who have physical or mental impairments that substantially limit one or more major life activities. In the context of transportation, the term usually refers to people for whom the use of conventional transit facilities would be impossible or would create a hardship. These people are also known as *transportation disabled,* as people who

have a *public transportation disability* and, more currently, *physically or mentally challenged.*

disabled accessibility – see *accessibility, disabled*.

discharge – in transit operations, to let passengers exit the vehicle.

discontinuous sidewalk – a sidewalk that is constructed to connect to the bus stop with the nearest intersection but does not extend beyond the bus stop.

E

elderly and disabled (E&H) – people who may have special needs for services such as transportation. Transportation especially provided for their benefit is called *elderly and disabled (E&D) transportation.* Transit operations may provide discounted *E&H* fares or include *E&H* in a more general concession fare. Minimum age varies by program — 55+, 60+, 65+. See also *disabled.*

exclusive right of way – see *right of way, exclusive*.

exclusive transit right of way – see *right of way, exclusive transit*.

F

FHWA – Federal Highway Administration; see *U.S. Government, Federal Highway Administration*.

FTA – Federal Transit Administration; see *U.S. Government, Federal Transit Administration*.

freeway – a divided highway for through traffic that has full access control and grade separations at all intersections. In some countries, it is also known as a motorway.

H

HCM – *Highway Capacity Manual.*

HOV – high-occupancy vehicle; see *vehicle, high occupancy.*

HOV lane – high-occupancy-vehicle lane; see *lane, high-occupancy-vehicle.*

headway – the time interval between the passing of the front ends of successive transit units (vehicles or trains) moving along the same lane or track (or other guideway) in the same direction, usually expressed in minutes; see also *service, frequency*.

hours of service – **1.** The number of hours during the day between the start and end of service on a transit route, also known as the *service span.* **2.** For calculating transit level of service, the number of hours during a day when service is provided at least hourly on a transit route.

hub – transit center or interchange for connections or transfers between modes and/or routes. Connections are usually timed in clock-headway pulses and allow convenient transfer between local routes and to express routes. The express routes can connect to the city center and to other hubs, thus offering better suburb to suburb trips than possible with a radial route system. Hubs are best located at activity centers such as shopping malls, suburban town centers and campuses. See *network, radial or timed transfer focal point*.

hub and spoke – type of route structure based on timed connections that increases connectivity and productivity, see *hub*.

I

ISTEA – Intermodal Surface Transportation Efficiency Act of 1991. See also *legislation, ISTEA*.

ITE – Institute of Transportation Engineers; see *organizations, Institute of Transportation Engineers.*

interchange – **1.** facility for passenger transfers or connection between routes or modes, see *hub*. **2.** The system of interconnecting ramps between two or more intersecting travel ways (highways, transit guideways, etc.) that are grade separated.

intermodal – those issues or activities which involve or affect more than one mode of transportation, including transportation connections, choices, cooperation and coordination of various modes.

intermodal integration – service coordination between two or more different transportation modes. This arrangement may include joint (transfer) stations, coordinated scheduling, joint fares, and combined public information activities.

J

jaywalk – to illegally cross a street in the middle of the block or against a pedestrian signal.

K

kiss-and-ride (kiss 'n' ride, K&R) – An access mode to transit whereby passengers (usually commuters) are driven to a transit stop and left to board a transit unit and then met after their return trip. Transit stations, usually rail, often provide a designated area for dropping off and picking up such passengers.

L

LOS – level of service.

lane, bus – a highway or street lane reserved primarily for buses, either all day or during specified periods. It may be used by other traffic under certain circumstances, such as making a right or left turn, or by taxis, motorcycles, or carpools that meet specific requirements described in the traffic laws of the specific jurisdiction. Also known as bus priority lane, preferential bus lane, priority bus lane.

lane, carpool – a highway or street lane intended primarily for carpools, vanpools, and other high occupancy vehicles, including buses, either all day or during specified periods. It may be used by other traffic under certain circumstances, such as while making a right turn. Minimum occupancy has been a contentious issue, many requirements for a minimum of three passengers have been reduced to two through political pressure or legal action.

lane, diamond – a high-occupancy-vehicle lane physically marked by diamonds painted on the pavement and often indicated by diamond-shaped signs as well. Often used synonymously with high-occupancy-vehicle lane.

lane, exclusive carpool – a highway or street lane reserved for carpools and vanpools.

lane, exclusive transit – a highway or street lane reserved for buses, light rail vehicles, or both. Also known as reserved transit lane.

lane, high-occupancy-vehicle (HOV lane) – a highway or street lane reserved for the use of high-occupancy vehicles (HOVs), see *lane, carpool*.

lane, priority – a highway or street lane reserved (generally during specified hours) for one or more specified categories of vehicles, for example, buses, carpools, vanpools.

layover, vehicle – see *time, layover.*

layover time – see *time, layover.*

layover zone – a designated stopover location for a transit vehicle at or near the end of the route or line or at a turnback point.

legislation, Americans with Disabilities Act of 1990 (ADA) – Federal civil law which assures people with disabilities equal opportunity to fully participate in society, the ability to live independently, and the ability to be economically sufficient.

legislation, Federal Transit Act of 1964 – Federal legislation enacted in 1964 that established the Federal Mass Transportation Program. Formerly known as the Urban Mass Transportation Act of 1964. Repealed in 1994 and reenacted as chapter 53 of Title 49, United States Code.

legislation, Intermodal Surface Transportation Efficiency Act (ISTEA) – signed into Federal law on December 18, 1991, it provided funding authorizations for highways, highway safety and mass transit for 6 years and serves as the basis of Federal Surface Transportation Programs. Renewed and amended in 1998 for 6 years as TEA-21, see *legislation, TEA-21.*

legislation, TEA-21 – 1998 Transportation Efficiency Act for the 21st Century, provided funding authorizations for highways, highway safety and mass transit for 6 years and was the basis of Federal Surface Transportation Programs, replacing ISTEA.

level of service (LOS) – **1.** A set of characteristics that indicate the quality and quantity of transportation service provided, including characteristics that are quantifiable *(system performance,* e.g., frequency, travel time, travel cost, number of transfers, safety) and those that are difficult to quantify *(service quality,* e.g., availability, comfort, convenience, modal image). **2.** For highway systems, a qualitative rating of the effectiveness of a highway or highway facility in serving traffic in terms of operating conditions. The *Highway Capacity Manual* identifies operating conditions ranging from A, for best operation (low volume, high speed), to F, for worst conditions. **3.** For paratransit, a variety of measures meant to denote the quality of service provided, generally in terms of total travel time or a specific component of total travel time. **4.** For pedestrians, sets of area occupancy classifications to connect the design of pedestrian facilities with levels of service (A for best through F for worst). **5.** The amount of transit service provided.

levels of service (transit) – six designated ranges of values for a particular service measure, graded from "A" (best) to "F" (worst) based on a transit passenger's perception of a particular aspect of transit service.

loading island – **1.** A pedestrian refuge within the right-of-way and traffic lanes of a highway or street. It is provided at designated transit stops for the protection of passengers from traffic while they wait for and board or alight from traffic vehicles; also know as a *pedestrian* or *boarding island*. **2.** A protected spot for the loading and unloading of passengers. It may be located within a rail transit or bus station. **3.** On-street car and light rail systems a passengers loading platform in the middle of the street, level with the street or more usually raised to curb height, often protected with a *bollard* facing traffic, also known as a *safety island*.

M

mass transit, mass transportation – urban public transport by bus, rail, or other conveyance, either publicly or privately owned, providing general or special service to the public on a regular and continuing basis (not including school bus, charter, or sightseeing service). The term has developed a negative connotation and its use is discouraged in favor of urban transport, transit, public transit, public transport or public transportation.

midblock stop – see *stop, midblock.*

middle traffic operations – the operation of transit vehicles on nonexclusive rights of way with non-transit vehicles.

mixed traffic operations – the operation of transit vehicles on nonexclusive rights of way with non-transit vehicles.

mode – **1.** a transport category characterized by specific rights of way or technological and operational features. **2.** a particular form of travel, for example, walking, traveling by automobile, traveling by bus, traveling by train.

mode, transit – a category of transit systems characterized by common characteristics of technology, right of way, and type of operation. Examples of different transit modes are regular bus service, express bus service, light rail transit, rail rapid transit, and commuter rail.

N

NCTRP – National Cooperative Transit Research and Development Program.

NTD – National Transit Database.

NTSB – National Transportation Safety Board; see *U.S. Government, National Transportation Safety Board.*

near-side stop – see *stop, near-side.*

network, radial – in transit operations, a service pattern in which most routes converge into and diverge from a central hub or activity center (e.g., central business district), like the spokes of a wheel. The hub may serve as a major transfer point. See *hub*.

nub – a stop where the sidewalk is extended into the parking lane, which allows the bus to pick up passengers without leaving the travel lane, also known as bus bulbs or curb extensions.

