

August, 2004

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1.0 INTRODUCTION

The wave of new and renewal development that has been sweeping Palm Beach County the last few decades has heightened interest in Transit land-use patterns. Palm Tran, Palm Beach County (PBC), the Metropolitan Planning Organization (MPO), Florida Department of Transportation (FDOT), and local jurisdictions are increasingly promoting the concepts for Transit- focused development of commercial and residential land uses.

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

In an effort to positively respond to the Transit needs of Palm Beach County, Palm Tran has developed this Transit Design Manual. It encourages planners, designers, developers and local jurisdictions to work with Palm Tran to give early consideration to Transit service in developing areas as well as revitalization projects. This manual outlines access and service criteria. We think that this manual makes it easier for you to consider designing Transit access in land-use, to create a Transit-friendly environment and to promote a Transit-focused development. It is hoped that this cooperative approach will serve as a traffic mitigation platform that will enable all concerned to provide better Transit service to our Riders.

1.1 PURPOSE

Palm Tran recognizes how important it is for developers and local jurisdictions to understand our system:

- Operating philosophy and service standards
- Basic operating criteria and physical access requirements
- Transit Infrastructure

Without that understanding, a Transit perspective is absent from decision-making and opportunities for improved Transit service may be lost. This manual has several purposes:

1. Explains the significant benefits of Transit accessibility
2. Reviews the goals and standards used by Palm Tran to make service decisions
3. Provides important operational and design standards

This manual is intended for use by developers, planners, and engineers who recognize that designing for Transit from project inception leads to better Transit, Rider convenience, safety, traffic mitigation and other socio-economic benefits. It is a design guide to be used with FDOT and Palm Beach County standards as they exist or are amended. There is more to good Transit service than buses. Providing clean, comfortable and safe vehicles is Palm Tran's responsibility. Assuring that our vehicles can easily access developing areas, encouraging Ridership, and providing a means for our Riders to safely get to/from their Bus Stop, and that the Rider can wait comfortably for the next bus is a joint responsibility. This is why developers and local jurisdictions are being called to work with Palm Tran in a cooperative Transit planning process.



TRANSIT DESIGN MANUAL

INTRODUCTION

1.2 PALM TRAN OVERVIEW

Palm Tran, formerly Florida Transit Management and Co-Tran, was created on August 2, 1971. It is responsible for providing Transit services in Palm Beach County. Operations include an integrated system of bus routes connecting with other bus routes (to include Broward County Transit-BCT and local jurisdiction circulator service), Tri-Rail (Mangonia Park, West Palm Beach, Lake Worth, Boynton Beach, Delray Beach, and Boca Raton Stations), and Palm Tran CONNECTION - our paratransit service for the elderly and mobility impaired. Annual Ridership is more than six million with approximately 20,000 Riders each weekday.

Palm Tran operates approximately one hundred buses daily on approximately thirty-five routes in Palm Beach County. The system serves most of Palm Beach County's urbanized areas with service to the Glades agricultural communities. Throughout Palm Beach County, the system has seventeen timed transfer locations, where three or more routes intersect. In most instances, the wait between transfers is ten minutes or less.

Palm Tran operates fixed route service seven days a week. All Palm Tran buses are fully ADA accessible and are equipped with bike racks.

Free route maps and schedules are available at the Palm Tran facilities (West Palm Beach and Delray Beach), the Palm Beach Governmental Centers and Public Libraries. Information Operators are also available by calling (561) 841-4287 or (561) 930-4287. Information is also available on our web site (www.palmtran.org/).

Palm Tran CONNECTION provides a full range of door-to-door, ambulatory and non-ambulatory, paratransit service for those unable to use the fixed-route service. In accordance with the Americans with Disabilities Act (ADA), sponsored service is provided to eligible Riders during the same service hours as fixed-route service. Other service sponsors include: Division of Senior Services (DOSS), Transportation Disadvantaged (TD) and Medicaid. A detailed description of this service may be found in the annual Transportation Disadvantaged Service Plan. Additional specific information may be obtained by contacting Palm Tran CONNECTION's Lake Worth facility at (561) 649-9838 (or TDD at (561) 649-0683).

1.2.1 Mission Statement

The mission of Palm Tran is to provide the citizens of Palm Beach County with a safe, convenient and affordable mode of transportation.

We, the Palm Tran employees, pledge to provide the highest quality of Transit service available by successfully accomplishing each of our assigned roles including not only meeting our customer's needs but exceeding their expectations.

The Management of Palm Tran is committed to the highest quality of customer and employee satisfaction and promises to do whatever it takes to achieve that satisfaction. This includes short and long term plans for system development, marketing, and employee training which will foster a sense of pride in our employees and customers.

We encourage all Palm Tran employees to fully embrace our slogan, "Wherever Life Takes You."

1.2.2 Essence of Design Planning

Given Palm Tran's mission, we are charged to provide our Riders with the most efficient timely service possible (given changing traffic conditions and situations) and provide advance detailed information on changes in a proficient manner. This is not an easy task listing. Our Riders expect and deserve a safe and efficient Transit system that provides mobility and a better quality of life in Palm Beach County within available financial resources. This is a difficult balance to achieve. Mobility and efficiency often oppose each other.

Palm Tran makes the necessary adjustments to routing, manpower and equipment so as to offer our Riders reliable convenient scheduled service. Our goal is to provide Transit service as close as possible to our advertised schedule (public timetables).

Making needed adjustments is only half the solution. Palm Tran Planning is responsible for coordinating with other agencies to insure that the Transit design plan is disseminated to all interested parties. Allowing adequate time to alert our Riders of service changes, detours and delays is essential to providing good Transit service. Good operations planning and communication are an integral part of mix.

1.2.3 Customer Service Philosophy

Our Riders deserve...

- A. Prompt, courteous, convenient service.
- B. Safe, reliable, clean, convenient and comfortable transportation.
- C. Accurate, timely, responsive communications.
- D. Meaningful input to Transit decision-making.
- E. Fairness, honesty and good value

1.3 BENEFITS OF TRANSIT ACCESSIBILITY

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

1.3.1 Creating Places of Community Life

Transit can support the creation of places—public spaces, streets and buildings—helping to enliven their usage and making them centers for a wide range of community activities. Because Transit brings people to a location, it influences the use and activity of these spaces and, indeed Transit is instrumental in making them work effectively. Transit can enhance destinations, helping to create community places by supporting existing spaces, as well as providing a place for new activities and services. A Bus Stop need not be just a place for transportation, but it can with the right Infrastructure and in the right setting become a conduit for community interaction and a place that accommodates a diversity of people

When a neighborhood is served by Transit its residents are more accessible to outside activities (jobs, shops, local and social services, medical appointments). Transit provides a link for Riders who do not have access to an automobile to essential services. Transit supports the goals of neighborhood livability by facilitating internal circulation to local destinations. It also provides an option for those who would rather avoid the hassles of driving.

Livable communities are communities where people socialize and come together, which reinforce a sense of common purpose and establish centers for public life. Transit facilities are themselves activity focal points. The Transition from Bus Stop to public space involves linking together activities that already take place or could take place in most communities.

1.3.2 Catalyst for Downtown and Neighborhood Renewal

Transit can serve as a key force in the revitalization of neighborhoods and commercial centers. Much of Transit's impact comes from its drawing pedestrians to areas, which helps enliven adjacent uses and support business. By alleviating traffic pressures on streets, Transit can help make an area more attractive and pedestrian friendly—a major goal in most downtown revitalization programs.

Developments served by Transit are more attractive to many prospective buyers and tenants. This is demonstrated by real estate advertisements that list convenient Transit service as a feature offered in the development. When demand is high, a developer can more easily sell or lease property. The increased demand created by Transit has a positive influence on property values and profits.

Livable communities are communities that have accessible and convenient commercial centers that support a community economically and socially. Commercial districts in downtowns and neighborhoods have traditionally been among the most important destinations for Transit. It is not a coincidence that the economic decline of these districts has been mirrored in the decrease in Transit Ridership. At the same time, Transit facilities—whether they are simple Bus Stops or major stations—can act as “ground zero” for the rebirth and revitalization of downtowns and neighborhoods.

1.3.3 Creating Opportunity for Entrepreneurship and Economic Development

Transit can help create new businesses and improve access to job opportunities. Transit facilities attract people everyday, and no one should underestimate the value of foot traffic for business. Transit brings customers to support and promote businesses of all sizes. Moreover, Transit supports business development by providing access for employees, especially Transit dependent populations who can take advantage of job-training and educational opportunities if they are made accessible.

Transit makes merchants and business convenient to a wider range of customers and clients. Larger market areas mean more business and greater profits. Riders traveling past a business are made aware of its location, and may patronize that business because it is convenient. All in all, businesses that rely on customer or client visits benefit from Transit.

Transit expands an employer's labor market to include potential employees who depend on or prefer Transit. Transit can bring in employees to fill entry-level job vacancies. Employees commuting by Transit can lesson parking problems.

Livable communities are communities that offer economic opportunity to all citizens. Transit brings the foot traffic necessary to support small businesses and provides access to jobs. In today's society dominated by retail chains in far-flung suburban locations, support for small, independently owned businesses and entrepreneurs is essential for the long-term growth of most communities.

1.3.4 Improving Safety and Infrastructure

Transit can help make communities safer, in part by making them more comfortable and attractive. Transit Infrastructure such as kiosks and benches contribute to downtown revitalization. Security is a major concern of Transit Operators, reflecting concerns of Transit Riders while they wait at Bus Stops or stations and on the Transit vehicle itself. Efforts to improve security can benefit the broader community around the Bus Stops as well as along the routes on which Transit proceeds. Efforts to bring activity to stations and to make Transit facilities more comfortable and attractive also have security benefits for communities.

Livable communities are communities where people no longer fear for their personal safety and feel comfortable in a public environment. With the loss of places where people feel comfortable has come the perception by many that Transit facilities are places to fear and avoid, even though statistically they are usually safe and virtually free of crime. As a perceptual problem, the solution to crime cannot be separated from other livability issues and, in particular, from the need to create an environment where people feel comfortable and safe. Making Transit facilities an asset and an Infrastructure is an important step in improving safety.

1.3.5 Making Communities Accessible and Convenient

Transit services and facilities can be tailored to meet community needs while providing a viable alternative to the private automobile. The goal of more progressive land-use strategies is to plan and design communities more compactly so residents can walk, bike, or take a bus and not always have to drive. Retrofitting traditional communities or re-establishing pedestrian and Transit networks in communities that were built prior to auto-dominated policies offers great potential for more immediate results. Some options include neighborhood-based community shuttles or connectors and Intermodal Transit centers.

Good Transit can help alleviate traffic congestion by reducing the number of cars on crowded roads and reduce the demand for commercial parking. Some municipal jurisdictions offer a reduction in the number of required parking spaces for developments served by Transit. This type of policy serves as a financial incentive to developers and employers since costs are reduced when fewer parking spaces are built and maintained. Additionally, limited parking serves as a Transit incentive.

Livable communities are communities where people have a variety of transportation alternatives. The basic mobility function of Transit is, indeed, integral to the livability of a community. Special services and approaches are emerging to enable Transit to serve the community more effectively and efficiently, while encouraging new land-use policies that center around Transit as a fundamental choice.

1.3.6 Shaping Community Growth

Transit can be a key component of efforts aimed at reducing sprawl and encouraging development of mixed-use centers. A major goal of guiding growth is to encourage the use of Transit. Transit can play a leading role, simply by initiating discussions about growth and livability.

Transit-oriented development (TOD) is a term used to express new development constructed around Transit facilities. These facilities act as focal points for a community and are generally accompanied by higher densities of land use, with an emphasis on walking. The automobile becomes an option rather than a necessity.

When Transit links the goods and service in surrounding areas to the new or revitalized community, the developer may not have to provide land to duplicate those services. This often means that more land is available for other desirable uses.

Livable communities are communities where growth enhances community life, not destroys it. Mismanaged growth erodes all aspects of a community:

- Accessibility and convenience
- Centers of public life
- Sense of safety and amenity

Transit can also be an essential component of reorganizing urban growth and creating mixed-use centers. It can also be an essential component of new land-use policies that set the stage for future, more livable places for people to live and work.

1.3.6 Implementation through Partnerships

Community groups and Palm Tran have found that by working in partnership, we can improve the livability of the community and increase Transit Ridership. Recent changes in federal Transit planning processes and policies are supportive of community-based processes for creating livable communities. The Transportation Equity Act for the 21st Century (TEA-21) significantly changed metropolitan transportation planning and now requires that Transit be integrated into planning for roads and congestion mitigation. Palm Beach County and many local jurisdictions have incorporated procedures that require a Transit as part of the planning process. This manual is offered in response to the need for guidelines that architects, planners, and developers can use to integrate Transit features into their projects

Transit improvements can significantly influence land use patterns and neighborhood revitalization only when new development actually takes place. Therefore, it must be supported by physical, legal and economic conditions that are necessary for any successful development. Local land use policies and Transit programs must be carefully coordinated if effective relationships between the two can be achieved. Commitment to integration of land use patterns with Transit must be expressed through policies, development standards, public improvement programs, and community growth management regulations.

1.4 TRANSIT ACCESSIBILITY CHECKLIST

The Transit Accessibility checklist that follows is provided as a quick and easy reference for the developer to determine if a project will meet Palm Tran's accessibility standards.

If all are present, or most, the developer can feel comfortable that the project is Transit accessible. If there are questions that cannot be answered with a yes, then the developer should review the appropriate sections of this manual to find out what should be done to make the project Transit accessible.

Once it is determined that Transit will benefit the project, the developer should contact Palm Tran. Palm Tran planners will evaluate the site for service options and will discuss the potential for service. Additionally, Palm Tran staff will review the development plans to assure that all design issues are addressed.

1.4.1 General:

- ☐ Transit service is desirable to the development and/or community. **(Section 1.3)**

1.4.2 Transit Service Standards:

- ☐ Activity levels within the Development are consistent with Palm Tran service threshold levels. **(Section 2.2)**
- ☐ The Development is directly accessible to a major roadway or Palm Tran Route. **(Section 2.2)**

1.4.3 Transit Access (Bus Operating Criteria):

- ☐ All roadways where Buses would travel in the Development are consistent with Palm Tran standards for lane width and clearance height. **(Section 3.1)**
- ☐ All roadways where Buses would travel in the development are consistent with Palm Tran standards for intersection and entrance radii. **(Section 3.2)**
- ☐ All roadways where Buses would travel in the development are capable of supporting the weight of Palm Tran's vehicles. **(Section 3.1)**
- ☐ All Transit accessible roadways will have sufficient drainage and be kept clear of any other obstructions. **(Section 3.2)**

1.4.4 Pedestrian Access:

- ☐ There are direct pedestrian pathways (not winding or circuitous) between buildings and Bus Stops. **(Section 5.1)**
- ☐ The site is designed to facilitate safe, convenient and comfortable pedestrian circulation. **(Section 5.1)**
- ☐ Pedestrian pathways will be paved with non-slip materials. **(Section 5.2)**

1.4.5 Bicycle Access:

- ☐ The site is designed to facilitate safe, convenient, and comfortable bicycle circulation. **(Section 4.5)**

- ❑ The bicycle circulation system is consistent with AASHTO and FDOT recommended standards. **(Section 4.5)**

1.4.6 Infrastructure:

- ❑ The Transit circulation pattern allows for convenient, direct, efficient Transit Service. **(Section 5.0)**
- ❑ The Transit circulation pattern connects with adjacent pedestrian, bicycle, and other Transit networks. **(Section 5.3)**
- ❑ Bus Stop locations are designed for pedestrian and bicyclist convenience and comfort. **(Section 5.2)**
- ❑ There are appropriate areas for Bus Stops. **(Section 4.0 and 5.0)**
- ❑ The Bus Stop locations are designed to be noticed. **(Section 4.5)**
- ❑ There is sufficient area at the Bus Stop to provide protection from inclement weather. **(Section 5.3)**
- ❑ There is sufficient area at the Bus Stop for other Transit Infrastructure, such as benches, shelters, route information signage, Park-N-Ride facilities, bike racks. **(Section 5.3)**
- ❑ All Transit facilities and access from the Transit facilities to the Development facilities are ADA-AG compliant. **(Section 5.2)**
- ❑ All Transit facilities locations will provide good visibility of approaching buses and avoid causing sight distance problems for pedestrians and vehicle Operators. **(Section 5.3)**
- ❑ All Transit facilities and Transit accessible roadways will have sufficient drainage and be kept clear of any other obstructions. **(Section 5.3)**

1.4.7 Coordination:

- ❑ Coordination with FDOT, Palm Beach County, and local jurisdictions has been maintained and the appropriate approvals obtained.
- ❑ Contact with Palm Tran during the planning, design, and construction phases has been maintained:

**Palm Tran
ATTN: Planning
3201 Electronics Way
West Palm Beach, FL 33407**

Phone: (561) 841-4200

Fax: (561) 841-4291

1.4.8 Operating Philosophy for Notifications:

Often a construction project or planned development will have permanent implications for Transit. If this is so, please contact Palm Tran Planning. We will evaluate the project for service options and discuss the potential for service. **A minimum six (6) month lead-time is required implementing major service changes requiring schedule changes.**

Short-Term detours (or minor temporary deviations) require a minimum two (2) week advance notification to advise the various internal Palm Tran elements and to alert our Riders. Shorter notification and emergency situations negatively affect Palm Tran coordination efforts. A six (6) week advance notification is desirable but may not always be practical. Longer advance notification may be necessary depending on the magnitude of the situation. Consultation with the municipal authority and interested civic interest groups may be required. Additional review of Transit alternatives may be necessary. As a general rule, the more advance warning of an impending detour situation, the better preparation and communication.

Sufficient lag time is needed to prepare public information clerks, service information literature, on-street signage, media releases and other coordination activities. Nothing is more frustrating to our Riders than to be left waiting for a Bus that will not be there. Also aggravating is the inability to get information on alternate Transit options.

Our experience shows that our Riders will tolerate detoured service that does not significantly negatively alter their perceived travel times and boarding/alighting destinations. If given an acceptable rationale, common sense alternatives and advance notification, our Riders will adjust to any detour-requiring situation. Our efforts must be directed to satisfying our Riders while maintaining an awareness of our fiscal and physical limitations.

Minimum information needed includes:

- Project
- Limits of the project
- Estimated start-up date and time
- Estimated project duration
- Estimated completion date and time
- Agency having jurisdiction over the highway or roadways (include point of contact and telephone number)
- Contractor or group performing requiring the detour (include point of contact, telephone number and trailer site)
- Traffic Maintenance Plan



TRANSIT DESIGN MANUAL INTRODUCTION

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2.0 SERVICE DESIGN

Palm Tran operates a modified grid network with no discernable downtown Central Business District (CBD). Population density is concentrated along the coast with a number of cities serving as the main traffic attractors. The core service area is defined as that area:

North of Palmetto Park Road in Boca Raton
West of the Inter-coastal Waterway
South of PGA Boulevard in Palm Beach Gardens
East of Military Trail

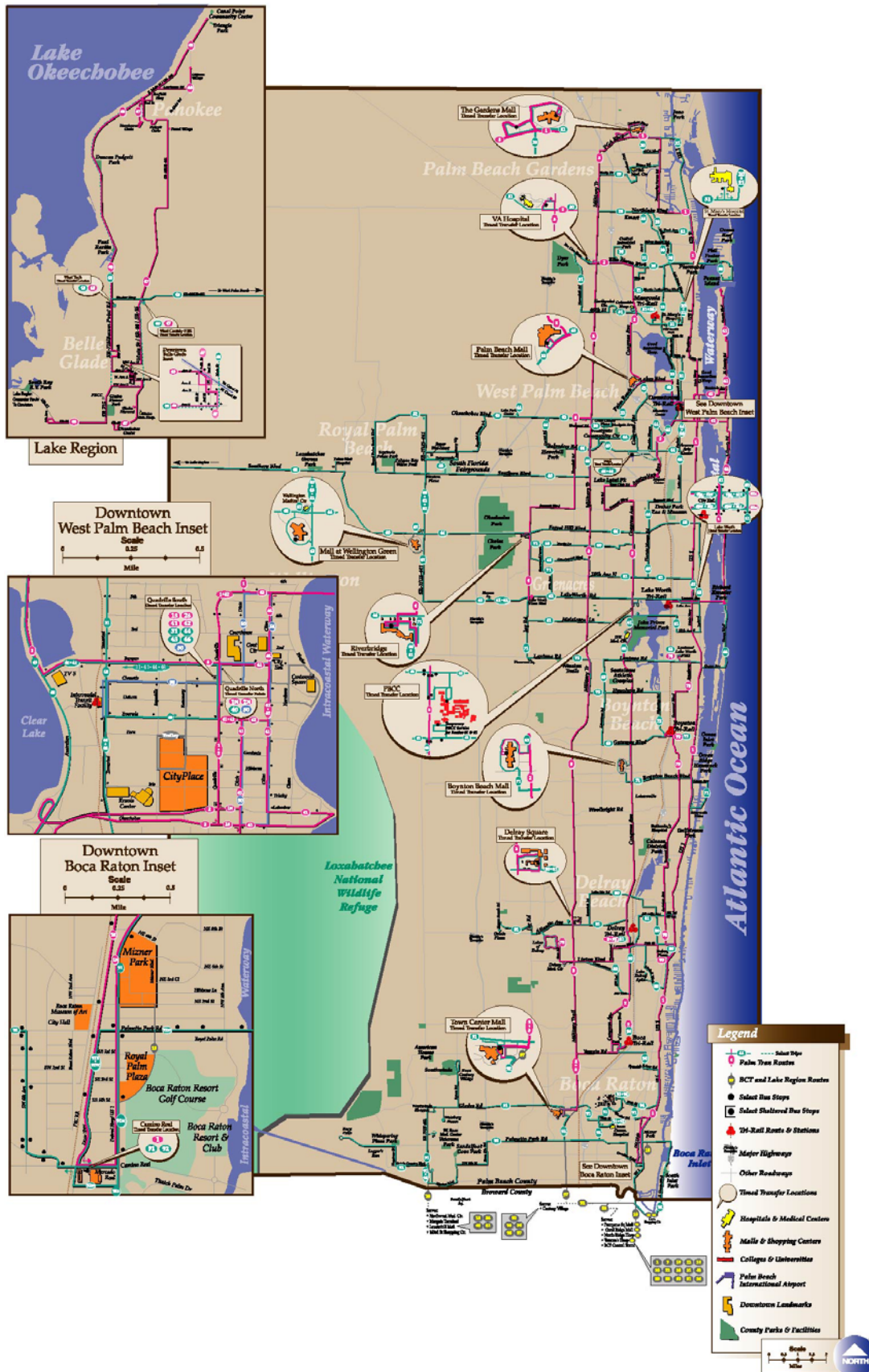
Service concentrations also exist in the suburban and western village communities bordering State Route 80 (Royal Palm Beach and Wellington)

Rural connecting service is also available to the far western and primarily agricultural cities bordering Lake Okeechobee (Belle Glade, Pahokee, Canal Point, and South Bay).

2.1 TYPES

The route numbering system is loosely designed to reflect service types and service areas:

- 00-09 Trunk Routes running North-South
- 10-19 Local, Circulator, and Shuttles serving for the Jupiter Area
- 20-29 Local, Circulator, and Shuttle service for the Palm Beach Gardens Area
- 30-39 Local, Circulator, and Shuttle service for the Riviera Beach Area
- 40-49 Local, Circulator, and Shuttle service for the West Palm Beach-Glades Area
- 50-59 Other service for the West Palm Beach Area
- 60-69 Local, Circulator, and Shuttles serving for the Lake Worth Area
- 70-79 Local, Circulator, and Shuttles serving for the Boynton Beach-Lantana Area
- 80-89 Local, Circulator, and Shuttles serving for the Delray Beach Area
- 90-99 Local, Circulator, and Shuttles serving for the Boca Raton Area



2.1.1 Trunk (T)

Trunk service (also called local service) in Palm Beach County operates along major north-south arterials. It collects and distributes high-turnover short-trip Ridership along developed corridors in the core service area. This service is characterized by frequent stops at regular intervals over prescribed local fixed routes at relatively low average bus speeds. Service generally operates seven days a week providing for a variety of needs - work, recreation, personal, business, shopping, medical, etc.

	From	To	Via
01	Gardens Mall	Boca Raton	US 1
02	VA Medical Center	Boca Raton	Congress Ave
03	Palm Beach Gardens	Boca Raton	Military Trail

2.1.2 Cross-Town (X)

Cross Town service (also called local service) links trunk routes serving the core service area, though many cross-town routes also serve high-density corridors with internal travel markets. This type of service provides travel opportunities linking cross-town routes with other cross-town routes, trunk routes and Tri-Rail stations. This service operates at regular intervals over a prescribed local fixed routing to/from a transfer center or branch intersection and makes frequent Bus Stops along a radial routing. Service generally operates five to seven days a week.

	From	To	Via
04	Okeechobee Blvd	Lake Worth Plaza W	Haverhill and Jog Rd
20	Gardens Mall	St Mary's Hospital	
21	Gardens Mall	St Mary's Hospital	US 1
30	VA Medical Center	Singer Island	Blue Heron Blvd
31	VA Medical Center	West Palm Beach	
33	Northlake	Cross County Mall	Australian Ave
41	West Palm Beach	Palm Beach Inlet	Okeechobee Blvd
42	West Palm Beach	Lake Worth	Palm Beach
43	West Palm Beach	Mall at Wellington	Okeechobee Blvd
44	West Palm Beach	Lake Point Center	Belvedere
46	West Palm Beach	Mall at Wellington	Forest Hill
60	Riverbridge	Lake Worth Tri-Rail	
61	River Bridge	Nassau Square	
62	Lake Worth	Wellington	Lake Worth Rd
63	Lake Worth Beach	Boynton Beach Mall	
70	Lantana	Delray Beach	Seacrest Blvd
71	Riverbridge	Boynton Beach	
80	Delray Beach	Cross-town	Lake Ida & Linton Rds
81	Delray Beach	Cross-town	Atlantic Ave
91	Boca Raton	Cross-town	Glades Rd
92	Boca Raton		Palmetto Park Rd

2.1.3 Limited (L)

Limited service is generally defined as service that has fewer stops at regular intervals along a limited access highway and operates at a higher speed than local service. Limited route tend to serve outlying areas, with designated Park-N-Ride lots and/or Shopping Centers, providing direct service to the core service area. Service generally operates seven days a week, between twelve and twenty hours a day providing for the same Transit needs as local service but at faster and more reliable travel times.

	From	To	Via
40	West Palm Beach	Belle Glade	Limited

2.1.4 Circulator (C)

Circulators (also called Community Circulators) provide Transit service that is typically confined to a specific location, such as downtown or a suburban residential neighborhood. This type of service connects to the major traffic corridors, and allows Riders to transfer to other routes to gain access to the rest of the fixed-route network. Frequency and span of service are dependent on Rider need.

	From	To	Via
47	Pahokee	Belle Glade	S.R. 715
48	South Bay	Canal Point	
52	Royal Palm Beach		

2.1.5 Shuttle (S)

Shuttles are short routes connecting two transportation centers, or as a feeder to another service (such as Tri-Rail Stations or Palm Beach International Airport). This service normally operates at regular intervals over prescribed roadways within a geographic zone or community and makes frequent Bus Stops. Frequency and span of service are dependent on Rider need.

	From	To	Via
50	West Palm Beach		
94	FAU	Boca Raton Tri-Rail	

2.1.6 Express (E)

Express service operates non-stop over limited access highways or fixed guide ways to/from a major traffic generator (normally a downtown Central Business District (CBD)). Service primarily operates during weekday peak periods (6:00 to 9:00 AM and 4:00 to 6:00 PM) with limited midday, evening and weekend service and serves work related Transit needs. Palm Tran currently does not operate any routes in this category.

	From	To	Via

2.2 STANDARDS

In an ideal setting, Transit can provide high quality service in a truly effective and efficient manner. Such a balance is difficult to attain due to the fact that the issues of quality and effectiveness often place opposing demands on Palm Tran's limited resources. Service standards provide a means to assist in achieving quality and cost-effectiveness.

Palm Tran's performance must be monitored and modified on a continual basis to ensure both adequate service levels and effective labor/equipment allocation. There are continued demands for new and improved service, despite limited resource availability. This combination of factors requires measures to maximize existing service while minimizing related costs, as well as defining a process to implement new services.

2.2.1 Route Design

Factors considered in developing or modifying bus routes include:

- Demographic Characteristics (population, employment, and Transit dependency)
- Route Spacing
- Travel Directness
- Transit Attractors and Infrastructure

Demographic characteristics used to identify potential Transit Ridership include population density, employment density, income level, age, and household vehicle ownership. **The Palm Beach County Comprehensive Plan's Transportation Element sets a minimum level of service (LOS) for each route shall not exceed 60-minute peak hour headway between successive trips.**

Route Spacing is defined as the average distance between parallel routes. A high level of accessibility enhances Transit's attractiveness. **In general, service should be provided along major arterials at a spacing of one-mile with a half-mile in the core service area, where densities and Transit-dependency are typically high.** Currently Palm Tran provides service within one-quarter mile for approximately fifty-six percent of Palm Beach County's population.

Routes should be devised to operate as directly as possible to maximize average operating speed and minimize travel time. At times, it may be necessary to deviate an existing or proposed route from the shortest or most direct routing. This should only be considered if it is consistent with the functional and operational characteristics of a route. Requests for a deviation will be evaluated against the following criteria:

The total additional travel time for all through Riders should not exceed five minutes for each Rider boarding or alighting along the deviation.

$$(P(t) * VTT) / P(d) \leq 5 \text{ minutes}$$

Where:

P(t) is the number of through Riders

VTT is the additional vehicle one-way travel time

P(d) is the number of Riders served by the deviation

2.2.2 Schedule Design

The criteria for schedule design are used to establish (or re-establish) the schedule interval between buses (or successive trips) as well as the service hours between which a route operates. Influencing factors include:

- Span of Service
- Frequency of Service
- Loading Guidelines

Span of service is the time between the first and last trips operated on a specific route. These minimum operating hours may vary from weekday to Saturday to Sunday. It is Rider demand and productivity sensitive. Some routes may require only mid-day service. Express routes may only operate in the weekday peak periods. **Typically, expansion of the existing span of service is only be considered if the first and last trips are performing better than fifty percent of the system average measured in Riders per revenue hour.**

Frequency of service is the headway or interval between successive trips on individual routes. Some routes operate during periods of low Ridership where strict adherence to frequency standards based on Rider loading factors (load factor) would result in excessively wide trip headways. **Our goal is to provide a maximum thirty-minute peak service and sixty minute off-peak and weekend service within the core service area.**

Operating Period	Express (E)/ Limited (L)	Core Service Area (T/X/C/S)	Outer Service Area (X/C/S)
Peak	30 min	30 min	60 min
Off-Peak		60 min	60 min
Evening		60 min	60 min
Weekend		60 min	60 min

Exceptions may be appropriate when the above guidelines would lead to denied service or a highly inefficient allocation of resources. Clock-face times evenly divisible into sixty minutes (60, 30, 20, 15, 12, 10) are desired since they are Rider predictable and eliminate the need for complex timetables.

