Transit Facilities Design Manual

SunLine Transit Agency

Thousand Palms, CA

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TMD

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ACKNOWLEDGEMENTS

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EXECUTIVE SUMMARY

SunLine Transit Agency (SunLine), the local transit provider in the Coachella Valley, has developed the *Transit Facilities Design Guidelines* to encourage the coordination of local development and transit service. The recommendations in this manual are designed to help local jurisdictions and the development community to accommodate transit in their development plans. Many times, SunLine is unable to serve locations due to street layouts and designs that do not support bus service. By designing for public transportation in the initial development plans, SunLine transit vehicles can be accommodated; thereby, promoting transit as a viable means of alternate mode of transportation. Coordinating land use and transportation planning not only result in providing effective transit service but may also lead to the reduction of traffic congestion.

SunLine encourages local jurisdictions and developers to follow these recommendations and work with SunLine in planning for public transportation in conjunction with new development or changes to existing development. Working with SunLine through the development review process will promote design options that encourage a transit oriented environment and also support mandates by the Americans with Disabilities Act (ADA) during initial planning phases. Additionally, transit service also can be tailored for future users.

This manual is organized into several sections corresponding with facility decisions. Section 2 *(Transit Friendly Urban Design)* describes the general relationship between transit service and the built environment. General guidelines on transit supportive density, site design, and transit supportive development policies are discussed. This sections also provides specific guidance on contacting SunLine when a new development or street changes are being contemplated.

Section 3 *(SunLine Fleet Characteristics)* discusses the physical attributes of SunLine equipment including dimensions, turning radii, and curb weight. The purpose of this is to guide local officials, facility developers and owners on the size of SunLine equipment to assure that the vehicles can access developments.

Section 4 provides guidance on the design of streets and intersections *(Streets and Intersections)* to facilitate transit utilization and operations. This section contains guidance on curb radii for intersections where transit service operates and other elements of street geometry.

Section 5 *(Transit Facilities Design)* discusses specific designs for transit amenities including bus stops, bus turnouts on arterial streets, bus shelters, layover and turnaround places, and design for major transit facilities.

Transit Facilities Design Manual

1. Introduction

1.1 Background and Purpose

SunLine Transit is the regional public transportation operator in the Coachella Valley. SunLine operates a fleet of regular route buses and smaller buses to serve the mobility requirements of the region's disabled population. The agency mission is succinctly:

> *"To keep the Coachella Valley moving with safe, reliable, and accessible public transit and a commitment to balance our fiscal and environmental responsibilities."*

The ability of SunLine to provide an effective and efficient transit services in the Coachella Valley area is determined by a large extent of development decisions made in the community. Planning decisions are often thought of in terms of residential density, street configuration and geometry, and zoning regulations. However, there are a number of design decisions made by developers and jurisdictional officials, such as bus stop layouts, which also facilitate better transit service.

This manual is intended to provide guidance for the development of physical facilities in the region to assure that they are supportive of, or at least not detrimental to, transit service. Through distribution of this manual to jurisdictions and major developers in the region, SunLine hopes to promote a better understanding of the role of physical development on transit service. We encourage developers to design for transit and pedestrian access concurrent with their overall design process. When facilities such as street intersections, commercial, retail, and residential developments are being planned, the cost of making the investment suitable for transit use is typically not very large. On the other hand, retrofitting a site after construction is usually quite costly. Developers and local officials are strongly encouraged to seek the guidance of SunLine staff in making design decisions on development and local infrastructure.

Following the guidelines in this manual will assist in the development of a transit system which provides:

- A safe environment for transit passengers, pedestrians, and motorists;
- Consistency within the region on the design of such facilities;
- Accessibility of the transit system to the region's seniors and disabled residents; and
- Consistency with sound engineering practice.

This manual is organized into several sections corresponding with facility decisions and describes the relationship between transit service and the built environment. It provides general guidelines on transit supportive density, site design, and transit supportive development policies and discusses physical attributes of SunLine equipment including dimensions, turning radii, and curb weight. Additional information is provided on the design of streets and intersections to facilitate transit utilization and operations as well as offers guidance on specific designs for transit amenities including bus stops, bus turnouts on arterial streets, bus shelters, layover and turnaround places, and design for transit facilities.

In general, if local jurisdictions or developers are planning a development which may be in SunLine's service area, they are invited to consult with SunLine staff at 760-343-3456 for more information. The following are examples of the types of facilities about which SunLine should be contacted early in the planning and design process:

- New housing developments
- Major commercial developments (over 10,000 square feet)
- Road reconstruction and intersection reconfiguration projects
- Street improvements, including driveway entrances on major streets

1.2 Coordination of Land Use and Transportation Planning Policies

Currently, SunLine participates in the development review process of all cities and the county in the Valley by offering suggestions and recommendations that may improve and enhance transit services provided in SunLine's service area. The process of siting and installing bus stops and bus shelters may appear to be a simple task; however, this task requires the consideration of many factors, including where and how bus stops are located, if transit service is provided along specific corridors, and proximity to bus stops on the opposite side of the road.

To expedite the development review process, all jurisdictions are encouraged to notify SunLine of its Planning review calendar, including dates, times and places of meetings for pre-submittal conferences, Development Review committee, Planning Commission and City council meetings, in addition to special community outreach and planning activities that may have impact on transit services. The best way is to include SunLine on Planning and Public Works Departments mailing list for new development projects. The types of local development projects that need to be reviewed by SunLine include:

Residential, Commercial and Industrial Tentative Tract or Parcel Maps

Based on the location and jurisdiction, SunLine can recommend the best possible location for bus stops, whether or not bus turn outs are needed, review and provide detailed information about pedestrian access and pathways for the project before to the development process progress beyond a point where it might be too late to consider transit elements.

Commercial Centers – Regional Malls and Local shopping Centers

Due to the fact that these development projects are usually trip generators located at potential employment nodes and activity centers, and are constructed along major arterials, it is likely that there will be a need for transfer locations and bus stops. As such,

it is important that local jurisdictions work with SunLine on appropriate locations to site bus stops and bus turnouts, if needed.

Industrial Projects – Business or Office Parks
These developments are for employment centers that can generate transit use.

Institutional Uses – Schools, Public buildings, Hospitals
Also viewed as employment centers, institutional types of developments tend to attract transit users and may require special treatment to promote pedestrian pathways between bus stops and building entrances. It is very important that School Districts work with SunLine when locating institutional developments to ensure that SunLine is able to provide transit service to the new school buildings. Because of federal regulations on Charter Service, SunLine, like all transit agencies must ensure that it is in compliance with federal mandates.

Plot or Site Plans
These plans enable SunLine to review small to medium size developments but also significant projects that may be located along important arterials or intersections. Small projects located off arterials may be reviewed but SunLine may not respond depending on its impact on transit service.

Conditional Use Permits
Because these planning actions may comprise of a variety of projects, SunLine recommends that local jurisdictions forward the site plans to SunLine for review.

Street Improvement Plans – For Arterial Streets
Because these projects impact existing and future bus stops, it is highly recommended that the jurisdictions coordinate these projects with SunLine. Given the nature of the projects, it may be an opportunity for SunLine to work with the local jurisdictions to upgrade existing bus stops or work with them to incorporate plans for construction of a new amenity. In the long run, this provides SunLine the opportunity to construct boarding pads for bus shelter installations.

Notices of Preparation, Draft Environmental impact Reports
SunLine would prefer to review projects and provide transit input at the beginning of the process to ensure that improvements recommended by the jurisdictions are acceptable and approved by SunLine's staff.

General Plans
This ensures that the proposed land use, circulation plans and community designs are supportive of and conducive to transit service. It also assures that SunLine works with the jurisdictions to encourage connectivity to all modes of transportation.

Specific Plans
This helps to determine the best possible location for potential transit centers and offers great opportunities to integrate public transit service to encourage those who might be interested in using the service.

To promote the coordination of transit facilities with private and/or public sector development, SunLine will pursue joint development opportunities with local jurisdictions when appropriate. Joint projects can support economic growth and transit use while providing investment opportunities to the development community. SunLine also encourages joint use for high density residential, office, commercial or industrial development to reduce trip making and alleviate congestion in suburban areas, particularly those that are experiencing population and employment growth. In the final analysis, high density residential mixed use will promote and facilitate more transit usage across the valley. SunLine will consider joint development proposals and encourages the private and public sectors to propose development projects that are linked to transit operations.

Construction Impacts

Private development construction and local jurisdiction public works activities, such as street improvements, including repaving, street grading or water line installation often impact bus operations and bus stops. Construction impacts to transit service and bus stops can be minimized through conditions placed on private development constructions to ensure they work with SunLine staff. Information provided in this section is intended to reduce construction conflicts, offer information and provide guidance to local jurisdiction staff when coordinating both design and construction projects with the development community.

Although, SunLine considers construction coordination as a local function, SunLine staff will provide assistance to ensure impacts to transit service is minimized, if needed. SunLine will participate in decisions on construction projects that require temporary closures and relocation of bus stops and route disruptions. Two methods are often used to communicate transit needs to developers and construction contractors. The most common one used are plans and specifications that usually contain language requiring contractors to maintain access and signage for safety reasons and concerns. The second and most often followed directions to contractors and construction inspectors is intended to provide safe access to bus stops for passengers and buses.

Oftentimes, no safe access is provided to bus stops and buses in service. The California Building Code and the revised Americans with Disabilities Accessibility Guidelines (ADAAG) requires that accessibility issues be addressed during construction, which includes:

- Providing advanced warning of signage closures;
- Ensuring that temporary solutions provided conform to access standard;
- Ensuring that alternate circulation pathway provided are accessible;
- Assuring that minimum vertical and horizontal clearances are maintained; and
- Providing barricades adjacent to work zones.

To ensure passengers wait in safe environment while waiting for buses at bus stops, the following actions should be taken:

- SunLine staff should be contacted 15 days prior to the beginning of construction in advance of all street closures that affect transit service operation;
- All contractors must work with SunLine to ensure temporary bus stops are established before permanent bus stops are closed during construction;

- SunLine will not approve any proposed access to bus stops during construction if this puts passengers in unsafe environment;
- SunLine is responsible for providing and posting the appropriate temporary bus stop signage;
- If needed, temporary access to the bus stop zones during construction should be approved by SunLine prior to beginning of the construction;
- A minimum four (4) feet wide walkway should be provided to maintain passenger access to and from bus stop during construction, if it is determined that the bus stop will remain open during construction; and
- Contractors must also notify SunLine upon completion of construction so that permanent bus stops signs can be reinstalled by SunLine.

While the above lists can help to alleviate construction impacts to bus stops and disruptions to transit service, many times, not all jurisdictions and contractors contact SunLine about proposed or planned road improvements or construction projects. These projects may require temporary displacements of bus stops or detour of service routes, but no permanent changes to route or bus stops. Prior to approval of these plans, SunLine requests that the jurisdictions or project contractor contact SunLine at least two weeks before the beginning of construction, so that we are able to notify bus patrons about proposed temporary changes. This also enables SunLine staff to develop detour plans and work with the jurisdictions on approval for temporary bus stop locations. The contractor and/or the jurisdiction should continue to work with SunLine to ensure that detour plans that are implemented continue to be effective.

To be more effective, the additional measures are recommended to help improve the process of coordinating construction projects with SunLine:

- SunLine requires 15 days notification as early as possible to coordinate and review requirements. This ensures we are able to notify passengers and bus drivers of temporary or permanent changes to the bus stop;
- Contractor shall make every effort to schedule their work to minimize impacts and the duration of impacts to transit operations and the general public.
- Contractor are not authorized to remove any bus stop signs or close or cone off any bus stops without prior authorization from SunLine Transit Agency;
- All work must conform to the Americans with Disabilities Act Accessibility Guidelines (ADAAG) requirements, including provisions for temporary access to and from bus stops;
- Contractor will be responsible for costs incurred for loss or damage to bus stop signs, hardware and transit furniture;
- Contractor shall provide SunLine with the name and telephone number of the construction manager on site prior to the beginning of construction;
- Representative from SunLine's Planning Department should be invited to the projects pre-construction conference meeting.

1.3 Development of Bus Turnouts, Passenger Waiting Areas and Shelters in New Facilities

The design of bus stop waiting areas and provision of amenities that enhance security and comfort plays a significant role in a person's decision to use transit. Passenger amenities are installed at selected bus stops to improve passenger comfort and the relative attractiveness of transit as a transportation alternative. Selection of bus stops at which to install amenities takes into account a number of factors, including:

- Average daily boardings
- Proximity to major trip generators
- Passenger activity
- Surrounding land uses
- Planned neighborhood improvements
- Transit corridor marketing efforts
- Equity among communities in the Valley
- Proximity of other nearby sheltered areas
- Proximity to other bus stops on the opposite side of the street, and
- Customer and community requests.

In some cases, local jurisdictions negotiate agreements with developers for the installation of bus turnouts, waiting areas and bus shelters in areas not currently served by SunLine. SunLine recently completed a Comprehensive Operations Analysis which provides a blue print for future SunLine service development. It is only after careful consideration that either new bus routes are established or existing routes are altered. The existence of safe, appropriate waiting facilities is but one of the factors influencing this decision.

Our experience has been that route extensions, particularly to lower density areas, do not generate sustainable ridership to support continued transit operation. SunLine recommends that new transit facilities such as bus turnouts and bus shelters not be installed in anticipation of future service. However, we recommend that the funds for this purpose be placed in escrow for future use whereby, SunLine can construct these facilities when bus service is implemented.

2. Transit-Friendly Urban Design

SunLine recently completed a transit study in the region. The map on the following page shows the proposed route network in the area. The area where bus service operates is characterized by either relatively high residential or employment density. The flexibility of bus service is such that routes and services can be extended. However, it is the policy of SunLine to focus resources where they are most effective.

In the areas where SunLine operates, some fundamental site planning principles are recommended:

- Walking distances for the transit user should not exceed one-half mile or, in low density areas, three-quarters mile to a transit stop. Transit is very ineffective in areas where passengers must walk a long distance to and from a bus stop.
- Direct walkways that link residences to transit stops should be provided within residential developments.
- Roadways should be designed to permit transit service to appropriate locations within the development. A through street or bus turnaround system can be incorporated into a development's site design to provide access to transit stops.
- Park and Ride facilities should be provided at appropriate transit points to concentrate transit users from low density residential areas. These facilities should be provided in conjunction with off-street open space parking.
- Retail establishments should be clustered to reduce the number of curb cuts and bus stops and to decrease shopper walking distances. Clustered retail centers should be located near residential areas to provide convenience goods and reduce the frequency of trips by shoppers to regional shopping centers. Buildings over 25,000 square feet should have a lobby with seating located at the front of the building and facing the arterial street. The lobby should be accessible to persons with disabilities and designed so that the fronting street is visible to waiting transit users for a distance of 1,000 feet.
- Buildings should have a setback no greater than 150 feet from the curb to provide employees with more effective and convenient access to public transit.
- Pedestrian walkways (sidewalks) should be constructed along the perimeter of all developments. The walkways should connect to the lobby, located at the front of the building, to the bus stop area. All walkways should be accessible to individuals with mobility limitations.
- Parking spaces should be assigned for vanpool and carpool vehicles. These parking spaces should be given priority designation and located adjacent to the primary building entrance from the parking lot.