O

operations, mixed traffic – see *mixed traffic operations.*

organizations, American Association of State Highway and Transportation Officials (AASHTO) – membership includes state and territorial highway and transportation departments and agencies and the U.S. Department of Transportation. Its goal is to develop and improve methods of administration, design, construction, operation, and maintenance of a nationwide integrated transportation system. It studies transportation problems, advises Congress on legislation, and develops standards and policies.

organizations, American Public Transit Association (APTA) – a nonprofit international industry association made up of transit systems and other organizations and institutions connected to or concerned with the transit industry. It performs a variety of services for the industry, and its objectives include promotion of transit interests, information exchange, research, and policy development.

organizations, Department of Transportation (DOT) – a municipal, county, state, or federal agency responsible for transportation; see also *U.S. Government, Department of Transportation.*

organizations, Institute of Transportation Engineers (ITE) – a society of professionals in transportation and traffic engineering. It promotes education, research, the development of public awareness, and the exchange of professional information in these areas with the goal of contributing individually and collectively toward meeting human needs for mobility and safety.

organizations, TCRP – Transit Cooperative Research Program.

organizations, Transportation Research Board – a unit of the National Research Council, operating under the corporate authority of the private nonprofit National Academy of Sciences. The purpose of TRB is to advance knowledge concerning the nature and performance of transportation systems by stimulating research and disseminating the information derived from there. Its affiliates and participants include transportation professionals in government, academia, and industry.

P

paratransit – forms of transportation services that are more flexible and personalized than conventional fixed route/fixed schedule service but not including such exclusory services as charter bus trips. The vehicles are usually low- or medium-capacity highway vehicles, and the service offered is adjustable in various degrees to individual users' desires. Its categories are public, which is available to any user who pays a predetermined fare (e.g., taxi, jitney, dial-a-ride), and semipublic, which is available only to people of a certain group, such as the elderly, employees of a company, or residents of a neighborhood (e.g., vanpools, subscription buses).

park-and-ride (park 'n' ride, P&R) – an access mode to transit in which patrons drive private automobiles or ride bicycles to a transit station, stop, or carpool/vanpool waiting area and park the vehicle in the area provided for that purpose (park-and-ride lot, park-and-pool lot, commuter parking lot, bicycle rack or locker). They then ride the transit system or take a car or vanpool to their destinations.

parking facility – an area, which may be enclosed or open, attended or unattended, in which automobiles may be left, with or without payment of a fee, while the occupants of the automobiles are using other facilities or services.

passenger amenity — an object or facility (such as a shelter, telephone, or information display) intended to enhance passenger comfort or transit usability.

pedestrian refuge – a space designed for the use and protection of pedestrians, including both the safety zone and the area at the approach that is usually outlined by protective deflecting or warning devices; see also *loading island.*

platform – the front portion of a bus or streetcar where passengers board.

platform, passenger – that portion of a transit facility directly adjacent to the tracks or roadway at which transit units (vehicles or trains) stop to load and unload passengers. Within stations, it is often called a *station platform.*

platform, high – a platform at or near the floor elevation of the transit unit (vehicle or train), eliminating the need for steps on the transit unit.

platform, low – a platform at or near the top of the roadway or road surface of the transit unit (vehicle or train), requiring the passenger to use steps to board and alight.

public transit – passenger transportation service, usually local in scope, that is available to any person who pays a prescribed fare. It operates on established schedules along designated routes or lines with specific stops and is designed to move relatively large numbers of people at one time. Examples include bus, light rail, rapid transit.

public way – any public street, road, boulevard, alley, lane, or highway, including those portions of any public place that have been designated for use by pedestrians, bicycles, and motor vehicles.

Q

queue – A line of vehicles or people waiting to be served by the system in which the rate of flow from the front of the line determines the average speed within the line.

queue jumper – **1.** A short section of exclusive or preferential lane that enables specified vehicles to bypass an automobile queue or a congested section of traffic. A queue jumper is often used at signal-controlled freeway on-ramps in congested urban areas to allow high-occupancy vehicles preference. It is also known as a *bypass lane* or *queue bypass.* **2.** A person who violates passenger controls.

queue jumper bus bay – a bus bay designed to provide priority treatment for buses, allowing them to use right-turn lanes to bypass queued traffic at congested intersections and access a far-side open bus bay.

queue jumper lane – right-turn lane upstream of an intersection that a bus can use to bypass queue traffic at a signal.

R

revenue, farebox – the passenger payments for rides, including cash, farecards, tickets, tokens, pass receipts, and transfer and zone charges but excluding charter revenue.

rider, captive – a person limited by circumstances to use one mode of transportation; see also *transit dependent* and *transportation disadvantaged*.

right of way (ROW) – **1.** A general term denoting land, property, or interest therein, usually in a strip, acquired for or devoted to transportation purposes.

For transit, rights of way may be categorized by degree of their separation: fully controlled without grade crossings, known as *grade separated, exclusive,* or *private ROW;* longitudinally physically separated from other traffic (by curbs, barriers, grade separation, etc.) but with grade crossings; or surface streets with mixed traffic, although transit may have preferential treatment. **2.** The precedence accorded to one vehicle or person over another.

right of way, lane – lanes restricted for at least a portion of the day for use by transit vehicles and/or other high occupancy vehicles. Use of controlled access lanes may also be permitted for vehicles preparing to turn. The restriction must be sufficiently enforced so that 95 percent of vehicles using the lanes during the restricted period are authorized to use them. Sometimes referred to as controlled access.

right of way, exclusive – roadway or other right of way reserved at all times for transit use and/or other high occupancy vehicles.

right of way, exclusive transit – a right of way that is fully grade separated or access controlled and is used exclusively by transit.

right of way, segregated – roadway or right of way reserved for transit use but which permits other modes to cross the right of way at defined locations such as grade crossings.

right of way, shared – roadway or right of way which permits other traffic to mix with transit vehicles, as is the case with most streetcar and bus lines.

roadway geometry– the proportioning of the physical elements of a roadway, such as vertical and horizontal curves, lane widths, cross sections, and bus bays.

roadbed – **1.** In railroad construction, the foundation on which the ballast and track rest. **2.** In highway construction, the graded portion of a highway within top and side slopes, prepared as a foundation for the pavement structure and shoulder.

route – **1.** The geographical path followed by a vehicle or traveler from start to finish of a given trip. **2.** A designated, specified path to which a transit unit (vehicle or train) is assigned. Several routes may traverse a single portion of road or line. **3.** In traffic assignments, a continuous group of links that connects two centroids, normally the path that requires the minimum time to traverse. **4.** In rail operations, a determined succession of contiguous blocks between two controlled interlocked signals.

S

segregated right-of-way – see *right of way, segregated*.

service, community – short feeder or loop route serving a local community, often operated with smaller buses.

service, express bus – bus service with a limited number of stops, either from a collector area directly to a specific destination or in a particular corridor with stops en route at major transfer points or activity centers. Express bus service usually uses freeways or busways where they are available.

service, feeder – **1.** Local transportation service that provides passengers with connections to a major transportation service. **2.** Local transit service that provides passengers with connections to main-line arterial service; an express transit service station; a rail rapid transit, commuter rail, or intercity rail station; or an express bus stop or terminal, see also *service, community.*

service, short-haul transit – low-speed transit service for circulation within small areas that usually have high travel density, such as central business districts, campuses, airports, exhibition grounds, and other major activity centers.

service, shuttle – **1.** service provided by vehicles that travel back and forth over a particular route, especially a short one, or connects two transportation systems or centers, or that acts as a feeder to a longer route. Shuttle services usually offer frequent service, often without a published timetable.

service frequency, transit – the number of transit units (vehicles or trains) on a given route or line, moving in the same direction that pass a given point within a specified interval of time, usually 1 hr. See also *headway*.

shared right of way – see r*ight of way, shared*.

shelter – see *transit shelter* or *advertising shelter.*

sight distance – the portion of the highway environment visible to the driver.

station – An off-street facility where passengers wait for, board, alight, or transfer between transit units (vehicles or trains). A station usually provides information and a waiting area and may have boarding and alighting platforms, ticket or farecard sales, fare collection, and other related facilities. Also known as a *passenger station.*

station, off-line – a station at which a transit unit (vehicle or train) stops outside the main track or travel lane so that other units can pass while passengers board and alight. These are rare but found on a few automated guideway transit systems and busways.

station, on-line – a station in which transit units (vehicles or trains) stop on the main track or travel lane. This is the common design, and the term is used only to distinguish this station from off-line stations.

stop, far-side – a transit stop located beyond an intersection. It requires that transit units (vehicles or trains) cross the intersection before stopping to serve passengers.

stop, midblock – a transit stop located at a point away from intersections.

stop, near-side – a transit stop located on the approach side of an intersection. The transit units (vehicles or trains) stop to serve passengers before crossing the intersection.

stop, transit – an area where passengers wait for, board, alight, and transfer between transit units (vehicles or trains). It is usually indicated by distinctive signs and by curb or pavement markings and may provide service information, shelter, seating, or any combination of these. Stops are often designated by the mode offering service, for example, bus stop, car stop.

street, transit – a street reserved for transit vehicles only.

street-side factors – factors associated with the roadway that influence bus operations.

system planning – in transportation, a procedure for developing an integrated means of providing adequate facilities for the movement of people and goods involving regional analysis of transportation needs and the identification of transportation corridors involved.