Loading guidelines balance Rider comfort with operating costs. Frequencies of service and vehicle loading standards have an inverse relationship and vary during operating periods. Loading is computed as a percentage of the number of seats available on a particular Transit vehicle. Even though Palm Tran operates a variety of Buses (size and seating capacity), for the purposes of discussion, all vehicles are presumed to have a seating capacity of 40 with a maximum load of 60 (150% of seating capacity). **Lower load factors or considerations may be given when the route demographics show a preponderance of accessibility challenged Riders. Conversely, higher load factors may be considered for short duration standing room trips and adjacent high-density origin and destinations (CBD).**

Headway (min.)	Peak	Off-peak	Evening	Weekend
less than 10 min	150%	125%	110%	100%
11 - 20 min	140%	110%	100%	100%
21 - 30 min	125%	100%	100%	100%
31 - 60 min	100%	100%	100%	100%

The 2000 US Census indicates that nearly 28% of the population in Palm Beach County is at least 60 years of age.

2.2.3 Performance Evaluation

Palm Beach County's population is not only growing (2000: 1,131,184), but is also changing demographically. These increases and changes have a major impact on transportation and, specifically the Transit environment. To keep up with the changing conditions and ensure an efficient and effective Transit, it is necessary to continually monitor and analyze existing service, and to explore new service areas and ways to provide service. Factors in this evaluation include:

- On-Time Performance
- Farebox Recovery

On-Time Performance is defined as the percentage of trips that arrive or depart within a specific time frame at a specific time-point. To maintain the existing the Ridership base and attract new Riders, Palm Tran must closely adhere to the times listed in the public time tables (or schedules). **Palm Tran defines "on-time" as arriving at a route time-point at the scheduled time and/or up to five minutes late. Our goal is ninety percent on-time peak-period performance and ninety-five percent off-peak, evening, and weekend performance.**

Schedule Time to 5 Minutes Late	
Peak	90%
Off-peak	95%
Evening	95%
Weekend	95%

Palm Beach County's Comprehensive Plan-Transportation Element states that **in order to increase Ridership and overall revenues, Palm Tran shall maintain a farebox recovery rate of twenty-three to twenty-five percent based on a strategy of:**

- **Reducing or eliminating bus routes with very low ridership, where appropriate**
- **Increasing bus service on remaining routes serving Transit-attractive areas**

Transit service must be balanced between its function as a public service and fiscal responsibility to the voters of Palm Beach County. Because of this function divergence, route evaluation must be by service type (T, X, L, C, S, E) and use multiple measures of productivity. Each service type serves different travel needs and patterns with various service levels.

Passenger trips per revenue hour are the average number of Riders carried in one revenue hour of service, either on a particular route or system wide. This measure is a very strong indicator of effectiveness of service consumption. While the lowest quartile will always exist, it is important to ascertain whether a particular route is meeting the standard or purpose for which it was designed. Ranking is a diagnostic tool to identify poor performing routes. They are closely monitored and efforts undertaken to improve their performance. Measures of evaluation are relative compared to other routes and service types in the system.

New service, initiated within the previous twenty-four months should be given time to attract new Ridership and measure the impact on adjacent routes. After the initial two years it can be more comprehensively analyzed and corrective actions taken.

The following corrective measures are applied to a route that consistently performs in the lowest quartile:

- Target marketing and/or special promotions
- Route realignment
 - To eliminate non-productive route segments
 - Reduce route mileage
 - Ensure that major activity centers are served
- Rescheduling
- Frequency changes/short-turn trips
- Span of service adjustments

If the above remedial actions do not result in improved performance, service will be considered for elimination, reallocation, or modification.

2.2.4 Service Reallocation

If another twelve months has expired since the above corrective measures have been applied and the route re-evaluated has not risen above the lowest quartile, service reallocation will be undertaken. **Based on this evaluations the following areas will then be considered:**

- Eliminating early and/or late trips
- Eliminating weekend service
- Increasing headways
- Eliminating route segments
- Eliminating off-peak or mid-day service
- Eliminating the route
- Interlining the route with a more productive route
- Eliminating duplicated service
- Substituting paratransit service

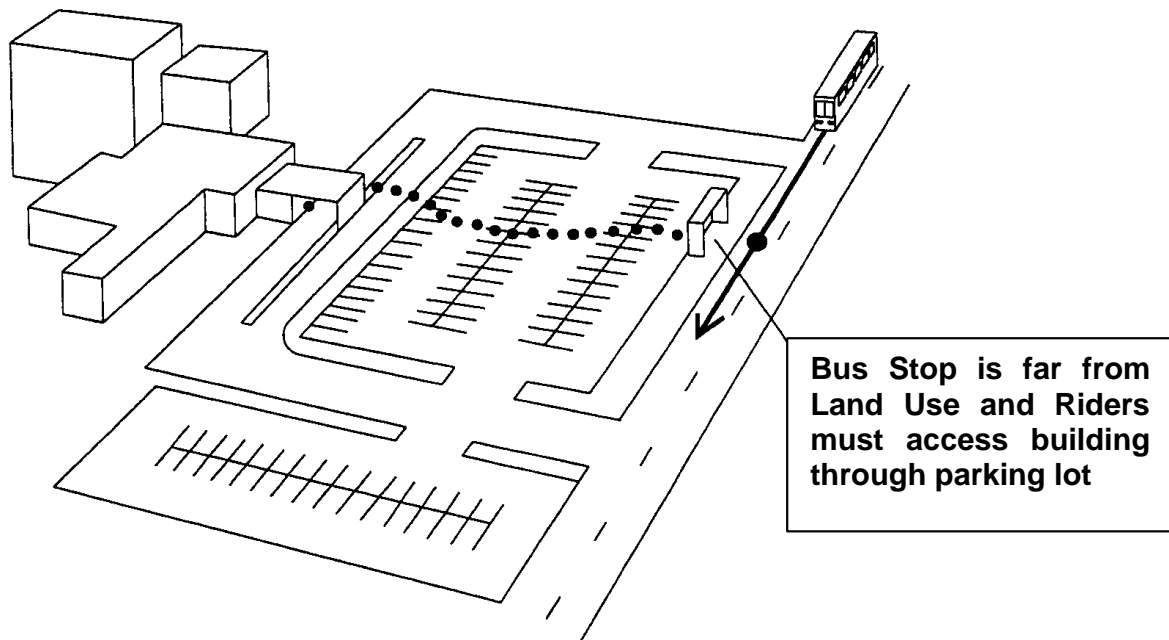
The purpose of the above actions is to reduce costs or unproductive service, while maintaining essential service to the needy. Note: the above action may create a downward spiral in Ridership, service levels and span of service. This process will not be undertaken without community involvement and participation.

2.3 COOPERATION AND DESIGN CONFLICTS

While Palm Tran, municipal planners, and developers may agree that there are significant advantages for Transit service for a particular development, the service design involves a close working relationship. The need for cooperation associated with service planning is illustrated in the below scenarios:

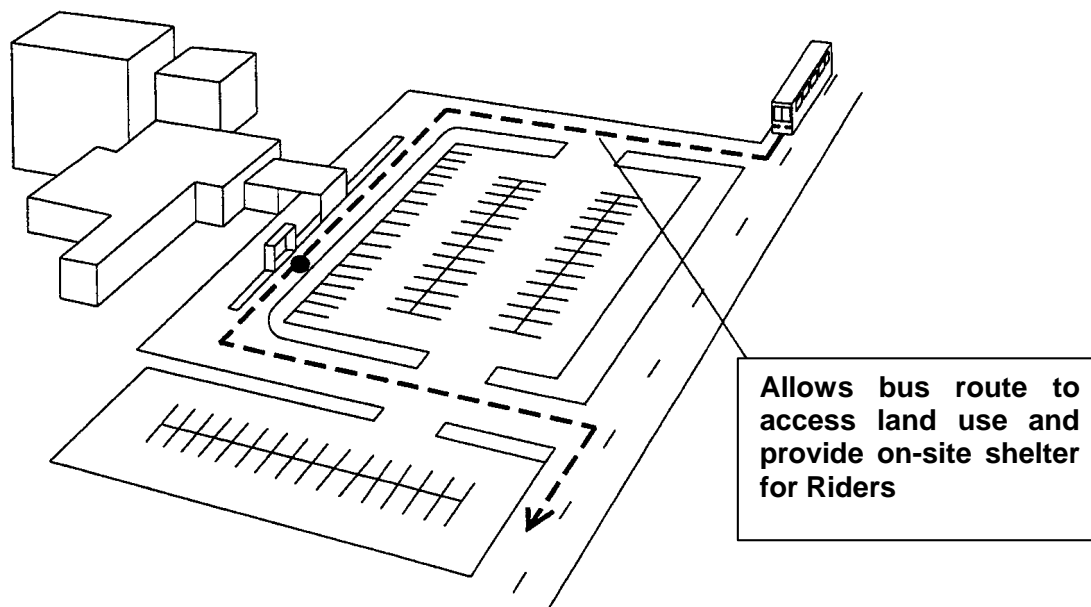
2.3.1 Thoroughfare Access Only

This presumes limited coordination and cooperation between Palm Tran and developer.



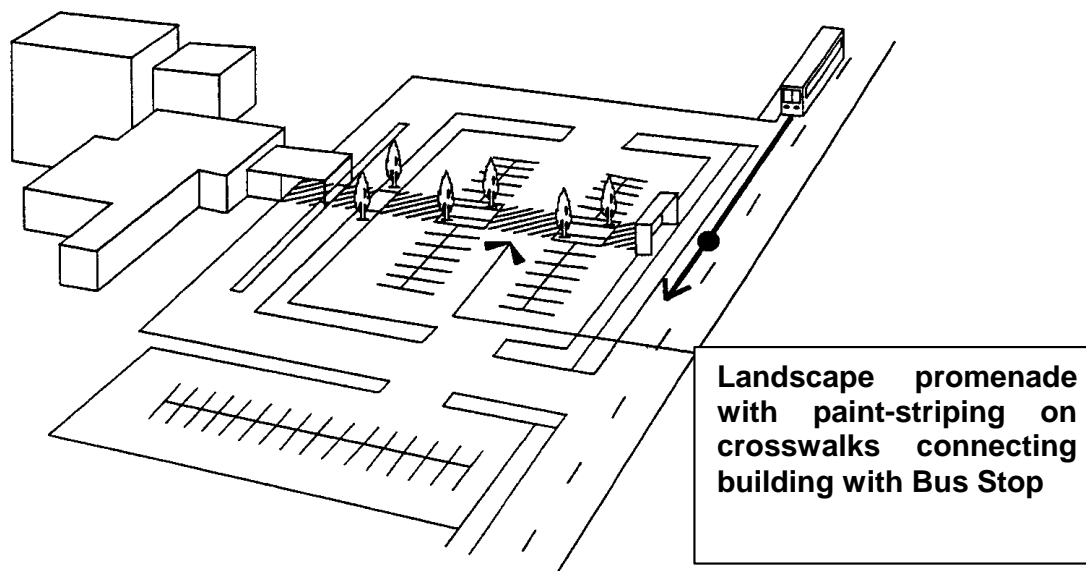
Advantages	Disadvantages
Bus remains on main thoroughfare	Riders must walk through the parking lot to reach the development
Bus Stop is more visible to passing traffic and helps advertise Transit's availability and location	Pedestrian conflicts with general parking lot traffic
	Rider security walking through the parking lot may be compromised
	Parking lot offers little environmental comfort

2.3.2 Routing Through Development Site



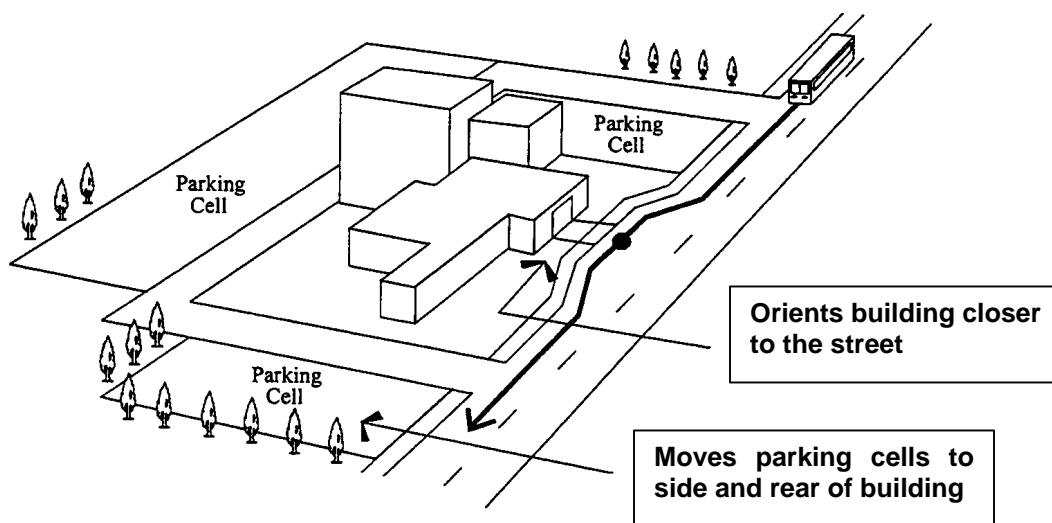
Advantages	Disadvantages
Bus route accesses land uses more directly	Bus conflicts with general parking lot traffic
Potential use of overhang in inclement weather	Increased bus travel time and distance
Reduced walking time and distance to Bus Stop	
Reduced potential vehicular/pedestrian conflicts	
Proximity to land use enhances Rider security	

2.3.3 Pedestrian Promenade



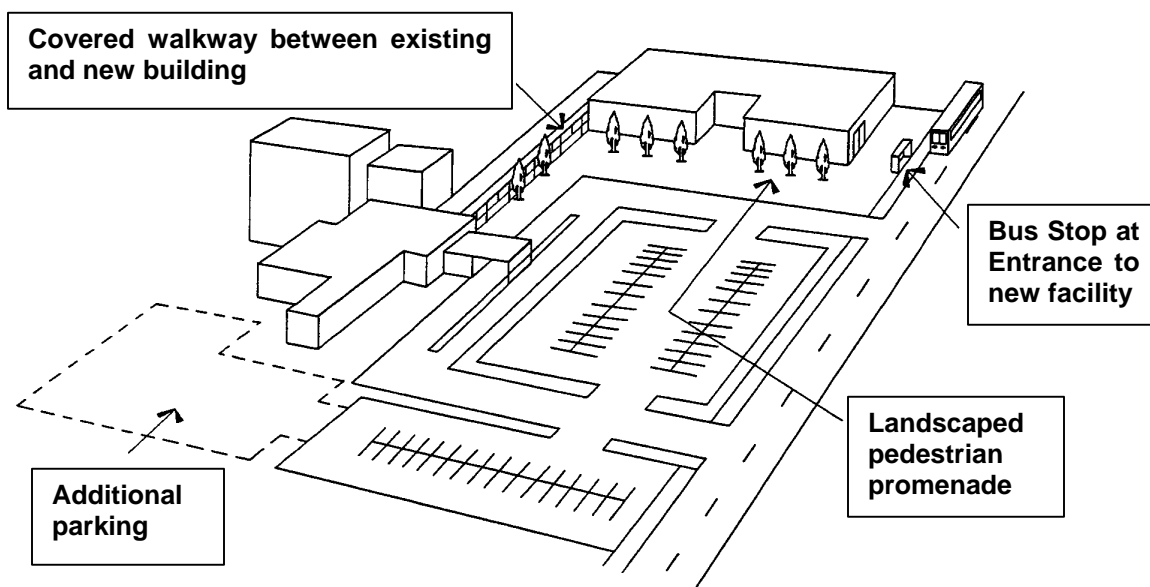
Advantages	Disadvantages
Bus remains on main thoroughfare	Riders must walk through the parking lot to reach the development
Reduces potential vehicular/pedestrian conflicts	Rider security walking through the parking lot may be compromised if sight lines obstructed by vegetation
Enhances Rider comfort with shade trees	Parking space reduction
Enhances Rider security if promenade is well lit	

2.3.4 Bus Bay – Development Front Door Access



Advantages	Disadvantages
Reduced walking time and distance to Bus Stop	Challenges traditional land use practices
Proximity to land use enhances Rider security	
Reduced potential vehicular/pedestrian conflicts	
Potential use of overhang in inclement weather	
Bus remains on main thoroughfare	

2.3.5 Expanded Facility



Advantages	Disadvantages
Bus remains on main thoroughfare	Costly Improvements
Access is enhanced by juxtaposing building with Bus Stop and creating pedestrian promenades	Challenges traditional land use practices
Enhances Rider comfort with shade trees and covered walk	
Reduced exposure to inclement weather	

2.3.6 Traffic Calming Schemes

Traffic calming is a term most closely associated with physical features placed on a roadway to influence the speed of motor vehicles and improve traffic safety and comfort levels for all users of residential streets. Unfortunately, by design they can have an adverse impact on our riders and often restrict (and in some cases do not permit) transit vehicle usage.

Palm Tran cannot operate over streets that do not meet our established operating design criteria as outlined in this design manual. Typical unduly restrictive traffic calming schemes include choke points, speed bumps (and humps), traffic circles, and other design measures falling below our minimum operating design criteria. Palm Tran desires to work with developers and municipal jurisdictions to insure that:

- Proposed traffic calming schemes that would affect proposed transit routes be reviewed by Palm Tran
- Restrictive traffic calming schemes should not be installed on streets that have transit service or are envisioned to have transit service
- Introduction of new transit routings on streets and roads that already have restrictive traffic calming schemes would be conditional upon the removal of these devices or lessening their impact to meet our minimum design criteria
- Appropriate route modifications are made to transit service on streets and roads where in place traffic calming schemes cannot be modified to meet our minimum design criteria.

3.0 OPERATION DESIGN

The standards contained within this manual should not be interpreted as strict engineering criteria or specifications. They are based on a composite of our Buses. This manual does not establish legal standards nor impose a legal liability or standard of conduct. In most cases, both the minimum and design standards are defined. In all cases, roadways that meet the desirable design standard will be recommended. Palm Tran recognizes that for a variety of reasons roadways that meet these standards may not be feasible.

3.1 BUS

In Transit Design, it is important to understand the design vehicle, its critical measurements and operating characteristics. Palm Tran currently operates vehicles from two different manufacturers. Three different models are employed with three different lengths (commonly referred to as 30-foot, 35-foot, and 40-foot). Although the majority of Palm Tran's fleet are the 35-foot variety, we must design for the most restrictive of our fleet--a 40-foot bus with forty seats, weighing twenty tons, requiring a twelve by twelve foot clearance envelope (or air tunnel), a minimum fifty-five foot outside turning radius with an minimum thirty foot inside turning radius, and grades not in excess of eight percent.

Key roadway design features, such as lane and shoulder widths, lateral and vertical clearances, vehicle storage dimensions, and minimum turning radii are typically based on the standard 40-foot bus. These dimensions are critical in designing roadway features as well as Transit Infrastructure.

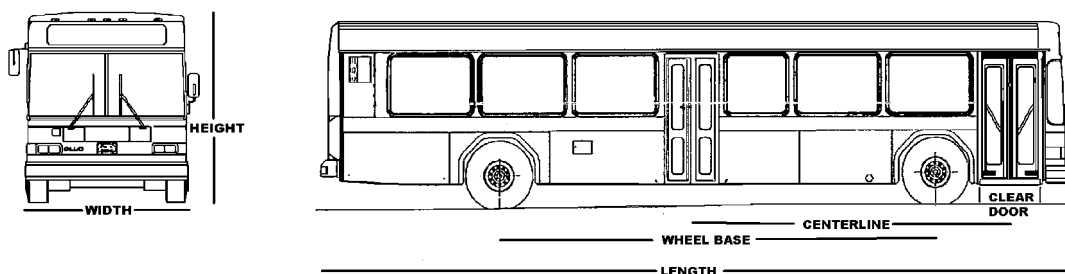
The weight of a bus is important in pavement design. The clearance envelope, turning radii, and maximum gradient (as well as crest and sag characteristics) are important when designing Transit friendly environments. These factors become more critical when designing Street-Side Infrastructure (or getting the bus to where the people are).

The location of the front doors and their relation to the rear doors and mirror overhang are important to designing bus zone dimensions, making ADA accommodations, and Transit shelter and/or bench placement. These factors are critical in designing Curb-side Infrastructure (or getting the people to where the buses are).

Of course, as new buses are acquired, fleet specifications will be updated and standards revised.

3.1.1 Specifications

The following table outlines the primary design specifications for the Buses comprising the majority of Palm Tran's fleet through 2002.



	Gillig					Flxible Metro	
	Low Floor	Phantom	Low Floor	Phantom	Low Floor		
Overall Length (excluding bike rack)	29	32	37	41	41		ft
Wheel Base	163	170	235	279	284		in
Front Axel to Bumper	90	90	90	90	90		in
Rear Axel to Bumper	117	121	117	121	117		in
Centerline Door to Door	164	158	188	267	208		in
Clear Door Opening, Front	40	42	40	42	40		in
Door Opening to Bumper	21	13	21	13	21		in
Overall Height (excluding antenna)	115	120	115	120	115		in
Overall Width (excluding mirrors)	102	102	102	102	102		in
GVWR (including riders)	15.0	19.7	19.8	19.7	19.8		ton
GAWR, Front	5.0	7.2	7.3	7.2	7.3		ton
GAWR, Rear	10.0	12.5	12.5	12.5	12.5		ton
Seating Capacity	23	29	32	43	40		
Quantity	2	26	57	6	29		

Quantity		30-foot	35-foot	40-foot	
Gillig					
	Phantom	26		6	32
	Low-Floor	10	57	29	96
		36	57	35	128

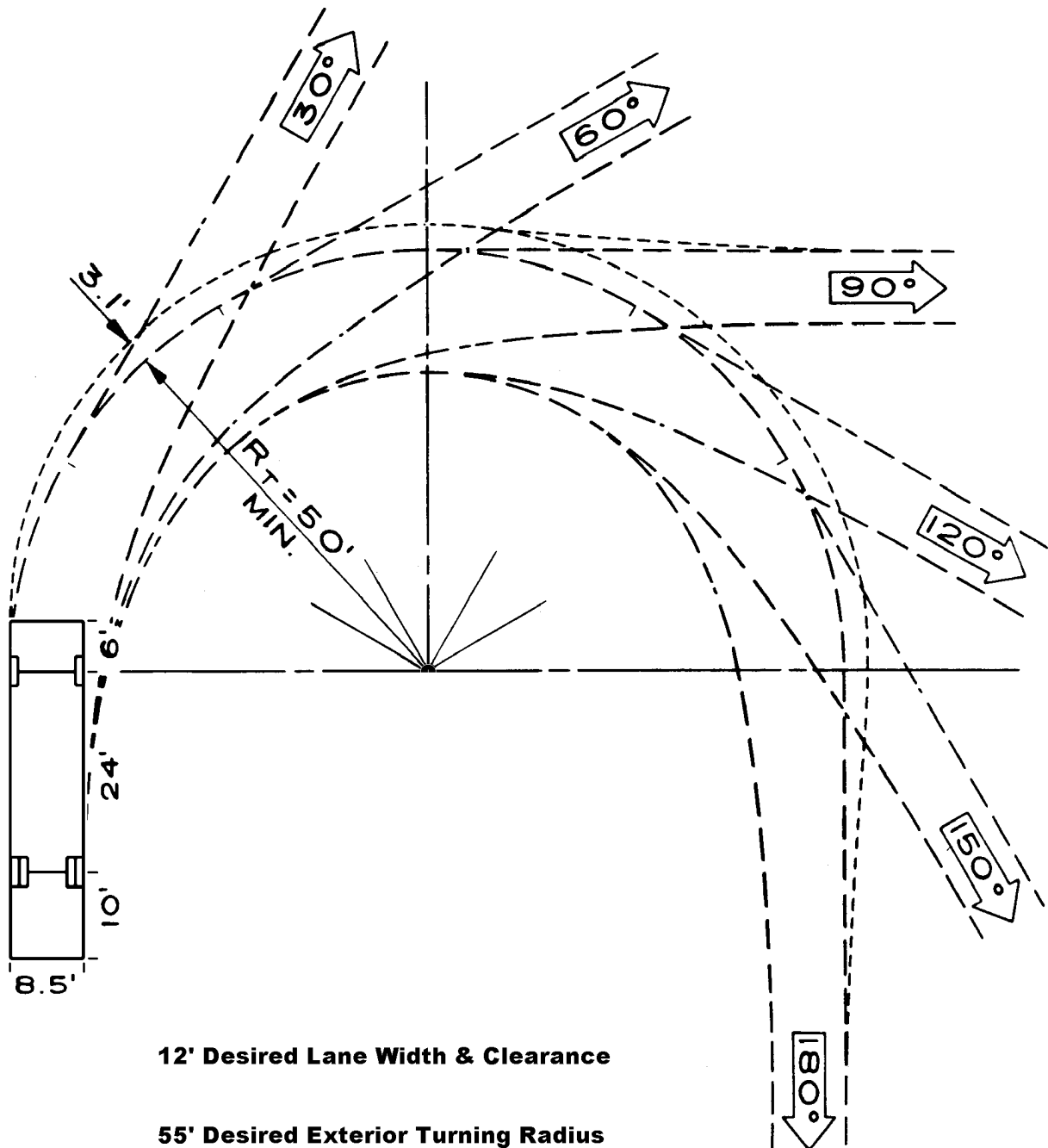
Remember that the above measurements do not take into account

- Bicycle racks in the upright or extended modes
- Radio antenna attached to the roof of the bus
- Outside mirrors set to individual Operator preferences

Gross Vehicle Weight Rating (GVWR) and Gross Axle Weight Ratings (GAWR) are maximum design weights assuming maximum load conditions. Typically, Transit vehicles are designed to accommodate 1.5 times their seating capacity. For example, a forty-seat vehicle has a standing capacity for an additional twenty Riders or a maximum load of sixty passengers.

3.1.2 Turning Radii

The following design template is for minimum turning path for a typical 40-foot bus.



Scale: 1 inch = 20 feet

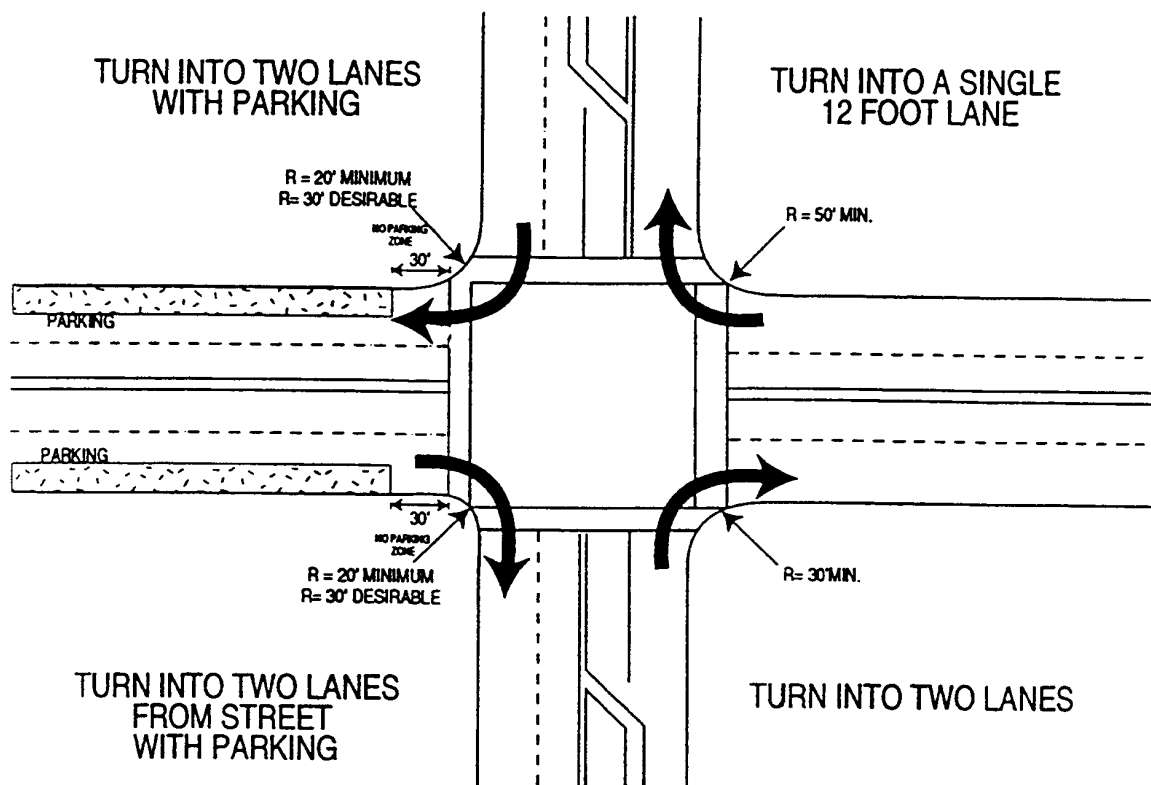
The above template is useful for either left turn or right turn designs. Turning radii transparencies applications include:

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

The standards should be applied; to all streets and facilities requiring Transit accessibility. The minimum fifty-five foot outside turning radius takes into account body overhang and makes allowances for driver reaction, vehicle movement, and extended bike rack clearance buffer. The minimum radii and Transition lengths shown are for turns at speeds of less than ten miles per hour. Higher speeds lengthen Transitions and require a larger turning radius.

3.1.3 Curb Radii

The corner radius at street intersections is a common Transit design concern. Designing intersections with adequate turning radii can avoid encroachment into oncoming lanes or mounting the adjacent curb.



Conversely, pedestrian crossing distances increase as intersection radii increase. When parking is allowed on either the approach street or the cross street desirable turning radii also increase. Parking restriction enforcement may be needed to avoid conflict and allow smooth flowing turning movements. Parking should be prohibited a minimum of thirty feet from the point of curve of the radius.

Advantages to properly designed corner curb radius include:

- Reduced automobile conflict and heavy-usage intersections
- Reduced bus travel time
- Improved Rider comfort
- Provisions for on street automobile parking
- Minimal bus encroachment into other same direction travel lanes and the need for hold-lines in opposing direction travel lanes

A curb radius of fifty feet is necessary for buses to safely turn into a single twelve-foot traffic lane without encroachment into opposing traffic.

A thirty-foot curb radius is acceptable if encroachment in a same direction travel lane is permitted. If encroachment into an opposing travel lane is envisioned, applicable advance stop bar treatments in adjacent opposite direction should be considered.

A minimum twenty-foot curb radius is acceptable when on-street parking exists on a multi-lane arterial (thirty-foot or greater corner radius is encouraged).

3.1.5 Intersections

The fundamental characteristic of Transit accessible development is safe, convenient access and circulation. It is important that the radii at intersections are adequate to accommodate turning Buses. Adequate radii will reduce vehicular conflicts; travel time and Rider inconvenience as well as maximize Rider comfort.