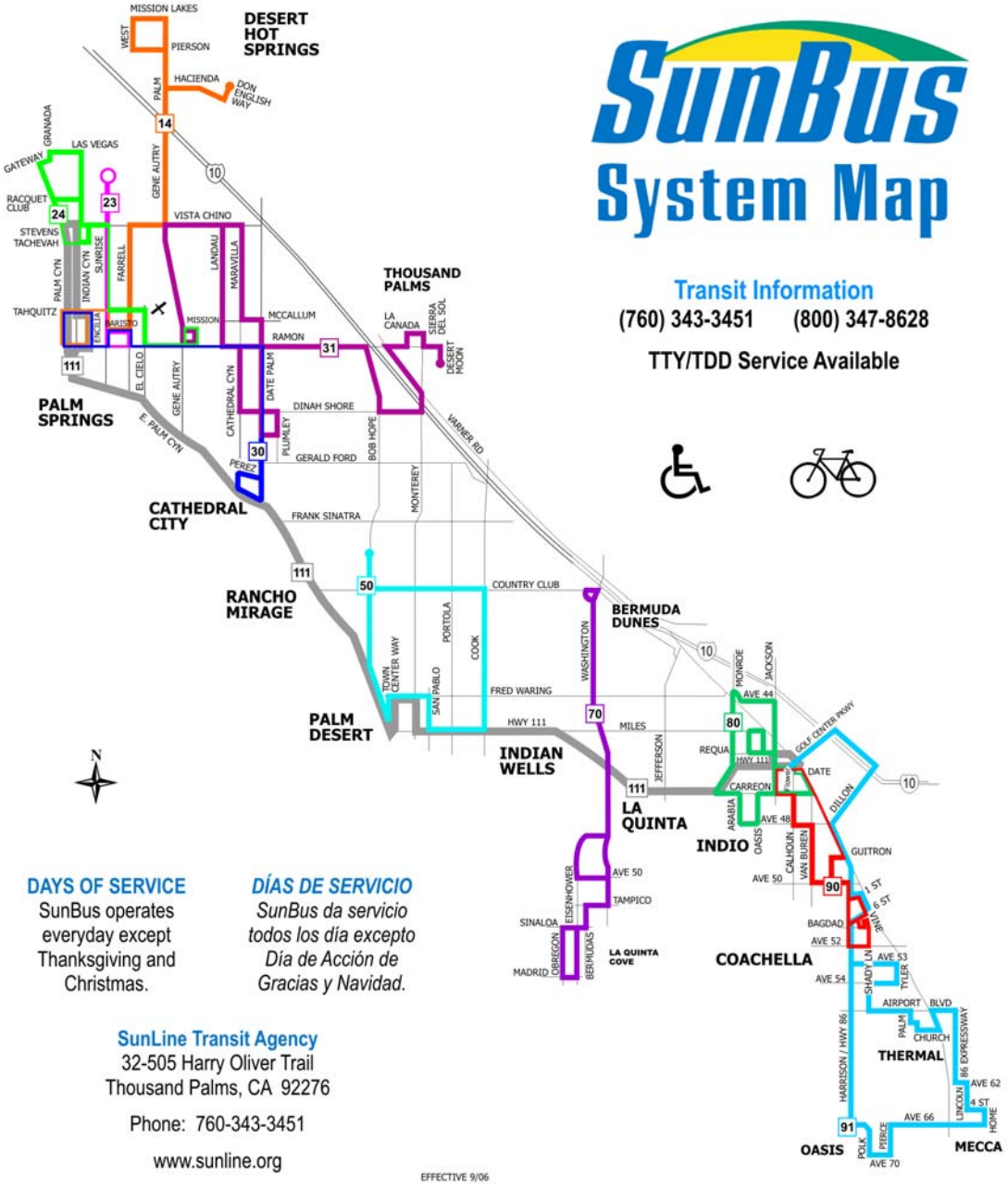


Figure 2.1 Current SunLine System Map

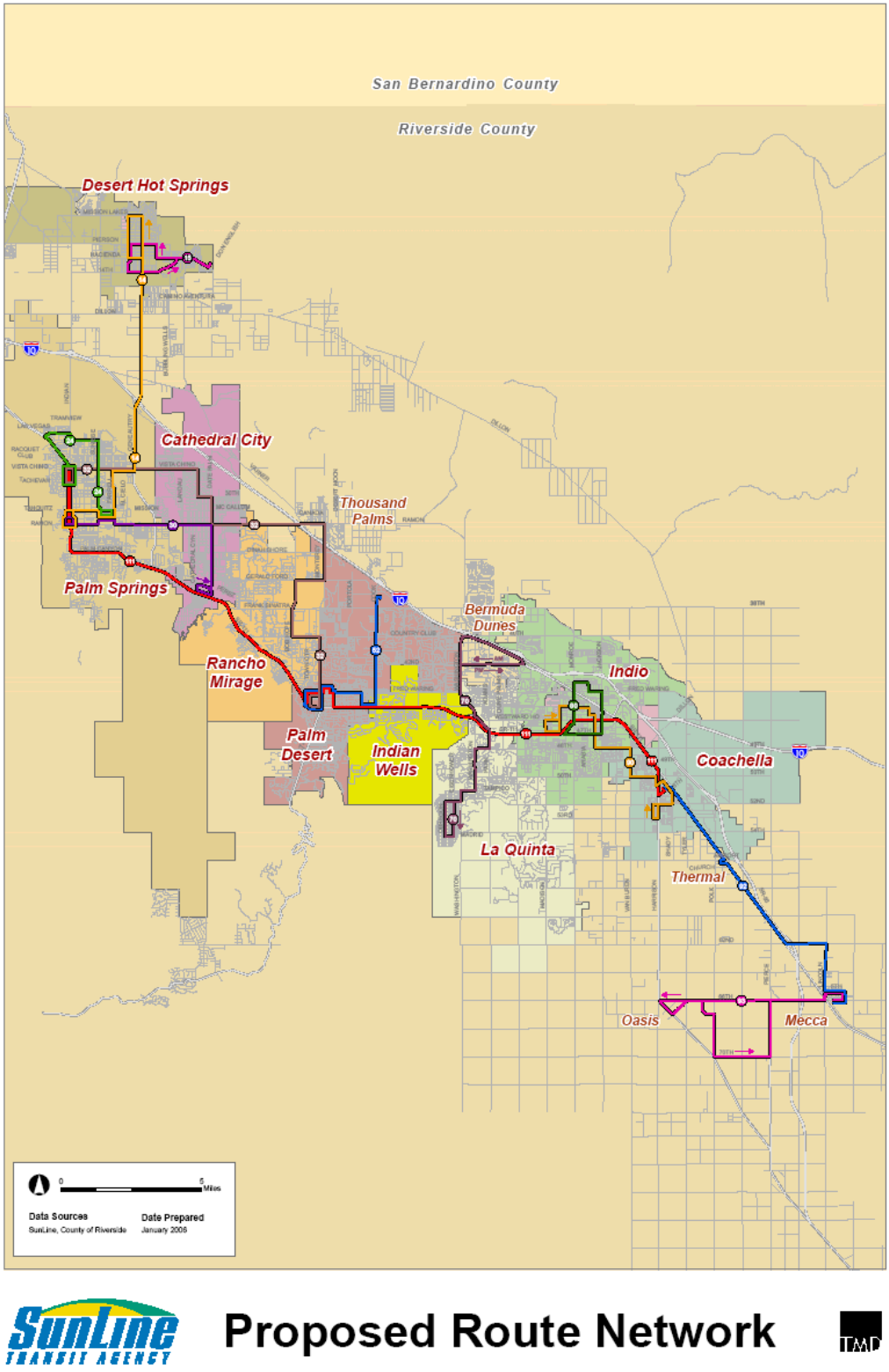


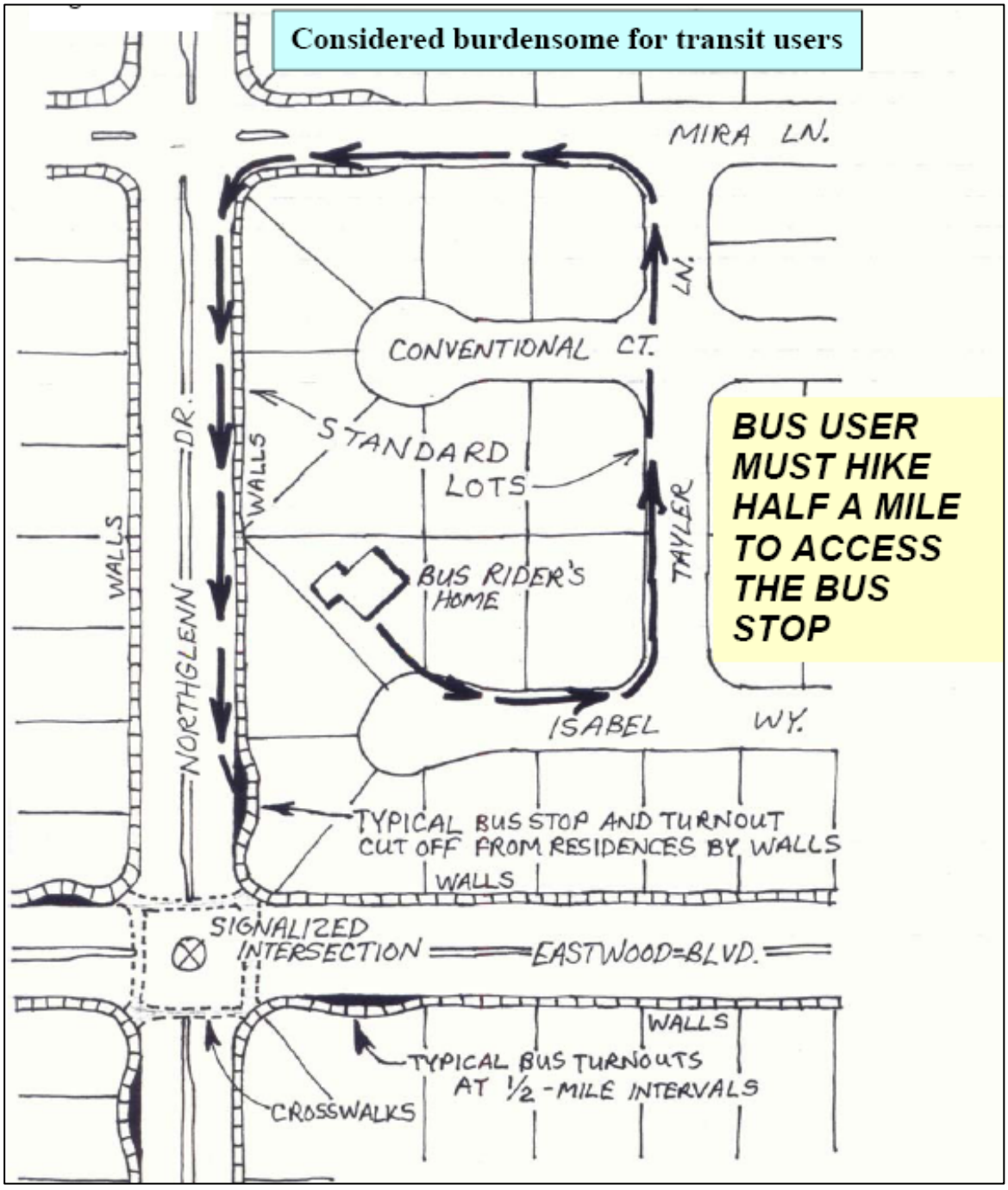
Figure 2.2 Proposed SunLine Route Network

- Mixed use developments, where residences are not far from neighborhood commercial activity, reduce the demand for travel of all forms in a region. In addition to the more obvious energy and environmental benefits of such an arrangement of land, recent studies have shown that it is a healthier environment because residents frequently substitute walking for motorized trips of all types.

Other more specific guidance on transit facilities and amenities is provided in later sections of this document.

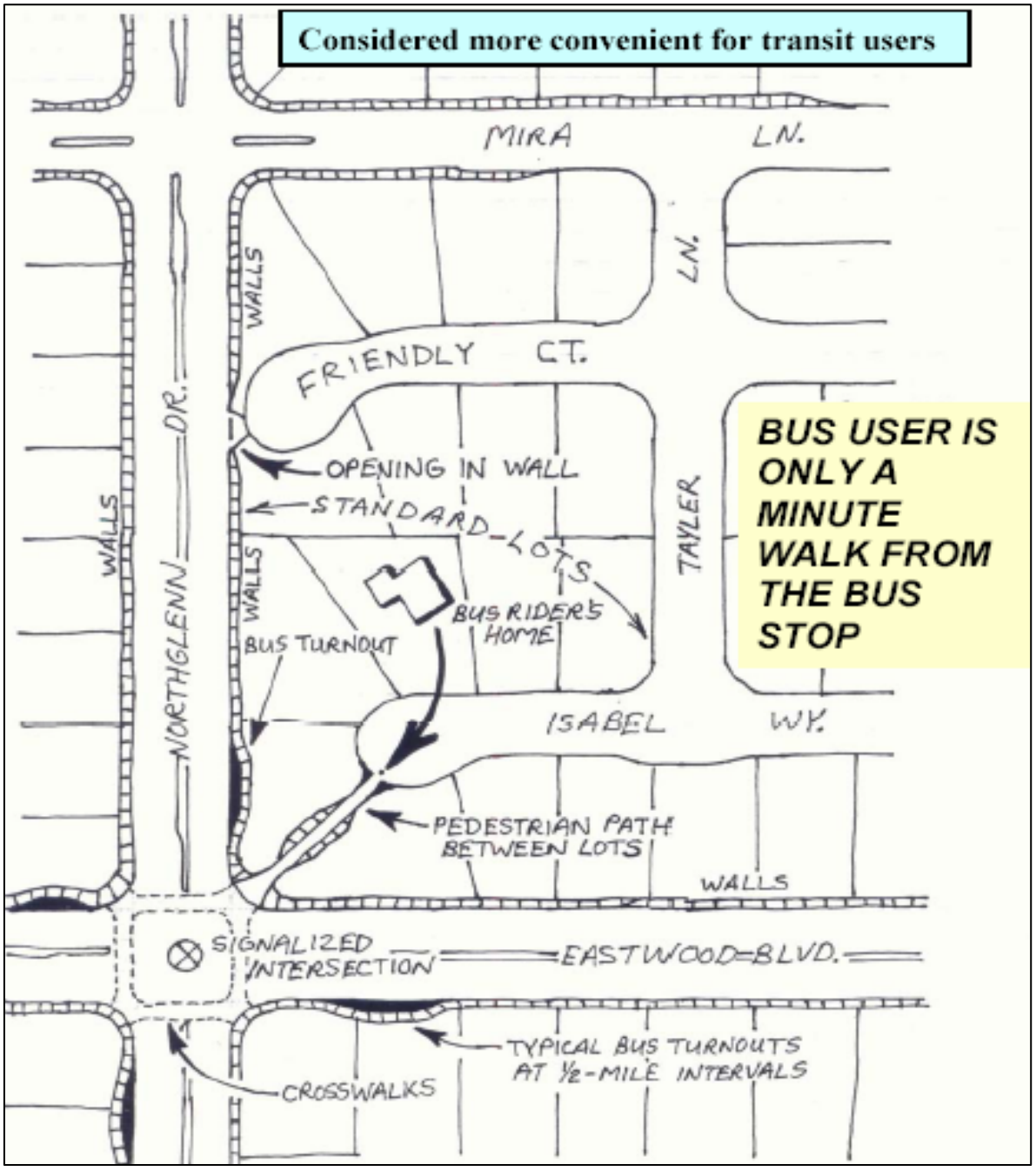
2.1 Street Networks

Transit-friendly designs recognize that a transit customer is a pedestrian first. The segment between the bus stop and the point of origin or ultimate destination is an integral part of the transit journey. It also means that meandering residential sidewalks with few means of access to arterial streets should be avoided. In the two examples on the text two pages, the first layout results in long walks to bus stops. The alternate plan in Figure 2.4 reduces walk distance by the use of pedestrian pathways.