T

TCRP – Transit Cooperative Research Program.

terminal – The end station or stop on a transit line or route regardless of whether special facilities exist for reversing the vehicle or handling passengers. Also known as a *terminus.*

time, dwell – the time a transit unit (vehicle or train) spends at a station or stop, measured as the interval between its stopping and starting.

time, layover (recovery time, relay time, spot time, turnaround time) – time built into a schedule between arrivals and departures, used for the recovery of delays and preparation for the return trip. The term may refer to transit units (also known as *vehicle layover*) or operators. Note that the layover time may include recovery time and operator rest time as two specific components.

timed transfer system – a transit network consisting of one or more nodes (transit centers) and routes or lines radiating from them. The system is designed so that transit vehicles on all or most of the routes or lines are scheduled to arrive at a transit center simultaneously and depart a few minutes later; thus transfers among all the routes and lines involve virtually no waiting. Typically used in suburban areas and for night service where headways are long. Transit centers (also known as *timed transfer focal points or hubs)* are ideally located at major activity centers, see also *hub.*

timetable – **1.** Usually refers to a printed schedule for the public. **2.** A listing of the times at which transit units (vehicles or trains) are due at specified time points; also known as a *schedule.* **3.** In railroad operations, the authority for the movement of regular trains subject to the rules. It contains classified schedules with special instructions for the movement of trains and locomotives.

transfer – **1.** A passenger's change from one transit unit (vehicle or train) or mode to another transit unit or mode. **2.** A slip of paper, card, or other instrument issued to passengers (either free or with a transfer fee) that gives the right to change from one transit unit or mode to another according to certain rules that may limit the direction of travel or the time in which the change may be made.

transfer, timed – **1.** A transfer that is valid only for a specified time. **2.** The scheduling of intersecting transit routes so that they are due to arrive at a transfer point simultaneously, eliminating waiting time for transfer passengers; also known as a *timed connection.* See also *timed transfer system.*

transit center – a transit stop or station at the meeting point of several routes or lines or of different modes of transportation. It is located on or off the street and is designed to handle the movement of transit units (vehicles or trains) and the boarding, alighting, and transferring of passengers between routes or lines (in which case it is also known as a *transfer center)* or different modes (also known as a *modal interchange center, intermodal transfer facility* or an *hub).*

Transit Cooperative Research Program – a major transit research program provided for in the Intermodal Surface Transportation Efficiency Act of 1991 and established by the Federal Transit Administration in 1992. The program is administered by the Transportation Research Board on behalf of the Federal Transit Administration and the American Public Transit Association. The program emphasizes the distribution of research information for practical use.

transit dependent – having to rely on transit services instead of the private automobile to meet one's travel needs; see also *rider, captive; rider, captive transit;* and *transportation disadvantaged.*

transit shelter – a building or other structure constructed at a transit stop. It may be designated by the mode offering service, for example, *bus shelter.* A transit shelter provides protection from the weather and may provide seating or schedule information or both for the convenience of waiting passengers.

transit system – the facilities, equipment, personnel, and procedures needed to provide and maintain public transit service.

transit system, accessible – a transit system that can transport any mobile person, including those who are physically disabled, and in which the vehicles and stops or stations are designed to accommodate patrons who are confined to wheelchairs.

transit system, bus rapid – an inexact term describing a bus operation that is generally characterized by operation on an exclusive or reserved right of way that permits higher speeds. It may include reverse lane operations on limited access roads.

transit system, fixed guideway – **1.** A transportation system composed of vehicles that can operate only on their own guideways constructed for that purpose. Examples are heavy rail, light rail, and monorail. **2.** Federal usage of the term in funding legislation also includes bus priority lanes, exclusive right of way bus operations, trolley coaches, and ferryboats as fixed guideway transit.

transitway – a dedicated right of way, most commonly in a mall, that is used by transit units (vehicles or trains), usually mixed with pedestrian traffic. See also *busway.*

transportation disadvantaged – people whose range of transportation alternatives is limited, especially in the availability of relatively easy-to-use and inexpensive alternatives for trip making. Examples include the young, the elderly, the poor, the disabled, and those who do not have automobiles. See also *transit dependent; rider, captive;* and *rider, captive transit*.

Transportation Research Board – see *organization, Transportation Research Board*.

transportation system, urban – the system of transportation elements (both private and public) that provides for the movement of people and goods in an urban area. The components include transit systems, paratransit services, and highway or road systems, including private vehicles and pedestrians.

trip – **1.** A one-way movement of a person or vehicle between two points for a specific purpose; sometimes called a *one-way trip* to distinguish it from a round trip. **2.** In rail operations, a mechanical lever or block signal that, when in the upright position, activates a train's emergency braking system. **3.** The movement of a transit unit (vehicle or train) in one direction from the beginning of a route to the end of it. Also known as a *run.*

trip generation – in planning, the determination or prediction of the number of trips produced by and attracted to each zone.

trip generator – a land use from which trips are produced, such as a dwelling unit, a store, a factory, or an office.

U

UA – urbanized area; see *area, urbanized.*

UMTA – Urban Mass Transportation Administration; previous name for FTA, see *U.S. Government, Federal Transit Administration.*

U.S. DOT – U.S. Department of Transportation; see *U.S. Government, Department of Transportation.*

upstream – toward the source of traffic.

U.S. Government, Department of Transportation (DOT) – a cabinet-level federal agency responsible for the planning, safety, and system and technology of national transportation, including highways, mass transit, aircraft, and ports.

U.S. Government, Federal Highway Administration (FHWA) – a component of the U.S. Department of Transportation established to ensure development of an effective national road and highway transportation system. It assists states in constructing highways and roads and provides financial aid at the local level, including joint administration with the Federal Transit Administration of the 49 USC Section 5311 (formerly Section 18 of the Federal Transit Act).

U.S. Government, Federal Transit Administration (FTA) – a component of the U.S. Department of Transportation, delegated by the Secretary of Transportation to administer the federal transit program under Chapter 53 of Title 49, United States Code and various other statutes. Formerly known as the Urban Mass Transportation Administration.

U.S. Government, National Transportation Safety Board (NTSB) – an independent agency of the federal government whose responsibilities include investigating transportation accidents, conducting studies, and making recommendations on transportation safety measures and practices to government agencies, the transportation industry, and others.

V

vehicle, high-occupancy – any passenger vehicle that meets or exceeds a certain predetermined minimum number of passengers, for example, more than two or three people per automobile. Buses, carpools, and vanpools are HOV vehicles.

W

waiting or accessory pad – a paved area that is provided for bus patrons and may contain a bench or shelter.

wheelchair lift – a device used to raise and lower a platform that facilitates transit vehicle accessibility for wheelchair users and other disabled individuals. Wheelchair lifts may be attached to or built into a transit vehicle or may be located on the station platform *(wayside lifts).*

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Appendix B[2]