More than just a simple template, the following factors can adversely affect intersection radii:

- Location of on-street parking
- Right of way restrictions
- Encroachment of roadside activities and adjacent lanes
- Minimum bus turning radius

The following shows the appropriate turning radii at intersections where parking is planned and is consistent with our bus curb radii design:

Intersection Radii for Parking Options		
Parking Regulations	Minimum Radii (ft)	Desirable Radii (ft)
No On-Street Parking	40	50
Before the Turn-Only	20	30
After the Turn-Only	20	30
Before and After the Turn	25	25

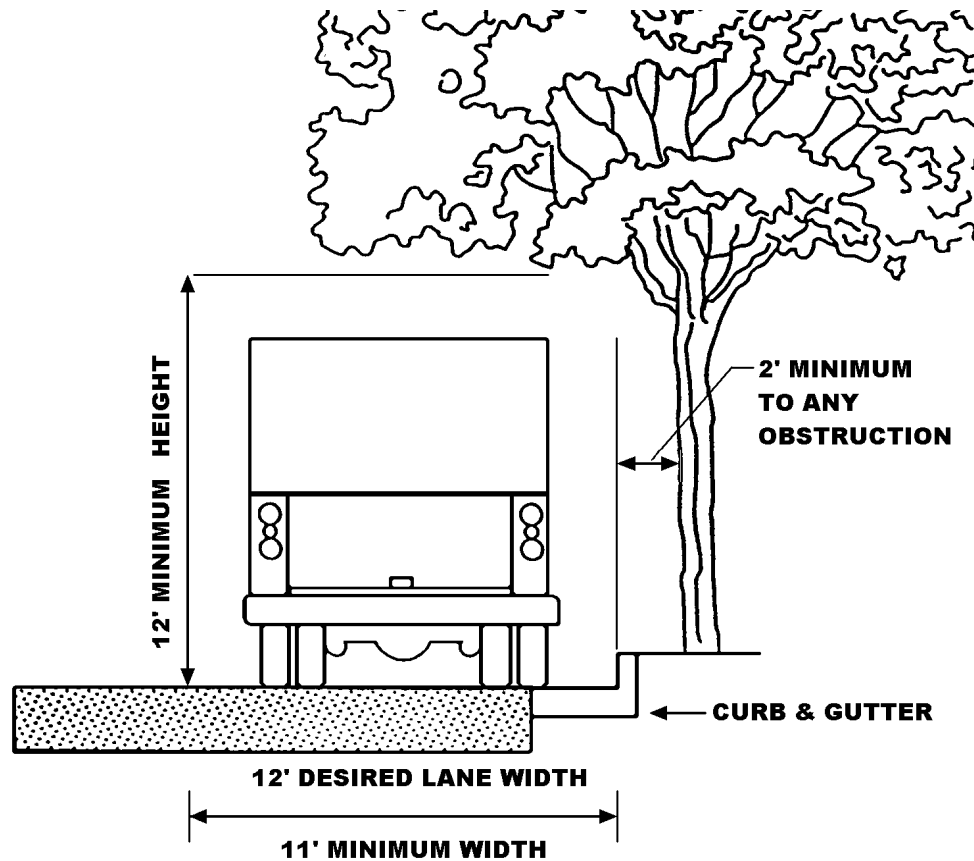
Note: The Palm Beach County standard minimum turning radius is thirty feet.

The trade-off in providing a large curb radius is pedestrian crossing exposure to vehicular traffic. Additional signal timing and median treatment may be warranted.

3.1.5 Clearance

Buses usually travel along the curbside lane, making frequent stops for Rider boarding and alighting. To safely curb the bus the following minimum clearance envelope requirements apply:

- Overhead obstructions should be a minimum twelve feet above street surface. **Note:** The Palm Beach County standard for a minimum overhead obstruction is thirteen feet 6 inches.
- Curbside obstructions should be a minimum two feet from the curb edge (or street edge) to facilitate bus mirror clearance. **Note:** The Palm Beach County standard for minimum curbside obstruction is four feet.
- Desired travel lane width is twelve-foot to accommodate mirrors (14-ft including gutter).

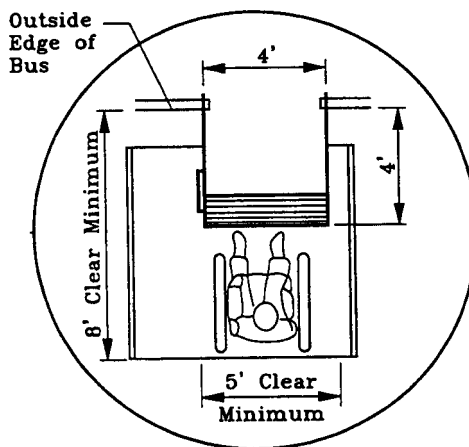


In addition to lane width, posted speed, increased additional traffic volume, right of way enforcement, and roadside obstructions (retaining walls, abutments, parked vehicles, construction materials and other roadside control fixtures) affect safe and efficient Bus operation. A twelve-foot desirable travel lane width minimizes the impact of those factors.

The Palm Tran fleet is ADA accessible (at the front door) with interior accessibility, priority seating and provisions for the placement of two wheel chairs.

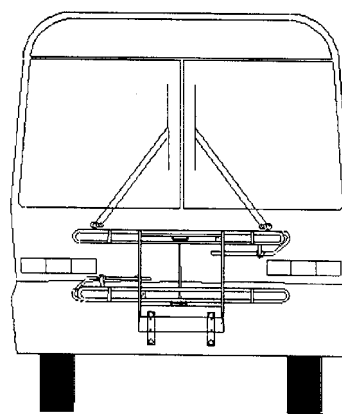
Approximately 25% of the fleet is equipped with the conventional wheel chair lift and the balance is low floor buses. The latter is becoming the industry standard allowing wheelchair access without the need for the conventional lift mechanism.

All buses are capable of kneeling to a floor height approximately ten inches above street level. Wheelchair Riders are then able to access the sidewalk by a ramp deployed from the bus's front door floor. The length of the ramp typically extends two to four feet from the edge of the bus. An additional four feet of clear space is required beyond the end of the lift when deployed.



Bikes-on-Buses (BOB) is a program that allows bicyclists to bring their bicycles with them while riding Palm Tran. Each bus is equipped with a front mounted bike rack capable of carrying two bicycles. The rack will accommodate all bicycles, from child-sized sixteen-inch wheels to heavily laden commuter bikes (excluding tandems and recumbents). All bikes fit into the rack in exactly the same manner.

The bike-rack dimensions (length x width) are 66-inches x 27-inches. In the stored position, it folds against the front of the bus. In either position visibility and mechanical operations of the bus are not impaired. In the extended position, the turning radius is extended another three feet.



3.2 ROADWAY

Street design and traffic regulations have historically been developed for the most part with little regard for Transit and Transit vehicles. Since buses have the capacity to carry the greater portion of the riding public, they should be given a greater preference than the single passenger vehicles (automobiles and trucks). Given the vital role that Transit plays in the transportation of commuters; preferential treatment (turning lanes, signal timing, roadway widths) should be considered.

New highway construction in Palm Beach County is regulated by the Florida Department of Transportation and administered by Palm Beach County and the local highway agency in which the development occurs. The developer should contact these agencies early in the design process to ensure that roadway and lane widths are consistent with applicable standards.

3.2.1 Roadway Design

Roadways and intersections with bus traffic and Bus Stops should be designed to accommodate the size, weight, and turning requirements of Palm Tran buses. The safety and operation of a roadway improve when these elements are incorporated into the design.

3.2.2 Pavement

Roadway pavements and turnouts need to have sufficient strength to accommodate repetitive bus axle loads of 20-tons. Exact pavement designs will depend on site specific soil conditions. Areas where buses start, stop and turn will require particular attention. Considering that Palm Tran's fleet operates primarily on diesel fuel, that a fuel residue is often left when a bus accelerates and that diesel breaks down hydrocarbon materials; prolonged use of an asphalt or bituminous surface is discouraged. Reinforced concrete pavement is desired and recommended to reduce pavement failure problems.

The paving material and thickness must be coordinated with FDOT and Palm Beach County Engineering & Public Works. Repetitive bus traffic can take their toll on local and temporary roadways. Traffic volume, design speed, soil characteristics and roadway materials can affect a roadway's ability to retain shape and dimensions, drainage and skid resistance.

The American Association of State Highway and Transportation Officials (AASHTO) categorize pavement design into three classifications: high, intermediate and low. A high type pavement is smooth riding and has good anti-skid characteristics. It's surface supports high volume and mixed vehicle types, while retaining its shape and dimensions. This type is recommended to support Buses. Lesser types will be subject to degradation requiring resurfacing, rehabilitation and replacement with prolonged Bus use.

Both FDOT and Palm Beach County have established design standards for highway construction that accommodate Buses. Developers are encouraged to provide concrete bus pads for the full length of the Bus Stop when the recommended paving section is not used. When recovery locations are required, a minimum full length and width concrete pad is also recommended.

The Palm Beach County's Land Development Standard Manual as well as the Thoroughfare Roadway Design Manual should be consulted for all new roadway construction to include pathways and sidewalks. Pavement construction for travel lanes and bus turnouts must conform to FDOT and Palm Beach standards for Collector or Thoroughfare Roadways.

3.2.3 Driveways and Entrances

FDOT and Palm Beach County both have established design standards for driveways and entrances. The bus turning radii template, curb radii criteria, and intersection radii are applicable for bus access to driveways and entrances. Encroachment on adjacent lanes should be avoided.

Ideally, Bus Stops should not be located close to driveways and entrances where a bus can block other vehicular entrance and egress. If this situation is unavoidable, the following Bus Stop location criteria will be used:

- Attempt to keep a least one entrance open to other vehicular access
- Allow for good other vehicular visibility and to minimize vehicular conflicts
- Allow for Rider boarding and alighting from a curb rather than a driveway

Early interaction within Palm Tran prior to starting the preliminary project site plan can preserve safe Rider loading zones and avoid these situations. Bus Stops should have approximately a one-hundred foot (100') buffer between the Bus Stop and the end of the driveway curb radii.

3.2.4 Traffic Signals and Signage

Bus Stops are frequently located at signalized intersections. Traffic signal design should accommodate buses and their Riders. The following should be considered in designing/redesigning traffic signal systems:

- Coordinate Bus Stop locations with traffic signal pole and signal head location. Bus Stops should be located so that buses do not block or restrict other vehicle traffic signal visibility.
- Far-side Bus Stops at a signalized intersections can cause vehicles stopping behind a bus to queue into the intersection.
- Since all Riders become pedestrians when exiting a bus, **WALK** and **DON'T WALK** indicators should be present at all signalized intersections with Bus Stops.
- Pedestrian push buttons should also be installed to activate pedestrian crossing treatments
- Bus Stops are often located between crosswalks and advance detectors for traffic signals. Detector placement is critical to enable the bus to actuate the detector and the signal controller to obtain or extend the green light. Otherwise, after serving a Bus Stop, the bus is forced to wait until other same direction traffic actuates the signal controller.
- Likewise, traffic signal timing should reflect the specific needs of buses. Longer clearance intervals may be required on higher speed roadways with significant bus traffic. Adequate time must be present for a bus to accelerate from a Bus Stop. Signalized intersections adjacent to railroad crossings also require timing and detection considerations

3.2.5 Traffic Control

Palm Tran encourages the enactment of traffic regulations, laws or ordinances prohibiting other vehicular parking, standing, or stopping at officially designated and appropriately marked Bus Stops. Allowances for other passenger vehicles (car pools, van pools, paratransit) to serve Riders at Bus Stops should be included. The Federal Highway Administration's *Manual on Uniform Traffic Control Devices (MUTCD)* includes general specifications for no parking signs at Bus Stops and curb markings to indicate parking restrictions, as well as guidelines for the placement of the signs.

3.2.6 Crest and Sag

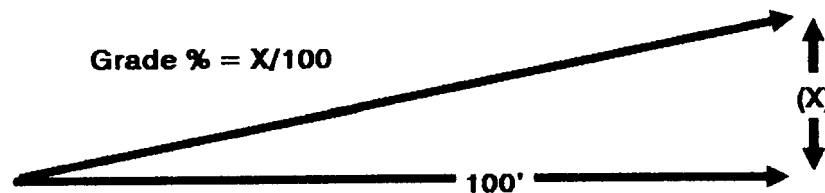
The distance between the front and rear axle of a bus pose limitations on bus operations. A sharp rise and fall on a hill may result in a bus "bottoming-out" at the **crest** of a hill--a bus's front and rear overhang beyond the respective axles. A similar condition known as **sag** occurs where a road surface depression is so severe that it can leave a bus suspended or "hung-up".

The American Association of State Highway and Transportation Officials (AASHTO) minimum acceptable vertical curve length is calculated by determining the "K-Value". This is the length of the vertical curve divided by the algebraic difference in the grade. The following are the minimum vertical curve (K-Values) for crest and sag at various speeds:

Minimum Vertical Curve K-Values		
Speed (MPH)	Crest (ft)	Sag (ft)
60	160	105
50	85	75
40	55	55
30	28	35

3.2.7 Grades

Roadway grades also place limits on Buses and Transit planning. The quality and quantity of the cut and fill material associated with a roadway can have an impact on the safety and economics of its selection. Grade is calculated as a percentage of the vertical height in feet over a 100-foot horizontal distance.



Typically the maximum grade for a 40-foot bus is between six and eight percent with the maximum recommended grade change not to exceed six percent.

3.2.8 Recovery Locations

The purpose of the recovery location or layover site is to provide a safe non-intrusive area where a Bus can consume time before beginning the next scheduled trip. Occasionally, alternate recovery or layover locations are required. It should be remembered that any area selected must take into consideration its impact on the surrounding neighborhood. Visibility, impact on other traffic and environmental considerations (air, noise and ecosystem) weigh heavily on site selection.

Off-street facilities are the most desirable. When located at an adjacent or nearby parking lot, it often becomes a de-facto Park-N-Ride facility that offers a safe convenient alternative where commuters can leave their automobiles, avoid congestion and travel by Transit to their destination.

Abandoned truck bays and low level loading bays can easily be substituted for Bus bays (or berths). Parallel and shallow saw tooth designs may afford multiple recovery sites. Parallel sights require additional length per vehicle and may require parking enforcement as they give the appearance of general curbside parking areas. Saw tooth design sites require additional width but discourage other vehicular parking. These will be discussed under off-street facilities later in this document.

3.3 BUS STOPS

The primary considerations in establishing Bus Stops are:

- Safe operation of Buses
- Safety of our Riders (and pedestrians)
- Rider convenience.

A safe operation implies that buses at Bus Stops are able to safely exit and reenter the flow of traffic with a minimum of interference with the other vehicular traffic. The position of a Bus alighting or boarding Riders should not interfere with the sight distance of other motorists.

Rider and pedestrian safety dictates that following minimal Infrastructure be present:

- The surface of Bus Stops should be even and offer safe footing.
- Riders at Bus Stops should not be subjected to moving traffic.
- Bus Stops should whenever possible be located near crosswalks and/or traffic control devices which give our Riders easy pedestrian access.
- Adequate lighting.
- Unobstructed pedestrian sight distance in crosswalks

Other limiting factors to establishing Bus Stops include: topography, parking or stopping restrictions, adequate waiting space (two-square-feet per waiting Rider), litter potential, and impact on adjacent commercial and private property.

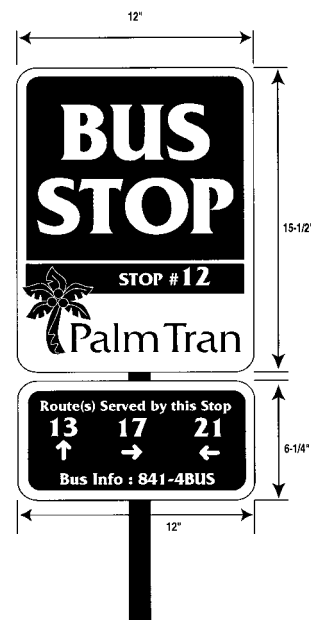
3.3.1 Location and Identification

It is Palm Tran policy to post every Bus Stop with a bus stop/route sign identifying the site as an officially designated Palm Tran Bus Stop. The Bus Stop signs measure 12-inches x 15.5-inches and have an accompanying route sign measuring 12-inches x 6.25-inches adjacent and immediately below the Bus Stop sign.

Information contained in this tandem sign arrangement includes:

- Travel direction Palm Tran Bus Stop identification
- Unique (up to) four digit number for that particular Bus Stop
- Routes served by this Bus Stop
- Direction the bus will take to the next Bus Stop
- Customer Service bus informational telephone number
 - North County: 841-4BUS
 - South County: 233-4BUS

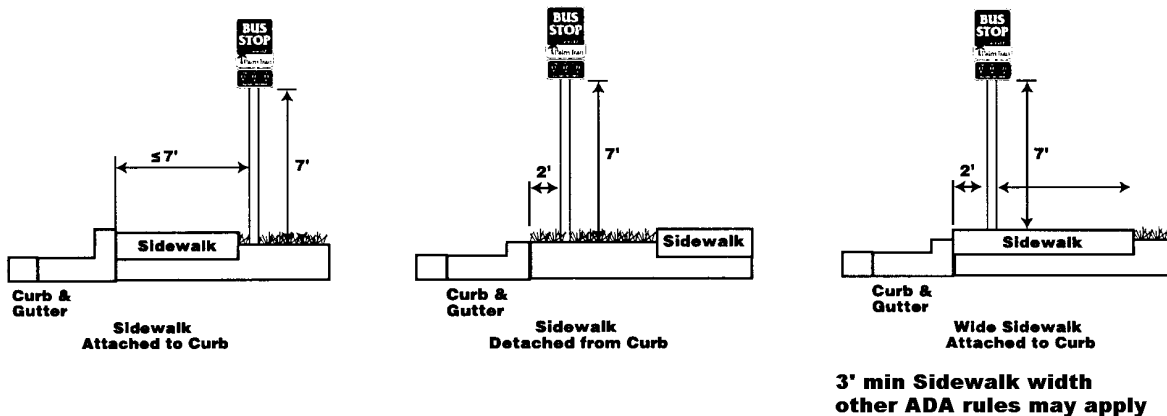
Palm Tran serves designated Bus Stops in commercial and residential areas so as not to block traffic and in the interest of safety. Flexibility is permitted, when warranted, provided it is done safely.



Construction zones on bus routes present problems in picking up and dropping off passengers. Many times, Bus Stop signs are removed during construction. Therefore, Palm Tran's Operators use their best discretion. Our Operators choose as safe an area as possible for stopping and alert the Dispatcher if a Road Supervisor is absolutely needed to evaluate certain areas.

While all Riders should board or alight at posted Bus Stops, if a Bus Stop sign is down, or there is an unusually long distance between Bus Stops, or if a Rider flag stops the bus, the Operator will exercise good judgment in selecting a safe Bus Stop.

Bus Stop signs are placed at the location where Riders board the front door of the bus. It serves as a guide for the Operator to position the bus at the Bus Stop. Bus Stop signs are installed perpendicular (or at a right angle) to the travel lane and centered on channels installed at a depth not to exceed three feet. The bottom of the sign shall be at least seven feet above surface level. The edge of the sign shall be at least two feet and no more than eight feet from the back-face of the curb so as to be visible to the operator.



For rural areas with flush travel lane shoulders, the minimum distance varies with the design speed of the travel lane.

Trees, buildings or other signs should not obstruct the Bus Stop signs. Conversely, Bus Stop signs should not obstruct the motorist's view of traffic control signs.

Bus Stops will not be located closer than twenty feet from a drainage structure opening or fifteen feet from a fire hydrant or disabled parking space. Signs, placements, anchors, and markers shall conform to Palm Beach County Standards (T-P-99-001)

TCRP Report 12, Guidelines for Transit Facility Signing and Graphics, suggests the use of 2-inch character height route numbers for Bus Stop signs mounted up to 80-inches above the surface and 3-inch character height for signs thereafter. If more than five routes serve a stop, a second signboard should be mounted on the channel or an additional Bus Stop sign posted.

3.3.2 Transit Service Area

The Transit Service Area extends one-quarter mile from each side of the bus route. This is the area in which most Riders can easily walk to Transit. Palm Tran considers all residential and commercial developments within this area adequately served.

3.3.3 Spacing

In determining the spacing of Bus Stops, comparable stops adjacent to regular stops are desirable. When this is not practical, the number of temporary Bus Stops should be kept to a minimum but still provide the maximum Rider convenience. Mitigating considerations include senior citizen/handicapped residences and activities.

Recommended Bus Stop Spacing		
Urbanized Areas	0.1 miles	528 feet
Residential Areas	0.1 to 0.2 miles	528 – 1056 feet
Rural	At intersections or recognizable landmarks	

3.3.4 General Considerations

While in service, buses generally stay in the right lane, except to turn left from a multi-lane roadway or to pass a stalled vehicle or very slow moving traffic. Operators must make sure before moving into the left lane that Riders waiting for to catch their bus are not missed.

Bus Stops types can be categorized by their relationship or location to the travel intersection:

- **Near Side**—immediately prior to passing through an intersection
- **Far Side**—immediately after passing through an intersection
- **Mid Block**—between two intersections

Right-turning lane treatments at intersections traditionally negate near side stops.

3.3.5 Near Side

Advantages	Disadvantages
Minimizes interference when traffic is heavy on the far side of the intersection	Increases conflicts with right-turning vehicles
Allows Riders to access buses closest to crosswalk	May obscure motorist's view of traffic control devices and crossing pedestrians
Allows Operator to use the width of the intersection as an acceleration lane	May obscure line of sight distance for motorists crossing the intersection
Eliminates potential double stopping through intersection	May obscure line of sight for crossing pedestrian
Allows Riders to board and alight at a traffic signal	May block travel lane with queuing buses
Allows Operators the opportunity to observe oncoming traffic and make transfer connections	May require more than one traffic signal cycle to cross an intersection

3.3.6 Far Side

Advantages	Disadvantages
Minimizes conflicts with right-turning vehicles	May block intersection during peak period traffic
Allows additional right-turning capacity before intersection	May obscure line of sight for crossing vehicles
Minimizes sight distance concerns when approaching an intersection	May obscure line of sight distance for crossing pedestrians
Encourages pedestrians to cross behind the bus	May require double stopping (before and after intersection) to serve Bus Stop
Allows Operators to use the width of the intersection as a deceleration lane	May cause rear-end collisions
Allows Operators to use gaps in traffic created by the traffic signal	May restrict or chock travel lanes on far side of intersection

3.3.7 Mid-Block

Advantages	Disadvantages
Minimizes motorist and pedestrian line of sight concerns	Requires additional no-parking restrictions at Bus Stop
Minimizes cross street pedestrian congestion	Encourages Rider street crossing (or jaywalking)
	Increases walking distance from intersections

4.0 STREETSIDE INFRASTRUCTURE

Street side Infrastructure are those features street side of the Bus Stop and usually associated with the bus operations interface with a Bus Stop and should not be confused with Curbside Infrastructure which are discussed in the next chapter.

4.1 BUS STOP ZONE

The Bus Stop Zone is that designated area along a route associated with Rider boarding and alighting. It includes everything street side of the Bus Stop to include acceleration/deceleration distances to/from a Bus Stop and the associated lane treatments. Travel lane designed speed and the number of buses serving a Bus Stop will lengthen the linear dimensions required.

Bus Stop Zone Types can be categorized by their relationship to the travel lane. (Each has its own unique requirements and specifications):

- **Curbside**-shared common area with the travel lane and usually requires minimal special lane treatments (parking restrictions)
- **Bus Bay**-separate lane segment adjacent to the travel lane (turnout or pullout)
- **Off-Street Facilities**-specialized designated area distinct from the travel lane with separate ingress and egress (Park-N-Ride or Transit Center)

4.2 CURBSIDE

Curbside Bus Stop Zones are the most prevalent. All are located along the travel way, identified by Bus Stop signs, and generally require parking restrictions adjacent to the curb or flush shoulder. Their spacing or frequency affect bus running time and traffic flow. Therefore, unnecessary stops should be avoided.

Although there are no absolute rules or criteria for this choice, factors for consideration include:

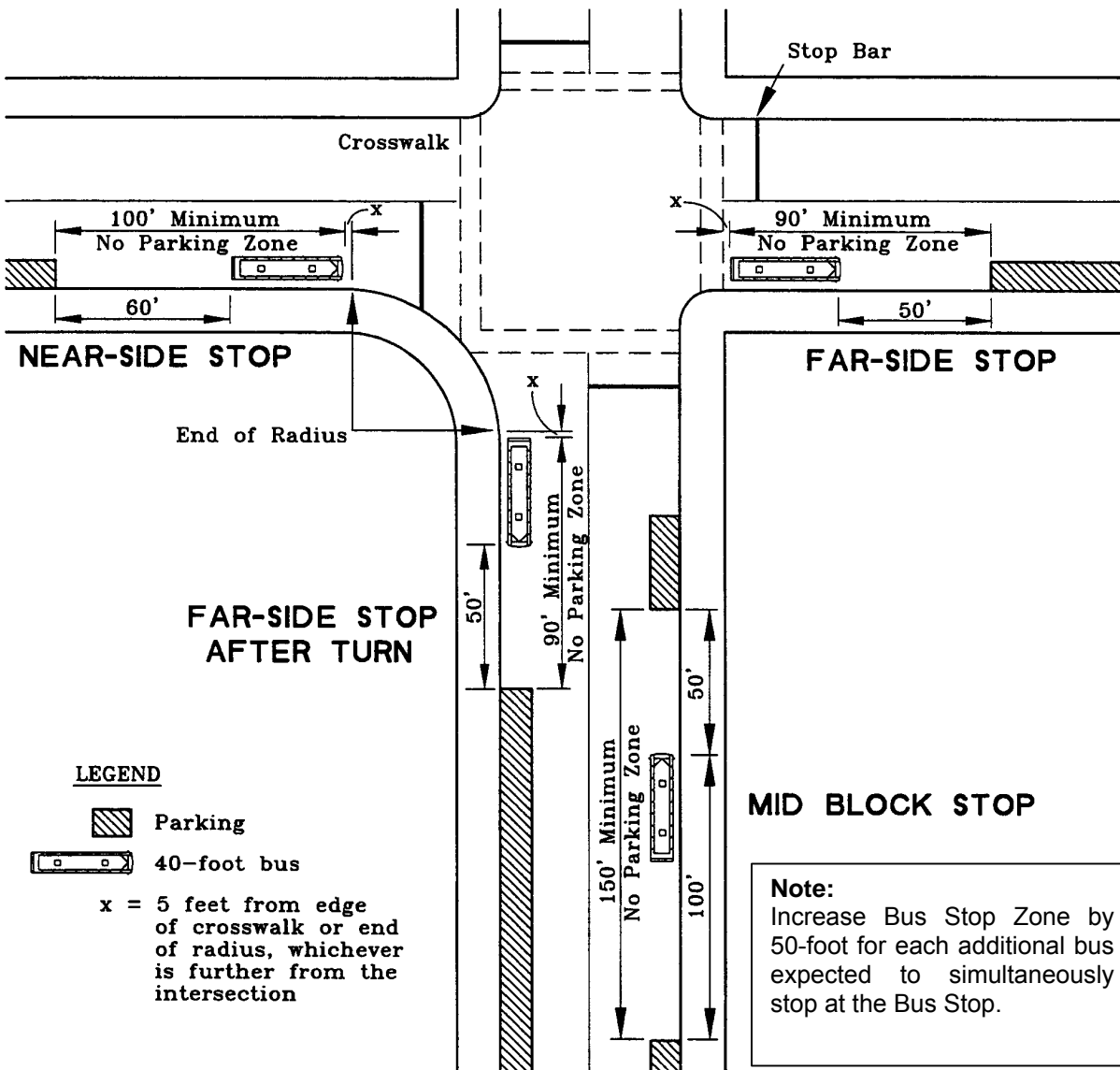
- Potential Ridership
- Rider origin and destination
- Pedestrian access
- Adjacent land use and activities
- Intersection geometries
- Parking restrictions and requirements
- Traffic control devices
- Physical roadside constraints (trees, poles, driveways, etc.)
- Intersecting Transit routes

Curbside Bus Stop Zones can further be delineated as:

- In-Line
- Bulb or Nub

4.2.1 In-Line

In-Line Curbside Bus Stop Zones are the most common and easily recognized. There is no impact on the travel lane or streetscape other than parking restrictions. The length of the associated Bus Stop Zone is depends on the Bus Stop type (relation to the intersection), end of the intersection curb radius, the placement of any crosswalks and stop bars (or hold lines).



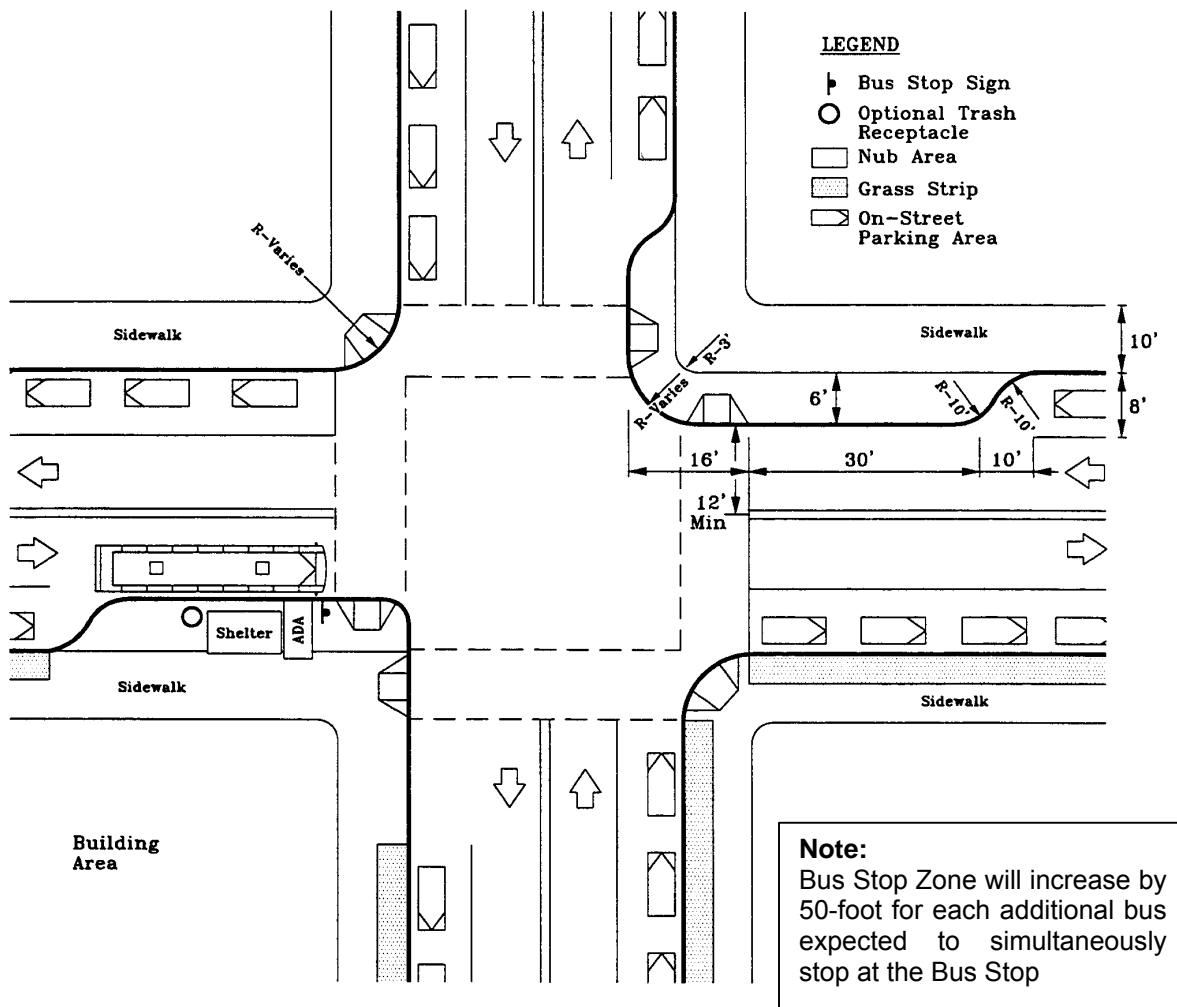
4.2.2 Bulb or Nub

Limitations on sidewalk space can near Bus Stops can be overcome with the addition of bus bulbs or nubs. Nubs are the horizontal curb extensions of sidewalks into the adjacent travel lane that operate similarly to In-Line Curbside Bus Stops. They are typically associated with near side and far side Bus Stops.