Source: Riverside Transit Agency

Figure 2.3 Inconvenient Subdivision Plan



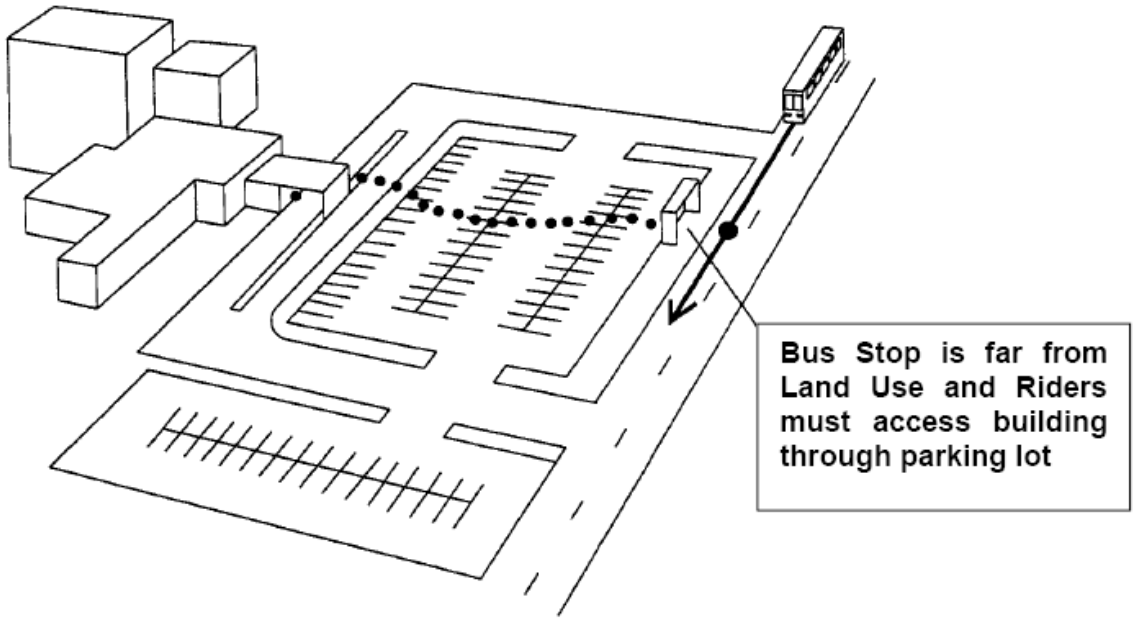
Source: Riverside Transit Agency

Figure 2.4 More Convenient Subdivision Plan

Some suburban street layouts are not very conducive to transit service. To a practical extent, a single logical path through a subdivision is preferred over a circulation network with street intersections appearing at random.

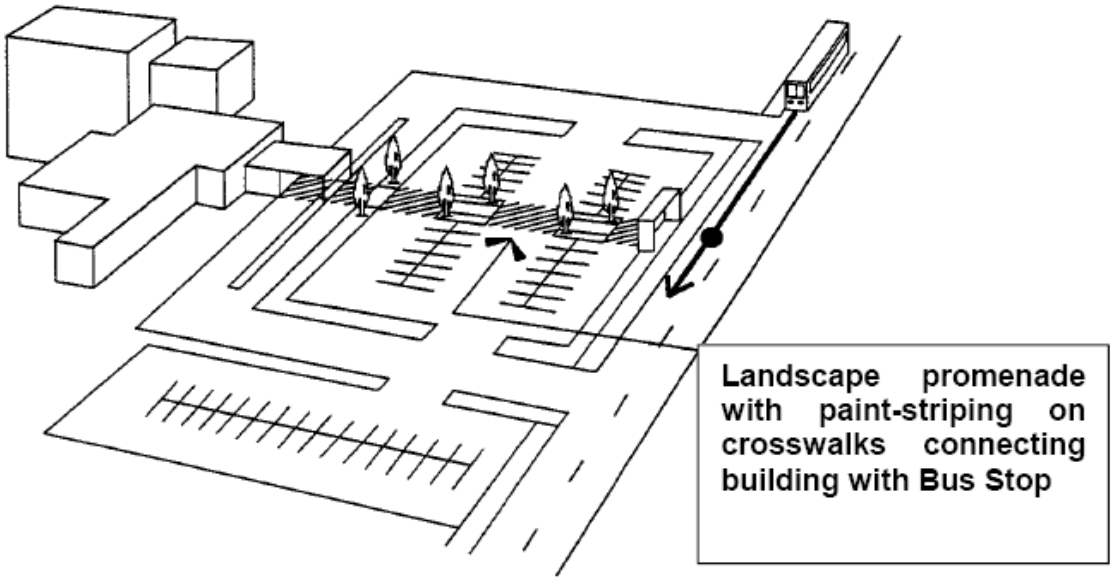
2.2 Facility Site Plans

The same general principles in building transit-friendly subdivisions apply to major commercial and institutional facilities. The link between the building entrance and bus stop is a critical part of the transit journey. While it is possible for SunLine to deviate routes into major faculties, SunLine refrains from doing so because it lengthens the trip of passengers who are not bound to the facility and also due to safety concerns with vehicular conflicts within these facilities. Further, meandering in and out of parking lots of major facilities dramatically reduces travel speed and makes the transit service a less attractive product relative to driving. The figures below also illustrate examples of good and poor practice in facility layout. The site layout in Figure 2.5 requires transit passengers to travel through a parking lot without a clearly identified pedestrian path. Figure 2.6 illustrates an improved example with a clearly defined path from the bus stop to the building. An even better example appears in Figure 2.7 in which the building is not deeply set back from the street.



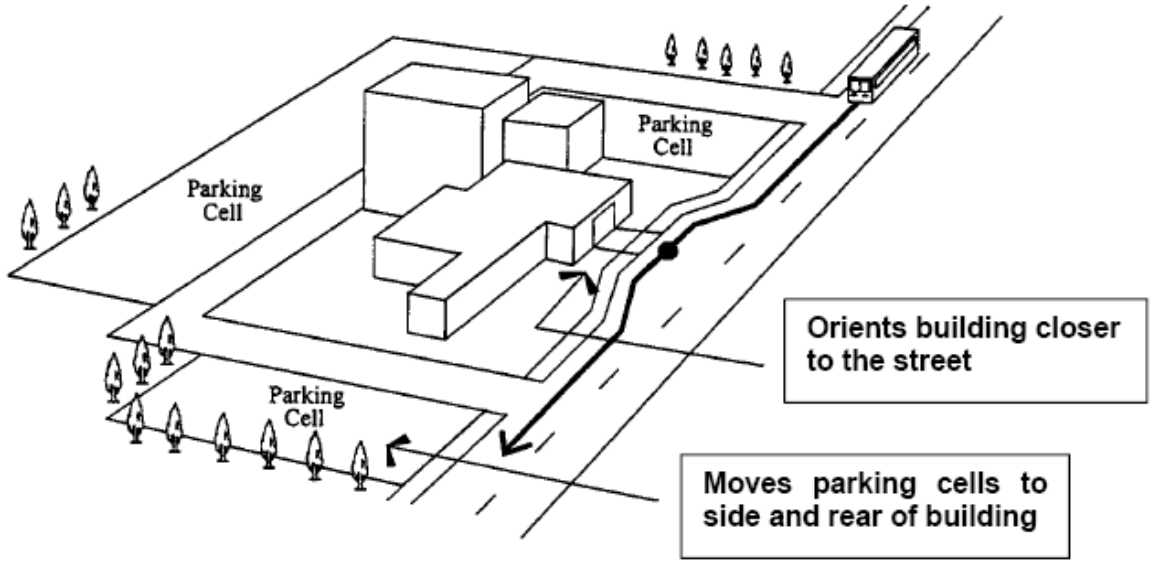
Source: Transit Cooperative Research Program, Report 19

Figure 2.5 Poor Example of Facility Site Plan



Source: Transit Cooperative Research Program, Report 19

Figure 2.6 Improved Example of Facility Site Plan



Source: Transit Cooperative Research Program, Report 19

Figure 2.7 Ideal Example of Facility Site Plan

2.3 Bus Stop Spacing

The actual design of specific bus stops is treated in Section 5. However, this section focuses on spacing between bus stops, which is an important aspect of transit planning. As a general rule, transit passengers will not walk more than one-quarter mile to a bus stop. This guideline must be balanced against the fact that frequent bus stops and starts makes for a slow, uncomfortable journey for a transit passenger.

Actual distance between stops is a function of the adjacent land use and density. The table below is illustrative of industry practice in bus stop spacing. It is generally the practice that bus stops are placed at intersections. However, where there are major mid-block generators or long blocks without intersecting streets, mid-block stops may be required. Section 5 gives practical guidance on the design of such stops. Some links in a transit route have long distances where adjacent land does not front on the route. Bus stops should be avoided in these areas, regardless of the stop spacing warrant.

Table 2.1 Design Criteria for Bus Stop Spacing

Density Characteristics	***Spacing Dimensions***
MAJOR ACTIVITY CENTERS – Activity centers such as hospitals and universities	Major facilities should be served.
HIGH – 5.000 persons per square mile. Apartments, seniors' housing, offices, and commercial. Density > 4 units/acre.	Approximately every 1/2 mile
MEDIUM – 2,000-4,000 persons per square mile. Density about 3 units/acre.	Every 1/2-3/4 mile
LOW or RURAL – Less than 2,000 person per square mile. Density = 1-2 units/acre.	Every 3/4 -1 mile or on flag stop

2.4 Transit-Oriented Development or Design (TOD)

Transit-Oriented Development or Design refers to a development that is centered around and coordinated with a bus and/or rail transit station in its use and design. The intent of TOD is to establish land uses and to design structures and public areas that will encourage people to ride transit more often. Typically, a TOD project has the following physical characteristics:

- *Mixed Uses.* Land uses are mixed and may include a combination of residential, commercial, retail and entertainment activities.
- *Compact Development.* Development is more "packed in," at medium to high densities. Parking is often limited.
- *Location within walking distance of transit.* Boundaries of the TOD area extend approximately ¼-mile from the transit center, a distance that can be covered in about five minutes.

- *Neighborhood Focal Point.* Open spaces or plazas near the station function as community gathering spots.
- *Pedestrian Orientation.* Streets and open spaces are friendly to pedestrians.

Transit-oriented projects can be designed with layouts and site features that enhance transit accessibility and convenience, resulting in diminished reliance on private automobiles for routine trips. For example, developers should endeavor to place commercial, office, institutional, apartment, and other high-intensity uses along existing and proposed transit corridors/centers, or within ¼ mile of them. This strategy will increase density patterns and evolve into a positive planning policy that many local governments and transit advocates support. For the elderly and mobility-impaired, distance is particularly important when selecting their mode of transportation, and where they live.

Transit-friendly streets "balance" street uses, with respect to having any single mode of transportation dominate. In many cases, this means altering a street to make transit use more efficient and convenient, and less so for automobiles, while still accommodating them. When these alterations are properly executed, a kind of equilibrium is achieved among transit, cars, bicycles, and pedestrians. Transit-friendly streets accomplish the following four goals:

- Establish a clear priority for transit vehicle operations with convenient, accessible transit stops;
- Reduce conflicts between cars and other vehicles, including reduction of vehicle speeds;
- Where practical, create a strong pedestrian orientation, including adequate circulation space, ease in crossing streets, and appropriate amenities, all of which contribute to comfort and convenience;
- Are integrated into large community development or livability strategies, which involve working closely with affected communities.

Because streets have many different patterns of use, there is no single way to achieve an optimum balance. Therefore, strategies such as transit malls sometimes fail. However, transit advocates have found that this balance can be achieved more effectively when the public participates in the planning process.

2.5 Transit and Land Use Interaction

SunLine staff is frequently asked the question why service is not extended into newer subdivisions. This section describes the interaction between transit and land use which determines transit productivity.

Figure 2.8 on page 22 illustrates weekday transit boarding density per square mile throughout SunLine's service area. Some communities have over 100 customer boardings per square mile per day which may be attributed to the distribution of auto ownership rates and population density.

While mass transit transportation is a public service, some business measures of performance are necessary to evaluate its efficiency. A useful measure is **vehicle productivity** which is the ratio of passengers carried for every hour a bus is in revenue service – not traveling to and from the garage. A bare minimum level of this measure is about 20 passengers per hour. Even at this level, using SunLine costs and fares, the ratio of farebox revenue to operating cost will be about 22%.

Assuming we have a neighborhood about a square mile with a route passing through it and it takes a bus about 5 minutes to pass through the neighborhood. If we want to have service every 30 minutes for all daylight hours, the number of bus hours in the neighborhood would be about 2 hours for the day. If the minimum acceptable boardings per hour is 20, this suggests that the number of boardings per square mile per day should be about 40. If hourly service is acceptable, the number of boardings per square mile per day would be about 20, a level achievable in more of the service territory.

Generally, new developments have lower density than the average density in the area. Figure 2.8 shows estimated boarding density which could be used as guide for future service expansion to new developments.

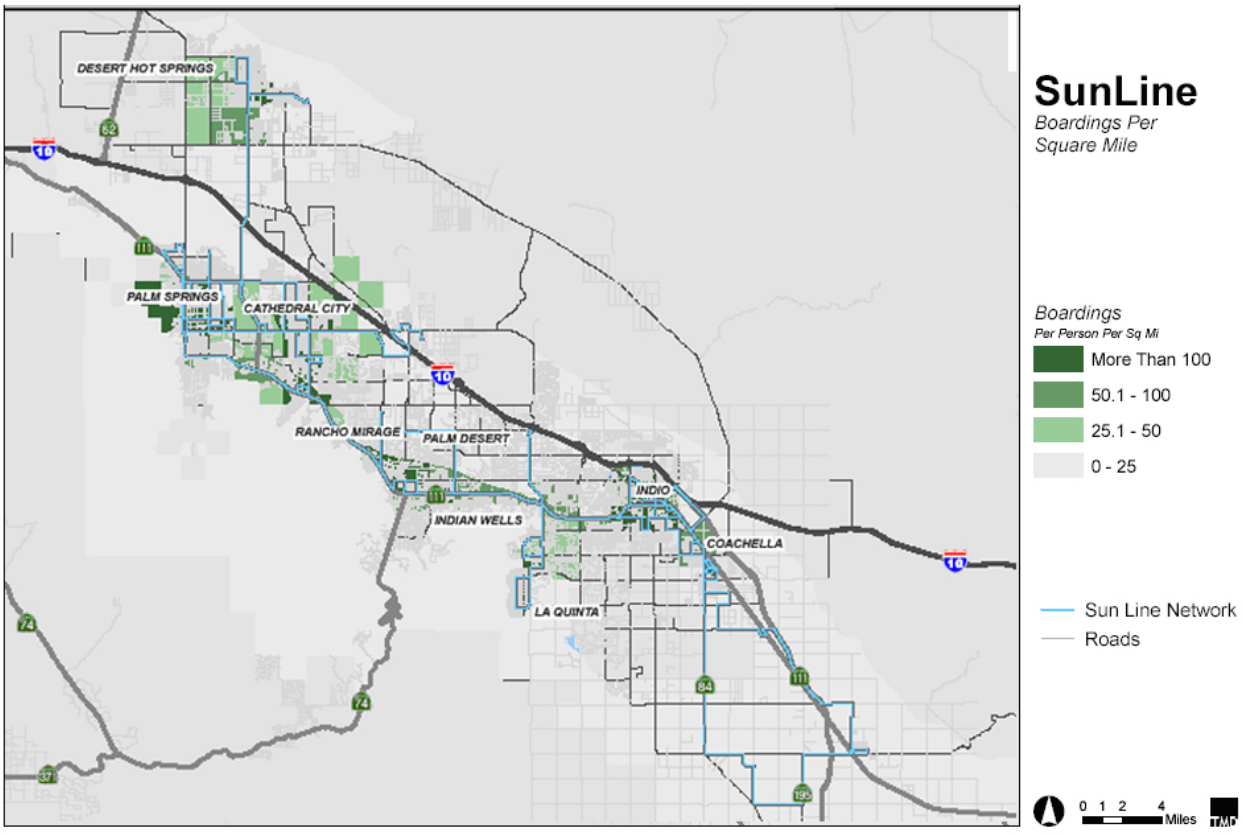


Figure 2.8 Boardings Per Square Mile Per Day

3. SunLine Fleet Characteristics

SunLine operates two types of service; SunBus, the fixed route service and SunDial, the paratransit service. SunBus consists of regularly scheduled routes using large buses that operate throughout the Coachella Valley. SunDial provides curb-to-curb service for the region's disabled population. While nearly all of SunLine's fixed route service operates on public streets, SunDial service occasionally operates on private property. Facilities with a large customer base among the region's disabled population should be particularly sensitive to the accessibility of their site by SunLine buses.