Bus Stop Flow Chart

Figure 1
Bus Stop
Location Flowchart

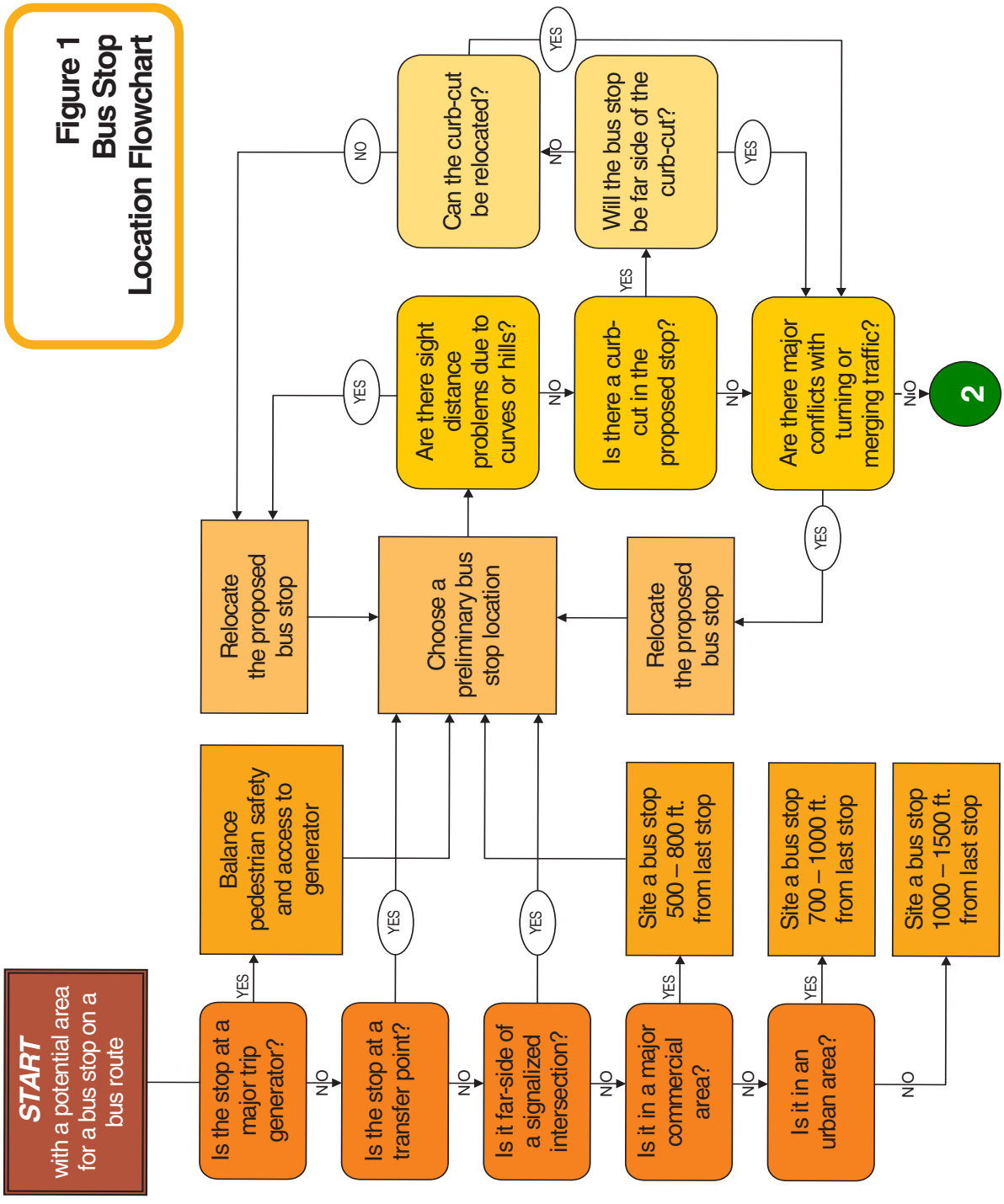
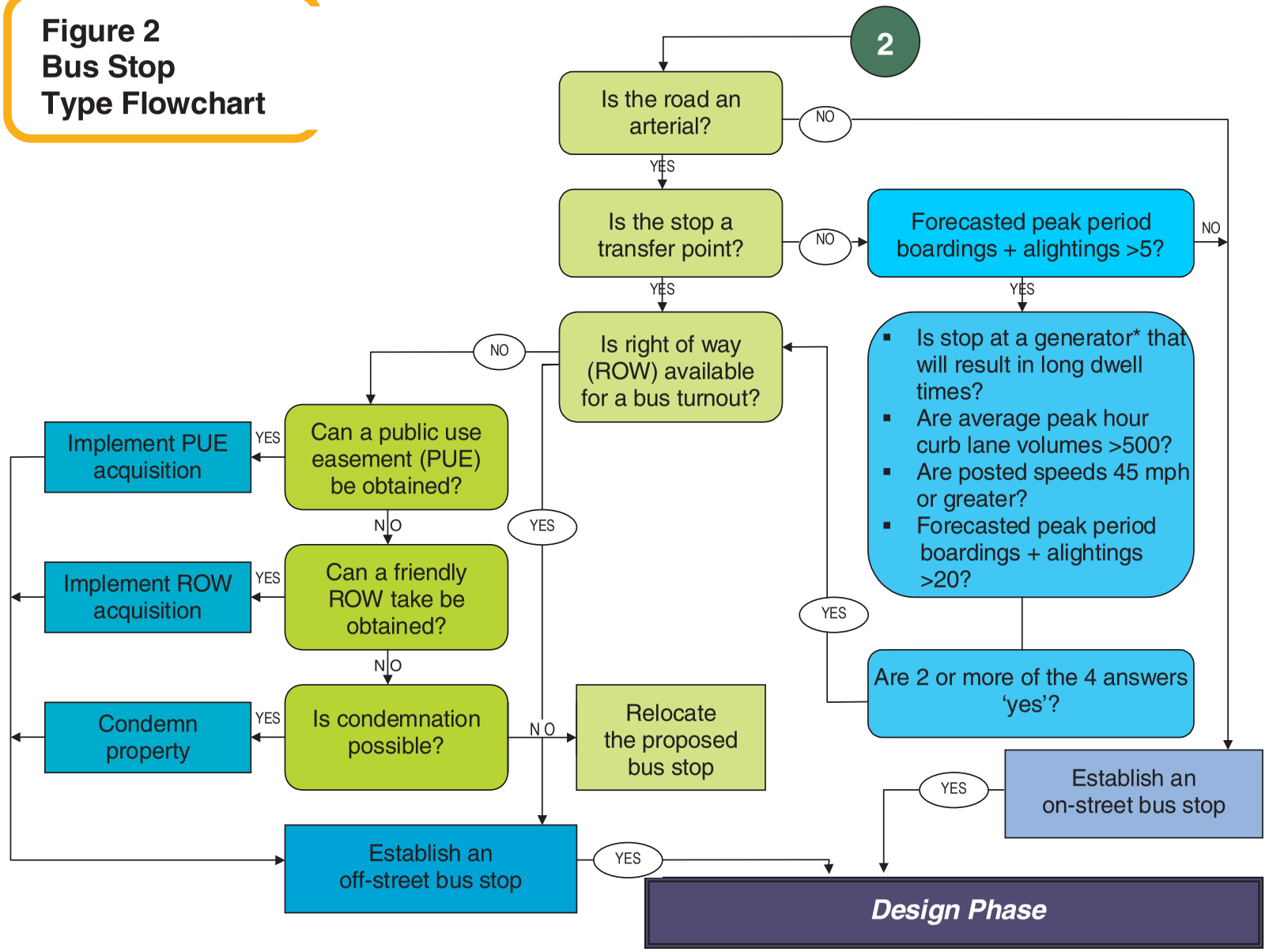


Figure 2
Bus Stop Type Flowchart



* e.g. senior Citizen's Center, school

(Refer to Handbook Chapters 1 and 2)

Appendix C[3]

Planning Procedure for Shelters Provided and Maintained by Others

Planning Procedure for Shelters Provided and Maintained by Others

1. Highlight the main point of contact at the transit agency for the advertising company. Highlight the main point of contact at the transit agency for county. Direct any new or changed site proposals to the appropriate contact. These points of contact will list the site as a “proposed” site on the master list.

2. The advertising company and the transit agency staff will field-check each proposed site, preferably at the same time.

3. The advertising company will submit a site plan to the transit agency for staff review and comment. Review will include:
   - ADA accessibility of the shelter and pad to the bus;
   - connectivity to land uses;
   - safe and convenient boarding and alighting;
   - safe bus operation within the existing lane geometry; and
   - FDOT, county, and municipal design criteria, such as setbacks based on posted speed

4. If in a municipality, that jurisdiction will review and comment on the site plan after the transit agency staff review.

5. If there is no consensus to proceed, the referents will change the status on the master list to “rejected.”

6. Notify adjacent property owners, follow their notification procedures for a neighborhood workshop, and then conduct a workshop.

7. If the consensus is to proceed, begin the formal permitting process. Notify the transit agency and change the status on the master list to “in progress.”

8. The advertising company should provide a monthly progress report to the transit agency on permitting and construction. As each new shelter is completed, the referents will change the status on the master list to “completed.”

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Appendix D

Accessibility Checklist

Accessibility Checklist

The Americans with Disabilities Act (ADA) requires that new and altered transit facilities be accessible. Title II of the ADA covers sidewalk and street construction and transit accessibility, referencing the ADA Accessibility Guidelines (ADAAG) or the Uniform Federal Accessibility Standards (UFAS) for new construction and alterations undertaken by or on behalf of a state or local government. The Department of Justice (DOJ) Title II regulation specifically requires that curb ramps be provided when sidewalks or streets are newly constructed or altered.

Bus Stop Sites and Alterations

Surface:
Are bus stop sites chosen such that, to the maximum extent practicable, the areas where lifts or ramps are to be deployed are on stable and firm surfaces?

Clear Dimensions:
Is there a clear length of at least 96-inches (measured from the curb or vehicle roadway) and a clear width of at least 60-inches (parallel to the roadway) provided to the maximum extent allowed by legal or site constraints?

Bus Stop Pad

Surface:
If a bus stop pad has been newly constructed at a bus stop, bay or other area where a lift or ramp is to be deployed, does it have a surface that is stable?

Clear Dimensions:
Is there a clear length of at least 96-inches (measured from the curb or vehicle roadway) and a clear width of at least 60-inches (parallel to the roadway) provided to the maximum extent allowed by legal or site constraints?