Nubs should be considered at the following sites:

- High pedestrian activity
- Crowded sidewalks
- Limited sidewalk space where shelters and benches are desired
- In-Line Bus Stop Zones restrict on-street parking
- Lengthy pedestrian crossing distances and times
- Bus-Automobile traffic conflicts

Turning radius requirements must be observed.



4.3 BUS BAY

Bus Bays (Turnouts or Pullouts) allow through traffic to flow freely without being impeded by stopped buses and provides a safer Rider waiting area. The most appropriate use is on roadways that experience high traffic volumes.

Again there are no absolute criteria. Location factors include:

- Traffic in curb lane exceeds 250 vehicle during the peak period
- Traffic design speed is greater than 40 MPH
- Bus volumes are greater than six per hour
- Rider volumes exceed twenty per hour
- Average peak period dwell time exceeds thirty seconds per bus
- Potential for vehicular and pedestrian conflict at Bus Stop
- Right-of-way is adequate without adversely affecting pedestrian movements
- Sight distances obscure view of bus in Bus Stop Zone
- Desirable Bus Recovery Site

A common Operator concern is that motorists will not allow the bus to re-enter the travel lane. Florida Statutes (FS 316.0815) which covers motorists responsibilities to yield to Transit vehicles, specifies that:

- (1) The driver of a vehicle shall yield the right-of-way to a publicly owned transit bus traveling in the same direction, which has signaled and is reentering the traffic flow from a specifically designated pullout bay.**
- (2) This section does not relieve the driver of a public transit bus from the duty to drive with due regard for the safety of all persons using the roadway.**

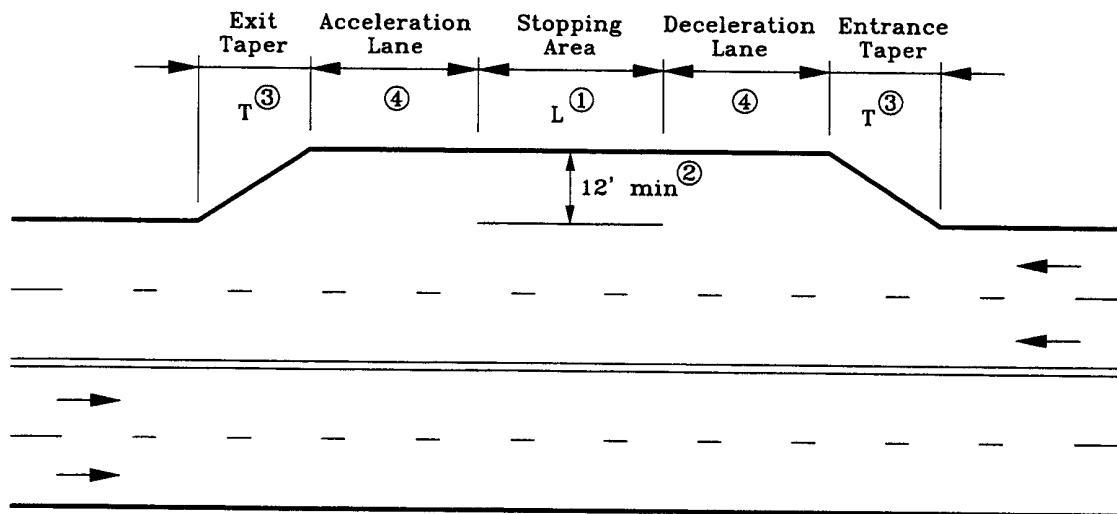
The use of sufficient accelerations lanes, signal priority treatments and far side placements can mitigate these concerns.

Near side bays should be avoided. They can create conflicts with right-turning vehicles, delay buses attempting to reenter the travel lane and obstruct traffic control devices and pedestrian activity. Likewise, mid-block bays are less desirable unless associated with pedestrian access treatments.

Advantages	Disadvantages
Allows vehicular traffic in travel lane to bypass buses in Bus Stop Zones	Difficult for buses to reenter travel lane on high traffic volume thoroughfares
Maximizes travel lane vehicle capacity	Additional linear space required
Clearly defines the Bus Stop Zone	May increase sideswipe accidents
Rider boarding and alighting are conducted in a more relaxed and safe manner	
Less potential for rear-end collisions	

Coordination with Palm Tran is essential to ensure that the design will lead to safe, comfortable, and efficient service. The critical feature is providing adequate acceleration and deceleration tapers to allow safe and comfortable ingress and egress. The lengths of the tapers are directly proportional to the design speeds of the adjacent travel lane.

4.3.1 Dimensions (derived from TCRP 19)



Notes:

1. Stopping Area length is 50 feet for each bus expected to stop simultaneously
2. Desirable Bus Bay width is 12 feet exclusive of gutter width
3. Desirable Taper lengths are related to the buses travel speed (assumed bay entering speed is at least 10 MPH less than travel lane speed)
 - Minimum entrance taper length (minimum 80 feet)
 - Minimum exit taper length (minimum 60 feet)
4. Recommended Acceleration and Deceleration Lane lengths are combined with Taper lengths are included in District 4 FDOT Transit Facilities Guidelines listed in the below table.

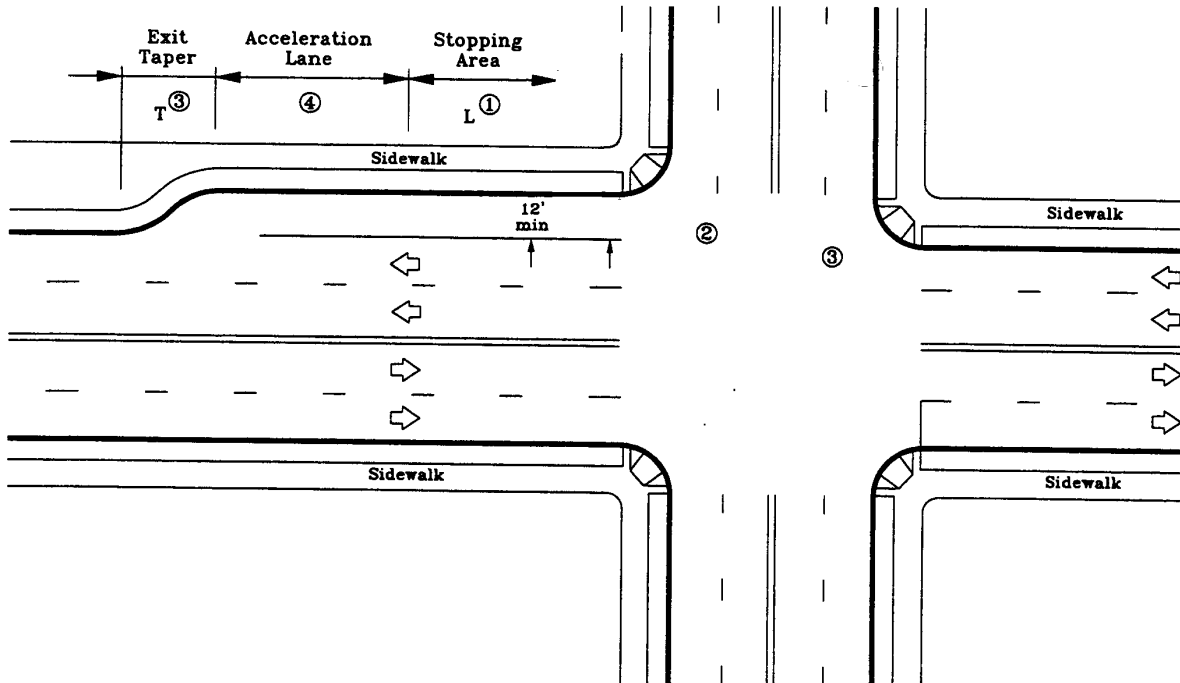
FDOT-IV Guidelines	Entrance Taper	Stopping Area	Exit Taper
Urban (curb & Gutter)	80	100 (2 bus minimum)	60
Rural (shoulder)	80	50 (1 bus minimum)	60

Signing and pavement marking (striping and “Bus Only” lettering) should clearly delineate the bus bay so that motorists in travel lanes are directed to continue through, rather than enter the bus bay. Generally, a broken six-inch white stripe (with a 2-4 foot skip) should be used in the entrance and exit taper and a solid six-inch white strip for the balance of the bus bay. Lettering should be a minimum 4-inches wide and 8-feet long so as to be visible to oncoming vehicular traffic. See FDOT-IV Transit Facilities Guidelines.

4.3.2 Open Bus Bay

The Open Bus Bay design is a variation of the traditional bus bay design. The bay is far side of the intersection and assumes that there is no dedicated right-turning lane for the general traffic. The bus has the full length of the intersection from the beginning of the near side curb radii through the far side curb radii for use as an entrance taper and deceleration lane.

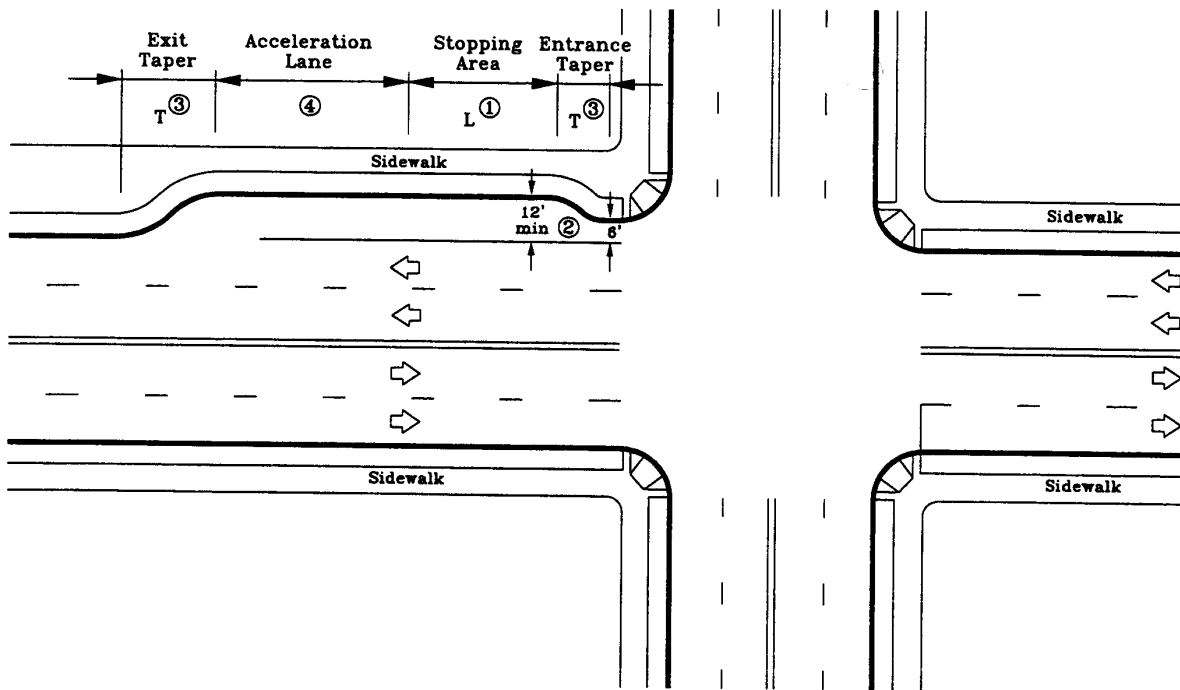
Advantages	Disadvantages
Allows bus to move efficiently into the bay	Increases pedestrian crossing time and distance
Allows bus to stop out of the traffic flow	May limit space available for benches and shelters
	May encourage right-turning vehicles to use the bus bay as an acceleration lane.



4.3.3 Partial Open Bus Bay

The Partial Open Bus Bay (or partial sidewalk extension) design also allows buses to use the intersection approach to enter the bus bay, but provides a partial sidewalk extension to mitigate pedestrian crossing time and distance.

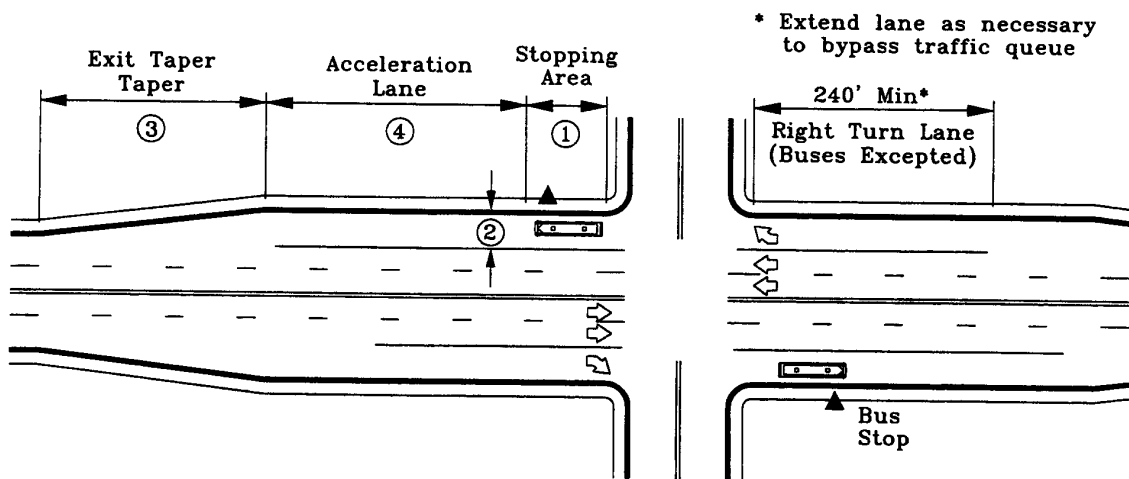
Advantages	Disadvantages
Allows bus to move efficiently into the bay	May create a choke-point for pedestrian movement
Allows bus to stop out of the traffic flow	May limit space available for benches and shelters
Prevents right-turning vehicles from using the bay for acceleration movements	



4.3.4 Queue Bus Bay (or Jumper Bus Bay)

The Queue (or Jumper) Bus Bay design provides a priority treatment for buses along the travel lane by allowing the bus to bypass through traffic congestion at intersections by taking advantage of the near side right-turning lane. Using this lane as a preferential treatment, the bus proceeds through the intersection to make a far side Bus Stop. This treatment requires that this lane be posted "Right Turn Only—Except Buses".

Advantages	Disadvantages
Removes stopped buses from the travel lane	May encourage other vehicles to cross
Guides buses through congested intersections	Increased pedestrian crossing time and distance



Note: The Palm Beach County Standard minimum storage length for turn-lanes is 280 feet.

4.4 OFF-STREET FACILITIES

Off-Street Facilities offer safer, more convenient locations for Riders to leave their automobiles and travel to their destinations. Typically, they are garages and Park-N-Rides served by Transit. They can range in scope from 10-20 reserved parking spaces within retail or institutional parking lot to 500-1000 dedicated parking spaces within Transit centers/facilities. They may be designated for pass-by service on the street adjacent to the parking area or for buses entering the facility to pick-up and discharge Riders at designated Bus Stops or stations. They may be as simple as off-street parking adjacent to a Bus Stop, or elaborate Intermodal Transit Centers that include shelters, benches, bicycle storage facilities, preferential parking, and landscaping.

Palm Tran encourages developers to provide reserved parking in already planned large scale parking lots located adjacent to bus routes. Riders utilizing dedicated parking for Transit benefit from the following:

- Reduced transportation Costs
- Reduced fuel expenditures
- Reduced travel time
- Reduced traffic congestion
- Reduced parking demand at work sites
- Reduced long-term on-street parking

Among the factors generally considered important in site selection are size, convenience, accessibility, compatibility, and safety

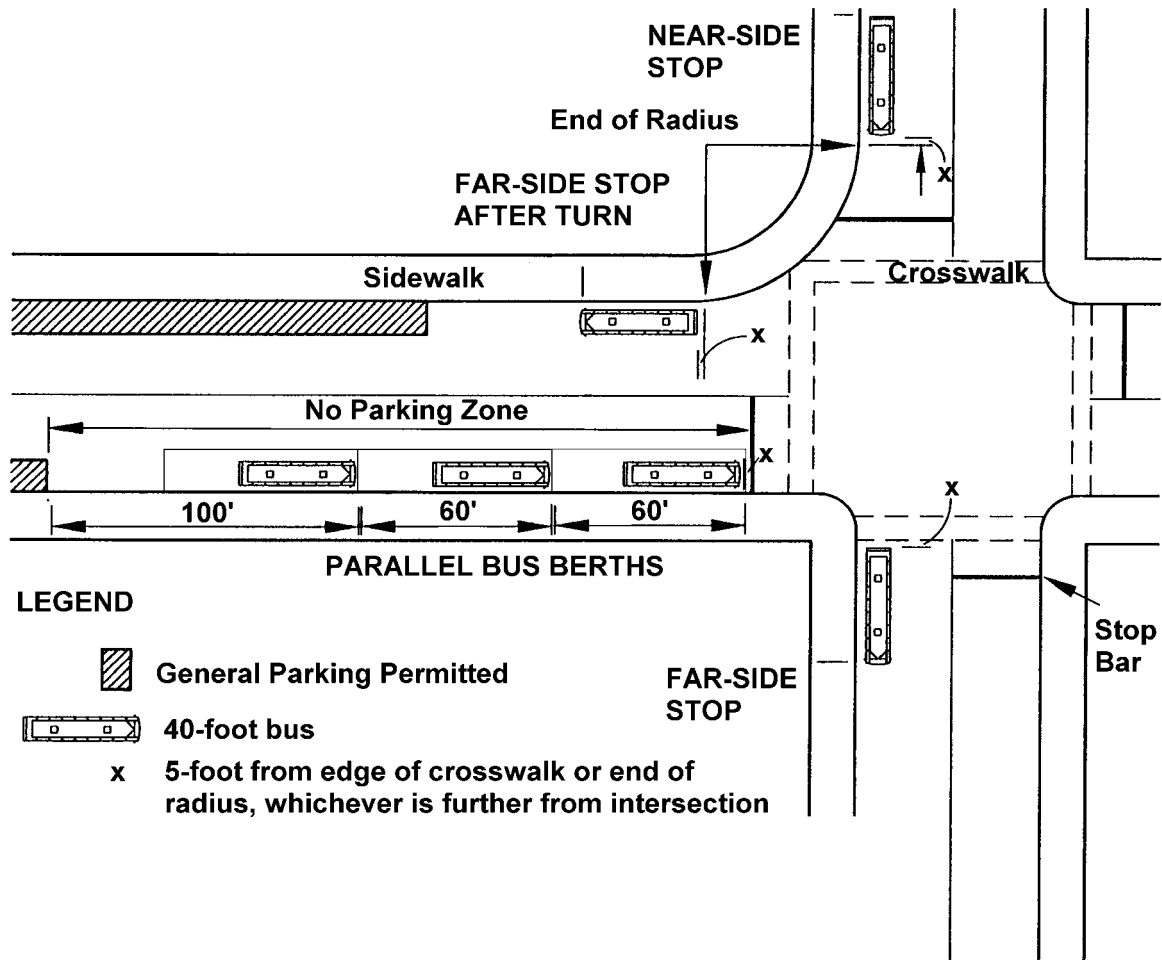
4.4.1 Berths (Parallel and Saw Tooth)

Occasionally multiple bus berths are required at off-street facilities, particularly where several bus routes converge and at bus recovery sites (or ends-of-the-line). Parallel and shallow saw tooth designs are the preferred options.

An important aspect of multiple bus berthing is proper signage for each bus berth. Each berth should be clearly delineated by route specific designation(s). Pavement should be marked with stripping to indicate the correct stopping position. This is more critical in the parallel design where misaligned buses may experience difficulty re-entering the general traffic.

The **parallel design** may require more parking enforcement, as it gives the appearance of general curbside parking areas. Even when properly signed and striped, it requires strict no-parking enforcement. Assuming a standard 40-foot bus length, the minimum dimensions for each parallel bus berth are a minimum 60-feet long and 12-feet wide. A minimum 20-feet is required between queued buses. Similar to In-Line Curbside Bus Stop Zones, the lead bus requires an additional 50-foot No Parking Zone to re-enter general traffic and the trailing bus requires a minimum 60-foot No Parking Zone to exit the general traffic when on street parking is permitted. Similar to Bus Bays, if the parallel berth design is located at an intersection, the full length of the intersection may be utilized for these taper transition dimensions.

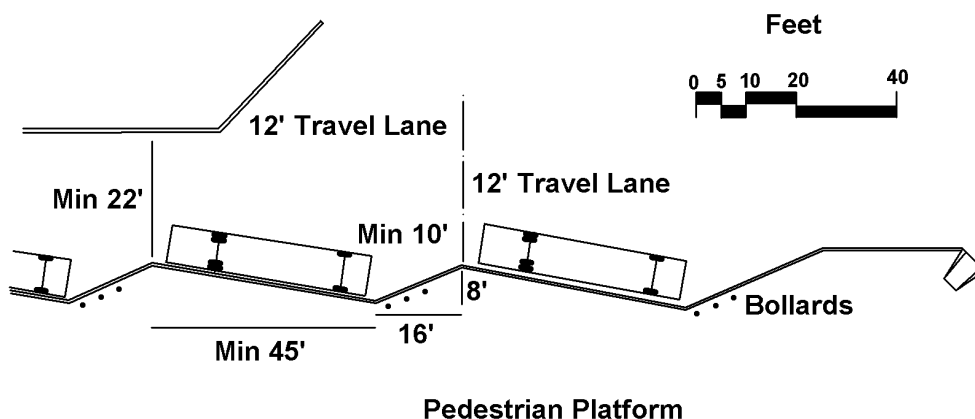
PARALLEL BUS BERTH



The **saw tooth design** offers the advantage of appearing more like a formal Transit facility and discourages unauthorized parking. It does require more depth and improved sight distances than the parallel design. It also precludes bus queuing.

Transit facility designs incorporating saw tooth designs or other types of designs that direct errant vehicular traffic toward pedestrian-occupied areas should include provisions for positive separation between the roadway and pedestrian areas sufficient to stop a bus operating under normal parking area speed conditions from progressing into the pedestrian area. Typically bollards are placed at the forward ends of saw tooth bus parking spaces. A single bollard is designed to stop a 36,600-pound vehicle traveling 4 MPH. Three bollards of concrete-filled, 8-inch diameter, heavy wall steel pipe should be used at each parking space. The pipe is set vertically in a 6-foot, auger-drilled hole, and retained by reinforced concrete.

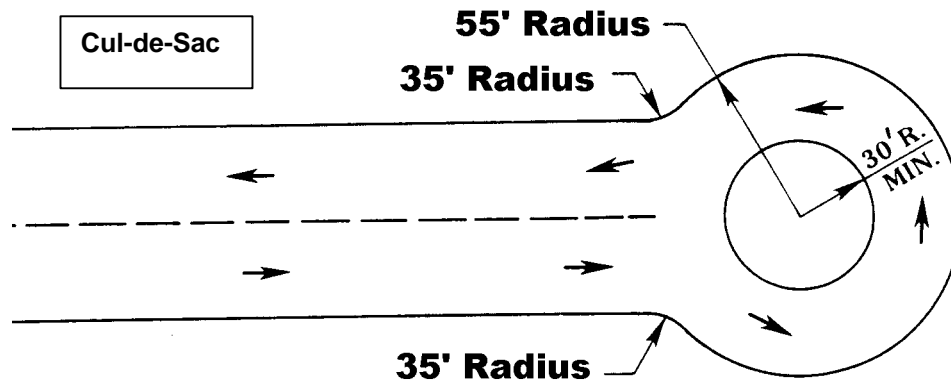
SAW TOOTH BUS BERTH



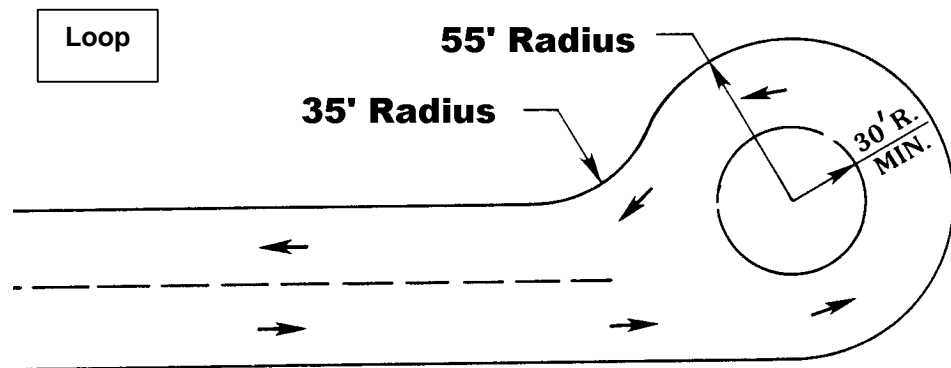
4.4.2 Bus Turnaround (Cul-de-Sac, Loop, Jug-Handle)

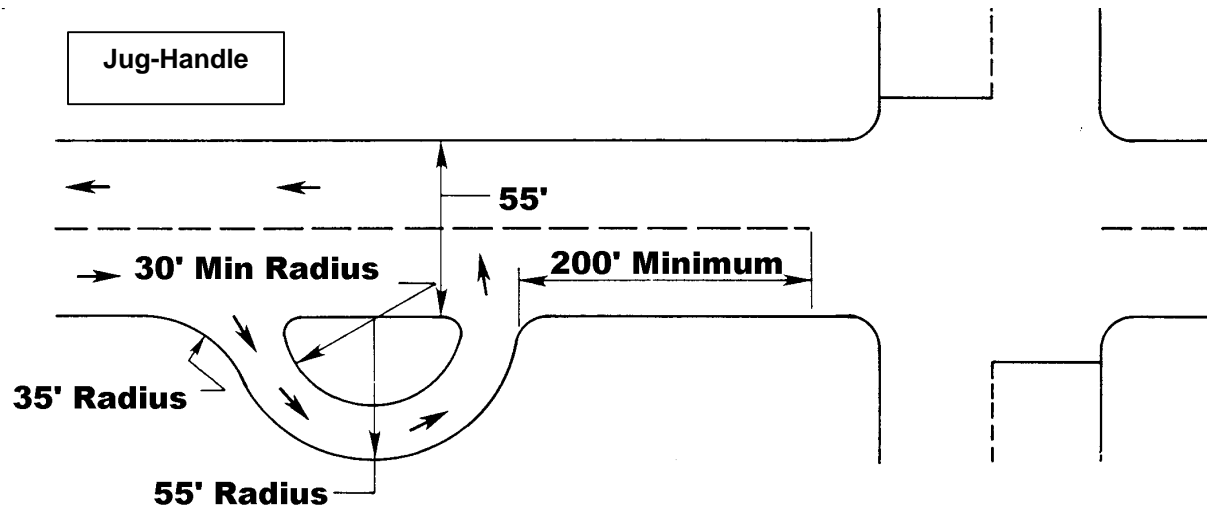
The preferred method for bus circulation and return to major arterials is via the internal street system. Occasionally, design constraints, trip time efficiency, or cost effectiveness will preclude this circulation pattern.

Often avoided because of their limited radii and residential atmosphere, a Cul-de-Sac with a sufficient turning radius can serve as a bus turnaround.



Outside loops and jug-handles may also serve as a method for bus circulation and return to a major arterial when the available street network, trip time efficiency or cost effectiveness do not permit alternative street circulation.



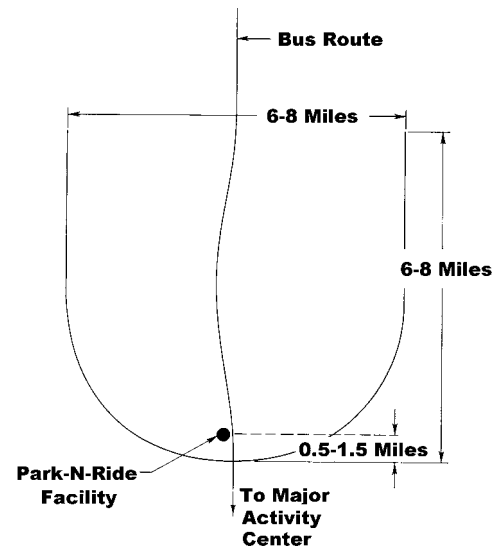


4.4.3 Park-N-Ride

A Park and Ride Facility is a parking garage and/or paved area used for parking passengers' automobiles, either free or fee paid, while they use Transit facilities. Park-and-ride facilities are generally established as collector sites for rail or bus service. Park-and-ride facilities may also serve as collector sites for vanpools and car pools, and as Transit centers.

The Transit Service Area for Park-N-Ride and Commuter Drop-Off facilities is much larger than for pedestrians, since its users arrive by automobile. Typically, it can extend as much as a mile and a half inbound from the facility, six to eight miles outbound from the facility and as many miles either side of a bus route.

Specific ADA requirements for the number of accessible parking spots, accessible routes, and curbs and ramps will further dictate the land use composition of the Park-N-Ride.