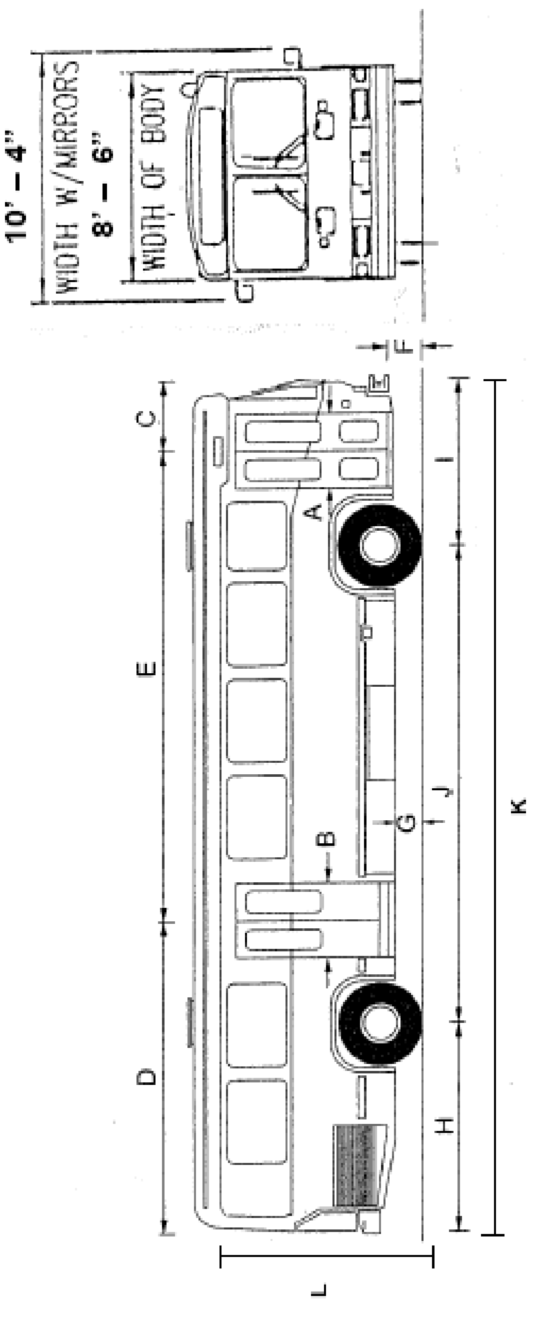
3.1 Bus Physical Characteristics

Figure 3.1 illustrates the physical dimensions for the 40 feet buses operated by SunLine. The description of breakover angle is intended to assure entrances to facilities and street-vertical curves are designed in such a way that buses do not "bottom out."

The weight of a loaded bus is summarized in the Table 3.1 below along with axle weightings with diagrams of both fixed route and paratransit buses shown on the next two pages.

Table 3.1 Loaded Bus Weight

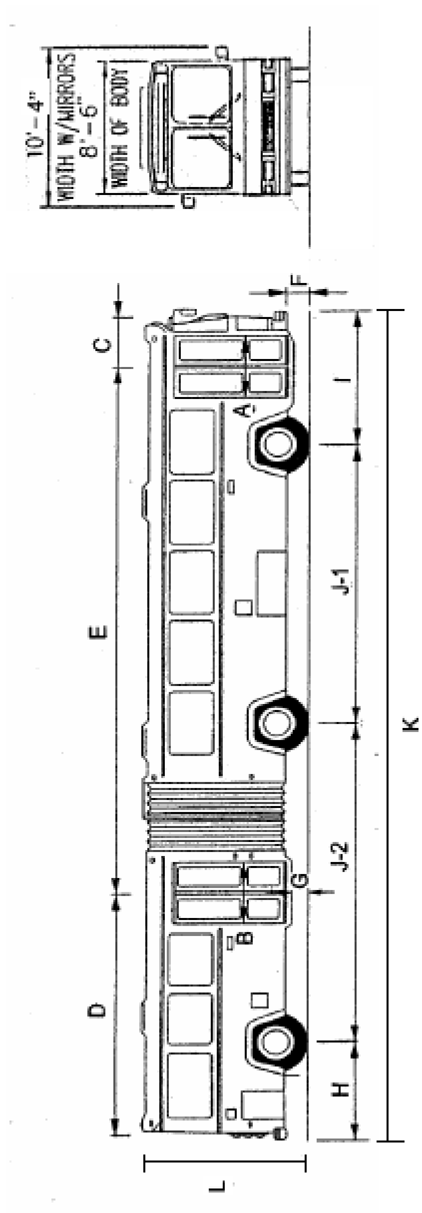
Total weight	40,500 pounds
Front axle	14,500 pounds
Rear axle	26,000 pounds



Key	Item	Typical Dimension
A	Clear Entrance Door Opening	2' - 6"
B	Clear Exit Door Opening	2' - 2.5"
C	Centerline of Entrance Door to Front	3' - 0"
D	Centerline of Exit Door to Rear	17' - 11.25"
E	Centerline of Entrance Door to Centerline of Exit Door	19' - 8"
F-1	Step Height to Ground at Entrance Door (not kneeled)	1' - 5"
F-2	Step Height to Ground at Entrance Door (kneeled)	0' - 9"
G	Step Height to Ground at Exit Door	1' - 4.5"
H	Rear Axle to Rear Bumper	9' - 4.75"
I	Front Axle to Front Bumper	7' - 3.75"
J	Length of Wheel base	23' - 9"
K	Body Length	40' - 0"
L	Body Height	10' - 5"
	Seat Capacity (excluding driver)[1]	44
	Standing Capacity	22
	Total Passenger Capacity	66

Source: Transit Cooperative Research Program, Report 19

Figure 3.1 40' Transit Bus Physical Characteristics



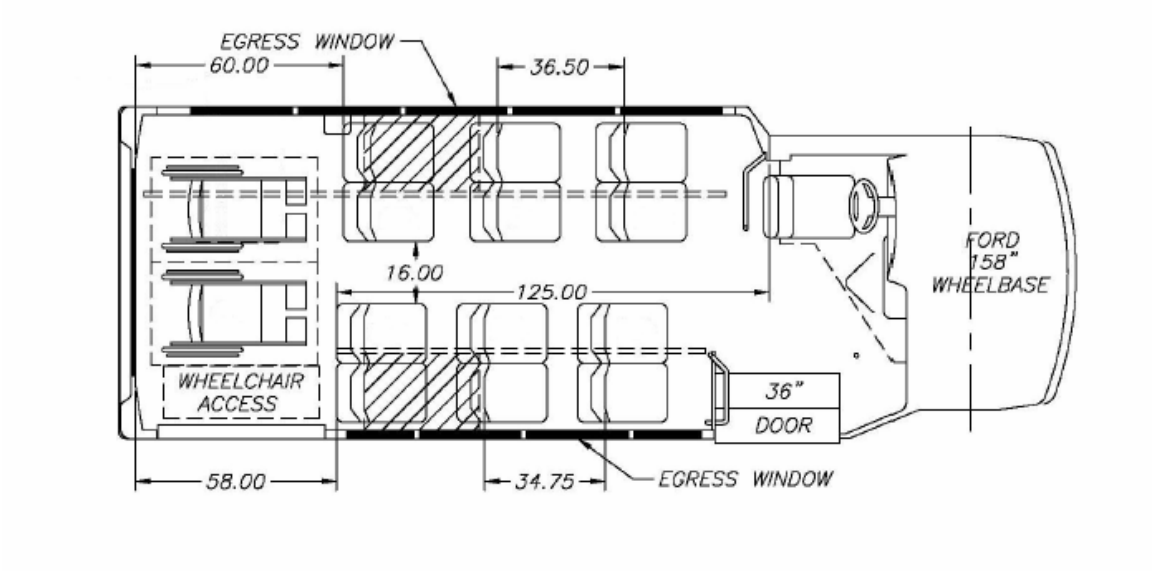
Key	Item	Typical Dimension
A	Clear Entrance Door Opening	3' - 2"
B	Clear Exit Door Opening	2' - 10"
C	Centerline of Entrance Door to Front (bumper outer edge)	3' - 5"
D	Centerline of Exit Door to Rear (bumper outer edge)	16' - 4"
E	Centerline of Entrance Door to Centerline of Exit Door	41' - 3"
F-1	Step Height to Ground at Entrance Door (not kneeled)	1' - 2"
F-2	Step Height to Ground at Entrance Door (kneeled)	9 - 7/8"
G	Step Height to Ground at Exit Door	1' - 3.75"
H	Rear Axle to Rear Bumper	10' - 11.5"
I	Front Axle to Front Bumper	8' - 1.5"
J-1	Length of Front Wheel Base	17' - 3"
J-2	Length of Rear Wheel Base	24' - 5"
K	Body Length	60' - 6"
L	Body Height	11' - 0"
	Maximum Horizontal Bend Angle	39 Degrees, ±
	Maximum Vertical Bend Angle	9 Degrees, ±
	Seat Capacity (excluding driver)	68
	Standing Capacity	51
	Total Passenger Capacity	119

Source: Transit Cooperative Research Program, Report 19

Figure 3.2 60' Articulated Transit Bus Physical Characteristics

Table 3.3 SunDial Paratransit Fleet Characteristics

Vehicle Feature	"Paratransit" Maximum Dimensions
Overall Height,	9 Feet, 0 Inches
Overall Length, w/bumpers	23 Ft, 0 In
Overall Vehicle Width	8 Ft, 0 In
Front Axle to Front Bumper	7 Ft, 5 In
Rear Axle to Rear Bumper	10 Ft, 0 In
Edge of Outside Mirror-to-Mirror	10 Ft, 0 In
Step to Ground, Front Entrance	0 Ft, 10 In
Step to Ground, Rear Entrance	Not applicable

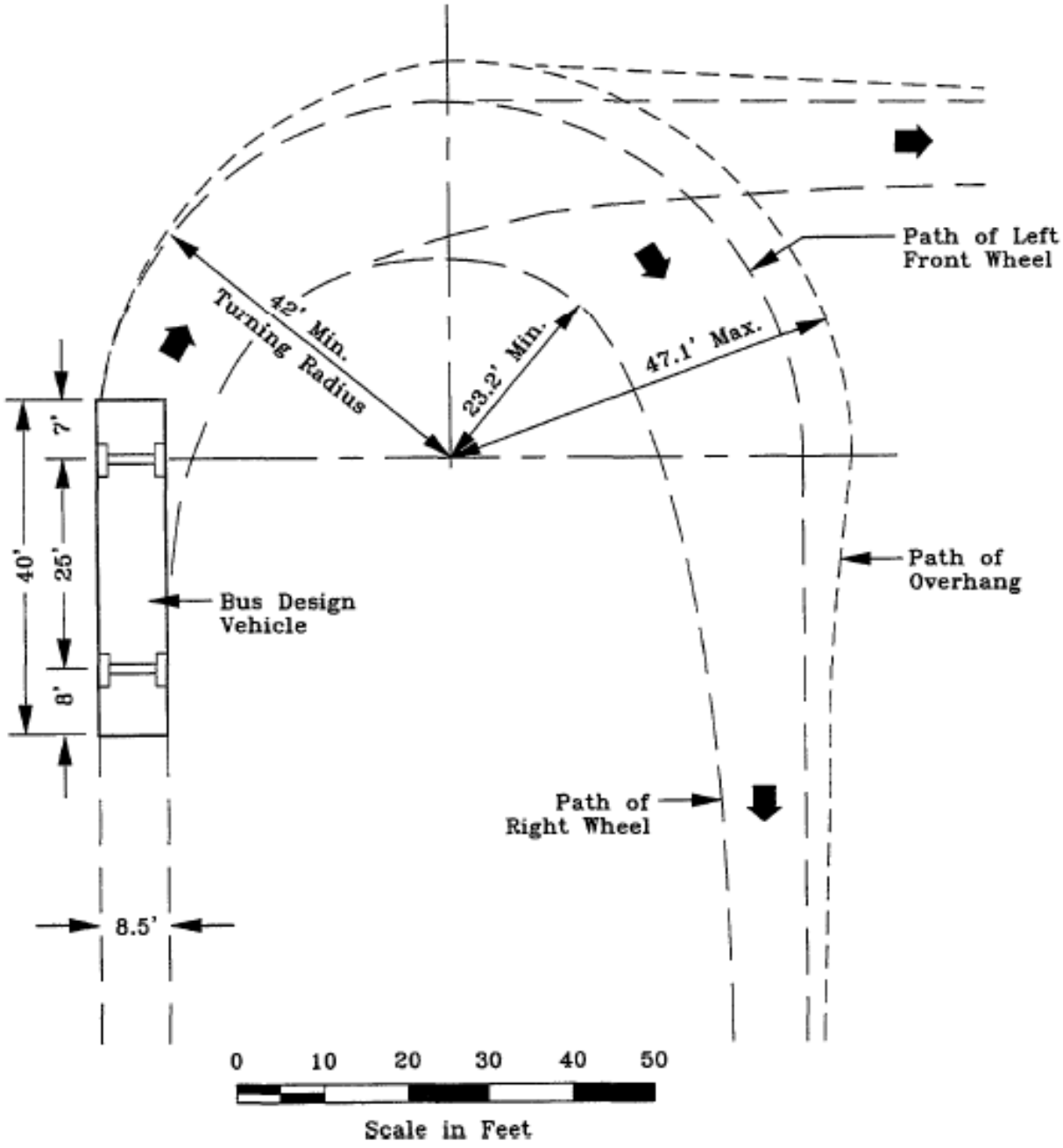


Source: Vehicle manufacturer

Figure 3.3 SunDial Bus Floor Plan

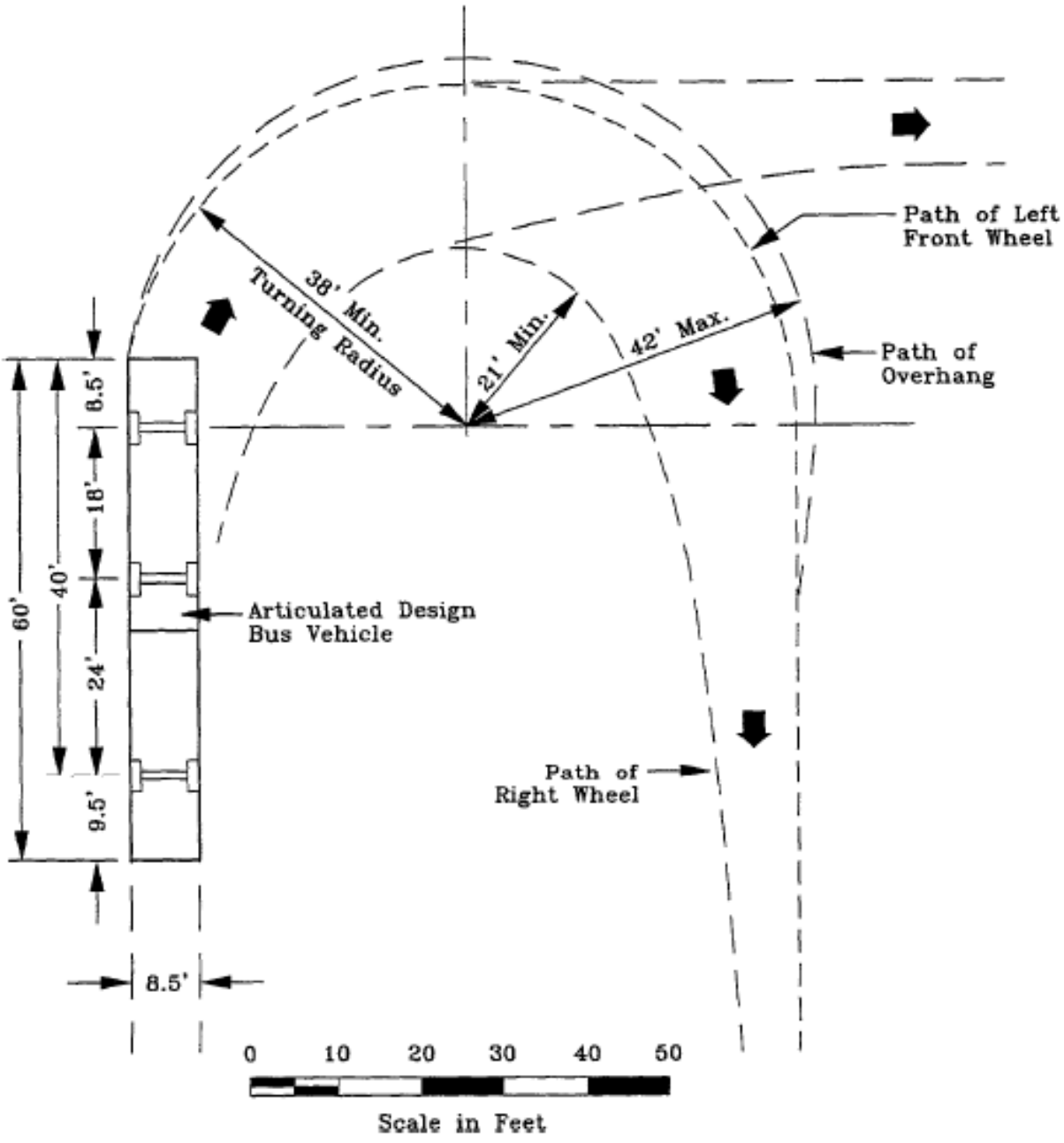
3.2 Bus Turning Templates

Figure 3.4 shows a turning template for a 40-foot bus. It illustrates the track of the front left bumper of the bus traveling around a curve as well as the track of the right rear tire. Articulated buses, with the capability of steering the third axle are able to turn with a slightly higher radius than the 40' bus. This scale drawing can be reversed for left hand turns. While a smaller template can accommodate smaller buses, using the larger template enables flexibility in the future. Further, this template is no larger than a template for a large delivery truck.