Connection to Pedestrian Way:
Is the pad connected to streets, sidewalks or pedestrian paths by an accessible route?

Slope:
Is the slope of the pad parallel to the roadway and, to the extent practicable, the same as that of the roadway?

Note: A maximum slope of 1:50 (2%) perpendicular to the roadway is allowed for water drainage.

Bus Shelter

Position:
Where provided, are new or replaced bus shelters installed or positioned in such a way that a wheelchair or mobility aid user can enter from the public way and reach a location having a minimum clear floor area of 30-inches by 48-inches, entirely within the perimeter of the shelter?

Connection to Boarding Area: Are such shelters connected by an accessible route to the boarding area provided? (Use Form 3: Exterior Accessible Routes)

Signs

Finish:
Do the characters and background on such signs have a non-glare finish?

Character Proportion:
Do the letters and numbers on such signs have a width-to-height ratio between 3:5 and 1:1; and a stroke width-to-height ratio between 1:5 and 1:10?

Character Size:
Are the characters on such signs sized according to viewing distance with characters on overhead signs at least 3-inches high?

Note: Signs that are sized to the maximum dimensions permitted under legitimate local, state or federal regulations or ordinances shall be considered in compliance.

Exceptions: Bus schedules, timetables, or maps that are posted at the bus stop or bus bay are not required to comply with this provision.

Appendix E[4]

Zoning Review

Land Development Code:

- Preserve and enhance the present advantages that exist in the municipality;
- Encourage the most appropriate use of land, water, and resources, consistent with the public interest;
- Overcome present handicaps;
- Deal effectively with future problems that may result from the use and the development of land within the total unincorporated area of the municipality;
- Preserve, promote, protect, and improve the public health, safety, comfort, good order, appearance, convenience, and general welfare of the municipality;
- Prevent the overcrowding of land and avoid undue concentration of population;
- Facilitate the adequate and efficient provision of transportation, water, sewerage, schools, parks, recreational facilities, housing and other requirements and services;
- Conserve, develop, utilize, and protect natural resources within the jurisdiction of the municipality;
- Maintain, through orderly growth and development, the character and stability of present and future land uses and development in the municipality.

The Local Government:

- Publishes minimum standards for all the development within the unincorporated portions of the municipality;
- Prohibits such development prior to authorization consistent with the code;
- Provides authoritative, general guidelines, not specific detailed public transit, engineering, architectural, construction, legal or other information.

If you wish to develop a parcel of land in the municipality, you must have a permit.

In order to obtain a permit, you must meet the minimum requirements recorded in the municipality Land Development Regulations (LDR).

The Transit Agency:

- Monitors the standards which pertain to accessibility by mass transit which serves developments, including accessibility for the disabled;
- Monitors mass transit standards, including rail and bus transit.

This is accomplished by:
reviewing all development and rezoning applications to the county for determination according to developers' thresholds and minimum standards.

- Adjusts the information contained in the handbook to the site-specific needs, constraints and applicable laws, regulations and codes.

Regulations:

- Subdivision Regulations – the first thing to examine is the ***location*** of the property to be divided.

- Any subdivision, which meets the developer thresholds and is located on ***public transit corridors***, is subject to the ***public transit facilities requirements***.

The public transit corridor	A public transit corridor is any route on which public transportation travels, including all bus routes. Planned corridors are listed in the Long Range Transportation Plan (LRTP).
Development thresholds and required facilities	The subdivision requirements are determined by: ▪ The number of residential units; ▪ Number of residential, non-residential and mixed use developments; ▪ Total area in square feet.

Appendix F[5]

Bus Stop Evaluation Program

Sample Request for Proposals Bus Stop Evaluation Program

Bus Stop Evaluation Programs assist transit agencies in directing capital and operations resources to locations in their service areas that will have the most impact. The following model scope of work is provided for the use of transit agencies interested in executing a bus stop evaluation program through contracting with consultants or by employing in-house resources.

Scope of Bus Stop Services

Task 1: Develop, in consultation with county staff, a set of principles, guidelines and standards for bus stop design and performance criteria.

Task 2: Evaluate existing bus stops within the county against the standard.

Task 3: Identify shortcomings and desired improvements with relation to safety, lighting, amenities, access to nearby origins/ destinations and ADA (Americans with Disabilities Act) requirements. The report should include examples from other transit agencies.

Task 4: Design specific improvements for the top 10% of stops needing the most improvement (such as safety improvements, shelters benches, tree trimming, re-location of stop, etc).

Task 5: Provide design on existing County Plan and Profile (P&P) sheets of the top 10% of stops identified in Task 4. Include existing items such as signage, paper boxes, etc. in the drawings. The county should supply P&P sheets of the selected stops for improvements identified in Task 4.

Task 6: Recommend an implementation plan and work with the county planning staff to prepare financial strategies and an action plan and schedule.

Task 7: Work with the county staff to recommend a plan for organizing multiple agencies to optimize cleaning of shelters, including recommended standards for frequency and repairs, emergency and routing maintenance.

Task 8: Complete an evaluation of the advantages and disadvantages of contracting for shelter installation and maintenance in exchange for advertising space, including case studies of actual programs.

Task 9: Complete file of digital pictures of each stop in an appropriate format, to be entered into the Geographic Information System (GIS) database.

Resources To Be Provided To Contractors

County staff has performed a survey of the bus stops with shelters, and the results are entered in a GIS. Ridership data at the bus stop level will be made available to the contractor after award from the transit agency through the relevant planning staffs. A list of all stops, with amenities, will be provided in an electronic spreadsheet. A description of desired bus stop information delivery systems (sign holders, electronic information signs and kiosks, etc.) will be provided, along with the desired street furniture design and vendors. Safety and accident reports from the transit agency and county will be provided through the county staff, as requested.

The county will act as intermediary to the transit agency and other sources of outside information that may be required for completion of this project. All requests shall be made to the county's project officer in writing.

The contractor should purchase a laptop computer, digital camera and other necessary equipment as directed by the county. These items will be reimbursed separately, and shall become county property at the end of the contract.

Deliverables

A. Monthly reports should be delivered to the county.

B. The GIS database should be updated, including an update of the inventory and photographs of bus stop.

C. Web page should be designed to provide current information about the bus stop study, and a procedure to handle email comments.

D. Technical Memorandum #1 should include:

- A report of bus stops from another region or agency outside of the county metro area;
- Local and state requirements that affect bus stop design standards;
- Responses from driver interviews;
- Incorporation of marketing consultant's information delivery system recommendations;
- Recommended bus stop standards.

E. Technical Memorandum #2 should include:

- Master list of identified shortcomings and recommendations on a stop-by-stop basis;
- Criteria for prioritizing bus stop improvements and ranking method, including (but not limited to) the items described in Task 4;
- The top 10% of bus stops needing the most improvement, as identified using the prioritizing method above.

F. Specific improvements should be drawn on plan and profile sheets (supplied by the county) or produced using a computer program. Improvements to each of the top 10% of bus stops should be also detailed in tabular and written format.

G. A plan to coordinate bus shelter maintenance with the county, the transit agency and another involved parties.

H. An evaluation of providing for shelter installation and maintenance through an advertising contract.

I. A final comprehensive report with executive summary that provides findings, conclusions and recommendations.

Time Line

1. The base term of this contract shall start upon award of the contact, and continue for seven months, with two extension options of three months each.

2. Monthly reports shall be due by the tenth day of each month.

3. The draft of the final comprehensive report shall be due six months from award of the contract, with the final report due one month after submittal of the draft unless rescheduled during contract performance. This shall include designing the action plan and schedule with the county planning staff.

4. The time line may be extended due to scheduling the advisory committee meetings to meet all members' availability to attend.

5. The contractor proposes the following time line:

		Months after notice to proceed						
	Tasks	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Task 1	Initiate project, purchase equipment and obtain database		*					
Task 2	Develop bus stop design standards			*	Technical Memorandum			
Task 3	Conduct field work							
Task 4	Assess bus stop improvement needs				*	Technical Memorandum		
Task 5	Design specific improvements for top 100 stops							
Task 6	Develop implementation plan							
Task 7	Develop shelter maintenance plan							
Task 8	Evaluate advantages and disadvantages of contracting							
Task 9	Provide technical assistance with updating GIS file							
Task 10	Write draft and final reports				Draft Final Report			
					Final Report			F

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Appendix G[6]

Bus Passanger Facility Development Thresholds

Development Thresholds and Transit Facilities

Developer Thresholds	Required Facilities
Developments greater than 500,000 sq. ft. or 1,000 residential units:	▪ Sidewalks ▪ ADA and paratransit access ▪ Sheltered Park-and-Ride facility ▪ Separate bus loading and unloading area ▪ Bus staging area for passenger loading/unloading
Developments of 500 to 1,000 residential units; Non-residential and mixed use developments of 200,000 - 500,000 sq. ft.:	▪ Sidewalks ▪ ADA and paratransit access ▪ Bus bay ▪ Transit accessory pad w/shelter, seating, trash receptacle and bicycle rack
Non-residential developments 100,000 -200,000 sq. ft.:	▪ Sidewalks ▪ ADA and paratransit access ▪ Transit accessory pad w/shelter, seating, trash receptacle and bicycle rack
Non-residential developments 50,000 -100,000 sq. ft.:	▪ Sidewalks ▪ ADA and paratransit access ▪ Transit accessory pad w/shelter, seating, trash receptacle and bicycle rack
Non-residential developments or single- or multi-tenant office buildings of less than 50,000 sq. ft.:	▪ Sidewalks ▪ ADA and paratransit access ▪ Pedestrian and bicycle connections

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Appendix H[7]

Pedestrian Improvement Tresholds

Pedestrian Improvement Thresholds

The purpose of this table is to provide a quick reference for addressing pedestrian access requirements and pedestrian mobility enhancements. The table cross-indexes street types, traffic volumes, and typical speeds with appropriate pedestrian amenities described in detail in Chapter 2.