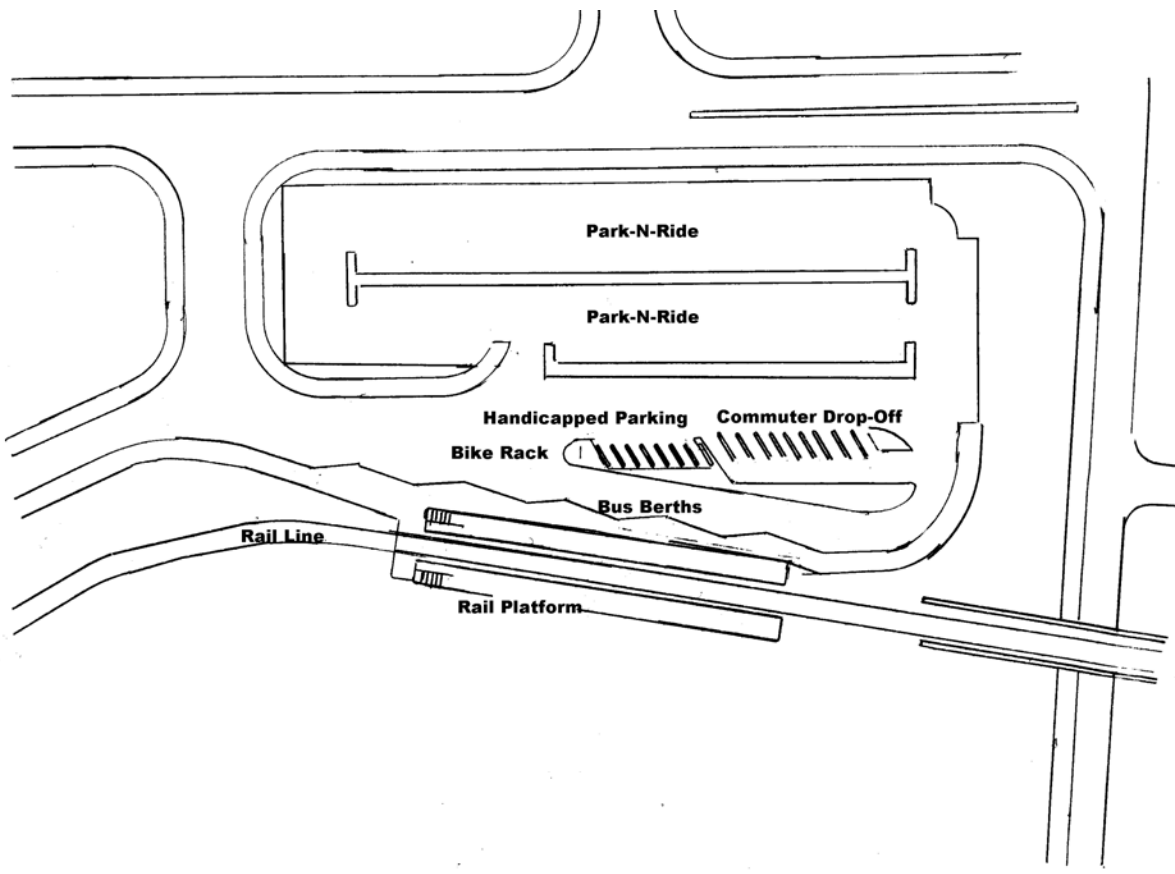
4.4.4 Commuter Drop-Off

A Commuter Drop-Off facility is part of a Park-N-Ride facility where commuters who are passengers in non-Transit vehicles are dropped off to board a Transit vehicle.

4.4.5 Intermodal Transit Center

The Intermodal Transit Center (also known as the Intermodal Transportation Center) is a compilation of all aspects outlined in this manual. It combines all the elements of design (service and operation) with Infrastructure (street side and curbside) to link multiple forms of Transit (walking, bicycle, automobile, bus, rail, and boat). It involves all the major transportation agencies (Palm Tran, DOT, FDOT, Palm Beach County (and local jurisdictions), MPO, developers, and the community).

Major Transit Attractor



4.5 STREETSIDE INFRASTRUCTURE CHECKLIST

Several items should be considered when designing and locating a Bus Stop on a roadway. The following checklist of street-side Infrastructure should be reviewed with each design because it brings together related issues that can have a significant impact on the safe operations of the Bus Stop.

4.5.1 Standardization: One of the most critical factors in the street-side design and placement of a bus stop involves standardization or consistency.

- ☐ Standardization is desirable because it results in less confusion for Operators, Riders, and motorists.
- ☐ Consistency in design, however, can be difficult to achieve since traffic, parking loss, turning volume, community preference, and political concerns can influence the decisions.

4.5.2 Periodic Review: A periodic review of Bus Stop conditions (both street side and curb side) is recommended to ensure the safety of bus passengers.

- ☐ This will encourage the timely reporting of items such as missing Bus Stop signs and poor pavement.

4.5.3 Near-Side/Far-Side/Mid-block Placement: Each type of placement has advantages and disadvantages.

- ☐ In general, each Bus Stop location should be evaluated individually to decide the best placement for the Bus Stop.

4.5.4 Visibility: Bus Stops should be easy to see.

- ☐ If the Bus Stop is obscured by nearby trees, poles, or buildings, the Operator may have difficulty locating the Bus Stop.
- ☐ Motorists and bicyclists may not know of its existence and will be unable to take necessary precaution when approaching and passing the Bus Stop.
- ☐ Visibility to pedestrians crossing a street is also an important consideration--"right turns on red."

4.5.5 Bicycle Lanes and Thoroughfares: When a bike lane and a Bus Stop are both present, the Operator needs to be able see cyclists in both directions while approaching the Bus Stop.

- ☐ Sufficient sight distance for cyclists to stop safely upon encountering a stopped bus is also needed.

4.5.6 Traffic Signal and Signs: Bus stops should be located so that buses do not restrict visibility of traffic signals and signs from other vehicles.

- ☐ Because all Riders become pedestrians upon leaving the bus, pedestrian signal indicators should be considered at nearby signalized intersections

4.5.7 Roadway Alignment: Horizontal and vertical roadway curvature reduces sight distance for Operators, motorists, bicyclists, and pedestrians.

- ❑ Bus Stops located on curves make it difficult for the Operator to stop the bus parallel to the curb and safely return to the driving lane.
- ❑ Where possible, Bus Stops should be located on sections of relatively straight and flat roadway.
- ❑ Trees and poles should not obstruct the visibility of the Operator for cross traffic, and Rider and pedestrian movement.

4.5.8 Driveways: Avoid locating Bus Stops close to a driveway.

- ❑ If placing a Bus Stop close to a driveway is unavoidable (for example, to lessen the loss of parking in a commercial area), keep at least one driveway open to vehicles accessing the adjacent development while a bus is loading or unloading passengers.
- ❑ Locate Bus Stops to allow full visibility for vehicles leaving an adjacent development and to minimize vehicle/bus conflicts.
- ❑ Placing Bus Stops on the far side of driveways will minimize conflicts; however, sight distance for left-turning vehicles from the driveway will still be a concern.

4.5.9 Location of Pedestrian Crosswalks:

- ❑ A minimum clearance distance of 5 feet between a pedestrian crosswalk and the front or rear of a bus at a Bus Stop is desirable.

4.5.10 Location of the Curb:

- ❑ Where possible, locate stops where a standard curb height of 6 inches exists.
- ❑ Bus steps are designed with the assumption that the curb is the first step.
- ❑ It is more difficult for elderly persons and passengers with mobility impairments to board and alight from the bus if the curb is absent or damaged.

4.5.11 Street Grades:

- ❑ Generally, Bus Stops should not be located on an upgrade in a residential area, since the bus engine noise created when the vehicle accelerates from a stop will bother area residents.
- ❑ Placing Bus Stops on steep grades should be avoided if slippery conditions prevail.

4.5.12 Road Surface Conditions:

- ❑ Since alighting passengers generally move from their seats when the bus decelerates on approach to a Bus Stop, do not locate Bus Stops where the roadway is in poor condition such as areas with broken pavement, potholes, or ruts or where a storm drain is located. The resultant motion of the bus in such a situation may cause bus passengers to fall and injure themselves.
- ❑ Boarding and standing passengers are also susceptible to falls or injuries where poor pavement conditions or low drainage basins exist.

5.0 CURBSIDE INFRASTRUCTURE

Curbside Infrastructure are those features curbside of the Bus Stop and are usually associated with the Rider's off-board interface with the Bus Stop.

Developers are encouraged to provide curbside Infrastructure for the convenience of their patrons and our Riders. New Developments provide an opportunity to incorporate Bus Stops and attractive Infrastructure into the site plan. Developers are encouraged to design for Transit in this way, so that these areas become a positive feature of the development rather than an afterthought. The incorporation of Infrastructure into the development serves as an endorsement of Transit as a viable alternative to the private automobile.

Attractive, compatible Bus Stop design and layout makes a statement that Transit is an important consideration for the area. Travel Habits change when other things change. A new job in an office park or a new home in a new community present opportunities for people to consider using Transit. Attractive Transit Infrastructure can influence transportation decisions

5.1 PEDESTRIAN

Pedestrian walkways should be provided between buildings within a development and along travel lanes served by Transit. Walkway design must be consistent with ADA, FDOT and Palm Beach County guidelines concerning material, width, thickness, and geometry.

To best serve Transit, walkways should be paved, adequately lit, and ADA accessible. They should connect building entrances and Bus Stops as directly as possible to avoid pedestrian "short-cutting" across lawns or parking lots. The more circuitous the path, the greater likelihood that pedestrians will develop their own more direct route.

Providing defined access to and from the Bus Stop is important. Sidewalks should be constructed of impervious non-slip material and should be well drained. Access to the Bus Stop from the intersection or land use should be as direct as possible. When possible, sidewalks and Bus Stops should be coordinated with existing street lights to provide a minimum level of lighting and security. To accommodate wheelchairs, ADA requires that sidewalks should be a minimum of five feet wide and equipped with wheelchair ramps at all intersections. Other improvements include defined pedestrian crosswalks and signals at intersections. Pedestrian enhancements, such as sidewalks, should be coordinated with roadway improvements to help improve Rider comfort and convenience.

Installation of a standalone or independent sidewalk from the intersection to the Bus Stop is one way to achieve greater Rider access to the Bus Stop in areas with limited or no sidewalk coverage. Although, the sidewalk may not continue toward the next land use or along the roadway, this strategy is the first step toward providing complete access to the Bus Stop. This ensures that access to the Bus Stop is not through uneven grass or exposed soil, which can be further impaired by poor drainage and surface changes during inclement weather. The elderly and the disabled may find access to the Bus Stop difficult as well.

The walk to the Bus Stop affects the comfort, convenience, and safety of the Rider. The best pedestrian access to Bus Stops are locations with sidewalks that are direct and comprehensive in approach. In rural or developing suburban areas, sidewalks may or may not be installed along major roadways due to continuing development in the area or lack of justification for them. Sidewalks along the roadways may or may not exist. Typically, the only passenger Infrastructure at the Bus Stops is a Bus Stop sign located on the soft shoulder, which makes reaching the Bus Stop inconvenient during inclement weather.

Riders either stand on the undeveloped right-of-way or seek relief from the elements by standing beneath nearby trees. Depending upon familiarity with the schedule, the Rider may or may not have a long wait at these unsophisticated Bus Stops. As areas become more developed, sidewalks become more commonplace. ADA compliance can be an impetus for installing sidewalks.

Sidewalks located far away from the curb can create large distances between the edge of the curb, sidewalk and Bus Stop. Suburban Bus Stops with wide right-of-ways are characteristically developed in this manner to permit further roadway expansion. The sidewalk is parallel to the curb but several feet from it. The sidewalk, Bus Stop, and curb may or may not be connected by impervious material. The Bus Stop is often located directly on the grass and is marked with a Bus Stop sign. A bench or bus shelter may or may not be present, depending upon demand. Over time, the site where the Bus Stop (bench or shelter) is placed becomes worn. Footpaths also develop in these areas showing common circulation paths. During inclement weather, the worn areas become muddy, creating the need for patrons to reach the bus from another location, such as a nearby driveway. Commonly, Bus Stops are positioned between the sidewalk and the curb or behind the sidewalk away from the curb. In both scenarios, the Bus Stop (bench or shelter) is away from the general pedestrian traffic on the nearby sidewalk. Palm Tran prefers to have the sidewalk in front of the Bus Stop so bus patrons can see the general vehicular traffic and the surrounding pedestrian activity. The additional space also provides waiting Riders with a zone of comfort away from the nearby traffic flow.

5.1.1 Commercial

The best strategy to improve pedestrian access at or to Bus Stops is to coordinate development with the location of the Bus Stop. Coordination and cooperation with the landowner or developer will enhance the connectivity between the land use and the Bus Stop. To ensure optimum placement, coordination should occur during the planning/development phase. Pedestrian improvements include defined or designated walkways through parking lots and openings or gates through walls. Access ways can be as elaborate as a landscaped sidewalk through the parking lot or as minimal as painted walkways that caution drivers and direct pedestrians. As with any pedestrian improvement, strict adherence to mobility clearances, widths, and slopes should be followed to improve access for persons with disabilities. Safety improvements and shorter walking times can be achieved by implementing such strategies.

Another solution is to place buildings closer to the road and place parking to the rear and sides of buildings.

5.1.2 Residential

Riders need efficient ways to reach the Bus Stop from their residences. Palm Tran needs to be involved early in the development approval process to reduce walking times and improve direct access to and from the Bus Stop. Sidewalk placement that is coordinated with land use and Bus Stop locations is critical to encouraging the use of transit.

Concerns over residential security have led to a proliferation of walled or gated residential communities that restrict access to a limited number of entry and exit points. By doing so, walking times to Bus Stops may be increased because direct access may not be available. Circuitous or curvilinear (winding) sidewalks can also increase walking times and create coordination problems for Palm Tran when choosing the final Bus Stop location. Curvilinear sidewalks along a street may not align with the final stop destination and may result in access problems through grass, berms, or other landscaping features.

Coordinating sidewalk design and placement is needed between developers and Palm Tran to ensure direct access to a paved Bus Stop. Designing gates, openings through walls, and installing direct sidewalks in residential communities can be coordinated with developers to reduce walking times from the land use to the Bus Stop.

5.2 ACCESSIBILITY GUIDELINES

The influence of ADA access mandates a direct and impervious path between the curb, sidewalk, and Bus Stop for both ambulatory and physically impaired Riders. Mobility impediments include cluttered sites that have an abundance of vending machines, bike stalls, trash receptacles and undeveloped rights-of-way that lack sidewalks. This manual does not purport to outline ADA standards BUT ONLY provide general guidelines.

The Americans with Disabilities Act of 1990 (ADA) is broad legislation intended to make American society more accessible to people with disabilities. Titles II and III (public services and public accommodations) affect Bus Stop planning, design, and construction. Although the definition of disability under the ADA is broad, Bus Stop placement and design most directly affect persons with mobility and visual impairments. These impairments, which relate to the more physical aspects of bus stop accessibility, have received the most attention.

Making new Bus Stops conform to ADA physical dimension requirements is relatively easy. Modifying existing Bus Stops to comply with ADA, though desirable from an accessibility perspective, is not required under ADA. Modification of existing stops is more difficult, especially if the stops are at sites with limited easement or not subject to the transit agency's control, such as shopping malls, on rights-of-way, or suburban subdivisions.

The ADA, however, is concerned with more than physical dimensions. It also involves accessibility from the point of origin to the final destination. For example, to get to the Bus Stop, individuals with limited mobility or vision need a path that is free of obstacles, as well as a final destination that is accessible. A barrier-free Bus Stop, bench or shelter is of little value if the final destination is not accessible. Although all Palm Tran buses are ADA accessible, full accessibility is more difficult to achieve when different organizations are responsible for different portions of the path (which is usually the case). Either way, the "equal access" provisions of the ADA require that the route for persons with limited mobility or vision be as accessible as the route used by those without disabilities. A person with disabilities should not have to travel further, or use a roundabout route, to get to a designated area.

Basic aspects of design exist that encourage accessibility and are applicable to most situations. Specific dimensions are available from several references, some of which are listed in **Appendix A: [Resources and References](#)** as well as **Appendix B: [On-The-Web](#)**. Also see **Appendix D: [CLARIFICATION OF ADA AFFECTING TRANSIT](#)**. Some general design considerations involve obstacles, surfaces, signs, and telephones.

5.2.1 Obstacles

Examine all the paths planned from the alighting point at the Bus Stop to destinations off the Bus Stop premises. Determine whether any protrusions exist that might restrict wheelchair movements. If protrusions exist and they are higher than 27 inches and/or lower than 80 inches, a person with vision impairment may not be able to detect an obstacle (such as a phone kiosk) with a cane. A guide dog may not lead the person with the impairment out of the path. Although it may not be Palm Tran's responsibility to address accessibility problems along the entire path, an obstacle anywhere along the path may make it inaccessible for some Riders with disabilities.

5.2.2 Surfaces

Surfaces must be stable, firm, and slip-resistant. Such provisions are beneficial for all Riders, but especially for those who have disabilities. Avoid abrupt changes in grade, and bevel those that cannot be eliminated. Any drop greater than 1/2 inch or surface grade steeper than 1:20 (5%) requires a ramp.

5.2.3 Signs

Signs providing route designations, bus numbers, destinations, and access information must be designed for use by Riders with vision impairments. Specific guidelines are given for these signs in Section 4.30 of ***Americans with Disabilities Act, Accessibility Guidelines for Buildings and Facilities (ADAAG)***. In some cases, two sets of signs may be needed to ensure visibility for most users and to assist users with sight limitations. Route maps or timetables are not required at the stop, though such information would be valuable to all passengers.

5.2.3 Telephones

Telephones at Bus Stops are not required under ADA, but if telephones are in place, they must not obstruct access to the facility and must be suitable for users with hearing impairments. At least one phone must be accessible for wheelchair users. Telephone directories must also be accessible.

5.2.3 Accessible Route

There should be a clear path to the entrance of any building that is accessible. It should serve all parking, Transit, loading zones, sidewalks and streets. It should be at least 36-inches wide and where turns are required be 36 to 60-inches wide depending on the shape of the turn. Requirements for curb cuts, ramps, parking, and slope are important considerations. (See ADAAG paragraphs 4.3.3 and 3.3.4)

5.2.4 Setbacks

Available right-of-way can significantly influence the location and number of Rider Infrastructure that can be constructed at a site. Items commonly found in the right-of way, such as the edge of the curb, sidewalk, landscaping, and utility poles can influence the size and positioning of a Bus Stop and the number of Infrastructure that can be placed at the site for our Riders. Different street-side stop designs, such as bus bays, can also place additional constraints on space availability. Many of the Bus Stop sites compromises between needed Infrastructure and the space available in the right-of-way.

Florida Statutes (FS 337.408), which covers the regulations of benches, shelters, and waste receptacles within rights-of-way, specifies that they:

... may not interfere with right-of-way preservation and maintenance.

A significant number of accidents involve vehicles leaving the roadway and either overturning or colliding with a fixed object. Clear zones are established to provide the necessary recovery area and minimum pedestrian safety.

FDOT and Palm Beach County conform to the same general setback requirements for the location of Curbside Infrastructure. The following are the general guidelines:

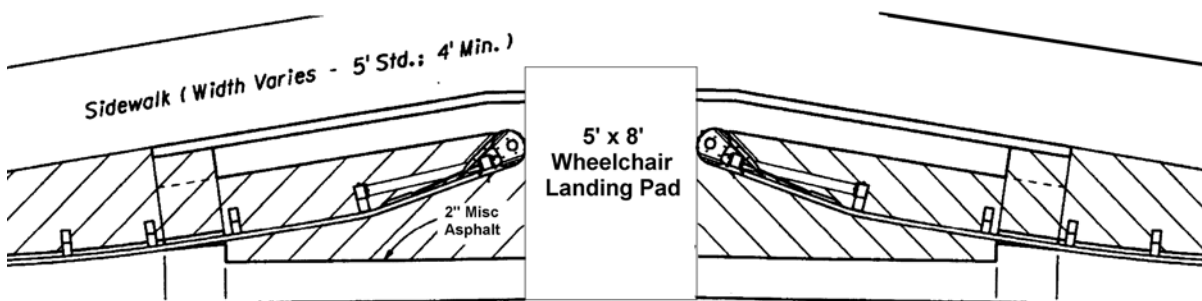
- For travel lanes with a curb and gutter travel lane-maintain a minimum four-foot separation between the Infrastructure and the back-face of the curb
- For travel lanes without a curb and gutter travel lane-maintain a minimum sixteen-foot clear zone separation between the Infrastructure and the flush shoulder of the travel lane. Greater distances may be required for increased design speeds and AADT. 20-foot is recommended. The following table outlining the clear zone recovery associated with design speeds (extracted from the "Florida Greenbook") is the standard for FDOT and Palm Beach County.

FDOT Clear Zone Width (feet)						
Design Speed (MPH)	Urban	Rural (measured from edge of travel lane)				
	Curb & Gutter from curb face	Local	Collector	Arterial	ADT < 1500	ADT ≥ 1500
≤25	2	6				
30	4	6	10	14		
35	4	6	10	14		
40	4		10	14		
45	4				14	18
50					14	18
55					18	24
≥60					18	30

- Curved highway alignments require additional widths and should be avoided.
- Developer designed Infrastructure will not be installed within FDOT or Palm Beach County right-of way without securing written agreement.
- Infrastructure other than Bus Stop signs and Route Information signs will be installed behind any existing sidewalk (and not on the sidewalk). Infrastructure requiring a horizontal concrete slab (benches and shelters) will install the slab horizontally and vertically flush with the existing or proposed sidewalk.
- Infrastructure providers under contract with Palm Beach County (and Palm Tran) within the limits of the agreement may install specified Infrastructure in the landscape buffer between the sidewalk and the right-of-way boundary in Unincorporated Palm Beach County. Separate agreements with private property owners and local jurisdictions are required outside of right-of-way and unincorporated limitations.
- No Infrastructure shall be placed in the median of any divided highway

5.2.7 Guardrails

When a guardrail runs parallel to a travel lane with an officially designated Bus Stop, an opening no greater than five-foot wide should be created to provide pedestrian and vehicular protection in accordance with FDOT standard regulations. An ADA compliant landing pad should also be installed to provide access to the bus. The opening should have reasonable proximity and access to a signalized intersection and/or crosswalk. Bus Stops (and Landing Pads) should not be placed in areas that might impede swale drainage. A bio-barrier should be installed in areas where trees are planted adjacent to the sidewalk.



5.2.8 Waiting Area (or Accessory Pad)

A bus stop boarding and alighting area, also known as a waiting area or accessory pad, is the area at a Bus Stop provided for Riders and can contain a bench and/or a shelter. Infrastructure, such as trash receptacles or bike racks, can also be located in the waiting area. Waiting area size dependent on:

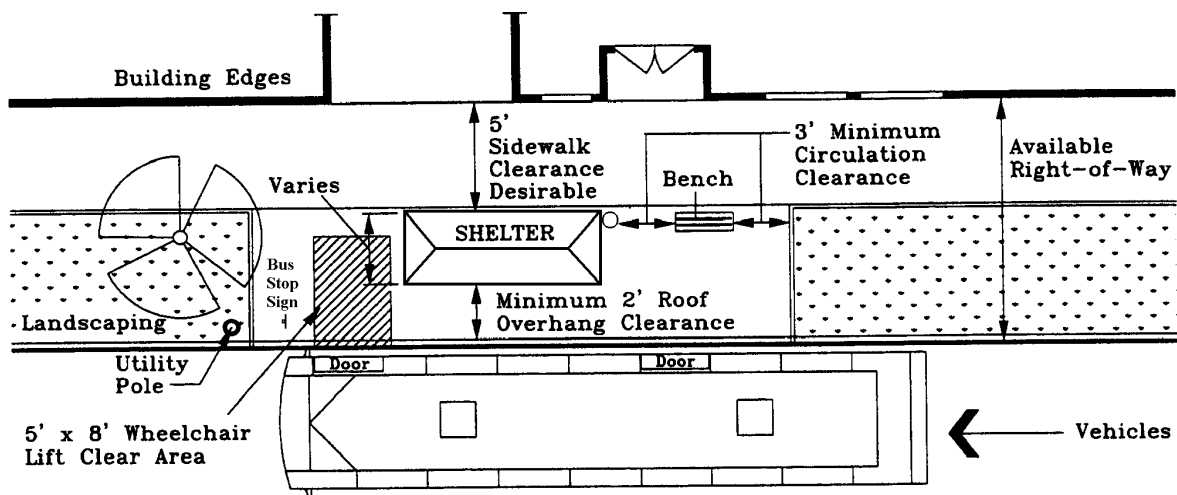
- Length and width of shelters and benches
- Clearance requirements for street furniture
- Location of wheelchair lift extension
- Length of the bus
- Setback requirements

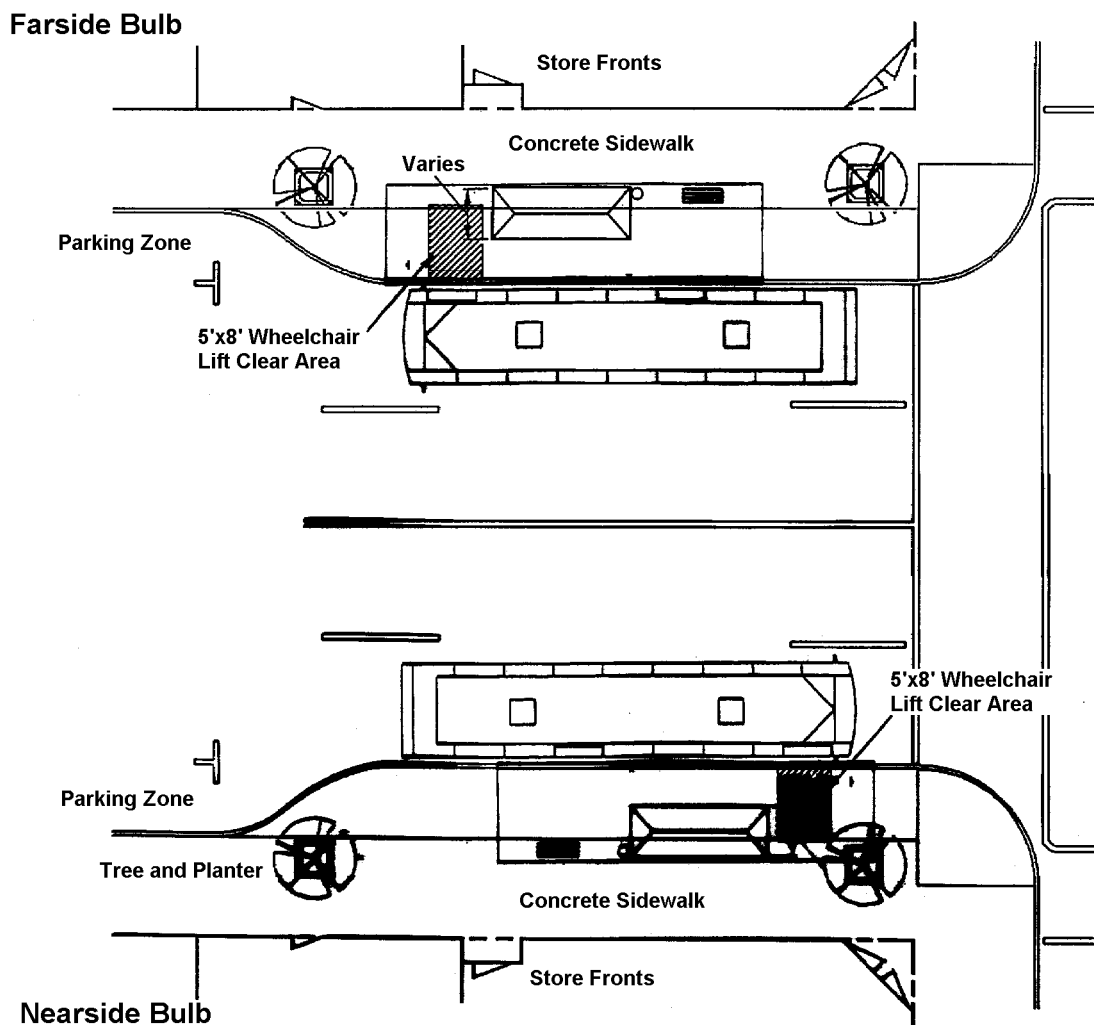
Given the varying size and door placement of Palm Tran's fleet, a standard ten-foot depth by thirty-foot length waiting area is recommended for each Bus Stop. An additional fifty-foot length is required for each additional bus expected to simultaneously stop at the Bus Stop.

The waiting area is usually separated from the sidewalk to preserve general pedestrian flow. It is generally recommended that 5-feet of clearance be preserved on sidewalks to reduce potential pedestrian conflicts and limit congestion during boarding and alighting. The pad can be located on either side of the sidewalk, depending on available right-of-way space, setback requirements, utility poles, or buildings. In either case, a paved surface is desired (but not required) between the waiting area and the back-face of the curb to enhance access and comfort.

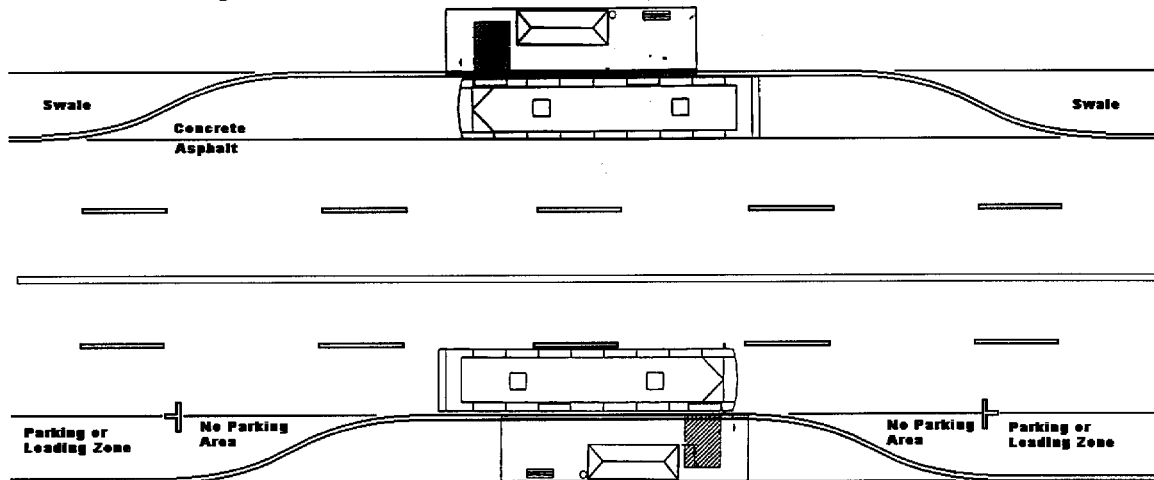
ADA mobility guidelines should be followed when street furniture is included on a waiting area. A waiting pad should accommodate a 5-foot (measured parallel to the street) by 8-foot (measured from the back face of the curb) wheelchair lift clear zone (or landing pad) that is free of all street furniture and overhangs. The paved ADA compliant wheelchair lift clear zone is required in all waiting areas where shelters are installed.

Waiting areas may be defined with brick pavers, and additional space may be provided at the waiting area to install a bench or shelter depending on need. Landscaping may also be installed during construction to provide shade trees for waiting Riders. There is a need to coordinate Bus Stop locations and improvements with other street projects. By coordinating with other street projects, Palm Tran has the opportunity to update and improve an existing Bus Stop or install a new Bus Stop at developing locations. The Bus Stop is considered an important element of the overall streetscape.