Source: Transit Cooperative Research Program, Report 19

Figure 3.4 Regular 40' Bus Turning Template



Source: Transit Cooperative Research Program, Report 19

Figure 3.5 60' Articulated Bus Turning Template

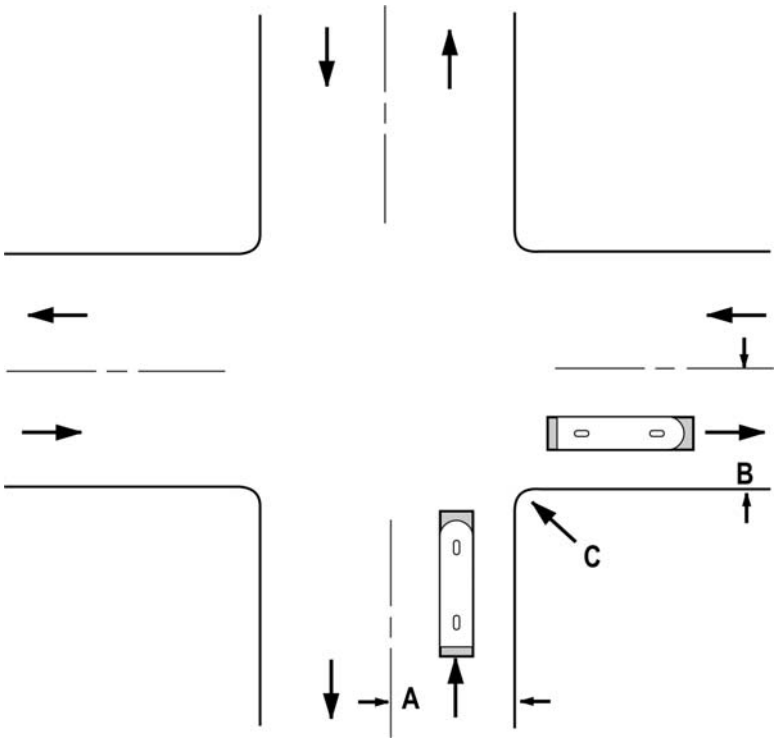
4. Streets and Intersections

The design of streets and intersections greatly affects the provision of transit services. Generally, bus stops are located at intersections for safety reasons, and proper design is necessary to assure safety of transit passengers, pedestrians, and motorists and to operate the intersection efficiently.

4.1 Intersection Radii

The radius of an intersection should be designed to facilitate turning movements and minimize lane encroachment by turning buses. Proper intersection design will allow appropriate bus operating speeds, decreased conflicts between buses and other vehicles at intersections, reduced travel times, and improved passenger comfort. Major factors that should be considered when determining intersection radii include on-street parking arrangements, the angle of intersection, transit vehicle turning radii, number and width of roadway lanes, and vehicle operating speeds.

During turning movements, transit vehicle encroachment into adjacent lanes of traffic should be avoided whenever possible to reduce vehicle conflicts. To accommodate a transit vehicle's 50-foot radius turn, parking should either be restricted or arranged to allow the vehicle to make smooth, unobstructed movements. SunLine recommends a 60-foot parking setback on the bus' approach to the bus stop and a 40-foot parking setback on the entry road. These setbacks should begin at the respective corner tangent points and should be sufficient to allow a 40-foot bus to pull up to the curb just beyond the bus stop sign. Parking setbacks will reduce conflicts between transit vehicles and parked cars, thereby allowing proper transit vehicle turns. The recommended curb radius and parking setback for various street intersection configurations are illustrated in the figure and table below. Designers should note that a larger turning radius increases the distance across the street and that, at signalized intersections, the green phase for crossing pedestrians should be appropriately elongated. Alternatively, a pedestrian refuge in the middle of the intersection can be established.

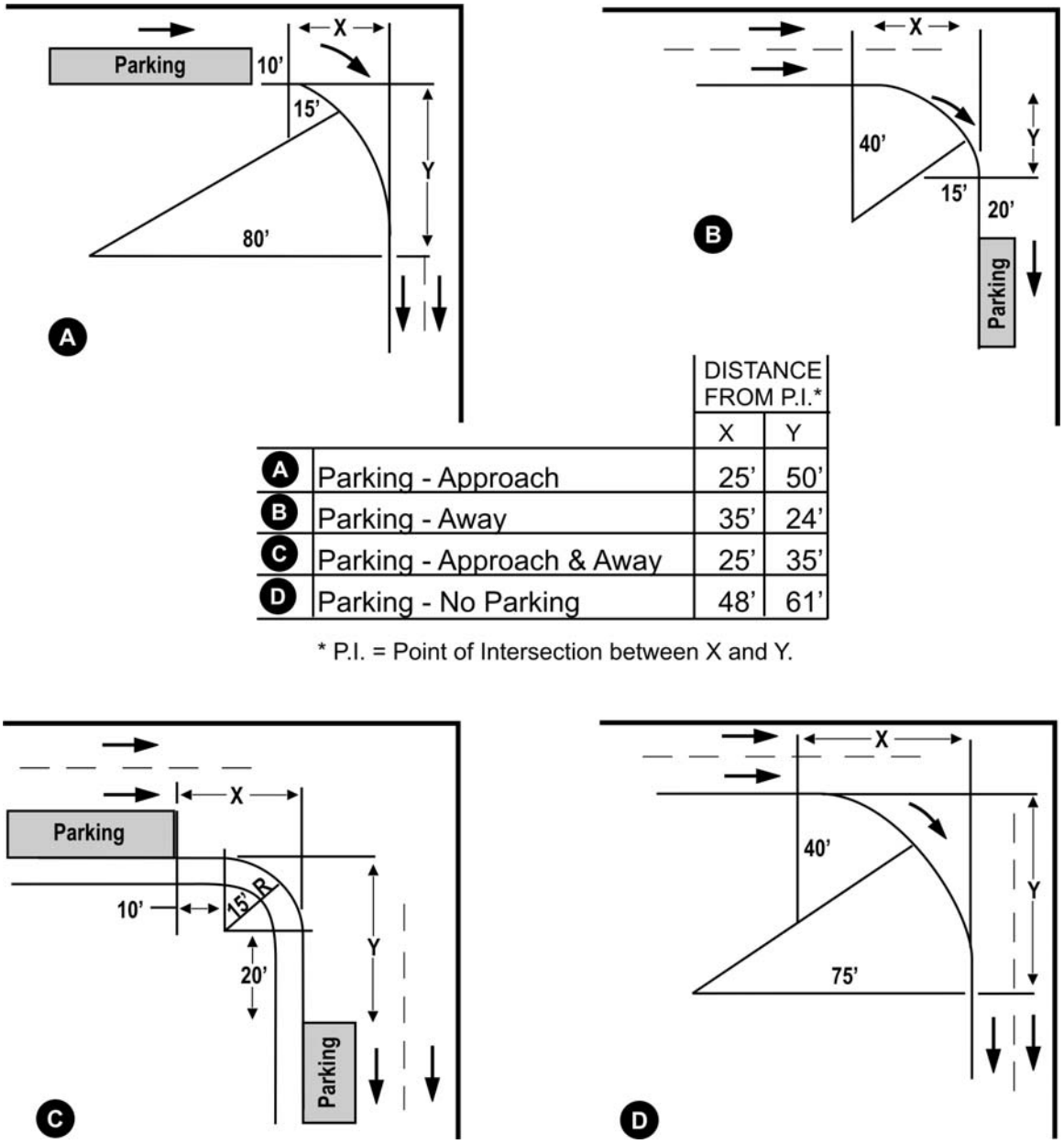


A Approach Width (feet)	B Entering Width (feet)	C Radii * (feet)
12 (1 lane)	12 16 20 24	50 45 40 35
16 (1 lane with 4-foot shoulder)	12 16 20 24	45 40 30 25
20 (1 lane with parking)	12 16 20 24	40 35 30 25
* Assumes no parking on cross street and minimal lane encroachment on opposing travel lanes.		

Source: Transit Cooperative Research Program, Report 19

Figure 4.1 Recommended Intersection Corner Radii

An alternative design where there are no bus stops at the intersection is shown in the figure below. It illustrates the effect of parking on the design of the curb.

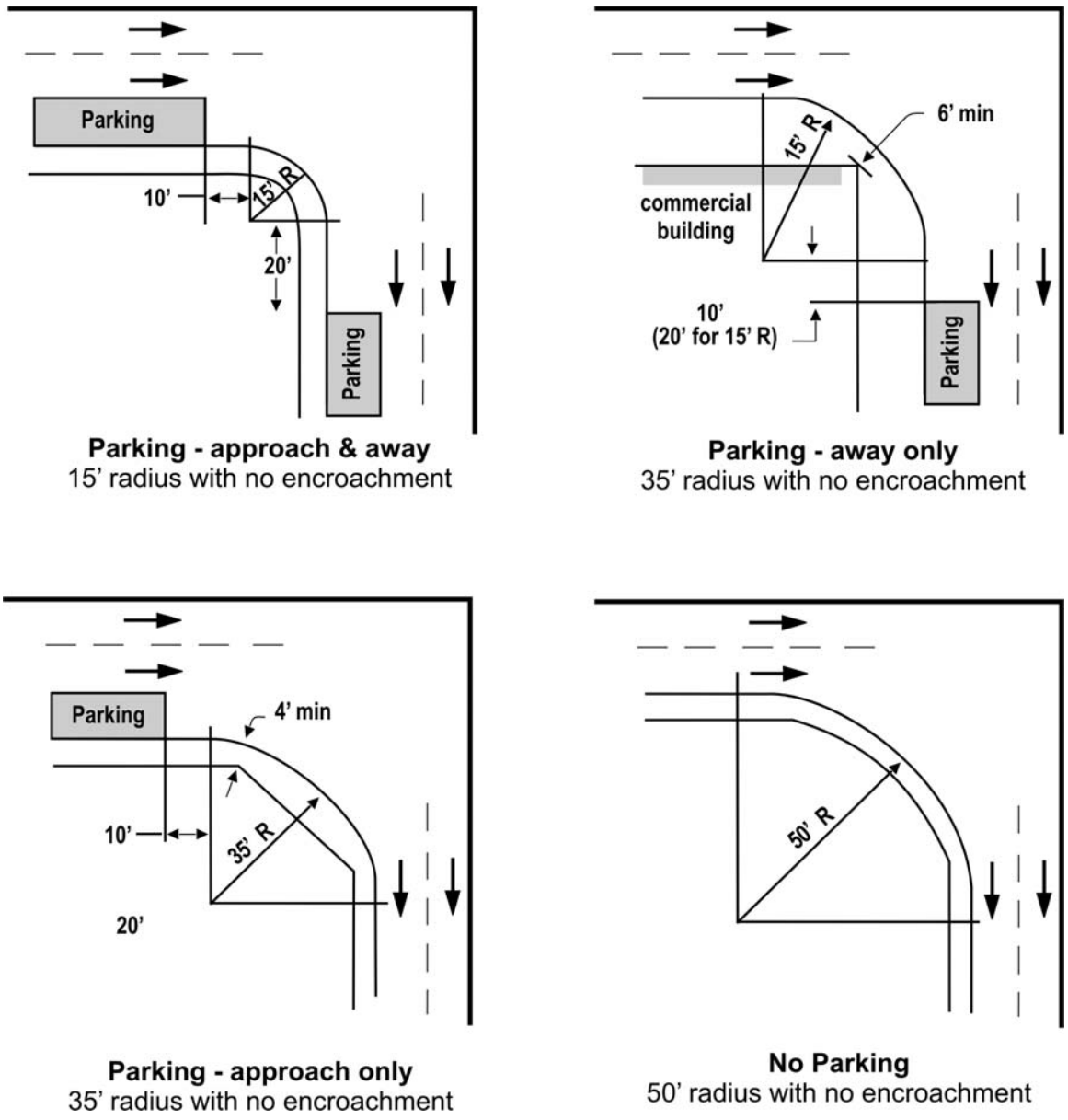


		DISTANCE FROM P.I.*	
		X	Y
A	Parking - Approach	25'	50'
B	Parking - Away	35'	24'
C	Parking - Approach & Away	25'	35'
D	Parking - No Parking	48'	61'

* P.I. = Point of Intersection between X and Y.

Source: Riverside Transit Agency

Figure 4.2 Two-Center Curb Design for Intersections Without Bus Stops



Source: Riverside Transit Agency

Figure 4.3 One-Center Curb Design for Large Buses

4.2 Parking and Loading Zones

In built-up commercial areas, there should be sufficient space for on-street truck loading and unloading. If there is no provision for deliveries, truck drivers will inevitably park at bus stops or double park, neither of which is beneficial for transit service or efficient traffic flow.

4.3 Crest and Sag

The distance between the front and rear axle of a bus poses 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' 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 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.

Table 4.1 Minimum Vertical Curve K-Values

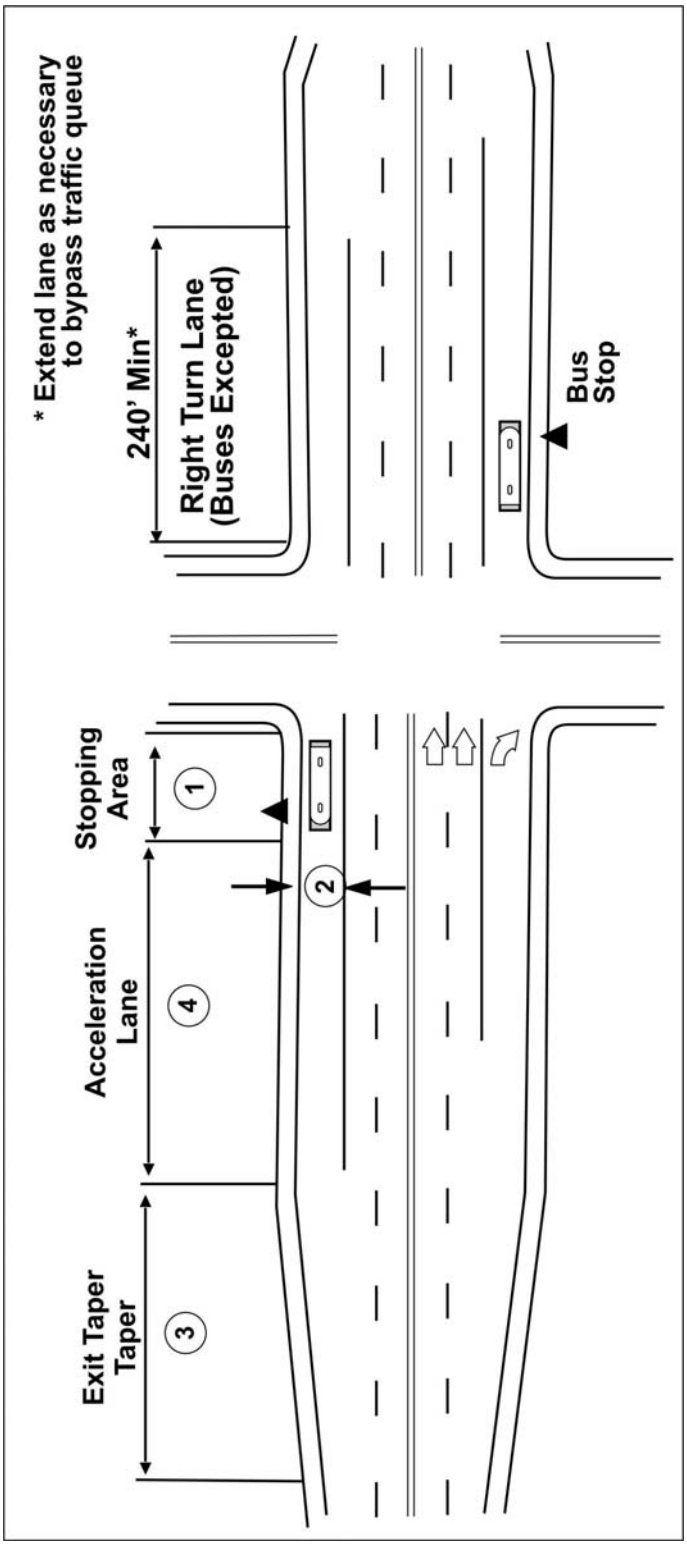
Speed (mph)	Crest (ft)	Sag (ft)
60	160	105
50	85	75
40	55	55
30	28	35

4.4 Road Surfaces

Roadway pavements need to have sufficient strength to accommodate repetitive bus axle loads of up to 25,000 pounds. Concrete is preferred to avoid failure problems that are experienced with asphalt, especially where buses start, stop, or turn. Concrete aids in the retention of roadway surface shape, drainage capabilities, and skid resistance. Rarely will SunLine buses use unpaved roads or parking surfaces. Most of the municipal and county pavement design standards are suitable for SunLine buses.