Pedestrian Measures Guidelines Matrix

	Residential	Residential	Residential collector	Main Street CBD	Commercial >2 lanes	Minor Arterials	Arterials	Major Arterials
Volume (vehicles per day)	<1,200	1,200-2,000	2-5,000	<10,000	7-15,000	10-15,000	15-20,000	>20,000
Typical speeds (mph)	15-25	25	25-30	25-30	30-35	30-35	35-40	35-40
Intersection Nubs								
Colored/Textured Crosswalks								
Midblock Crossings								
Raised Pedestrian Crossing								
Pedestrian Islands								

Most appropriate	
Moderately appropriate	
May be appropriate with mitigating circumstances	

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H2

Appendix I

Recommended Comprehensive Plan Language

Recommended Transit-Supportive Language and Policies For Local Government Planning Documents

As an addendum to some Florida County's Transit Development Plan (2003-2007) the Center for Urban Transportation Research (CUTR) at the University of South Florida has developed recommended transit-supportive language to be used in the comprehensive plans and other planning-related documents in the county or its encompassing municipalities. This language represents a strengthening in policies and procedures to better integrate transit into land use and development activities. The recommendations address a broad range of land use and transportation planning issues, including increasing density, mixed-use, pedestrian-oriented design, and most importantly, transit service. In general, transit-supportive development involves dense, mixed-use development designed for pedestrians and multi-modal transportation.

Florida counties have an opportunity to strengthen their comprehensive plans and other planning-related documents to ensure the integration of public transportation policies into the land use planning and development process. It is imperative that *all local government entities* consider how proposed developments and recommended land use changes can impact or will be impacted by public transit. County and municipal planning documents can be useful instruments in the development of a public transportation system.

However, local governments should be encouraged to adopt proactive policies rather than reactive ones so that they can be prepared for opportunities to enhance public transportation.

CUTR recommends that county staff consider the reasoning behind each recommendation and determine whether it is in keeping with the goals of the transit system and county government, as a whole. In addition, the language may be recommended to other local governments within the county to promote consistency. It is important to recognize that the absence of transit service to an area does not preclude the local government from establishing guidelines for the future.

Typically, transit-related policies and language can be found in the Future Land Use Element and Transportation Element. In addition, each local government's comprehensive plan or land development code may have other elements to which transit-related language is applicable. Presented below are recommended transit-supportive objectives and policies that might complement goals established in the Future Land Use and Transportation Elements of the county's plan. The county should ensure that the goals in those elements reflect support for a multi-modal transportation system.

Future Land Use Element

The Future Land Use Element usually represents the "blueprint" for land development in the jurisdiction. The Future Land Use Element should include broad guidelines related to land use patterns and population densities that can be instrumental in implementing transit-supportive development projects.

Recommended language for the Future Land Use Element

Objective: The county shall promote an intensive mixture of employment, goods and services, and residential uses in activity centers and promote the use of public transit throughout major corridors of such activity centers.

Policy: Medium- and high-density multi-family residential development shall be encouraged near major employment centers with convenient access to transit routes.

Policy: Shopping centers shall be located in areas served by public transit along arterials with secondary access on another collector or arterial streets providing convenient access to surrounding residential areas as well as opportunity to facilitate return trips.

Policy: Ensure that the public transit network serves major corridors and centers.

Policy: Encourage the location of public and semipublic uses on the public transit network.

Objective: The county shall encourage land use developments that generate pedestrian activity and transit ridership.

Policy: Ensure that land development regulations address the requirement of sidewalks and appropriate pedestrian infrastructure.

Policy: Encourage design development that reflects consideration of pedestrian, bicyclists, and transit users.

Policy: Encourage streets designed to promote multi-modal use by ensuring safe connections between streets and sidewalks, as well as safe links to transit routes.

Policy: Manage the growth of parking and encourage its efficient use.

Transportation Element

Often the Transportation Element of a comprehensive plan is reflective of goals, objectives, and policies that only relate to roads and the impact that development might have on roads. However, it is imperative that mass transit be included in any discussions or policy considerations related to the transportation network.

Recommended Language to the Transportation Element

Objective: Provide a coordinated multi-modal transportation system to serve current and future land uses and population needs.

Policy: Coordinate with the Metropolitan Planning Organization (MPO) to ensure that the provision of public transportation is considered in lieu of or part of major transportation construction projects.

Policy: Coordinate with the MPO to develop efficient and effective public transportation and other ride-sharing programs.

Policy: Establish public transportation to and from the airport for passengers, as well as employees.

Policy: The county shall coordinate with the MPO and the paratransit and transit provider to ensure that the transportation disadvantaged population is adequately served.

Policy: The county shall work to establish land use, site, and building design guidelines for development in exclusive public transportation corridors to assure the accessibility of new development to public transportation.

Objective: Promote alternate modes of transportation through the construction of bicycle facilities, pedestrian facilities, and the use of public transit.

Policy: New residential development shall provide sidewalks on both sides of minor collector streets and one side of every other street except for cul-de-sacs which are less than six hundred feet in length.

Policy: The county shall integrate bicycle and pedestrian features (i.e. bicycle racks on buses, bicycle storage lockers, and park and ride lots) into transit planning.

Policy: The county shall designate all roads serviced by existing and/or proposed bus routes as "public transportation corridors".

Policy: The county shall work to develop a coordinated and consistent policy with the Future Land Use Element to encourage land uses that promote public transportation in designated public transportation corridors.

Policy: The county shall encourage the provision of cut-throughs in residential developments for pedestrian and bicycle access to public transportation.

Policy: New commercial, industrial, and residential developments shall provide bus stop improvements if located on an existing or proposed bus route and shall provide transit information to employees and/or residents.

Policy: The county shall work with the MPO and the mass transit provider to develop numerical indicators against which the achievement of the mobility goals can be measured, such as: modal split, annual transit trips per capita, or automobile occupancy rate.

Policy: The county shall request that all major employers consider implementing Transportation Demand Management (TDM) strategies such as flextime, parking policies, carpools, vanpools, monthly transit passes, or alternate work schedules for their employees to spread the peak travel times in the county.

Policy: The county shall incorporate into its Land Development Code appropriate project design standards to ensure that the needs of pedestrians and bicyclists are met.

Policy: The county shall coordinate with the MPO, transit provider, and all affected local municipalities to provide passenger amenities along major public transportation corridors based upon the established criteria.

Policy: The county shall coordinate with the MPO, transit provider, and all affected local municipalities to establish programs directed toward financing public transportation passenger amenities to enhance the attractiveness of public transportation usage.

Objective: The county shall coordinate its transportation planning with the MPO, the transit provider, Florida Department of Transportation (FDOT), and other transportation agencies to the maximum extent feasible.

Policy: The county shall respond in writing to all requests for information from other agencies involved in transportation planning in the area.

Policy: The county shall work with the transit provider and local municipalities to improve the location of bus stops and to install benches, clearly marked signs, lights, and covered or enclosed waiting areas at selected bus stops (based on established criteria).

Policy: The county shall require applicants for development proposals to be consistent with all adopted transportation plans of the FDOT, the MPO, the county, and all affected municipalities.

Policy: The county shall work with the MPO and the transit provider to develop numerical indicators against which the achievement of the mobility goals of the community can be measured, such as: modal split, annual transit trips per capita, or an automobile occupancy rate.

Policy: The county shall continue to involve the citizens and those affected agencies within the county in the development and implementation of its Transit Development Plan.

In accordance with Florida Statutes Chapter 163.3194 (b), "All land development regulations enacted or amended shall be consistent with the adopted comprehensive plan, or element or portion thereof, and any land development regulations existing at the time of adoption which are not consistent with the adopted comprehensive plan, or element or portion thereof, shall be amended so as to be consistent."

Land Development Code

In response, below are standards and guidelines that might be considered for the county's Land Development Code in support of the recommended language for the Comprehensive Plan. Specifically, site plan application requirements and public transit facilities standards are sections which might be be included in the land development code to better achieve the inclusion of transit facilities in planned development projects.