Mid-Block Bus Bay



Mid-Block Bulb



5.3 RIDER

The following general guidelines are recommended for the selection and placement of Rider Infrastructure:

- Riders should be able to see approaching buses from the Infrastructure, the Infrastructure from the approaching bus and be seen by passing traffic
- The Infrastructure should have reasonable and sufficient inclement weather protection
- As close as possible proximity to the Bus Stop so as to provide quick access to the bus doors and to be highly visible to approaching buses and passing traffic. Typically:
 - In front of the Bus Stop in the bus' travel direction, and
 - Outside the buffer zone between the travel lane and the Bus Stop sign
- Minimum three-foot clearance (or circulation space) around the Infrastructure and an adjacent sidewalk to provide for unrestricted pedestrian traffic. If located adjacent to a building, the design should include a twelve-inch clear space to permit trash removal and cleaning.
- Infrastructure ingress and egress should be oriented toward the street and ADA accessible
- Pedestrian and Vehicular sight distance will not be impaired
- Adequate street lighting is essential
- Provisions for prominent display of Route Information Signage

Florida Statutes (FS 337.408), which covers the regulations of benches, Transit shelters, and waste disposal receptacles within rights-of-way, specifies that:

(1) Benches or Transit shelters, including advertising displayed on benches or Transit shelters, may be installed within the right-of-way limits of any municipal, county, or state road, except a limited access highway; provided that such benches or Transit shelters are for the comfort or convenience of the general public, or at designated stops on official bus routes; and, provided further, that written authorization has been given to a qualified private supplier of such service by the municipal government within whose incorporated limits such benches or Transit shelters are installed, or by the county government within whose unincorporated limits such benches or Transit shelters are installed. A municipality or county may authorize the installation, without public bid of benches and Transit shelters together with advertising displayed thereon, within right-of-way limits of such roads...

(2) Waste disposal receptacles of less than 110 gallons in capacity, including advertising displayed on such waste receptacles, may be installed within the right-of-way limits of any municipal, county, or state road, except, a limited access highway; provided that written authorization has been given to a qualified private supplier of such service by the appropriate municipal or county government. A municipality or county may authorize the installation, without public bid of waste disposal receptacles together with advertising displayed thereon, within right-of-way limits of such roads...

5.3.1 Signage

Proper signage is an important element of good Transit service. It provides a source of information to our Riders and Operators regarding the location of Bus Stops, Park-N-Rides, schedule information, etc. and is an excellent marketing tool to promote Transit use. The more people are aware that a convenient, effective service exists, the greater the likelihood that they will use it.

5.3.2 Benches

The following are the minimum Palm Beach County design criteria for Transit benches:

- Durable, vandal-resistant, low maintenance and remain structurally sound with a minimum ten-year usable life expectation.
- Seating for at least three adults and shall be designed to minimize vandalism, graffiti and tipping. Anti-vagrant bars are preferred. Seating shall be secured to the concrete pad.
- Seating area shall be a high density material design so as to allow water to drain, and shall be properly sealed to assure resistance to the elements.
- The bench backrest shall not be greater than six-feet in length nor two-feet in height (18-inch minimum) and shall also be a high density design material properly sealed (or treated) to assure resistance to the elements
- Withstand current wind loads code requirements. A registered engineer licensed in the State of Florida shall sign design calculations. Anchoring technique shall be specified and allow for minimal effort to remove and reinstall the bench.
- Full compliance with the Federal Americans With Disabilities Act of 1990 as amended and regulations thereto (49 CFR Part 37, Appendix A.) to include but not limited to obstacles, surfaces, signage, telephones, wheelchair lift clear area (or landing pad) free of all street furniture and overhangs, ramp and pad accessibility, curb cuts and sidewalk modifications.
- Bench foundation base shall be a reinforced concrete slab at least four-inches thick extending four-inches beyond the bench "foot-print". Although not required by ADAAG, if provided, any accompanying paved ramp or wheelchair pad must be compatible with ADA, ANSI, and above standards. A maximum 2% slope perpendicular to the roadway is allowed for drainage.
- A trash receptacle of commercial design shall be installed adjacent to the bench. The trash receptacle may be either freestanding or pedestal mounted with a plastic liner with a capacity of at least five gallons.

Preserving minimum circulation guidelines, coordinating with existing landscaping, and providing additional waiting areas can improve bench and site utilization. The following additional bench placement guidelines are recommended:

- Avoid locating benches in completely exposed locations. Coordinate bench locations with existing shade trees if possible. Otherwise, install landscaping to provide protection from the wind, sun, rain, and other elements.
- Coordinate bench locations with existing streetlights to increase visibility and enhance security at a Bus Stop.
- Avoid locating benches in undeveloped areas of the right-of-way.

TRANSIT DESIGN MANUAL

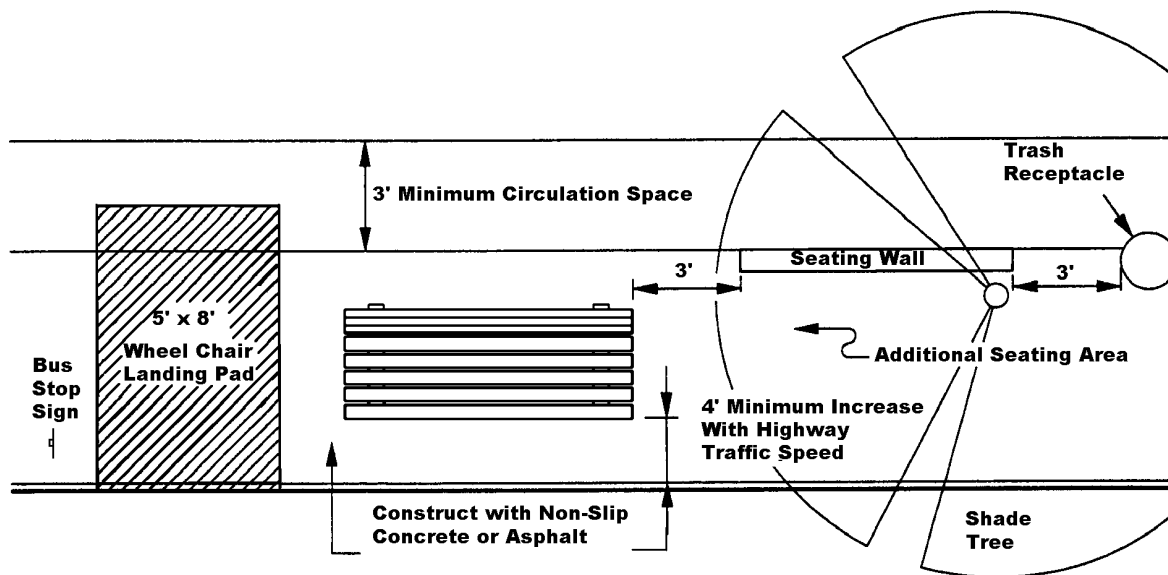
CURBSIDE INFRASTRUCTURE

- Locate benches away from driveways to enhance Rider safety and comfort.
- Do not install the bench on the 5-foot by 8-foot wheelchair lift clear area (or landing pad)

Location of the proposed Transit bench must be at a current or proposed Palm Tran Bus Stop on an existing or proposed Palm Tran route meeting at least one of the following:

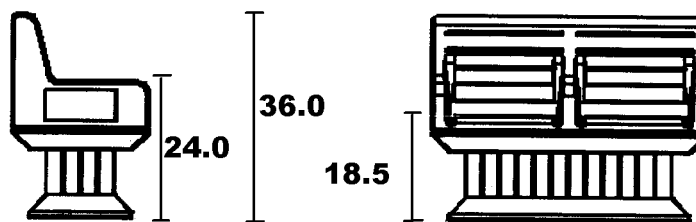
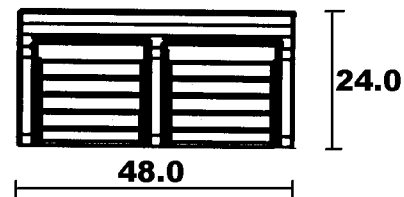
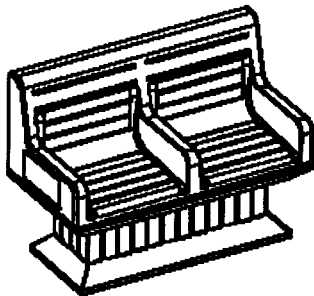
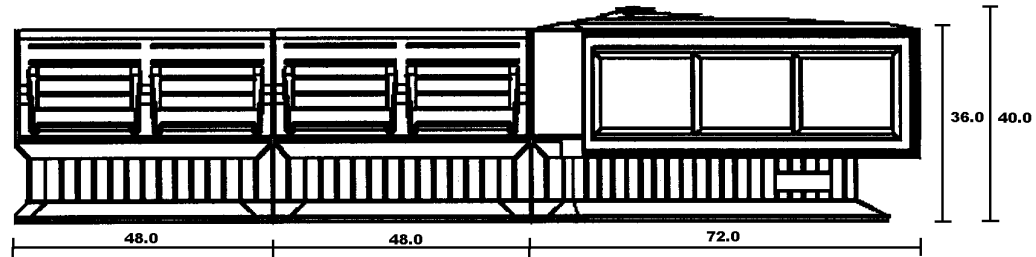
- Tri-Rail Station
- Designated Park-N-Ride Lot
- Transfer Point for Palm Tran Bus Riders
- Major Transit Generator or Activity Centers (malls, hospitals, schools, shopping centers, governmental centers)
- End of the line or scheduled bus recovery location
- Major arterial or thoroughfare intersection
- High density urbanized location
- Special Consideration Facilities (senior citizen centers, clinics, nutritional centers, welfare facilities)

Two factors that greatly influence the use of benches are crowding at a site and the environment at a site. Crowding limits Rider choices about sitting and waiting, and forces Riders to wait around, rather than at the Bus Stop. Uncomfortable Bus Stop environmental conditions, such as rain, heat and sun, can also discourage use of the bench.



TRANSIT DESIGN MANUAL

CURBSIDE INFRASTRUCTURE



Advantages	Disadvantages
Rider Comfort	Requires Maintenance
Identifies Bus Stop	Graffiti potential
Low Cost Infrastructure	

5.3.3 Shelters

The following are the minimum Palm Beach County design criteria for Transit shelters:

- Durable, vandal-resistant, low maintenance and remain structurally sound with a minimum ten (10) year usable life expectation
- Standing seam peaked roof design with an insulated roof (sandwiched rigid foam with aluminum covering) either attached to and conforming to the roof pitch or installed so that the insulation creates a flat ceiling no less than 7' 6" in height. Roof drainage and scuppering shall be to the rear or sides of the shelter. (Note: A flat roof will not be acceptable.)
- Withstand current wind loads code requirements. A registered engineer licensed in the State of Florida shall sign design calculations. Anchoring technique shall be specified and allow for minimal effort to remove and reinstall the shelter.
- Three sides (the back may be modified to allow wheelchair access) and an open front with sufficient roof coverage to protect the Riders from the elements. Rain angle is assumed to be 30 degrees from vertical
- Seating for two adults and space for one wheelchair and shall have anti-vagrant bars. Seating shall either be secured to the concrete pad or to the shelter.
- Full compliance with the Federal Americans With Disabilities Act of 1990 as amended and regulations thereto (49 CFR Part 37, Appendix A.) to include but not limited to obstacles, surfaces, signage, telephones, wheelchair lift clear area (or landing pad) free of all street furniture and overhangs, ramp and pad accessibility, curb cuts and sidewalk modifications.
- Shelter foundation base shall be a reinforced concrete slab at least six-inches thick extending six-inches beyond the shelter "foot-print" with a compatible paved ramp from the Bus Stop to the shelter. Suitable alternatives may be considered if they meet the ADA, ANSI, and above standards. A maximum 2% slope perpendicular to/toward the roadway is allowed for drainage.
- Minimum clear floor area 30-inches wide by 48-inches deep entirely within the perimeter of the shelter to permit wheelchair or mobility aid user access.
- A trash receptacle of commercial design shall be installed adjacent to the shelter. The trash receptacle may be either freestanding or pedestal mounted with a plastic liner with a capacity of at least twenty gallons and no more than fifty gallons.

Additional physical location criteria include:

- Minimum distance of two feet between the back-face of the curb and the roof or panels of the shelter to permit clear passage of the bus and its side mirror.
- The shelter should be located as close as possible to the end of the Bus Stop zone so it is highly visible to approaching buses and passing traffic. The walking distance from the shelter to the bus should also be minimized
- Locating shelters in front of store windows should be avoided when possible so as not to interfere with advertisements and displays.
- When shelters are directly adjacent to a building, a 12-inch clear space should be preserved to permit trash removal or cleaning of the shelter.

TRANSIT DESIGN MANUAL

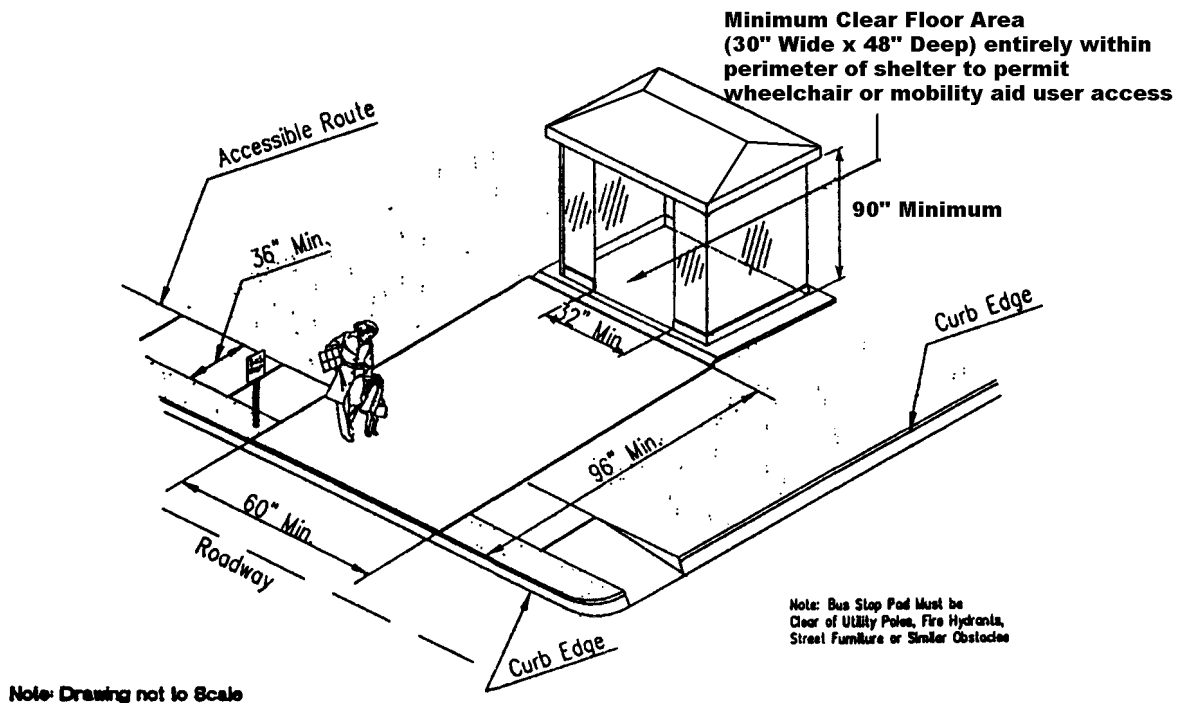
CURBSIDE INFRASTRUCTURE

Location of the proposed Transit shelter must be at a current or proposed Palm Tran Bus Stop on an existing or proposed Palm Tran route meeting at least one of the following:

- Tri-Rail Station
- Designated Park-N-Ride Lot
- Transfer Point for Palm Tran Bus Riders
- Major Transit Generator or Activity Centers (malls, hospitals, schools, shopping centers, governmental centers)
- End of the line or scheduled bus recovery location
- Major arterial or thoroughfare intersection
- High density urbanized location
- Special Consideration Facilities (senior citizen centers, clinics, nutritional centers, welfare facilities)

Ideally, the final location of a shelter should enhance the circulation patterns of Riders, reduce the amount of pedestrian congestion at a Bus Stop, and reduce conflict with nearby pedestrian activities. The location of the curb and sidewalk and the amount of available right-of-way are determining factors for locating a shelter.

Example 1

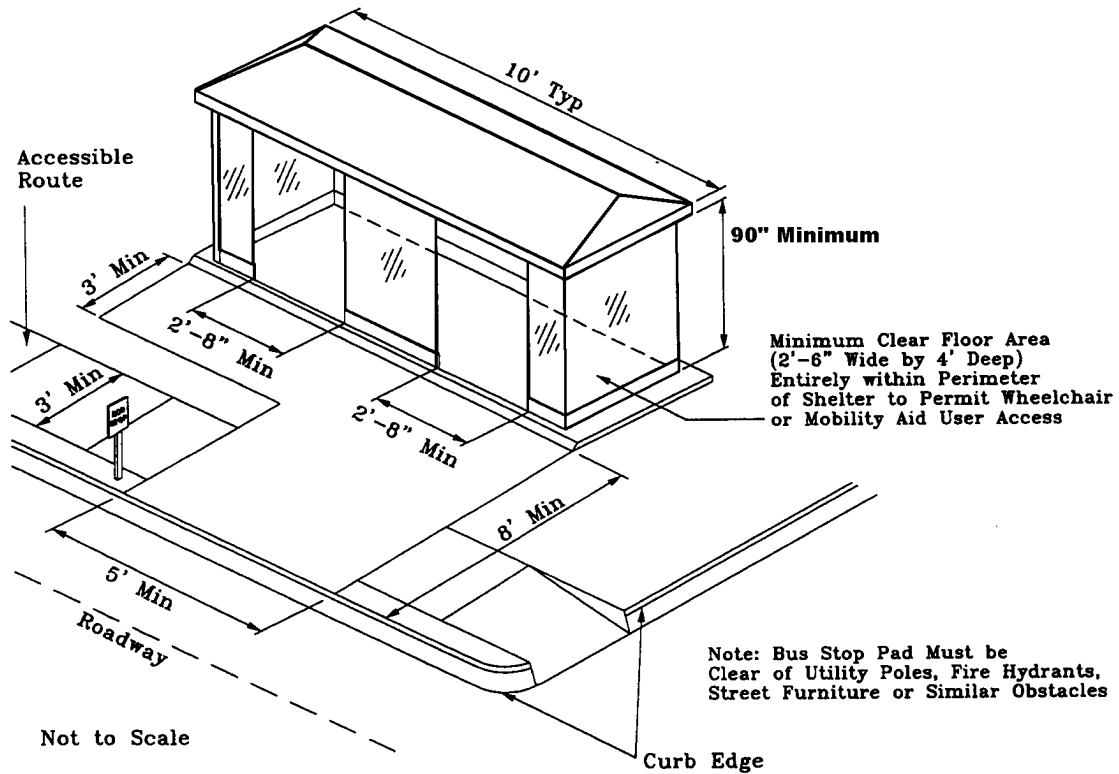


TRANSIT DESIGN MANUAL

CURBSIDE INFRASTRUCTURE

Example 2

Accessible Bus Stop Pad & Shelter Minimum Dimensions



Advantages	Disadvantages
Rider Comfort	Maintenance and Trash Removal
Inclement Weather Protection	Graffiti Potential
Bus Stop Identification	
Venue for Establishing Lighting	
Route and Schedule Information Location	

5.3.4 Kiosks

An alternative to advertising panels placed directly on shelters is advertising kiosks located in close proximity to the shelter, as part of the shelter, or stand-alone without a shelter. If located with or in proximity of a shelter, the form, color, and material must be similar to the adjacent shelter. Kiosks also create additional shade during the morning and evening hours.

The following are the minimum Palm Beach County design criteria for Transit kiosks:

- Durable, vandal-resistant, low maintenance and remain structurally sound with a minimum ten-year usable life expectation
- Free standing detachable display with side panel width no larger than five-feet. The maximum side panel advertising display will measure 6-feet in height x 4-feet in width.
- If multiple panel kiosk-a standing seam peaked roof design conforming with the shelter design standard so that the height of the advertising panel is no less than 7' 6" in height. (Note: A flat roof will not be acceptable). If single panel (maybe double sided)-no roof design required.
- Kiosks may be incorporated into the shelter design provided that the shelter design specifications are not jeopardized.
- The angle of the forward facing panels from the curb or flush surface of the roadway or travel lane will be equal to 180-degrees divided by the number of panel sides.
- Withstand current wind loads code requirements. A registered engineer licensed in the State of Florida shall sign design calculations. Anchoring technique shall be specified and allow for minimal effort to remove and reinstall the kiosk.
- Full compliance with the Federal Americans With Disabilities Act of 1990 as amended and regulations thereto (49 CFR Part 37, Appendix A.).
- Kiosk foundation base shall be a reinforced concrete slab at least six-inches thick extending six-inches beyond the kiosk "foot-print" with a compatible paved ramp from the Bus Stop to the Kiosk. Suitable alternatives may be considered if they meet the ADA, ANSI, and above standards. A maximum 2% slope perpendicular to the roadway is allowed for drainage.
- A trash receptacle of commercial design shall be installed adjacent to the kiosk. The trash receptacle may be either freestanding or pedestal mounted with a plastic liner with a capacity of at least twenty gallons and no more than fifty gallons.

Additional physical location criteria include:

- Minimal walking distance from the kiosk to the Bus Stop.
- Kiosks will be located downstream of the traffic flow to permit full view of the Bus Stop from passing traffic and Operators.

Location of the proposed Transit kiosk must be at a current or proposed Palm Tran Bus Stop on an existing or proposed Palm Tran route meeting at least one of the following:

- Tri-Rail Station
- Designated Park-N-Ride Lot
- Transfer Point for Palm Tran Bus Riders
- Major Transit Generator or Activity Centers (malls, hospitals, schools, shopping centers, governmental centers)
- End of the line or scheduled bus recovery location
- Major arterial or thoroughfare intersection
- High density urbanized location
- Special Consideration Facilities (senior citizen centers, clinics, nutritional centers, welfare facilities)

Advantages	Disadvantages
May Reduce Lighting at Bus Stop	May Reduce Sight Lines
Maintained by Advertising Agency	Compatibility Issues

5.3.5 Route Information Signs

Route information, such as maps and schedules, is an Infrastructure that is quite valuable to Riders. Information can be displayed in various ways.

The Bus Stop sign provide minimal information on location and routes served.

Route Information Sign holders are included at sites with large passenger volumes, scheduled time points and timed transfer locations. 8.5-inch x 14-inch Route Information Signs are inserted into information holders attached to Bus Stop sign channels at all time points and high usage stops. The information holders should be between 40-inches and 54-inches above the surface. Typical information contained on the Route Information Signs includes:

- Route Map
- Scheduled times for Route(s) at that time point.
- Customer Service Telephone Number

Interior panels of shelters and kiosks also can be used for posting route and schedule information. Side panels may be large enough to display the entire system map and can include backlighting for display at night.

Advantages	Disadvantages
Useful for First-Time and regular Riders	May be Graffiti Prone
Communicates General Transit Information and Changes	High Maintenance Required to Update Route and Schedule Information

5.3.6 Leaning Rail

Limited space Bus Stops that do not have enough space for a bench or shelter may utilize leaning rails. This is any structure that allows Riders to recline in a standing position. Walls are another substitute. They should not encourage or provide opportunities for loitering or vagrancy. Rails must conform to setback requirements.

The following are the minimum Palm Beach County design criteria for Transit Leaning Rails:

- Durable, vandal-resistant, low maintenance and remain structurally sound with a minimum ten-year usable life expectation
- Design of the rail shall minimize protrusions or appendages that may snag, tear, or catch clothing or pose a safety hazard.
- Withstand current wind loads code requirements. A registered engineer licensed in the State of Florida shall sign design calculations. Anchoring technique shall be specified and allow for minimal effort to remove and reinstall the leaning rail.
- Full compliance with the Federal Americans With Disabilities Act of 1990 as amended and regulations thereto (49 CFR Part 37, Appendix A.).
- Leaning rail foundation base shall be a reinforced concrete slab at least four-inches thick extending four-inches beyond any vertical rail “foot-print”.
- The height of the leaning rail shall be between 32 and 36-inches above the finished surface.
- A trash receptacle although not required is suggested. If provided, it shall be of commercial design shall be installed adjacent to the leaning rail. The trash receptacle may be either freestanding or pedestal mounted with a plastic liner with a capacity of at least twenty (20) gallons and no more than fifty gallons.

Additional physical location criteria include:

- Minimal walking distance from the leaning rail to the Bus Stop.
- Located on the periphery of the waiting area.

5.3.7 Vending Machines

Vending machines can provide Riders with reading material while they wait for the bus. They can be undesirable for many reasons:

- The machines are often poorly maintained and reduce the amount of room for mobility and waiting.
- Trash accumulates at Bus Stops with vending machines and removal is time-consuming and costly.

The existence of vending machines at or near Bus Stops is neither encouraged nor discouraged by Palm Tran. More often, it is a result of newsprint companies aggressively pursuing a high-profile site.

The following are the minimum Palm Beach County design criteria for Transit vending machines at Bus Stops:

- If authorized in the right-of-way, they must meet setback requirements.
- ADA mobility guidelines shall be followed for improved site circulation (e.g., the location of the vending machines should not obstruct the wheelchair landing pad area).
- They shall not be located in or obstruct access to the Bus Stop waiting area.
- Vendor provided and maintained trash receptacles should be included.

- Vending machines at Bus Stop should be anchored to the ground to reduce vandalism.

Advantages	Disadvantages
Infrastructure for Waiting Riders	Increased Trash Accumulation
	May Detract from Visual Appearance of Site
	Reduces Circulation Space
	Prone to Vandalism

5.3.8 Bicycle Storage

Bicycle storage facilities, such as bike racks, may be provided at Bus Stops for the convenience of bicyclists using Transit. Designated storage facilities discourage bicycle riders from locking bikes onto the bus facilities or on an adjacent property. Proper storage of bicycles can reduce the amount of visual clutter at a Bus Stop by confining bikes to one area. Recommendations regarding bicycle storage include:

The following are the minimum Palm Beach County design criteria for bicycle storage:

- Paved access to the Bus Stop and construct the waiting area with non-slip concrete or asphalt that is properly drained.
- Durable, vandal-resistant, low maintenance and remain structurally sound with a minimum ten-year usable life expectation.
- Design of the storage facility shall minimize protrusions or appendages that may snag, tear, or catch clothing or pose a safety hazard. Locate the storage area away from other pedestrian or Rider activities to improve safety and reduce congestion.
- Withstand current wind loads code requirements. A registered engineer licensed in the State of Florida shall sign design calculations. Anchoring technique shall be specified and allow for minimal effort to remove and reinstall the storage facility.
- Full compliance with the Federal Americans With Disabilities Act of 1990 as amended and regulations thereto (49 CFR Part 37, Appendix A.).
- Bike storage facility (or bicycle rack) foundation base shall be on a reinforced concrete slab at least four-inches thick extending four-inches beyond any vertical rail "foot-print".
- The height of the bicycle rack shall not exceed 48-inches above the finished surface.
- A trash receptacle although not required is suggested. If provided, it shall be of commercial design shall be installed adjacent to the leaning rail. The trash receptacle may be either freestanding or pedestal mounted with a plastic liner with a capacity of at least twenty gallons and no more than fifty gallons.

Additional physical location criteria include:

- Minimal walking distance from the storage facility to the Bus Stop.
- Located on the periphery of the waiting area.
- Do not locate the storage area where views into the area are restricted by the shelter, landscaping, or existing site elements, such as walls.

- Coordinate the location of the storage area with existing on-site lighting.

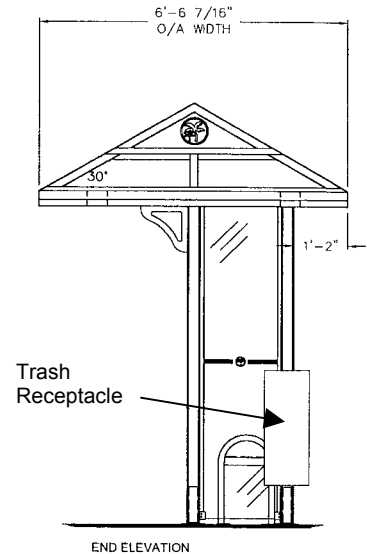
Many prefabricated storage methods are available, however, as bicycle prices have escalated in recent years, interest has grown in storing bikes in completely enclosed containers called bike lockers or taking bikes on the bus (BOB). Bicycle storage is associated with the commuter market and should be installed when demand warrants, which is primarily at major suburban stops. Also see Appendix E: [BICYCLE PARKING GUIDELINES](#).

5.3.9 Trash Receptacles

Trash receptacles at well used Bus Stops encourage Riders and other passer-by pedestrians to deposit their trash instead of littering and creating an unsightly area for the community. The developer should realize that installation must come with a commitment for regularly scheduled pick-up and removal. Overflowing receptacles are far more unsightly than occasional litter and will disturb the neighborhood just as much, if not more.

Palm Tran requires trash receptacles at all Bus Stop waiting areas where benches, shelters, and kiosks are located. Trash receptacles are strongly encouraged at waiting area with leaning rails, vending machines and bicycle storage facilities. See the above listed Infrastructure for related requirements.

Trash receptacles can improve the appearance of a Bus Stop by providing a place to dispose of trash. Not all Bus Stops require trash receptacles. Low ridership may not justify the inclusion of this Infrastructure; however, litter at a site may warrant the inclusion of a trash receptacle.



Problems can arise when the receptacles are not regularly maintained or when the Bus Stop is next to a land use that generates considerable trash such as convenience stores and fast food restaurants. In such cases, Palm Tran desires to work with these establishments to define maintenance responsibilities for the Bus Stop and the area around the businesses.

Recommendations regarding installing a trash receptacle at a Bus Stop include:

- Anchor the receptacle securely to the ground to reduce unauthorized movement.
- Locate the receptacle away from wheelchair landing pad areas and allow for at least a 3-foot separation from other street furniture. Receptacles may be attached to a bench or shelter when included in the design.
- Locate the receptacle at least 2-feet from the back of the curb (further to meet setback requirements).
- Ensure that the receptacle, when adjacent to the roadway, does not visually obstruct nearby driveways or land uses.
- Avoid installing receptacles that have ledges or other design features that permit liquids to pool or remain near the receptacle—this may attract insects.
- Avoid locating the receptacle in direct sunlight. The heat may encourage foul odors to develop.

Advantages	Disadvantages
Provides Place To Discard Trash	High Maintenance and Cost
Keeps Bus Stop Clean	May Be Used By Non-Riders (fast food)
	Environmental Concerns

5.3.10 Shopping Center Cart Storage

A phenomenon frequently observed at Bus Stops located adjacent to commercial shopping centers is the accumulation of shopping carts. Because such Bus Stops normally do not have storage facilities for shopping carts, carts often litter the area around the stop and along the sidewalk accessing the stop. The sight of haphazardly placed shopping carts around a Bus Stop is visually unappealing and can block sidewalk access.

Because the shopping carts are generated by the shopping center, agreements should be made between the land owner and Palm Tran to remove the carts regularly. Frequently, however, the time between removals is too long and shopping carts accumulate at a Bus Stop. One solution is to install a storage facility near the Bus Stop to prevent random storage in and around the stop. Factors affecting installation of a storage facility include the location of the sidewalk, available right-of-way, utilities, landscaping, terrain, and cost. Any cart storage facility should follow the general site circulation guidelines above, adhere to applicable ADA requirements, and remain clear of the sidewalk, wheelchair landing pad area, and Bus Stop Zone Waiting Area.

5.3.11 Pay and Emergency Telephones

The local telephone utility may be interested in installing a public phone at particular well utilized Bus Stops. Riders may find telephone service at the stop more convenient than having to search for a pay phone and possibly missing the bus. The increase of vandalism and cellular phones may negate any interest.