4.5 Bus Queue Jumps

The Queue Jump 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 stop. This treatment requires that this lane be posted "Right Turn Only – Except Buses" (see Figure 4.4 on the next page). Ideally, SunLine prefers not to have this kind of street treatment because of safety concerns and conflicts with other vehicles; however, SunLine will work each jurisdiction and the County should the need arise to use this type of street treatment.



Source: Transit Cooperative Research Program, Report 19

Figure 4.4 Queue Jump Design – Right Turn Only Lane

5. Transit Facilities Design

5.1 Bus Stops

Bus stops are the interface between the transit vehicle network and the sidewalk network. Accordingly, they must be designed from both the on-street perspective and the pedestrian perspective. Section 2 (*Transit Friendly Design*) discussed network issues of bus stop spacing. Design issues are addressed in this section.

5.1.1 SunLine's Bus Stop Improvement Program

In October 2005, SunLine initiated the Bus Stop Improvement Program to improve bus stops in its service area in Coachella Valley. As part of the Comprehensive Operational Analysis (COA) recently completed, SunLine evaluated existing bus stops to determine how to improve amenities located along bus routes. Results of the COA recommended improving and enhancing bus stops located throughout the valley.

5.1.2 Bus Stop Placement Policies

The proper location of bus stops is critical to the safety of passengers and motorists, and to the proper operation of the transit system. Bus stop locations are recommended by SunLine and approved by the local jurisdictions. Local jurisdictions can suggest bus stop locations at their discretion; however, because of the numbers of factors involved, each new or relocated bus stop must be examined on a case-by-case basis. It is important to consider these unique circumstances at each possible site when selecting bus stop locations including the following:

- Spacing along the route
- Proximity to and expected trip generators
- Adequate right-of-way to ensure the bus stop meets the Americans with Disabilities Act (ADA) accessibility standards
- Presence of sidewalks and curb ramps leading to trip generators and nearby pedestrian circulation system
- Width, placement and condition of sidewalks
- Protected crossings at signalized or stop controlled intersections, or at crosswalks
- Conflict between buses, other vehicles and pedestrians
- Pedestrian activity through the intersection
- Open and visible spaces for personal security and passenger visibility
- Street illumination
- Ability to control parking

- Adequate curb space for the number of buses expected to be at the bus stop, and return to the traffic flow
- Volume and turning movements of other vehicles including bicycles
- Proximity and traffic volumes of nearby driveways, and traffic safety
- Street and sidewalk grades
- Convenient passenger transfers to intersecting bus routes
- Ease for bus re-entering the traffic stream
- Bus route turns
- Unusual intersection angles or predominant turning movements
- Proximity to rail crossings
- Sight distance at adjacent intersections and driveways

5.1.3 Bus Stop Location

The proper location of bus stops is critical to the safety of passengers and motorists, and to the proper operation of the transit system. Bus stops are generally located at intersections where they maximize pedestrian accessibility from both sides of the street and provide connection to intersecting bus routes. The first design determination in bus stop placement is whether stops should be near side (before the intersection), far side (after the intersection), or mid-block. Very frequently, bus turning movement and the location of major generators dictate the placement of stops at or near an intersection. While there are compelling reasons to have the stop at either side of an intersection, two factors - right turn on red and the introduction of automatic traffic signal priority - increase the desirability of far side stops.

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 their bus are not missed.

Bus stop 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. Further, if the traffic control at an intersection is a stop sign on either the route or intersecting street or both, near side stops can impede sight distance and should be avoided.

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 close to the crosswalk	May obscure motorists' view of traffic control devices and crossing pedestrians
Allows operators to use the width of the intersection as an acceleration lane	May obscure line of sight distance for the motorists crossing the intersection
Eliminates potential double stopping through intersection	May obscure line of sight for crossing pedestrians
Allows riders to board and alight at 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

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
Allows operators to use the width of the intersection as a deceleration lane	May require double stopping (before and after intersection) to serve the bus stop
Allows operators to use gaps in traffic created by the traffic signal	May restrict or choke travel lanes on far side of intersection

Mid-Block

Advantages	Disadvantages
Minimizes motorist and pedestrian line of sight concerns	Requires additional no-parking restrictions at the bus stop
Minimizes cross street pedestrian congestion	Encourages rider street crossing (or jaywalking)
	Increase walking distance from intersections

The Far Side may be better where:

- Buses regularly execute many left turns at intersections. The far side stop provides a more convenient service point after such turns;
- Dedicated, high-volume right run lanes are present;
- Easier bus re-entry into traffic compensates for gaps created by traffic signals;
- Complex intersections occur with multi-phased signals, dual turn lanes, etc. far side stops remove buses from complicated maneuvers and circulation activities in and around intersections.

The Near Side may be better where:

- Transit users can board or alight from buses closer to crosswalks and intersections, thereby often minimizing walking distance to connecting transit service;
- There may not be sufficient room for an accumulation of multiple buses at the far side. Then, to avoid buses spilling over into the intersection area, the near side becomes preferable.

Mid-Block may be better where:

- It is simply the safest location to stop;
- A less congested location away from the intersection is preferred;
- The bus makes a relatively sharp right turn and can't maneuver into a far-side stop;
- Long stretches of road offer no suitable intersecting streets or traffic stops.

Special Circumstances may override these general rules where:

- Transfer activity between two routes exhibits a strong directional pairing (i.e. heavy volumes from eastbound to northbound). Then, placing one bus stop nearside and one far side can minimize pedestrian activity through the intersection;
- If a single trip generator/attractor (school, office, shopping center, etc.) weighs heavily on an intersection, and then the bus stop should be located closest to that generator, whether near or far side.

SunLine staff makes many of these locational recommendations during the normal development review process. However, all interested parties are advised to consult SunLine staff whenever special circumstances arise regarding bus stop placement.

5.1.4 Stops and Intersection Geometry

Information on pages 37 and 38 summarizes the advantages and disadvantages related to locating bus stops on the farside, nearside, and mid-block, as well as conditions under which each location may be recommended. The placement of bus stops at intersections varies from site to site. General conditions that should be considered when placing bus stops at intersections include:

- When the route alignment requires the bus to make a left turn, the preferred location for the bus is the farside of the intersection after the bus completes the left turn.
- When the route alignment requires the bus to make a left turn and it is not feasible or desirable to locate the bus stop on the farside of the intersection after the bus turns, a mid-block stop may be warranted. The mid-block bus stop should be located about 500 feet from the intersection so that the bus can easily maneuver into the proper lane to turn left. If a mid-block is necessary, SunLine will work with the jurisdiction and developer to incorporate design elements to discourage bus patrons from jay-walking.
- If there is a high volume of vehicles turning right at an intersection, the preferred location for a bus stop is on the farside of the intersection after the turn.
- If the route alignment turns right at the intersection, the preferred location for the bus stop should be on the farside of the intersection after the bus turns.
- In situations where two or more buses stop at a farside bus stop, which spills over into the intersection and additional length is not available, the bus stop should be placed on the nearside of the intersection. This reduces the potential for queuing buses to overflow into or block the intersection.
- At intersections with complex, multi-phased traffic signals or dual right or left turn lanes, farside bus stops are preferred because they eliminate buses from an area of complicated traffic movement at that intersection.
- When passenger transfers between two bus routes show a strong directional pairing, e.g. heavy passenger volumes from eastbound to southbound, placing one bus stop on the nearside and the other on the farside can curtail pedestrian activity at the intersection.

The street geometric design of bus stops is illustrated in the figures on the next three pages. These enable buses to pull into the curb and not block through traffic. In the case of farside and mid-block bus stops, they also enable buses to return to the traffic stream without a hard left turn. The layouts shown are for a 40 foot bus; however on major streets, where there is a possibility of using a 60 foot articulated bus, this would require adding 20 feet. The design shown should not be confused or construed for designing bus turnouts. Design criteria for bus turnouts appear later in this chapter.