I. Site Plan Application Requirements

A. The preliminary and final site development plans shall identify existing transit routes on abutting streets. A circulation plan map delineating the location, classification, names, and widths of all major public or private streets and rights of way, pedestrian paths, trails, bikeways, and transit routes within 1,500 feet of property boundaries shall be identified on the site development plans.

II. Public Transit Facilities

A. General - Public transit facilities including pedestrian circulation systems and pathways to public transit facilities shall be provided as established with each threshold listed below.

B. Location - Public transit facilities shall be provided on sites meeting the threshold requirements and located on public transit corridors or planned corridors as listed in the Long Range Transportation Plan.

C. Development thresholds and required facilities-

1. Developments greater than 1,000 residential units and non-residential and mixed-use developments of greater than 500,000 square feet shall be required to provide the following:

a. A circulation pattern with turning radii sufficient to accommodate bus movement.

b. Bus staging areas segregated from automobile traffic with the number of bays or pull-ins to be decided by the developer and the county based upon the adopted MPO Long-Range Transportation Plan.

c. Shelter protected space that is suitable for waiting out of inclement weather throughout the transit service provided as approved by the county.

d. Park-and-Ride accommodation, the county and the developer shall decide on the location, timing, and construction of such a facility.

e. At the sole discretion of the county, the developer may be allowed a reduction in required parking spaces based on a credited modal split for transit.

2. Developments of 500 to 1,000 residential units and non-residential and mixed-use development of 200,000 square feet to 500,000 square feet shall provide pedestrian and bicycle connections.

3. Non-residential developments of 100,000 to 200,000 square feet shall provide a transit accessory pad including the following: shelter, seating, trash receptacle, and bicycle rack.

4. Non-residential developments of 50,000 to 100,000 square feet shall provide a transit accessory pad including the following: shelter, seating, trash receptacle, and bicycle rack.

5. Non-residential development or single- or multi-tenant office buildings of less than 50,000 square feet shall provide a bus stop and pedestrian and bicycle connections.

D. Exceptions - If determined by the county that the public transit facilities are not needed for a project, either in whole or in part, the county may waive the public transit facilities requirement.

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Appendix J

Passenger Amenities at Bus Stops

Advantages and Disadvantages of Passenger Amenities at Bus Stop

Amenity	Advantages	Disadvantages
Shelters	▪ Provide comfort for waiting passengers ▪ Provide protection from climate-related elements (sun, glare, wind, rain, snow) ▪ Help identify the stop	▪ Require maintenance, trash collection ▪ May be defaced by graffiti
Benches	▪ Provide comfort for waiting passengers ▪ Help identify the stop ▪ Low cost when compared to installing a shelter	▪ Require maintenance ▪ May be defaced by graffiti
Vending Machines	▪ Provide reading material for waiting passengers	▪ Increase trash accumulation ▪ May have poor visual appearance ▪ Reduce circulation space ▪ Can be vandalized
Lighting	▪ Increase visibility ▪ Increase perceptions of comfort and security ▪ Discourage “after hours” use of bus stop facilities by indigents	▪ Require maintenance ▪ May be defaced by graffiti
Trash Receptacles	▪ Provide place to discard trash ▪ Keep bus stop clean	▪ May be costly to maintain ▪ May have a bad odor
Telephones	▪ Convenient for bus patrons ▪ Provide access to transit information	▪ May encourage loitering at bus stop ▪ May encourage illegal activities at bus stop
Route or Schedule Information	▪ Useful for first-time riders ▪ Helps identify bus stop ▪ Can communicate general system information	▪ Must by maintained to provide current information ▪ May be defaced by graffiti

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Appendix K
Bus Shelter Manufacturers

The following is a sample list of firms that sell prefabricated transit shelters. This list is meant to be a helpful sample of firms to help transit agencies get started in the purchasing process. This list has not been approved by or pre-qualified by the Florida Department of Transportation or Florida State University. The Florida Department of Transportation, Florida State University and the authors of this guideline do not take responsibility for or accept liability for any of the products on this list or for the use of these products. This list is not meant to be complete, and due to the rapidly changing nature of commerce in the world today, it may be obsolete by the time the guidelines are printed. It is recommended that users of this guideline search for alternative firms on the internet or through equipment supplier catalogues or other sources to supplement this list.

Architectural Products Co.

P.O. Box 418
Monroe, WA 98272-0418
Telephone: 866-805-5159
Fax: 360-805-5258
http://www.architectural-products.com

Company Description: Manufacturing and distribution of architectural site furnishings and accessories, park benches, trash and ash receptacles, bike racks, bike lockers, structures, shelters, custom signage and directories, and architectural and ornamental fencing.

Austin Fabricating, Inc.

2175 Beech Grove Place
Utica, NY 13501
Telephone: 315-793-9390
Fax: 315-793-9370

Company Description: Manufacturer of prefabricated aluminum booths, buildings, bus shelters and smoking shelters. Uses include guard houses, parking lots, security, service stations, shopping malls, ticket collection, film developing.

B.I.G. Enterprises, Inc.

9702 T E. Rush St.
El Monte, CA 91733-1730
Telephone: 626-448-1449
Fax: 626-448-3598
http://www.bigbooth.com

Company Description: Shelter manufacturer.

Brasco International, Inc.

1000 Mt. Elliott St.
Detroit, MI 48207
Telephone: 800-893-3665
Fax: 313-393-0499
http://www.brasco.com/

Company Description: Manufacturers of outdoor smoking shelters, covered walkways, bus stop shelters, advertising display shelters, and entrance way enclosures. Prefabricated aluminum structures are also used as guard booths, kiosks, bicycle shelters and platform shelters. A wide range of roofing styles and custom configurations are available.

Design by Brasco International

CKC

440 Wenger Drive
Ephrata, PA 17522
Telephone: 888-227-5672
http://www.ckckiosk.com

Company Description: Design, manufacture and delivery of custom designed kiosks and shelters. Uses include gas island kiosks, convenience stores, customs inspection stations, toll collection booths, parking security, smoking and transit shelters. Units arrive fully assembled and ready for hook-up. Variety of sizes and shapes; electrical, plumbing, and HVAC systems are available. Assortment of glass, door and hardware components is available. Complete selection of both exterior and interior finishes and colors, plus additional features. Operational components (cash drawers, safes, power windows, counters, and signage) can be added.

Columbia Equipment Co., Inc.

180-10-T 93rd Ave.
Jamaica, NY 11433-1408
Telephone: 888-768-2337
Fax: 718-526-4110
http://www.columbiaequipment.com

Company Description: Manufacturer of prefabricated bus and transit shelters; smoking shelters, advertising shelters, taxi stands, security guard booths, information kiosks, golf shelters, building entrance canopies and windbreaks, and benches.


Design by Columbia Equipment Co., Inc.

Daytech Manufacturing, Inc.

227-T Thorn Ave.
Orchard Park, NY 14127
Telephone: 716-667-1702
Fax: 716-667-1709
http://www.daytechmfg.com/

Company Description: Shelters, kiosks, walkways, canopies, back-lit signs and displays, map frames, schedule holders, benches, and street furniture.

Design Dimensions

7208 McNeil Dr., Suite 104
Austin, TX 78729
Telephone: 512-258-8596
Fax: 512-258-9108
http://www.designdimensions.com

Company Description: Industrial and engineering, design and development, plus electrical and mechanical.

Duo-Gard Industries Inc.

40442 Koppernick Dr.
Canton, MI 48187
Telephone: 734-207-9700
Fax: 734-207-7995
http://www.duo-gard.com

Company Description: Smoking shelters, bus shelters, site shelters, walkway and entry canopies, skylights, plastic modular buildings, and translucent daylighting systems.

Handi-Hut, Inc.

3 Grunwald St.
Clifton, NJ 07013
Telephone: 800-603-6635
Fax: 973-614-8011
http://www.handi-hut.com

Company Description: Designer and manufacturer of glass and aluminum modular shelters.

Lacor Streetscape Inc.

505 W. Dunlap, Suite 1A
Phoenix, AZ 85021
Telephone: 602-371-3110
Fax: 602-216-2772
http://www.lacorss.com

Company Description: Bus shelters, benches, trash receptacles, ash urns, advertising kiosks, and solar lighting

Little Buildings, Inc.

161 Shafer Dr.
Romeo, MI 48065
Telephone: 586-752-7100
Fax: 586-752-7108
http://www.littlebuildingsinc.com

Company Description: Bullet resisting security enclosures, cashier booths, and shelters.

Midwest American Shelter Systems

P.O. Box 4555
Akron, OH 44310-0555
Telephone: 800-480-4887
Fax: 330-673-5227

Company Description: Prefabricated shelters, custom walkways guard booths, and benches.

Modular Engineering Co.

P.O. Box 8241
Erie, PA 16505-0241
Telephone: 800-397-6395
Fax: 814-833-2577
http://www.modularengineering.com


Design by Par-Kut International Inc.