Phones at Bus Stops offer many potential benefits for Riders. They can make personal and emergency calls while waiting for the bus. Phones also can provide real-time bus arrival information. Palm Tran does not have explicit policies regarding the installation of phones at Bus Stops.

When locating a phone at a Bus Stop, the following guidelines should be considered:

- Separate the phone and the Bus Stop Zone waiting area by distance when possible.
- Follow general ADA site circulation guidelines.

Advantages	Disadvantages
Rider Convenience	May Encourage Loitering
Customer Service Accessibility	May Encourage Illegal Activities

5.3.12 Landscaping

Installation of trees and general landscaping at Bus Stops can enhance environmental comfort. They should be coordinated with the placement of other Infrastructure. Landscaping provides additional aesthetic value and shade serves a necessary function in South Florida. Bus Stops with limited natural protection should be improved to enhance Rider comfort. Landscaping that blocks visual access at a Bus Stop should be avoided or at least regularly trimmed. Drought tolerant plants and techniques (such as mulching) should be used.

5.3.12 Lighting

Proper lighting at Transit facilities is required for safety and security. A poorly lit Bus Stop may not be used at night, if the potential Rider perceives it as unsafe. Street lighting must be consistent with ADA, FDOT, and Palm Beach County guidelines.

Lighting affects Rider perception of safety and security at a Bus Stop, as well as the use of the site by non-riders. Good lighting can enhance a waiting Rider's sense of comfort and security; poor lighting may encourage unintended use of the facility by non-riders, especially after hours. Typical lighting should provide between 2 to 5 foot-candles. Bus Stops should be located within 30-feet of an existing light source.

Cost and availability of power influence the decision to install direct lighting at a Bus Stop. When installing direct lighting at a Bus Stop, the fixtures should be vandal resistant and durable but easily maintained. For example, avoid using exposed bulbs or elements that can be easily tampered with or destroyed.

A cost-effective approach to providing indirect lighting at a site is to locate Bus Stops near existing street lights. When coordinating shelter or bench locations with existing street lights, the minimum clearance guidelines for the wheelchairs shall be followed.

Advantages		Disadvantages	
Increased Visibility		High Maintenance and Cost	
Increased Comfort and Security Perceptions			
Discourages After-Hour Indigent Usage			

5.3.13 Security

Security is a major issue in Bus Stop design and location, because they can positively or negatively influence Rider perception of that Bus Stop. From the perspective of security, landscaping, walls, advertising panels, and solid structures can restrict sight lines and provide spaces to hide. Each of these items can be an integral part of the Bus Stop, either by design or by proximity of existing land uses. Therefore, Palm Tran carefully reviews which Infrastructure are to be included at a Bus Stop and considers any factors that may influence security.

Other sections of this manual have discussed some of these concepts and should be referenced. Some guidelines regarding security at Bus Stops include:

- Shelters should be constructed of materials that allow clear, unobstructed visibility of and to patrons waiting inside.
- Bus Stops should be at highly visible sites that permit approaching Operators and passing vehicular traffic to see the Bus Stop clearly.

- Landscaping elements that grow to heights that would reduce visibility into and out of the Bus Stop should be avoided. Low-growing shrubbery, ground cover and shade trees are preferred at Bus Stops. Evergreen trees provide a visual barrier and should be avoided.
- Bus Stops, whenever possible, should be coordinated with existing street lighting to improve visibility.
- Bus Stops should be next to existing land uses, such as stores and businesses, to enhance surveillance of the site.

5.4 CURBSIDE INFRASTRUCTURE CHECKLIST

Several items should be considered when designing and locating a Bus Stop on a sidewalk or on the berm of a roadway. The following checklist of curbside Infrastructure should be reviewed to enhance Rider comfort, convenience, and security:

5.4.1 Location within Community: The location of the Bus Stop should be coordinated with the business community and neighborhood.

- ❑ Businesses want to preserve clear views of storefronts and maintain open circulation spaces in and around the storefronts. Although improperly located shelters can obstruct business activities, Bus Stops can enhance both transit and business activities when sited properly.
- ❑ Homeowners are another influential voice in the community. Typically, they do not want stops in front of their properties. Efforts to maintain Bus Stops in residential neighborhoods may reduce the "not-in-my-backyard" attitudes.
- ❑ Coordination between governmental agencies can enhance or impede this process. Liability can be a major issue for governmental agencies and businesses. This is especially true when improvements are made to sidewalks at or near Bus Stops.

5.4.2 Compatibility: Bus Stops should be located so as to limit conflicts with pedestrians and other activities.

- ❑ Bus Stops that create conflict points with pedestrians and bicyclists or reduce the capacity of existing sidewalks should be avoided.
- ❑ Benches, shelters, and other bus-related facilities should be separated from pedestrian or bicycle facilities when space permits.
- ❑ Because Bus Stops are commonly placed near parking lots, bollards and/or a raised curb would prevent cars from damaging bus facilities (benches and shelters) or interfering with bus activities and Riders.
- ❑ Bus Stops should be located so as to provide safe separation of Riders and vehicles from nearby land uses. They should not be directly next to the curb, which puts Riders close to passing vehicles. This is especially true for Bus Stops on roads with high traffic speeds.
- ❑ The zone of comfort or separation for Riders from high speed traffic may be violated when the shelter or bench is too close to the edge of the roadway. The minimum acceptable offset for benches and shelters from the back face of the curb is four feet. This distance should increase with flush shoulders and higher speed limits.

5.4.3 Direct Access to Bus Stop: Landscaping, berms, security walls, large parking lots, and circuitous sidewalks can decrease the convenience of using Transit by increasing the walking time between the origin or destination and the Bus Stop.

- ❑ Direct access to and from the Bus Stop is critical to the convenience of using Transit. Palm Tran desires to work with local jurisdictions or developers to ensure that direct sidewalks are installed near Bus Stops from the intersection or adjacent land uses.
- ❑ Defined paths or walkways can be installed through parking lots or landscaping to reduce walking times and improve safety.

5.4.4 Impervious Ground Surfaces: Palm Tran avoid locating Bus Stops on exposed soil, grass, or uneven ground. For Rider comfort and convenience, a waiting pad constructed of impervious non-slip material should be provided at the Bus Stop.

- ❑ This should be graded for proper runoff control and meet ADA requirements for cross slopes.
- ❑ The Bus Stop should be coordinated with existing sidewalks to provide defined and controlled access to the stop.
- ❑ In developing areas, Palm Tran can coordinate Bus Stop location with sidewalk locations and installation through local jurisdictions or developers.

5.5.5 Proper Pedestrian Circulation: Utility poles, fire hydrants, and street furniture can reduce the available space for Riders to maneuver.

- ❑ Avoid locating stops near items that may restrict proper movement in and around a Bus Stop.
- ❑ Appropriate spacing of items at a Bus Stop should also be maintained to allow proper access for wheelchairs and pass-by pedestrian traffic.
- ❑ Shelters, benches, utility poles, and other street furniture should not intrude on the ADA landing pad, which shall be at least five feet (measured parallel to the curb) by eight feet (measured perpendicular from the back face of the curb).
- ❑ At least three feet of clearance should be maintained to enable wheelchair access to and from the stop and around any transit Infrastructure, posts, poles, fire hydrants, vending machines, or other fixtures that might be present. All Bus Stop Zone waiting areas should have clear pedestrian access from both bus doors.

5.4.6 Existing Street Furniture: Selecting sites with existing street furniture can save the Palm Tran money while providing Riders with Infrastructure, such as benches, vending machines, and phones.

- ❑ Palm Tran reviews the condition of the Infrastructure to make sure the items are properly maintained and free of graffiti or other signs of wear.
- ❑ Palm Tran records the placement of all Palm Tran provided or contracted Infrastructure.
- ❑ When additional improvements are made to the site because of the installation of a Bus Stop, the location of existing street furniture may reduce circulation space and accessibility.

5.4.7 Environmental Treatments: Existing site conditions can be used to enhance the environmental comfort of a Bus Stop.

- ❑ Sun/shade patterns provided by existing vegetation or structures can contribute to the comfort of waiting bus patrons.
- ❑ The final design of the shelter should also respond to the environmental demands of a site (e.g., sun/shade patterns, winds, and precipitation).
- ❑ Panel placement, orientation, and materials should be selected to provide maximum comfort to patrons.
- ❑ The site should also be well drained.

5.4.8 Bus Stop Security: Perception of security at a Bus Stop can have a significant influence on the comfort level of patrons using that Bus Stop.

- ❑ To enhance the security of Bus Stops, regularly remove graffiti and trash (to discourage repeat occurrences), ensure indirect surveillance from nearby land uses and passing traffic, and avoid locating stops where there is opportunity for concealment.
- ❑ When landscaping is involved, use low-growing shrubs that preserve sight lines.

5.4.9 Street Lighting: Bus Stops may include lighting or be located near existing streetlights that provide indirect lighting to enhance the security of a stop.

- ❑ Interior shelter lighting can be a critical Infrastructure when Riders arrive and return in the dark. The interior lighting elements should be resistant to vandalism and be maintained regularly.
- ❑ Pedestrian-oriented lighting should be encouraged in new developments or when major infrastructure work is being planned.
- ❑ Indirect lighting from nearby businesses can also enhance surveillance of the site from these land uses.

5.4.10 Sight Line: The Bus Stop should be clearly visible for both safety and security reasons.

- ❑ Stops obscured by existing structures or vegetation are difficult for bus drivers to see. Passing vehicles may be unaware of the presence of pedestrians near or on the roadways; this increases the chance that accidents will occur.
- ❑ Right turns on red can increase the likelihood of pedestrian-vehicle conflicts.
- ❑ The Bus Stop site should be inspected carefully to detect any potential sight-related problems.
- ❑ For security reasons, sight lines should be preserved to maintain direct and indirect surveillance of the Bus Stop.
- ❑ Landscaping, walls, advertising panels, and structures can restrict sight lines and provide spaces to hide. Bus Stops should be easily viewed from nearby land uses and passing traffic to enhance the security of the stop.
- ❑ Bus shelters should be constructed of materials that allow clear, unobstructed visibility of Riders waiting inside. Riders also need to be able to observe their surroundings when inside the shelter.

5.4.11 Maintenance: Proper maintenance of bus facilities is crucial to preserving a positive image of Palm Tran.

- ❑ Trash and graffiti should be removed as soon as possible to prevent further degradation of the facilities.
- ❑ A database containing maintenance schedules should be maintained to track the condition of the facilities, including pavement surface conditions; age of the facilities; history of damage; and condition of shelter, benches, or other transit Infrastructure.
- ❑ Bus Stop maintenance can be costly and time-consuming. Working agreements between local businesses or commercial centers and Palm Tran should be pursued to reduce the financial responsibilities.
- ❑ For Bus Stops next to convenience stores, Palm Tran will try to obtain working agreements with the local store or businesses to provide trash removal and general maintenance at the Bus Stop.
- ❑ Agreements with commercial-strip centers should also be obtained to remove used shopping carts from a Bus Stop regularly. Shopping carts abandoned around Bus Stops are visually unappealing and restrict movement through a site.

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RESOURCES AND REFERENCES

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ON-THE-WEB

Americans with Disabilities Act Document Center: <http://janweb.icdi.wvu.edu/kinder/> This site includes links to a wide variety of ADA related sites.

Accessible Rights-of-Way: A Design Guide: www.access-board.gov/publications/PROW%20Guide/PROWGUIDE.htm

ADA Accessibility Guideline for Buildings Facilities (ADAAG): www.access-board.gov/adaag/html/adaag.htm

American Public Transportation Administration (APTA): www.apta.com This site includes links to a wide variety of Transit related sites. Florida Transit Web sites: www.apta.com/sites/transus/fl.htm

Association of Pedestrian and Bicycle Professionals (APBP): www.apbp.org

Broward County Transit (BCT): www.co.broward.fl.us/bct/

Central Florida Regional Transportation Authority (LYNX): www.golynx.com/ This site includes links to the Central Florida Mobility Design and Customer Amenities Manuals

Federal Highway Administration Manual of Uniform Traffic Control Devices (MUTCD): <http://mutcd.fhwa.dot.gov>

Federal Transit Administration: www.fta.dot.gov/

Florida Department of Transportation: www.dot.state.fl.us

Florida Public Transportation Association: www.floridaTransit.org/

Hillsborough Area Regional Transit (HARTline): www.hartline.org/

Jacksonville Transportation Authority (JTA): www.jtaonthemove.com/

Miami-Dade Transit Agency (MDTA): www.co.miami-dade.fl.us/Transit

National Center for Transit Research: www.nctr.usf.edu/

Palm Beach County Government: www.co.palm-beach.fl.us/ This site includes links to Planning, Zoning & Building, Engineering and Public Works, Palm Tran, etc.

Pinellas Suncoast Transit Authority (PSTA): www.psta.net/

Port Authority of Allegheny County: www.portauthority.org/

South Florida Commuter Services: www.commuterservices.com/sf/

TCRP Home Page: www.tcrponline.org/

Tri-County Commuter Rail Authority (TRI-RAIL): www.tri-rail.com/

Tri-County Metropolitan Transportation District of Oregon (TRI-MET): www.tri-met.org/

US Access Board: www.access-board.gov

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KEY BUS STOP ZONE WAITING AREA ENHANCEMENT GOALS

1. New bench/shelter RFP with municipal option:
 - a. New requirements for installation of benches and shelters
 - b. All benches and shelters must have trash receptacles
2. Bus Shelter grant program for local jurisdictions with money provided by MPO, for locations where advertising is not allowed—up to \$7,500 in matching funds for each shelter
3. Incorporate sidewalks, shelters, benches, and trash receptacles into roadway designs of FDOT, Palm Beach County, and local jurisdictions.
4. Encourage local jurisdictions to require shelters for major commercial and multi-family developments, and where appropriate, residential subdivisions. (Note: Palm Beach County requires same in all developments in Unincorporated Palm Beach County)
5. Install Route Information Signs or kiosks at all key Bus Stops to include:
 - a. All Timepoints
 - b. Timed Transfer Sites
 - c. Major Transit Attractors
6. Install trash receptacles on all buses and key Bus Stops that do not have a bench or shelter
7. Install trash receptacles with all shelters, benches, and Bus Stops
8. Incorporate trash removal in contracts with local trash haulers
9. Budget Bus Stop Maintenance:
 - a. Trash removal
 - b. Landscaping (grass cutting, week removal)
 - c. Bus Stop beautification (plantings)
10. Partnerships to improve Bus Stops and enhance use of Transit—Palm Tran

Features	Daily Rider Boardings				
	>50	50-100	101-200	201-500	>500
Bus Stop Sign	S	S	S	S	S
Bench	O	S	S	S	S
Shelter	O	S	S	S	S
Kiosk	O	O	O	S	S
Route Info Sign	O	O	S	S	S
Trash Receptacle	S	S	S	S	S
Landscaping/Sidewalks	S	S	S	S	S
Lighting	S	S	S	S	S
Bus Bay or Nub	O	O	O	S	S

S—Standard
O—Optional

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CLARIFICATION OF ADA AFFECTING TRANSIT

The following are Transit related extracts from the July 23, 2004 ADA-ABA Accessibility Guidelines:

209 Passenger Loading Zones and Bus Stops

209.1 General. Passenger loading zones shall be provided in accordance with 209.

209.2 Type. Where provided, passenger loading zones shall comply with 209.2.

209.2.1 Passenger Loading Zones. Passenger loading zones, except those required to comply with 209.2.2 and 209.2.3, shall provide at least one passenger loading zone complying with 503 in every continuous 100 linear feet (30 m) of loading zone *space*, or fraction thereof.

209.2.2 Bus Loading Zones. In bus loading zones restricted to use by designated or specified public transportation vehicles, each bus bay, bus stop, or other area designated for lift or *ramp* deployment shall comply with 810.2.

209.2.3 On-Street Bus Stops. On-street bus stops shall comply with 810.2 to the maximum extent practicable.

218 Transportation Facilities

218.1 General. Transportation *facilities* shall comply with 218.

218.2 New and Altered Fixed Guideway Stations. New and *altered* stations in rapid rail, light rail, commuter rail, intercity rail, high speed rail, and other fixed guideway systems shall comply with 810.5 through 810.10.

218.3 Key Stations and Existing Intercity Rail Stations. *Key stations* and existing intercity rail stations shall comply with 810.5 through 810.10.

218.4 Bus Shelters. Where provided, bus shelters shall comply with 810.3.

218.5 Other Transportation Facilities. In other transportation *facilities*, public address systems shall comply with 810.7 and clocks shall comply with 810.8.

305 Clear Floor or Ground Space

305.1 General. Clear floor or ground space shall comply with 305.

305.2 Floor or Ground Surfaces. Floor or ground surfaces of a clear floor or ground space shall comply with 302. Changes in level are not permitted.

EXCEPTION: Slopes not steeper than 1:48 shall be permitted.

305.3 Size. The clear floor or ground space shall be 30 inches (760 mm) minimum by 48 inches (1220 mm) minimum.

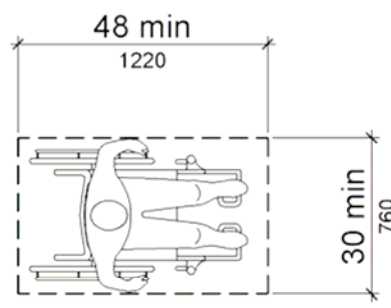


Figure 305.3
Clear Floor or Ground Space

305.4 Knee and Toe Clearance. Unless otherwise specified, clear floor or ground space shall be permitted to include knee and toe clearance complying with 306.

305.5 Position. Unless otherwise specified, clear floor or ground space shall be positioned for either forward or parallel approach to an *element*.

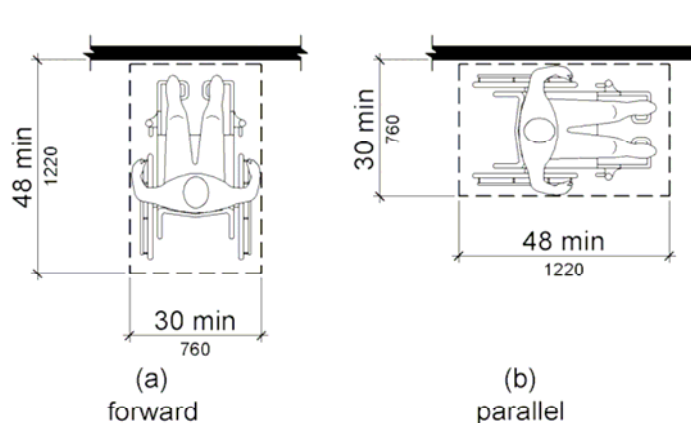


Figure 305.5
Position of Clear Floor or Ground Space

305.6 Approach. One full unobstructed side of the clear floor or ground *space* shall adjoin an *accessible* route or adjoin another clear floor or ground *space*.

305.7 Maneuvering Clearance. Where a clear floor or ground *space* is located in an alcove or otherwise confined on all or part of three sides, additional maneuvering clearance shall be provided in accordance with 305.7.1 and 305.7.2.

305.7.1 Forward Approach. Alcoves shall be 36 inches (915 mm) wide minimum where the depth exceeds 24 inches (610 mm).

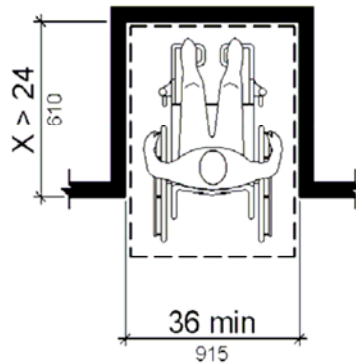


Figure 305.7.1
Maneuvering Clearance in an Alcove, Forward Approach

305.7.2 Parallel Approach. Alcoves shall be 60 inches (1525 mm) wide minimum where the depth exceeds 15 inches (380 mm).

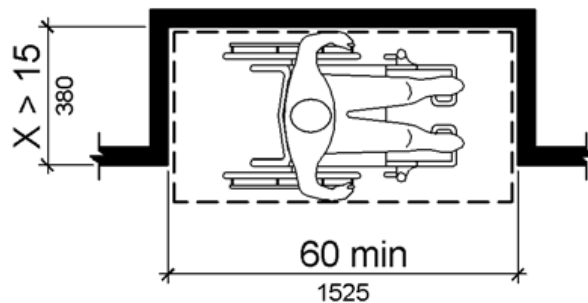


Figure 305.72
Maneuver Clearance in an Alcove, Parallel Approach

307 Protruding Objects

307.1 General. Protruding objects shall comply with 307.

307.2 Protrusion Limits. Objects with leading edges more than 27 inches (685 mm) and not more than 80 inches (2030 mm) above the finish floor or ground shall protrude 4 inches (100 mm) maximum horizontally into the *circulation path*.

EXCEPTION: Handrails shall be permitted to protrude 4½ inches (115 mm) maximum.

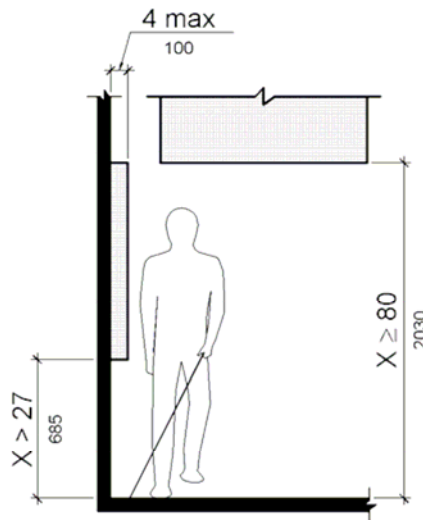


Figure 307.2
Limits of Protruding Object

307.3 Post-Mounted Objects. Free-standing objects mounted on posts or pylons shall overhang *circulation paths* 12 inches (305 mm) maximum when located 27 inches (685 mm) minimum and 80 inches (2030 mm) maximum above the finish floor or ground. Where a sign or other obstruction is mounted between posts or pylons and the clear distance between the posts or pylons is greater than 12 inches (305 mm), the lowest edge of such sign or obstruction shall be 27 inches (685 mm) maximum or 80 inches (2030 mm) minimum above the finish floor or ground.

EXCEPTION: The sloping portions of handrails serving stairs and *ramps* shall not be required to comply with 307.3.

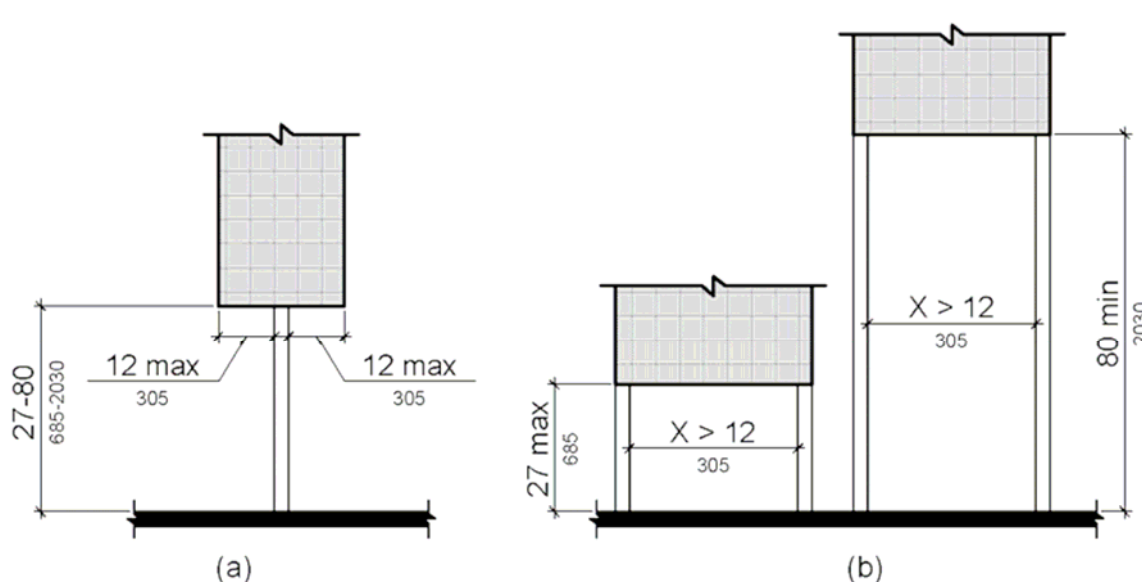


Figure 307.3
Post-Mounted Protruding Objects

402 Accessible Routes

402.1 General. *Accessible* routes shall comply with 402.

402.2 Components. *Accessible* routes shall consist of one or more of the following components: walking surfaces with a *running slope* not steeper than 1:20, doorways, *ramps*, *curb ramps* excluding the flared sides, elevators, and platform lifts. All components of an *accessible* route shall comply with the applicable requirements of Chapter 4.

403 Walking Surfaces

403.1 General. Walking surfaces that are a part of an *accessible* route shall comply with 403.

403.2 Floor or Ground Surface. Floor or ground surfaces shall comply with 302.

403.3 Slope. The *running slope* of walking surfaces shall not be steeper than 1:20. The *cross slope* of walking surfaces shall not be steeper than 1:48.

403.4 Changes in Level. Changes in level shall comply with 303.

403.5 Clearances. Walking surfaces shall provide clearances complying with 403.5.

EXCEPTION: Within *employee work areas*, clearances on *common use circulation paths* shall be permitted to be decreased by *work area equipment* provided that the decrease is essential to the function of the work being performed.

403.5.1 Clear Width. Except as provided in 403.5.2 and 403.5.3, the clear width of walking surfaces shall be 36 inches (915 mm) minimum.

EXCEPTION: The clear width shall be permitted to be reduced to 32 inches (815 mm) minimum for a length of 24 inches (610 mm) maximum provided that reduced width segments are separated by segments that are 48 inches (1220 mm) long minimum and 36 inches (915 mm) wide minimum.

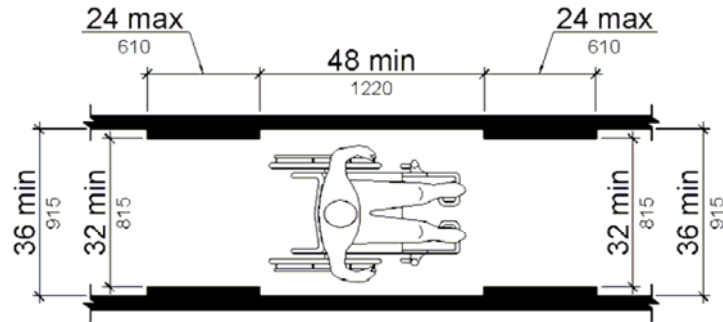


Figure 403.5.1
Clear Width of an Accessible Route

403.5.2 Clear Width at Turn. Where the *accessible* route makes a 180 degree turn around an *element* which is less than 48 inches (1220 mm) wide, clear width shall be 42 inches (1065 mm) minimum approaching the turn, 48 inches (1220 mm) minimum at the turn and 42 inches (1065 mm) minimum leaving the turn.

EXCEPTION: Where the clear width at the turn is 60 inches (1525 mm) minimum compliance with 403.5.2 shall not be required.

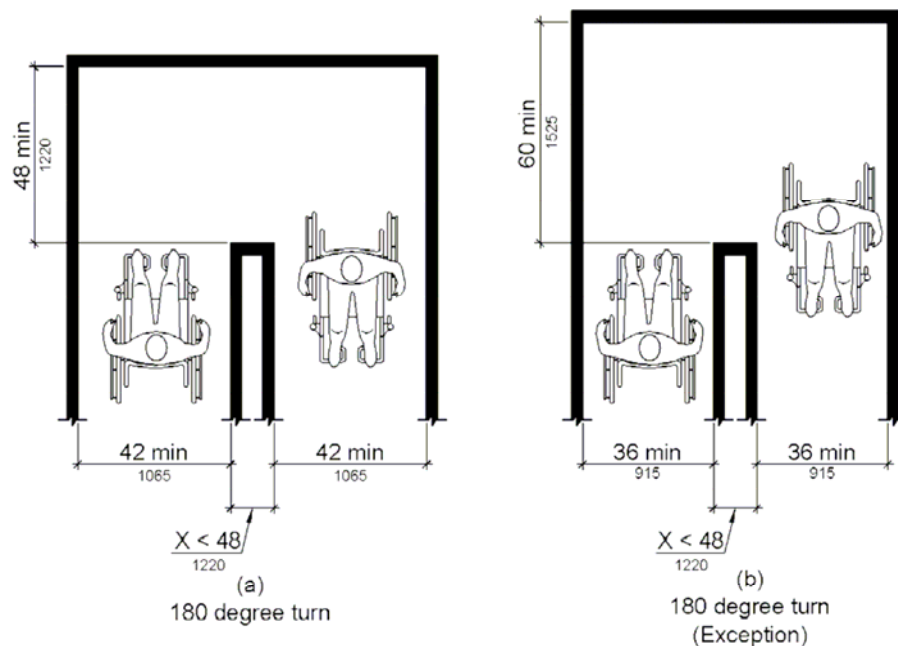


Figure 403.5.2
Clear Width at Turn

403.5.3 Passing Spaces. An accessible route with a clear width less than 60 inches (1525 mm) shall provide passing spaces at intervals of 200 feet (61 m) maximum. Passing spaces shall be either: a space 60 inches (1525 mm) minimum by 60 inches (1525 mm) minimum; or, an intersection of two walking surfaces providing a T-shaped space complying with 304.3.2 where the base and arms of the T-shaped space extend 48 inches (1220 mm) minimum beyond the intersection.

503 Passenger Loading Zones

503.1 General. Passenger loading zones shall comply with 503.

503.2 Vehicle Pull-Up Space. Passenger loading zones shall provide a vehicular pull-up space 96 inches (2440 mm) wide minimum and 20 feet (6100 mm) long minimum.

503.3 Access Aisle. Passenger loading zones shall provide access aisles complying with 503 adjacent to the vehicle pull-up space. Access aisles shall adjoin an *accessible* route and shall not overlap the *vehicular way*.

503.3.1 Width. Access aisles serving vehicle pull-up spaces shall be 60 inches (1525 mm) wide minimum.

503.3.2 Length. Access aisles shall extend the full length of the vehicle pull-up spaces they serve.

503.3.3 Marking. Access aisles shall be marked so as to discourage parking in them.

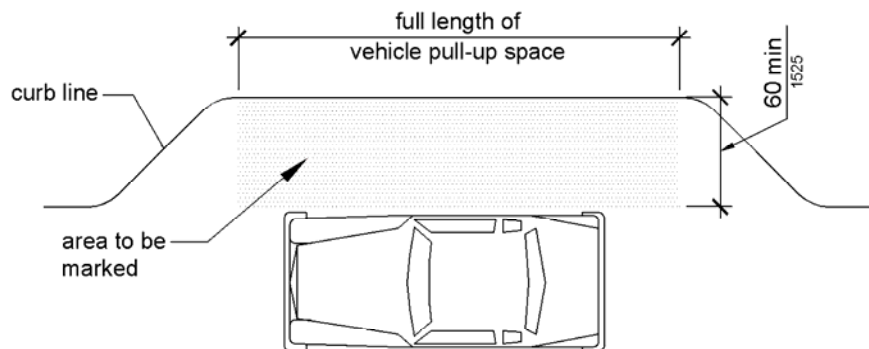


Figure 503.3
Passenger Loading Zone Access Aisle

503.4 Floor and Ground Surfaces. Vehicle pull-up spaces and access aisles serving them shall comply with 302. Access aisles shall be at the same level as the vehicle pull-up space they serve. Changes in level are not permitted.