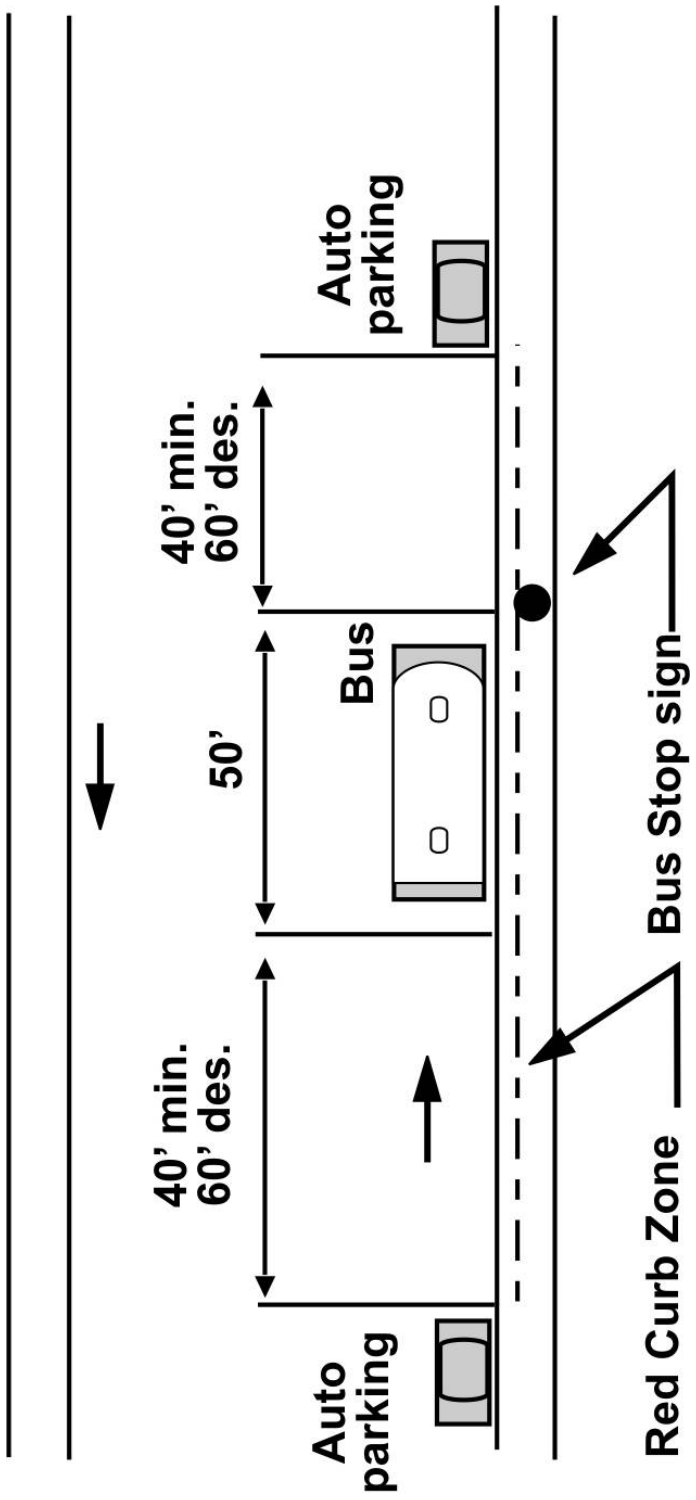


Figure 5.1 Mid-Block Bus Stop Geometry

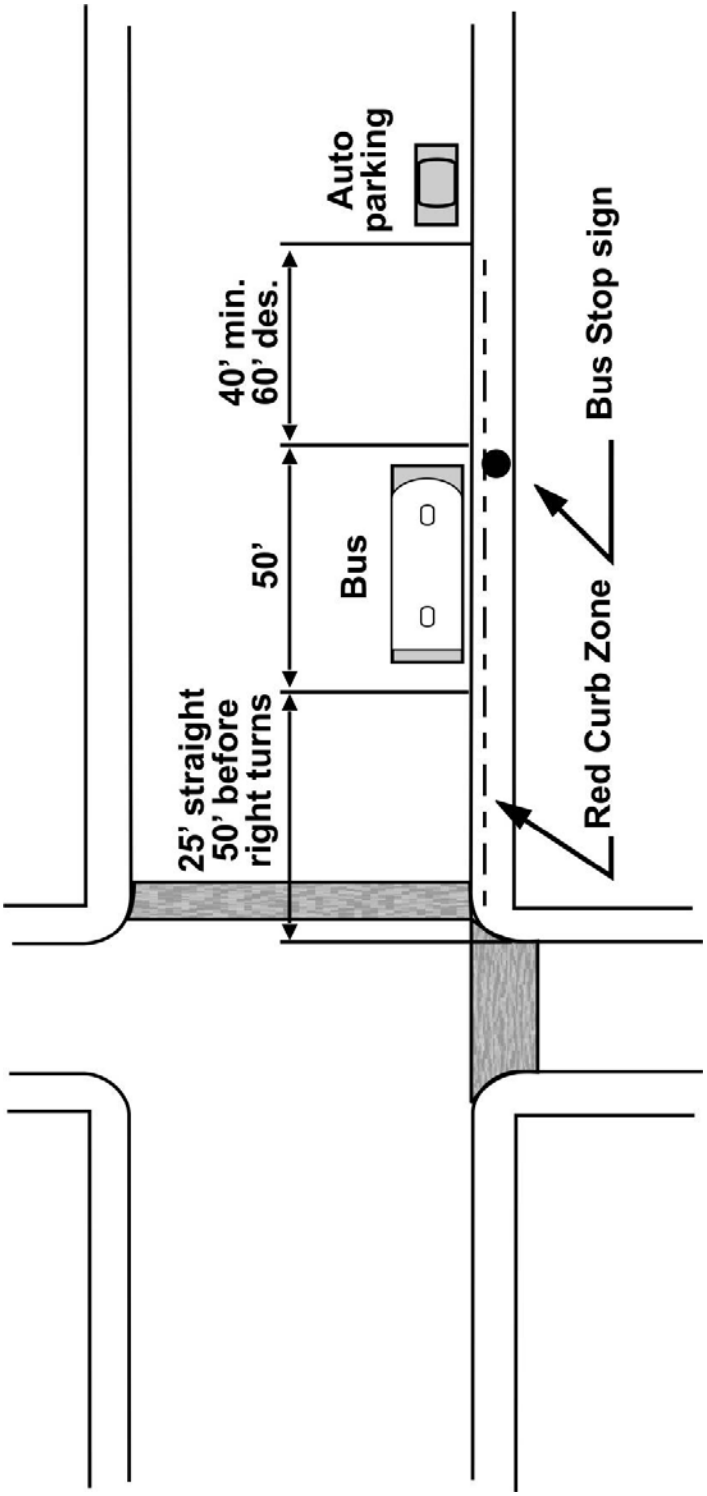
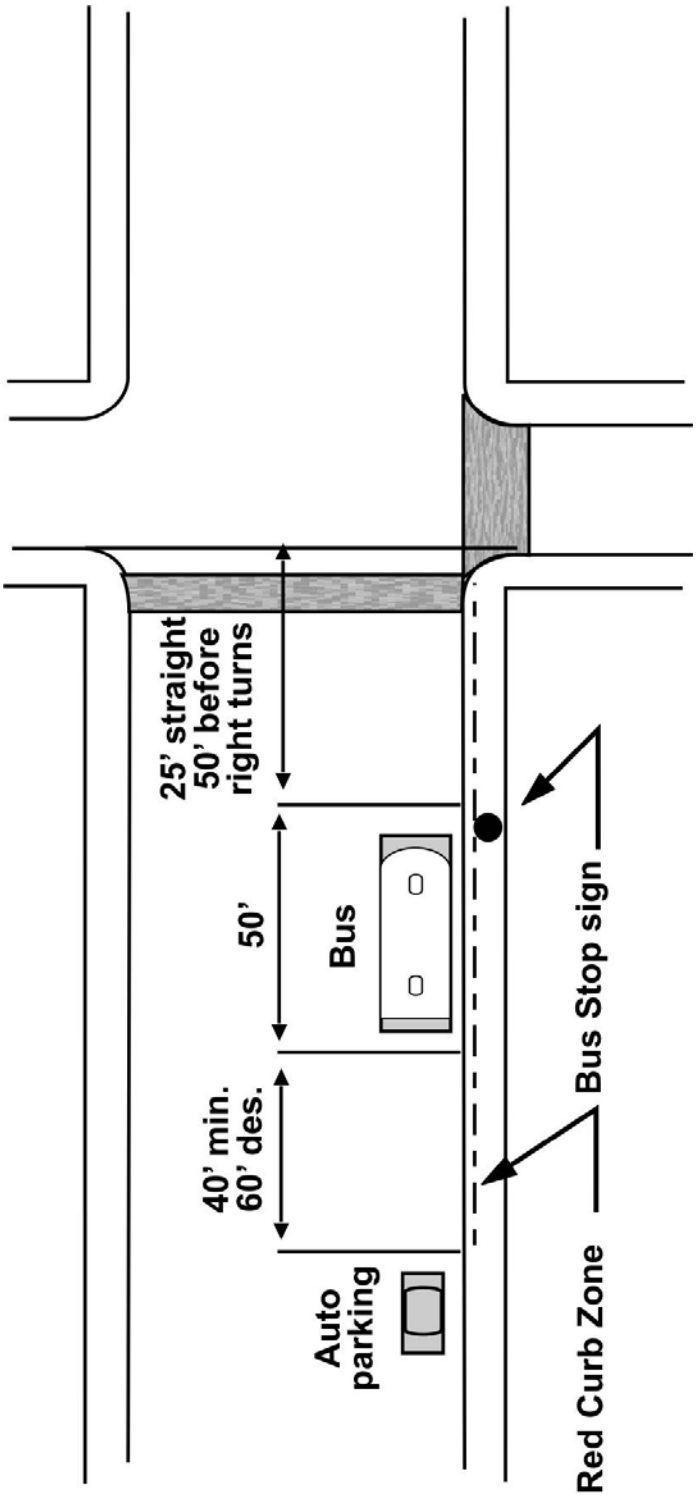


Figure 5.2 Farside Bus Stop Geometry



These dimensions are for stops for a single bus.

Source: Riverside Transit Agency

Figure 5.3 Nearside Bus Stop Geometry

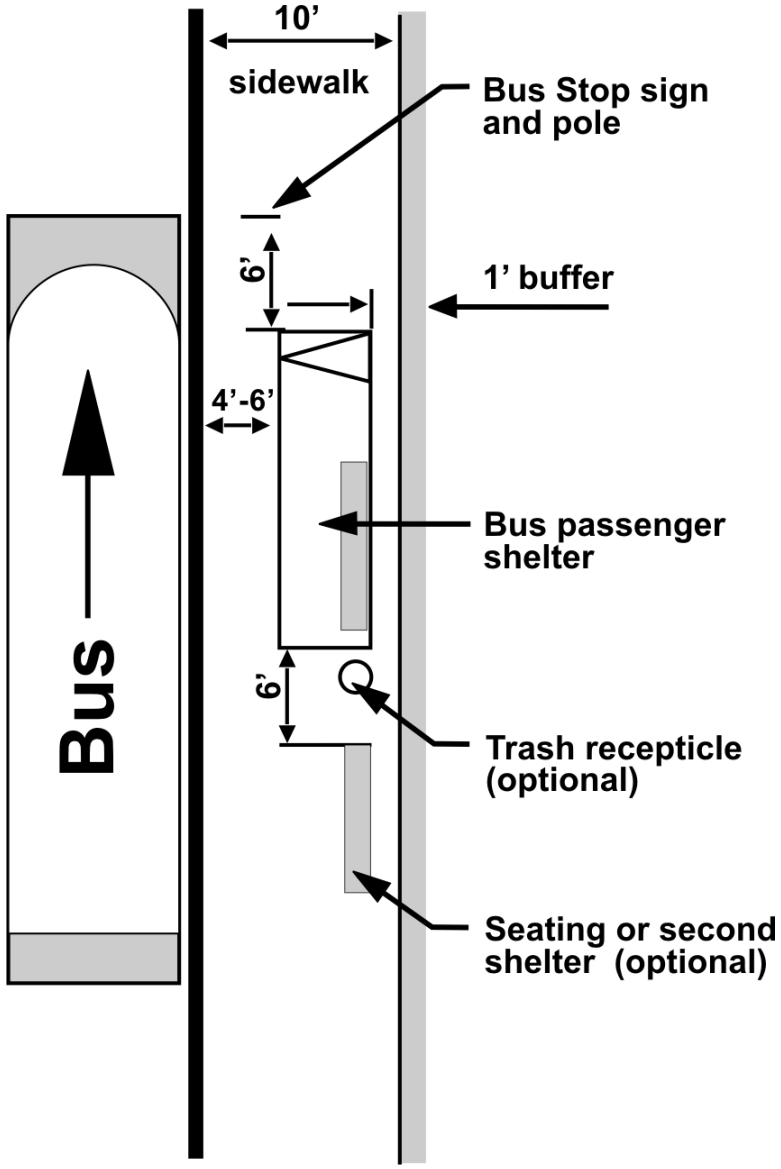


Figure 5.4 Design For Standard Bus Stops

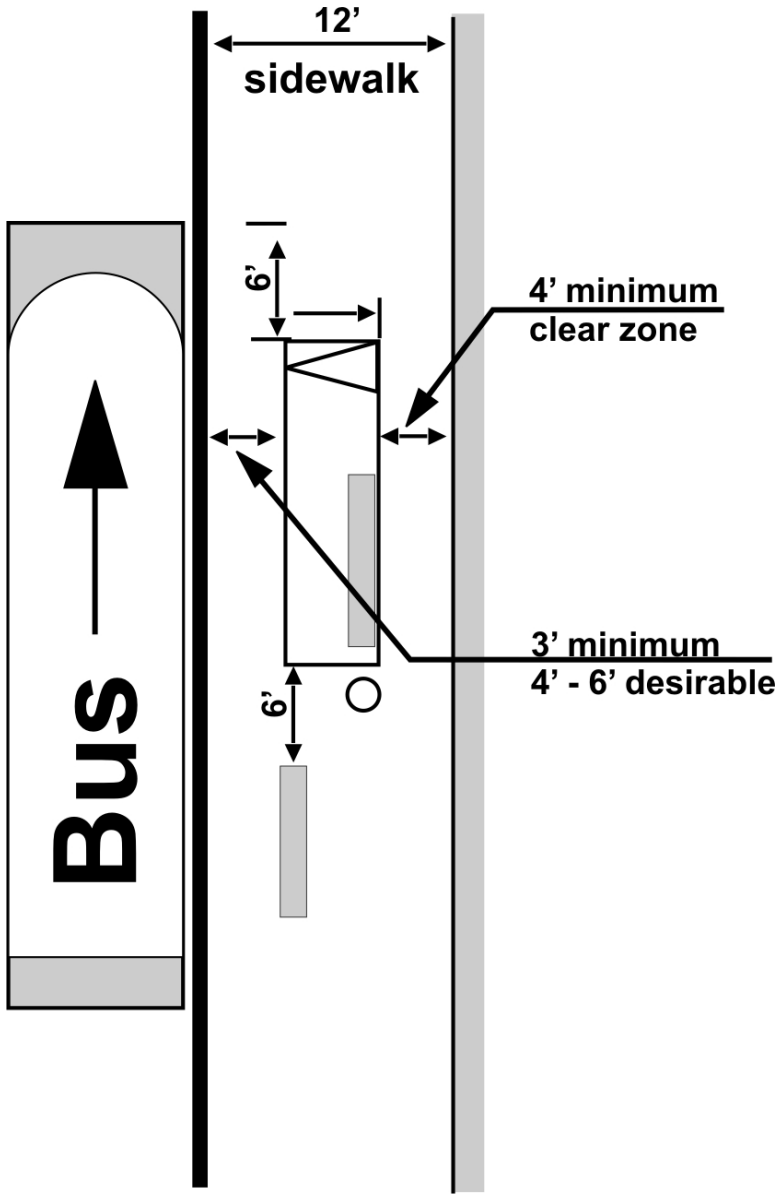
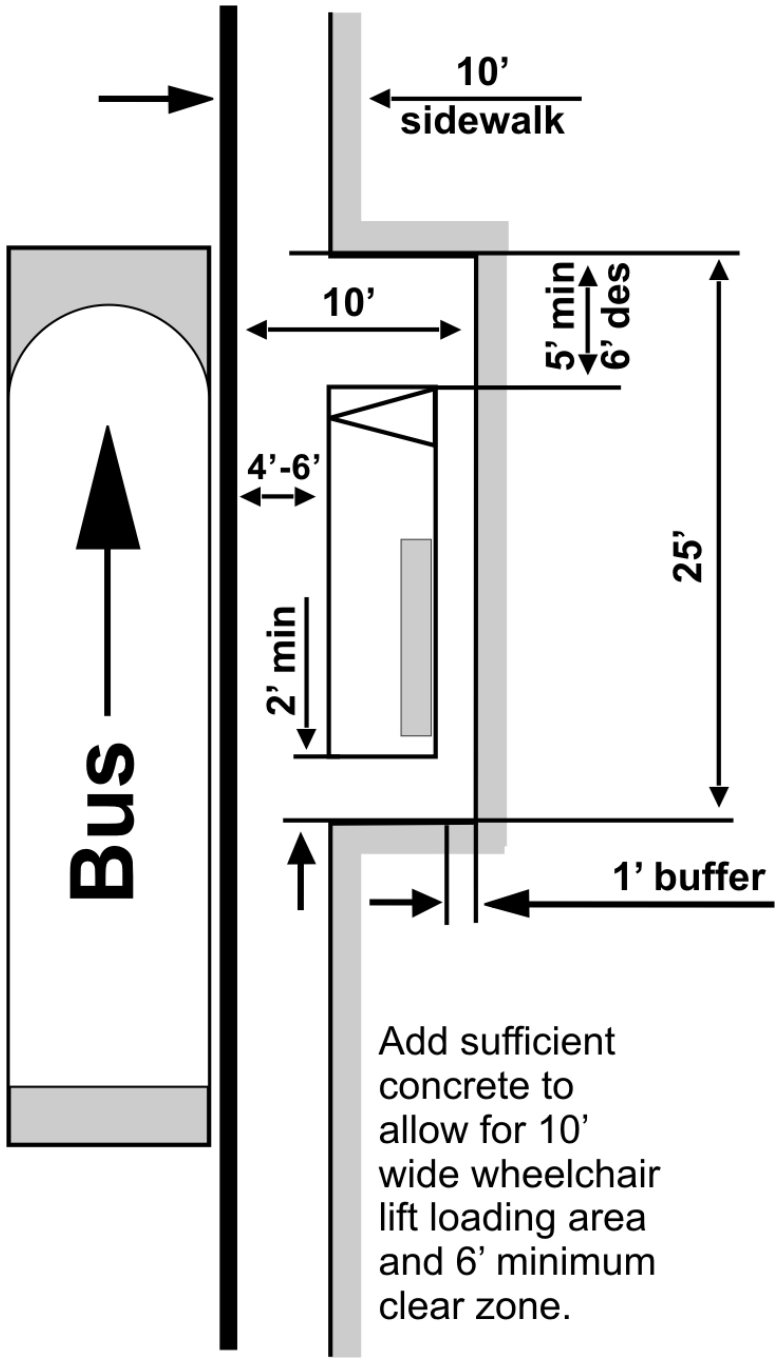


Figure 5.5 Design For Bus Stops on Sidewalks More than 12’ Wide



Source: San Diego Metropolitan Transit Development Board

Figure 5.6 Design for Bus Stops on Narrow Sidewalks or Severely Constrained Locations

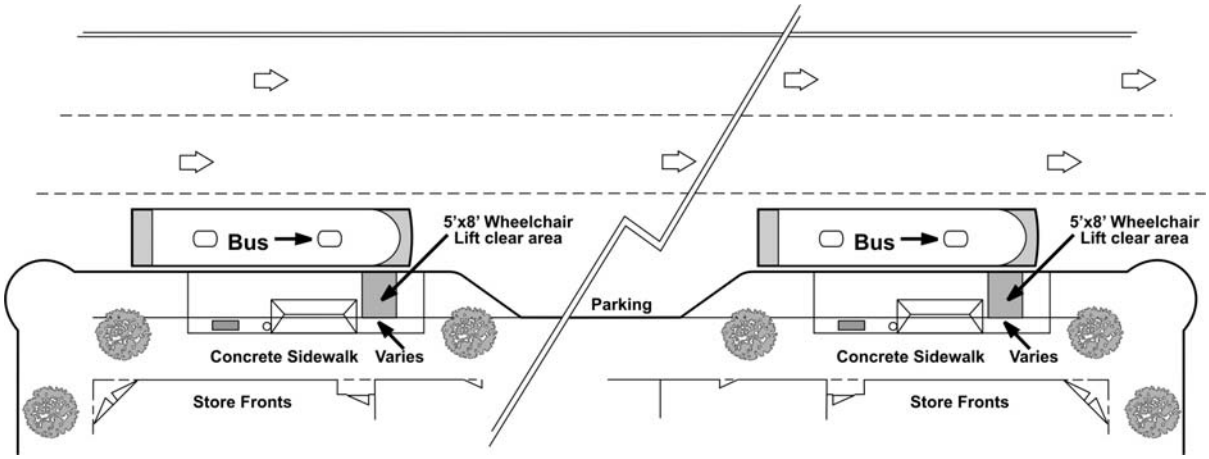
Bus Bulbs

In some areas where it is not feasible to construct a bus turnout, a bus "bulb" may be desirable. Bus bulbs, also known as nubs or curb extensions may solve the problem of locating bus amenities in dense urban environments with considerable traffic. A bus bulb is an extension of the sidewalk through the parking lane that is directly adjacent to the travel lane, which eliminates the requirement of buses to pull into a curb area and re-enter the traffic stream. Bus bulbs are used when space limitations prevent the inclusion of amenities and may create additional space at a bus stop for bus shelters, benches, and other transit improvements along sidewalks. Bus bulbs may also provide additional space for transit patrons to board and deboard the bus away from pedestrian traffic and sometimes shortens the walking distance across a street.