Company Description: Custom builder of modular steel buildings for industrial, commercial, public or institutional use. Can design custom sizes and shapes.

National Shelter Co.

P.O. Box 477
Torrance, CA 90255
Telephone: 310-488-3346
http://www.nshelter.com

NEC Architectural Metal Products

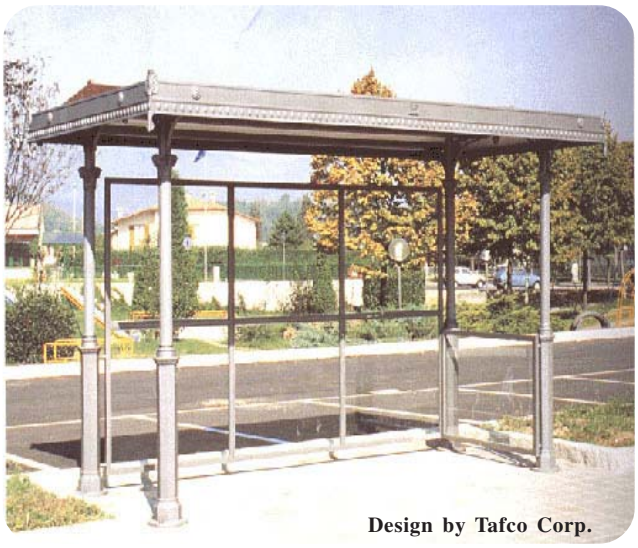
1122 Lauder
Houston, TX 77039-2902
Telephone: 281-987-1144
Fax: 281-987-9443
http://www.neonelectric.net

Company Description: Manufactureer of shelters, furniture, benches, tables, trash receptacles, kiosks, and signs.

Par-Kut International, Inc.

40963 Production Dr.
Harrison Township,
MI 48045-1351
Telephone: 800-394-6599
Fax: 586-463-6059
http://www.parkut.com

Company Description: Manufacturer of custom and standard portable steel buildings which arebuilt to specifications. Uses include guardhouse, parking cashier booths, turnpike, tunnel and bridge toll booths, weigh scale houses, in-plant offices, euipment shelters, and crane cabs. nts. Modular, site assembled, building systems are used for application including; in-plant offices, team centers, guardhouses, smoking shelters, and bus shelters.


Design by Tafco Corp.

Porta-King Building Systems

4133 Shoreline Dr.
Earth City, MO 63045-1211
Telephone: 866-867-0166
Fax: 314-291-2857
http://www.portaking.com

Company Description: Manufacturers of modular and preassembled building systems used by industry, institutional and government clients. Modular, site assembled, building systems are used for application including; in-plant offices, team centers, guardhouses, smoking shelters, and bus shelters.

Quality Manufacturing Inc.

969 Labore Industrial Ct. Dept. TR
Saint Paul, MN 55110
Telephone: 888-243-5473
Fax: 651-483-1101
http://www.qualitymanufacturing.com

Company Description: Completer manufacturer of custom shaped shelters. Made with rigid plastic and flexible or metal faces.

Tafco Corp.

5024 Rose St.
Schiller Park, IL 60176-1099
Telephone: 847-678-8425
Fax: 847-678-8471
http://www.tafcocorp.com

Company Description: Manufacturer of transit and smoking shelters, kiosks, windscreens, and bollards.

Tolar Mfg. Co., Inc.

258 Mariah Cir.
Corona, CA 92879
Telephone: 909-808-0081
Fax: 909-808-0041
http://www.tolarmfg.com/

Company Description: Manufacturer of bus and smoking shelters, street furniture, and site furnishings and amenities.

Vermont Street Furniture

139 Main St.
Brattleboro, VT 05301
Telephone: 802-257-7883
Fax: 802-257-5119

Company Description: Manufacturer of bus, ski and smoking shelters.

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Appendix L

Costs

The following are estimates of construction costs for a range of facility elements described in this handbook. This information is provided for planning purposes only. Costs will vary depending on site conditions, facility location, design, specification, materials, purchasing processes, and the local market for construction services.

Curb-Side Facilities

Facility	Elements	Estimated cost
ADA Enhancements	Landing pads, wheelchairs ramps	Varies depending on type of project.[7]
Lighting	Roadway lighting improvements	Varies depending on fixture type and service agreement with local utility.[7]
Landscaping	Suitable landscaping	Opportunities for funding landscaping are often more flexible than with major street changes. For example, the cost of the actual landscaping may be paid by neighborhood or business groups. Often, municipalities will pay for the initial installation and neighborhood residents or businesses agree to maintain anything more elaborate than basic street trees. [7]
Other	Bike racks, trash receptacles, shopping cart storage, bollards	Varies depending on the type of furniture, and the material out of which it is constructed. [7]
Sidewalks	Sidewalks or walkways	The cost for concrete curb and sidewalk is approximately $15/linear foot for curbing and $11/square foot for walkways. Asphalt curbs and walkways are less costly but require more maintenance.[7]

Streetside Facilities

Facility	Elements	Estimated cost
Bus Bay	Specific paving treatments	Variable; materials requiring hand labor (cobblestones or pavers) have a higher cost. [7]
Queue Jumper Bus Bay	Right–turn slip lanes or bus lane	Approximately $50,000–$200,000 to reconfigure roadway, add striping and construct an island. [7]
	Bus prioritarization traffic signals	$30,000–$140,000. [7]
Bus Bulb	Curb extensions	Curb extensions cost from $2,000 to $20,000 per corner, depending on design and site conditions. Drainage is usually the most significant determinant of costs. If the curb extension area is large and special pavement and street furnishings and planting are included, costs will be higher. Costs can go up significantly if something major such as a traffic signal mast arm or controller box is moved. [7]
Bike Lanes	Adding bicycle lanes	The cost of installing a bike lane is approximately $5,000 to $50,000 per mile, depending on the condition of the pavement, the extent of removing and repainting lane lines, the need to adjust signalization, and other factors. From a cost stand point, the best time to create bicycle lanes is during regular street reconstruction, street resurfacing or at the time of original construction. [7]
Pedestrian Crossings	Curb ramps	$800 to $1,500 per curb ramp (new or retrofitted). [7]
	Pedestrian signals	$30,000–$140,000. [7]
	Recessed stop lines	Low cost. There is no extra cost when the recessed stop line is installed on new paving or as part of repaving projects. A stop sign can be used to supplement the recessed stop line. [7]

Streetside Facilities

Facility	Elements	Estimated cost
Intersection Nubs	Marked crosswalks and enhancements	$100 for a regular striped cross-walk, $300 for a ladder crosswalk and $3,000 for patterned concrete crosswalk. [7]
	Upgrade/modify pedestrian signal timing	Adjusting signal timing is very low cost, and requires a few hours of staff time to accomplish. New signal equipment is approximately $20,000. [7]
Raised Pedestrian Crossing	Raised intersection and raised pedestrian crossing	Raised crosswalks are approximately $5,000 - $7,000, depending on drainage conditions and materials used. The cost of a raised intersection is highly dependent on the size of the roads They can cost from $25,000 to $70,000. [7]
	Speed hump/table	The cost for each speed hump is approximately $2,000. Speed tables are $5,000–$15,000, again depending on drainage conditions and materials used. [7]
Pedestrian Islands	Pedestrian islands	Costs range from $6,000 - $9,000. The cost for installing a raised concrete pedestrian refuge island (with landscaping) is about $10,000 to $30,000. The cost is less for an asphalt island or one without landscaping. [7]
Median	Raised medians	The cost for adding a raised median is approximately $15,000 to $30,000 per 100-feet, depending on the design, site conditions, and whether the median can be added as part of a utility improvement or other street construction project. [7]
	Intersection median barriers	$10,000 - $20,000. [7]
Parking	On-street parking	$30–$150 per sign. Curb paint and stall marks or striping costs are additional. [7]

Typical Transit Facilities

Facility	Elements	Estimated cost
On-line Bus Stop	Bus stop signs, benches, leaning rails, shelters, bus stop information and way-finding devices, shelter lighting	$1,000–$10,000. Cost varies widely depending on type of improvements.[7]
Primary Stop	Shelters, bench seating, newspaper vending machines and trash receptacles, signs identifying the transit systems and the routes, bicycle storage area and pay telephone.	Approximately $15,000, exclusive of land costs.[8]
Transfer Center	Sawtooth bus bays, passenger shelters and seating, an information kiosk, secure bicycle storage, trash receptacles, and public telephones.	Approximately $50,000, exclusive of land costs.[8]
Park-and-ride	Parking spaces shared, parking lot lighting, installing signage	Approximately $30,000, exclusive of land costs.[8]

Notes

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[8] National Center for Urban Transportation Research, Center for Urban Transportation Research University of South Florida. (2001). *Neighborhood Intermodal Transfer Facilities. Final Report.* Tampa, FL: Center for Urban Transportation Research.

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