EXCEPTION: Slopes not steeper than 1:48 shall be permitted.

503.5 Vertical Clearance. Vehicle pull-up spaces, access aisles serving them, and a vehicular route from an *entrance* to the passenger loading zone, and from the passenger loading zone to a vehicular exit shall provide a vertical clearance of 114 inches (2895 mm) minimum.

703 Signs

703.5 Visual Characters. Visual *characters* shall comply with 703.5.

EXCEPTION: Where visual *characters* comply with 703.2 and are accompanied by braille complying with 703.3, they shall not be required to comply with 703.5.2 through 703.5.9.

703.5.1 Finish and Contrast. *Characters* and their background shall have a non-glare finish. *Characters* shall contrast with their background with either light *characters* on a dark background or dark *characters* on a light background.

703.5.2 Case. *Characters* shall be uppercase or lowercase or a combination of both.

703.5.3 Style. *Characters* shall be conventional in form. *Characters* shall not be italic, oblique, script, highly decorative, or of other unusual forms.

703.5.4 Character Proportions. *Characters* shall be selected from fonts where the width of the uppercase letter “O” is 55 percent minimum and 110 percent maximum of the height of the uppercase letter “I”.

703.5.5 Character Height. Minimum *character* height shall comply with Table 703.5.5. Viewing distance shall be measured as the horizontal distance between the *character* and an obstruction preventing further approach towards the sign. *Character* height shall be based on the uppercase letter “I”.

Table 703.5.5 Visual Character Height

Height to Finish Floor or Ground From Baseline of Character	Horizontal Viewing Distance	Minimum Character Height
40 inches (1015 mm) to less than or equal to 70 inches (1780 mm)	Less than 72 inches (1830 mm)	5/8 inch (16 mm)
	72 inches (1830 mm) and greater	5/8 inch (16 mm), plus 1/8 inch (3.2 mm) per foot (305 mm) of viewing distance above 72 inches (1830 mm)
Greater than 70 inches (1780 mm) to less than or equal to 120 inches (3050 mm)	Less than 180 inches (4570 mm)	2 inches (51 mm)
	180 inches (4570 mm) and greater	2 inches (51 mm), plus 1/8 inch (3.2 mm) per foot (305 mm) of viewing distance above 180 inches (4570 mm)
Greater than 120 inches (3050 mm)	Less than 21 feet (6400 mm)	3 inches (75 mm)
	21 feet (6400 mm) and greater	3 inches (75 mm), plus 1/8 inch (3.2 mm) per foot (305 mm) of viewing distance above 21 feet (6400 mm)

703.5.6 Height From Finish Floor or Ground. Visual *characters* shall be 40 inches (1015 mm) minimum above the finish floor or ground.

EXCEPTION: Visual *characters* indicating elevator car controls shall not be required to comply with 703.5.6.

703.5.7 Stroke Thickness. Stroke thickness of the uppercase letter “I” shall be 10 percent minimum and 30 percent maximum of the height of the *character*.

703.5.8 Character Spacing. *Character* spacing shall be measured between the two closest points of adjacent *characters*, excluding word *spaces*. Spacing between individual *characters* shall be 10 percent minimum and 35 percent maximum of *character* height.

703.5.9 Line Spacing. Spacing between the baselines of separate lines of *characters* within a message shall be 135 percent minimum and 170 percent maximum of the *character* height

705 Detectable Warnings

705.1 General. *Detectable warnings* shall consist of a surface of truncated domes and shall comply with 705.

705.1.1 Dome Size. Truncated domes in a *detectable warning* surface shall have a base diameter of 0.9 inch (23 mm) minimum and 1.4 inches (36 mm) maximum, a top diameter of 50 percent of the base diameter minimum to 65 percent of the base diameter maximum, and a height of 0.2 inch (5.1 mm).

705.1.2 Dome Spacing. Truncated domes in a *detectable warning* surface shall have a center-to-center spacing of 1.6 inches (41 mm) minimum and 2.4 inches (61 mm) maximum, and a base-to-base spacing of 0.65 inch (17 mm) minimum, measured between the most adjacent domes on a square grid.

705.1.3 Contrast. *Detectable warning* surfaces shall contrast visually with adjacent walking surfaces either light-on-dark, or dark-on-light.

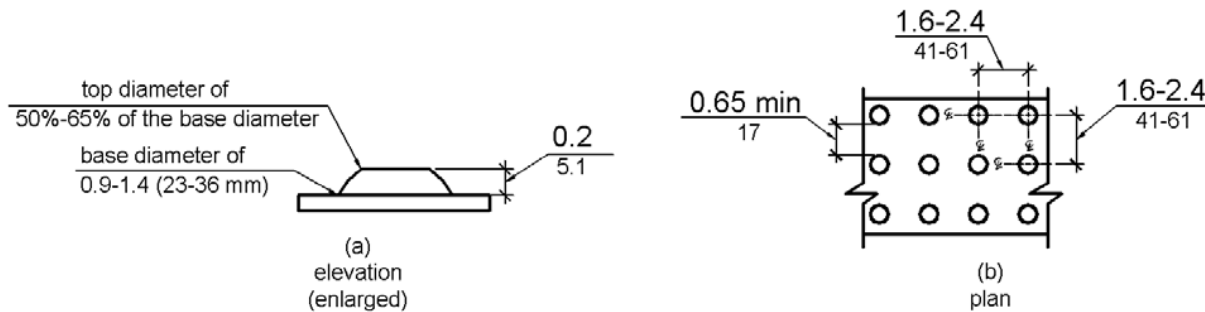


Figure 705.1
Size and Spacing of Truncated Domes

705.2 Platform Edges. *Detectable warning* surfaces at platform boarding edges shall be 24 inches (610 mm) wide and shall extend the full length of the *public use* areas of the platform.

810 Transportation Facilities

810.1 General. Transportation *facilities* shall comply with 810.

810.2 Bus Boarding and Alighting Areas. Bus boarding and alighting areas shall comply with 810.2.

810.2.1 Surface. Bus stop boarding and alighting areas shall have a firm, stable surface.

810.2.2 Dimensions. Bus stop boarding and alighting areas shall provide a clear length of 96 inches (2440 mm) minimum, measured perpendicular to the curb or vehicle roadway edge, and a clear width of 60 inches (1525 mm) minimum, measured parallel to the vehicle roadway.

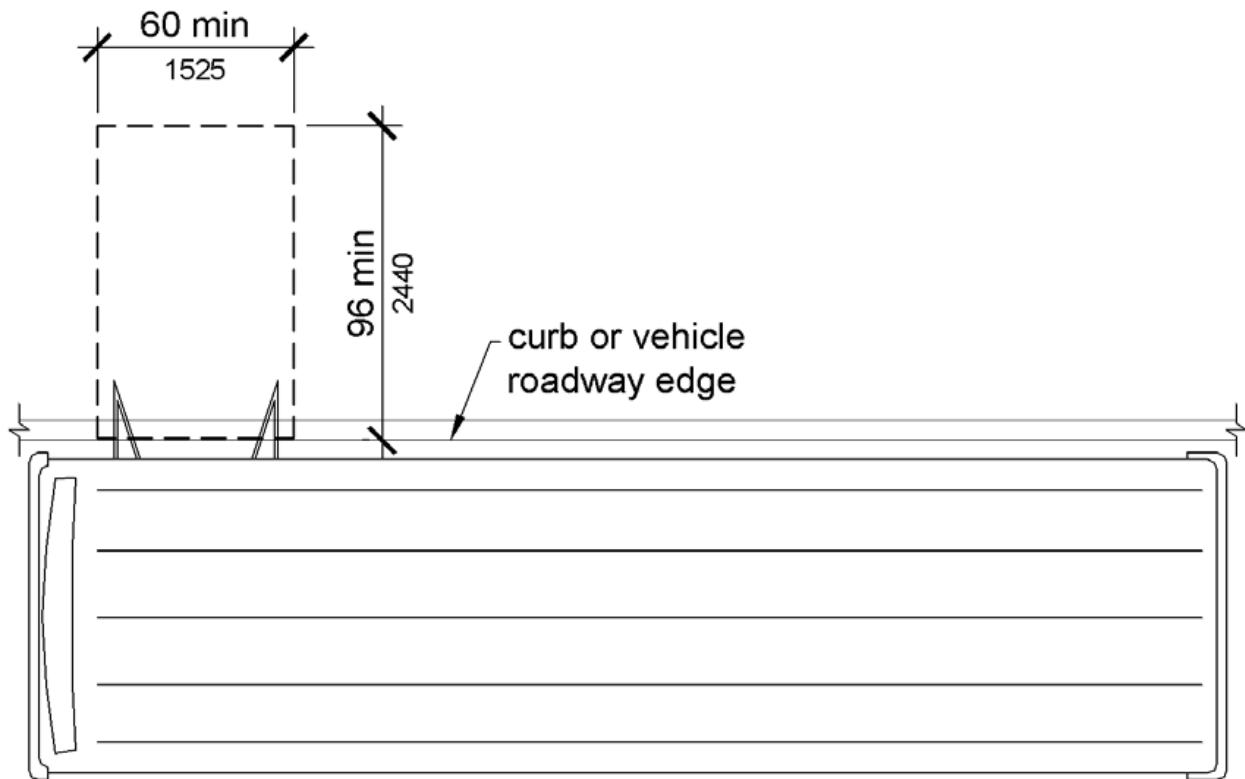


Figure 810.2.2
Dimensions of Bus Boarding and Alighting Areas

810.2.3 Connection. Bus stop boarding and alighting areas shall be connected to streets, sidewalks, or pedestrian paths by an *accessible* route complying with 402.

810.2.4 Slope. Parallel to the roadway, the slope of the bus stop boarding and alighting area shall be the same as the roadway, to the maximum extent practicable. Perpendicular to the roadway, the slope of the bus stop boarding and alighting area shall not be steeper than 1:48.

810.3 Bus Shelters. Bus shelters shall provide a minimum clear floor or ground *space* complying with 305 entirely within the shelter. Bus shelters shall be connected by an *accessible route* complying with 402 to a boarding and alighting area complying with 810.2.

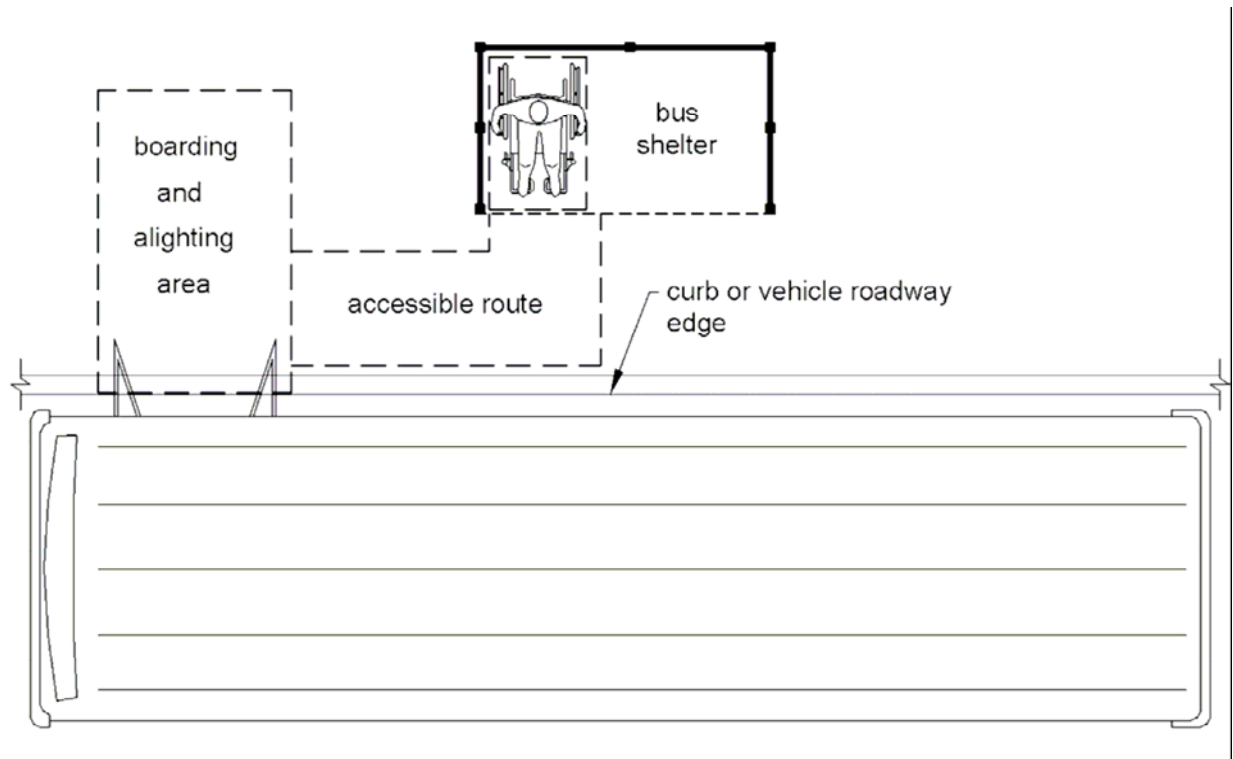


Figure 810.3
Bus Shelters

810.4 Bus Signs. Bus route identification signs shall comply with 703.5.1 through 703.5.4, and 703.5.7 and 703.5.8. In addition, to the maximum extent practicable, bus route identification signs shall comply with 703.5.5.

EXCEPTION: Bus schedules, timetables and maps that are posted at the bus stop or bus bay shall not be required to comply.

810.5 Rail Platforms. Rail platforms shall comply with 810.5.

810.5.1 Slope. Rail platforms shall not exceed a slope of 1:48 in all directions.

EXCEPTION: Where platforms serve vehicles operating on existing track or track laid in existing roadway, the slope of the platform parallel to the track shall be permitted to be equal to the slope (grade) of the roadway or existing track.

810.5.2 Detectable Warnings. Platform boarding edges not protected by platform screens or guards shall have *detectable warnings* complying with 705 along the full length of the *public use* area of the platform.

810.5.3 Platform and Vehicle Floor Coordination. Station platforms shall be positioned to coordinate with vehicles in accordance with the applicable requirements of 36 CFR Part 1192. Low-level platforms shall be 8 inches (205 mm) minimum above top of rail.

EXCEPTION: Where vehicles are boarded from sidewalks or street-level, low-level platforms shall be permitted to be less than 8 inches (205 mm).

810.6 Rail Station Signs. Rail station signs shall comply with 810.6.

EXCEPTION. Signs shall not be required to comply with 810.6.1 and 810.6.2 where audible signs are remotely transmitted to hand-held receivers, or are user- or proximity-actuated.

810.6.1 Entrances. Where signs identify a station or its *entrance*, at least one sign at each *entrance* shall comply with 703.2 and shall be placed in uniform locations to the maximum extent practicable. Where signs identify a station that has no defined *entrance*, at least one sign shall comply with 703.2 and shall be placed in a central location.

810.6.2 Routes and Destinations. Lists of stations, routes and destinations served by the station which are located on boarding areas, platforms, or *mezzanines* shall comply with 703.5. At least one *tactile* sign identifying the specific station and complying with 703.2 shall be provided on each platform or boarding area. Signs covered by this requirement shall, to the maximum extent practicable, be placed in uniform locations within the system.

EXCEPTION: Where sign *space* is limited, *characters* shall not be required to exceed 3 inches (75 mm).

810.6.3 Station Names. Stations covered by this section shall have identification signs complying with 703.5. Signs shall be clearly visible and within the sight lines of standing and sitting passengers from within the vehicle on both sides when not obstructed by another vehicle.

810.7 Public Address Systems. Where public address systems convey audible information to the public, the same or equivalent information shall be provided in a visual format.

810.8 Clocks. Where clocks are provided for use by the public, the clock face shall be uncluttered so that its *elements* are clearly visible. Hands, numerals and digits shall contrast with the background either light-on-dark or dark-on-light. Where clocks are installed overhead, numerals and digits shall comply with 703.5.

810.9 Escalators. Where provided, escalators shall comply with the sections 6.1.3.5.6 and 6.1.3.6.5 of ASME A17.1 (incorporated by reference, see "Referenced Standards" in Chapter 1) and shall have a clear width of 32 inches (815 mm) minimum.

EXCEPTION: Existing escalators in *key stations* shall not be required to comply with 810.9.

810.10 Track Crossings. Where a *circulation path* serving boarding platforms crosses tracks, it shall comply with 402.

EXCEPTION: Openings for wheel flanges shall be permitted to be 2½ inches (64 mm) maximum.



Figure 810.10 (Exception) Track Crossings

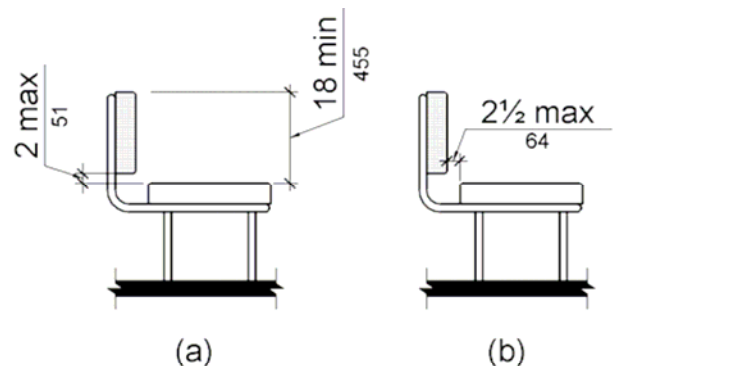
903 Benches

903.1 General. Benches shall comply with 903.

903.2 Clear Floor or Ground Space. Clear floor or ground space complying with 305 shall be provided and shall be positioned at the end of the bench seat and parallel to the short axis of the bench.

903.3 Size. Benches shall have seats that are 42 inches (1065 mm) long minimum and 20 inches (510 mm) deep minimum and 24 inches (610 mm) deep maximum.

903.4 Back Support. The bench shall provide for back support or shall be affixed to a wall. Back support shall be 42 inches (1065 mm) long minimum and shall extend from a point 2 inches (51 mm) maximum above the seat surface to a point 18 inches (455 mm) minimum above the seat surface. Back support shall be 2 1/2 inches (64 mm) maximum from the rear edge of the seat measured horizontally.



**Figure 903.4
Bench Back Support**

903.5 Height. The top of the bench seat surface shall be 17 inches (430 mm) minimum and 19 inches (485 mm) maximum above the finish floor or ground.

903.6 Structural Strength. Allowable stresses shall not be exceeded for materials used when a vertical or horizontal force of 250 pounds (1112 N) is applied at any point on the seat, fastener, mounting device, or supporting structure.

903.7 Wet Locations. Where installed in wet locations, the surface of the seat shall be slip resistant and shall not accumulate water.

BICYCLE PARKING GUIDELINES

A set of recommendations from the Association of Pedestrian and Bicycle Professionals (APBP)



“I would ride to work if there was a safe place to lock my bike.”



The lack of a secure parking space keeps many people from using their bikes for basic transportation. Leaving a bicycle unattended, even for short periods, can easily result in damage or theft. Finding a bike rack that doesn't work or isn't conveniently located makes for a frustrating experience.

The purpose of this document is to assist with the selection and placement of appropriate bicycle racks for short-term parking. Four major components will be discussed.

1. The rack element. This device supports the bicycle.
2. The rack. It is important to understand how bikes interact with each other when rack elements are assembled together.
3. Combining of multiple racks into a bicycle parking lot.
4. Locating the rack, and the relationship of the rack to the building entrance it serves and the cyclists' approach to that entrance.

The discussion will focus on outdoor installations. The racks are intended to accommodate conventional, upright, single-rider bicycles. It is assumed the cyclist will use a solid, U-shaped lock, or a cable lock, or a combination of the two.

The APBP Task Force that developed this guide is also developing recommendations for other important bicycle parking-related issues including:



- a. Assessing the appropriate number of bicycle parking spaces for different buildings and land uses, including the use of bicycle parking ordinances.
- b. Long-term bicycle storage facilities such as lockers and bicycle parking garages.
- c. Indoors bicycle parking and the carriage of bicycles in transit vehicles.



1. The Rack Element

Definition: The rack element is the part of the bike rack that supports one bicycle.

The rack element should:

- Support the bicycle upright by its frame in two places
- Prevent the wheel of the bicycle from tipping over
- Enable the frame and one or both wheels to be secured
- Support bicycles without a diamond-shaped frame with a horizontal top tube (e.g. a mixte frame)
- Allow front-in parking: a U-lock should be able to lock the front wheel and the down tube of an upright bicycle
- Allow back-in parking: a U-lock should be able to lock the rear wheel and seat tube of the bicycle



Comb, toast, schoolyard, and other wheel bending racks that provide no support for the bicycle frame are NOT recommended.

The rack element should resist being cut or detached using common hand tools, especially those that can be concealed in a backpack. Such tools include bolt cutters, pipe cutters, wrenches, and pry bars.



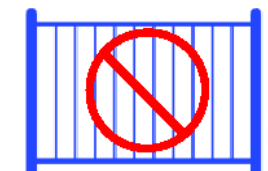
INVERTED "U"
One rack element supports two bikes



"A"
One rack element supports two bikes



POST AND LOOP
One rack element supports two bikes.



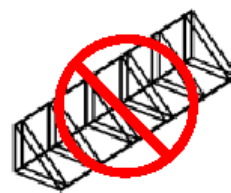
COMB
One rack element is a vertical segment of the rack. **Not recommended**



Not Recommended



WAVE
One rack element is a vertical segment of the rack.
(See additional discussion below)

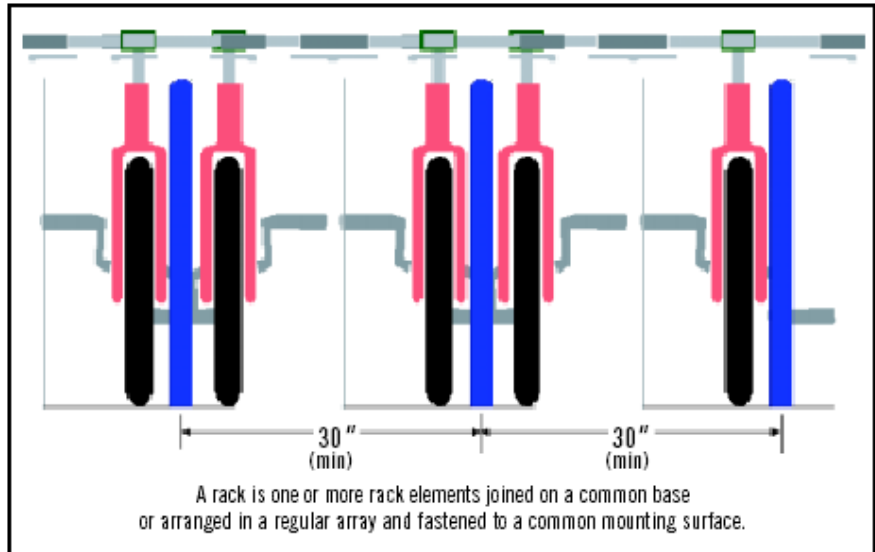


TOAST
One rack element holds one wheel of a bike.

2. The Rack

Definition: A rack is one or more rack elements joined on any common base or arranged in a regular array and fastened to a common mounting surface.

The rack should consist of a grouping of rack element. The rack elements may be attached to a single frame or remain single elements mounted within close proximity to each other. The rack elements should not be easily detachable from the rack frame or easily removed from the mounting surface. The rack should be anchored so that it cannot be stolen with the bikes attached—vandal resistant fasteners can be used to anchor a rack in the ground. An exception is a rack that is so large and heavy that it cannot be easily moved or lifted with the bicycles attached.



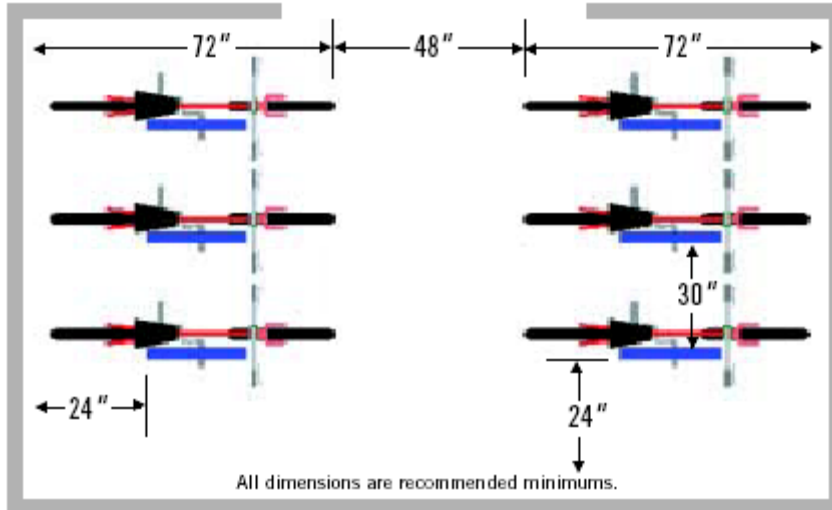
The rack should provide easy, independent bike access. Inverted “U” rack elements mounted in a row should be placed on 30” centers. This allows enough room for two bicycles to be secured to each rack element. Normally, the handlebar and seat heights will allow two bicycles to line up side-by-side if one of them is reversed. When there is a conflict, the bikes can be placed slightly offset from one another as shown. If the elements are placed too close together, it becomes difficult to attach two bikes to the same element. If it is too inconvenient and time consuming to squeeze the bikes into the space and attach a lock, cyclists will look for an alternative place to park or use one rack element per bike and reduce the projected parking capacity by 50 percent.

Wave style racks are not recommended. Bicyclists commonly use a “wave” rack as if it were a single inverted “U.” This limits the actual capacity of the rack to two bikes regardless of the potential or stated capacity. Bicycles parked perpendicular to a wave rack (as intended by the manufacturer) are not supported in two places and are more likely to fall over in the rack. The advertised capacity of a wave rack is usually much higher than the practical capacity.

An empty rack should not create a tripping hazard for visually impaired individuals.

3. The Rack Area

Definition: The rack area is a bicycle parking lot where racks are separated by aisles.



A rack area or "bicycle parking lot" is an area where more than one rack is installed. Aisles separate the racks. The aisle is measured from tip to tip of bike tires across the space between racks. The minimum separation between aisles should be 48 inches. This provides enough space for one person to walk one bike. In high traffic areas where many users park or retrieve bikes at the same time, such as a college classroom, the recommended minimum aisle width is 72 inches.

The rack area is a bicycle parking lot where racks are separated by aisles.

72 inches (six feet) of depth should be allowed for each row of parked bicycles. Conventional upright bicycles are just less than 72 inches long and can easily be accommodated in that space. Some rack types will allow the racks to be mounted closer to the wall. This will not change the space required by the bicycles or the aisles.

Large rack areas with a high turnover rate should have more than one entrance. This will help facilitate the arriving and departing of cyclists and pedestrians.

If possible, the rack area should be protected from the elements. Racks along building walls can be sheltered by an awning. Even though cyclists are exposed to sun, rain, and snow while en route, covering the rack area keeps the cyclist more comfortable while parking, locking the bike, and loading or unloading cargo. An awning will also help keep the bicycle dry, especially the saddle.

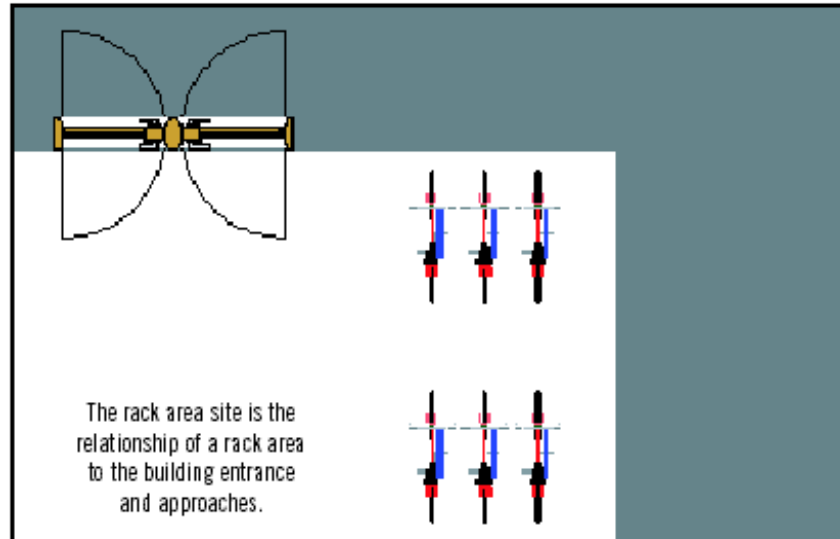


4. The Rack Area Site

Definition: the rack area site is the relationship of the rack area to a building entrance and approach.

The location of a rack area in relationship to the building it serves is very important. The best location for a rack area is immediately adjacent to the entrance it serves. Racks should not be placed so that they block the entrance or inhibit pedestrian flow in or out of the building. Racks that are far from the entrance, hard to find, or perceived to be vulnerable to vandalism will not be used by most cyclists.

It is important to understand the transition a cyclist makes from vehicle to pedestrian. The cyclist approaches the building mounted on the bicycle. At some point, the cyclist stops, dismounts, and walks the bike to a rack. The bicycle is attached to the rack and any cargo is removed. The cyclist now walks into the building carrying the cargo. Adequate space must be provided to allow for this transition.



The rack area should be located along a major building approach line and clearly visible from the approach. The rack area should be no more than a 30-second walk (120 feet) from the entrance it serves and should preferably be within 50 feet.

A rack area should be as close or closer than the nearest car parking space. A rack area should be clearly visible from the entrance it serves. A rack area should be provided near each actively used entrance. In general, multiple buildings should not be served with a combined, distant rack area. It is preferred to place smaller rack areas in locations that are more convenient.

The rack area site is the relationship of a rack area to the building entrance and approaches.

5. Creative Designs



The recommended practices above are not intended to stifle creativity. There are many creative, three-dimensional bicycle-parking racks that work very well. Whether the rack is a type of “hanger”, “helix” or another configuration, the

critical issue is that the rack element supports the bike in two places and allows the bicycle to be securely locked.

Creative designs should carefully balance form with function. For example, the distinctive “croquet set” rack shown here likely has a smaller effective capacity than might be immediately

apparent because one or more of the rack elements is not accessible. Similarly, the “hanger” racks shown below must be carefully manufactured and maintained to prevent weaknesses at the joints of the hanger and rack—such weakness might compromise the security of bicycles locked to the rack. In addition, the “coat hanger” elements should be spaced at least 30” apart.

Conclusion

More information about bicycle parking is available from a wide variety of sources. Visit www.bicyclinginfo.org to access many of those sources, and to find a list of bicycle parking manufacturers. More information about the Association of Pedestrian and Bicycle Professionals is available at www.apbp.org.



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