Bus bulbs may be considered at areas along crowded city sidewalks with high passenger volumes where parking along the curb is allowed. Locations with the following characteristics listed below may be suitable for bus bulbs. They include:

- High pedestrian activity areas
- Sidewalks with high pedestrian usage
- Need to reduce pedestrian crossing distances
- Bus stop in travel lanes

Bus bulbs have specific applications along streets with lower traffic speeds and/or low traffic volumes where buses can stop in the traffic lane. They should be designed to accommodate vehicle turning movements to and from side streets and should be part of a larger sidewalk and streetscape strategy. A typical bus bulb layout is shown below.

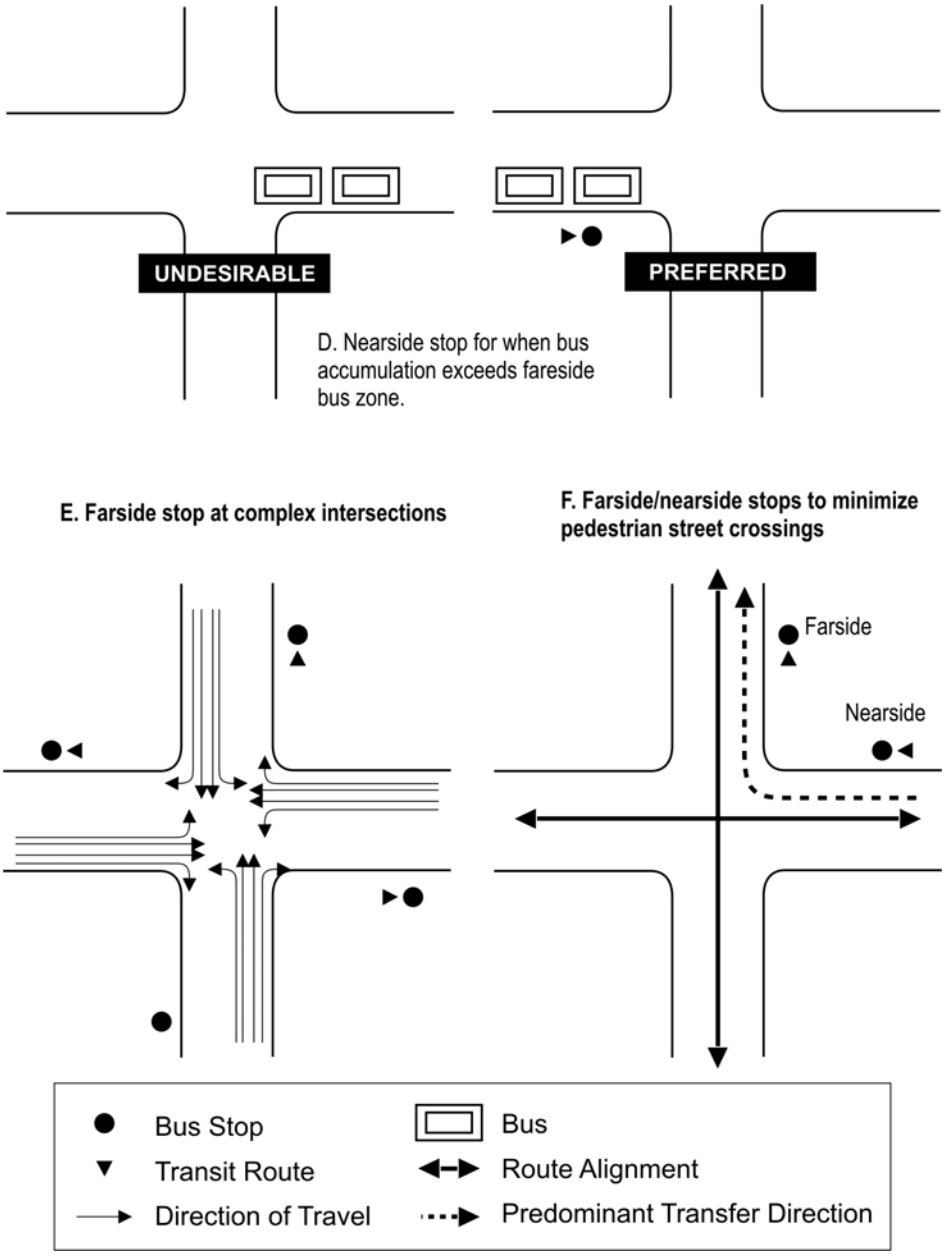


Source: PalmTran, Palm Beach County, Florida

Figure 5.7 Bus Bulbs

5.1.6 Complex Intersections

The previous discussion in Section 5.1.4 is appropriate for most simple intersections. Intersections with complex turning movements warrant special consideration. A couple of examples follow.



Source: Riverside Transit Agency

Figure 5.8 Examples of Bus Stop Designs

5.1.7 Other Design Considerations

Crosswalks

All bus stops should be designed with the eventual path of the passenger in mind. Crosswalks are essential to enable safe crossing of arterial streets. At mid-block stops, an ideal treatment is a bus bulb and a clearly lit crosswalk behind the bus with a pedestrian activated traffic control device. Particular attention should be paid to road side distance both for crossing pedestrians and buses re-entering the traffic stream.

Curb Clearance for Bus Stop Zones

In urban areas where these clearances are not feasible, SunLine will work with the local jurisdictions whenever possible to ensure that buses have enough room to serve the bus stop with comfortable space to exit and re-enter the travel lane. An additional 25 feet is needed for pulling in and out (totaling 50 feet for both), plus the length of the vehicle (totaling 90 feet for a mid-block bus stop). In areas where the parking lane is over 8 feet in width, or where bus turnouts are provided, additional space is needed for the buses to reenter the traffic lane; therefore, the clearance area should be increased accordingly.

Additional curb clearance is needed at bus stops where more than one bus stops at any given time. The general rule of thumb is to add a bus length plus 10 feet to accommodate each additional bus stopping at the bus stop at the same time. Furthermore, additional curb clearance will be needed for bus stops following right-hand route turns and may also be needed following left-hand turns.

Parking Restrictions at Bus Stops

Parking restrictions should be placed at bus stops when parking is expected to impact bus service. This can be achieved by painting the curb "red" or installing a "No Parking" sign at the bus stop. The lack of parking restrictions can impact bus service, sight distances and passenger access. Potential issues that may arise include:

- Buses may have to double park when they stop to pick or drop off passengers, which interferes with traffic movement.
- Passengers may have to maneuver between parked vehicles whey the board or deboard the buses, which may contribute to hazardous environments that endangers them.
- The restrictions prevent the buses from accessing the curb and sidewalk area to pick or drop off passengers.

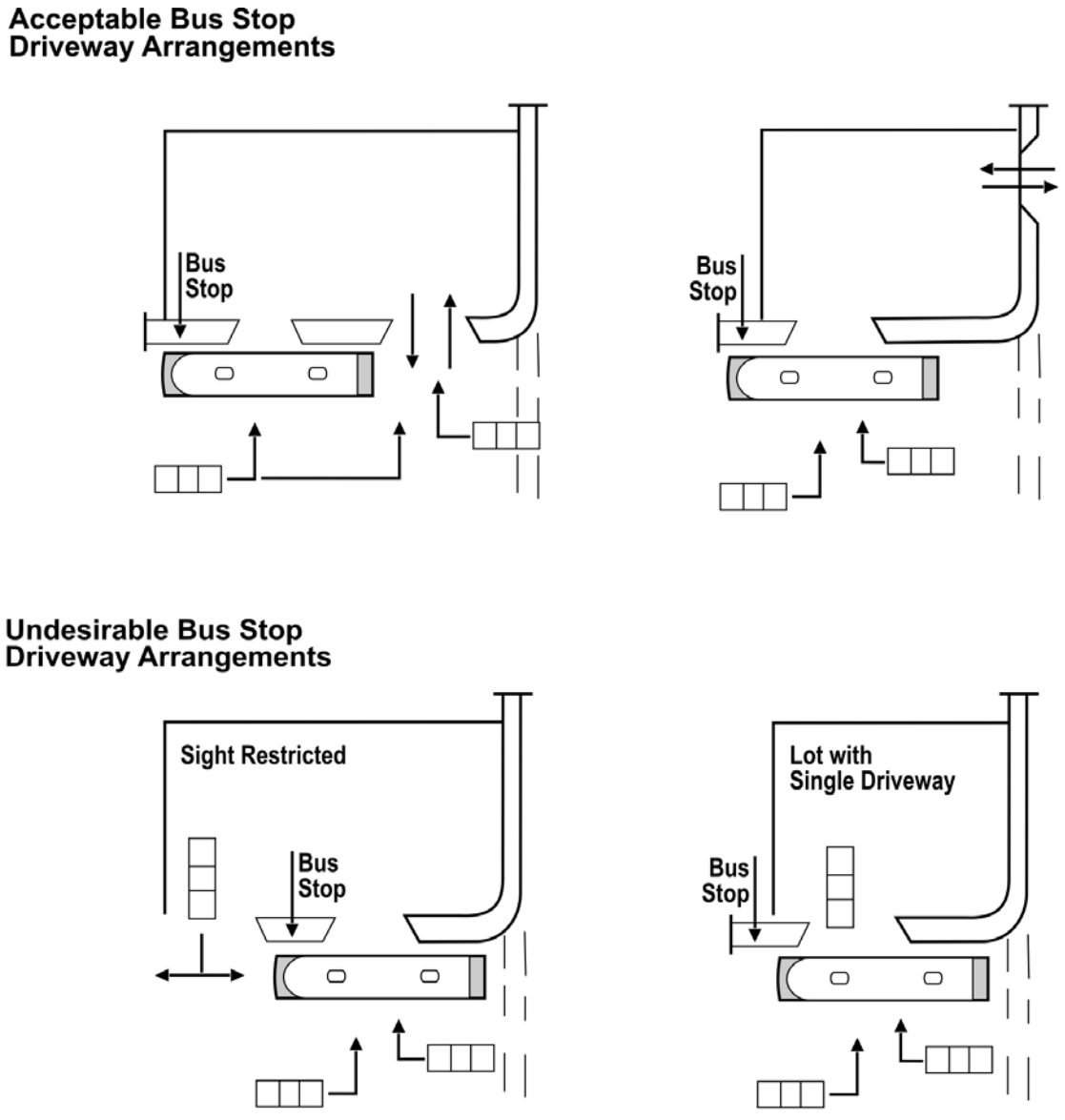
Driveways

Whenever possible, the location of bus stops should not interfere with safe street operation. Bus stops should not block driveway entrances since they interfere with driveway operation and impede sight distance of motorists exiting from the driveway. However, if placement near a driveway is unavoidable:

- At least, keep one exist and entrance open to vehicles accessing the property while a bus is loading or unloading passengers. When there are two or multiple driveways to a parcel on the same street, local jurisdictions should consider blocking the upstream driveway to force vehicles to turn behind the bus to access the driveway.

- It is preferable to fully rather than partially block the driveway to prevent vehicles from attempting to drive a the bus in situations with reduced sight distance.
- Bus stops should be located to allow good visibility for vehicles leaving the property to reduce vehicular conflicts. This can be accomplished by placing the bus stops at locations where the driveways are behind a stopped bus.
- Ensure that passengers have safe areas for waiting for the bus when loading must occur adjacent to driveways.

Figure 5.9 on this page illustrates how to install bus stops by driveways.



Source: Transit Cooperative Research Program, Report 19

Figure 5.9 Location of Bus Stops Near Driveways

5.1.8 Bus Stop Elements

Bus stop landing areas shall be chosen such that, to the maximum extent possible lifts or ramps can be deployed on a firm, stable, and level surface to permit a wheelchair or mobility aid user to safely maneuver onto or off the bus and bus stop. Figures 5.10 and 5.11 shows typical bus stop dimensions and Figure 5.12 illustrates a compliant bus stop pad with a bus shelter. The following factors listed below should be considered when constructing a bus stop landing pad:

Bus Pad Dimensions:

- The minimum landing pad required for a bus stop (area which passengers board and deboard the bus) is a continuous, unobstructed solid area contiguous to the curb measuring at least 5 feet parallel to the street and at least 8 feet perpendicular to the street at the front door of the bus; and at least 10 feet parallel to street and 8 feet perpendicular to the street to the back door. The distance between the front and back door is 23 feet.
- These are the minimum dimensions needed to deploy a lift or ramp that would allow passengers in a wheelchair board or deboard the bus.
- The landing pad must adjoin the accessible pathway.
- The landing pad for larger buses should ideally be at least 30 feet long for bus stops served by 40 feet buses and at least 40 feet long for bus stops served by 60 feet articulated bus stops.

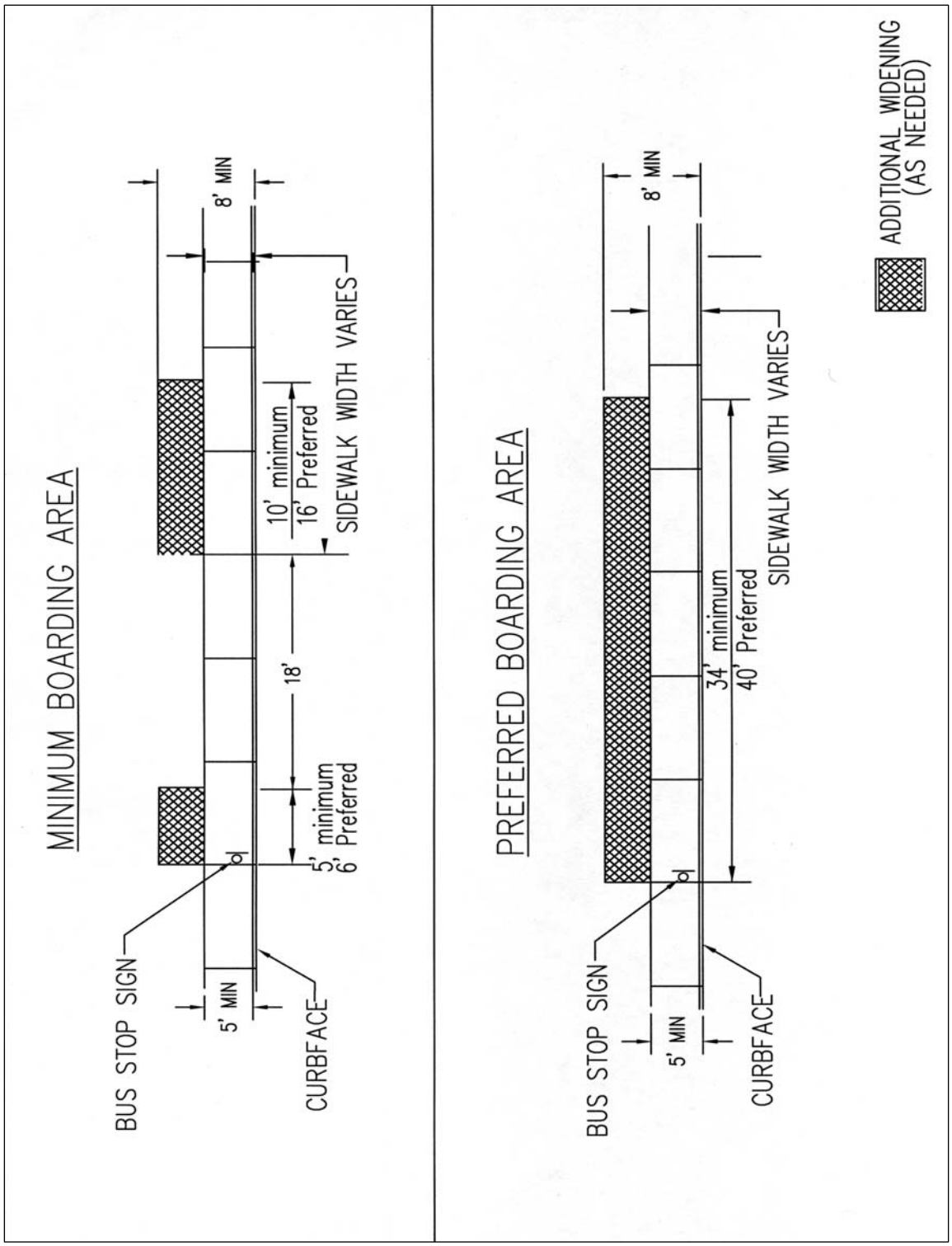


Figure 5.10 Typical Bus Stop Dimension – Contiguous Sidewalks

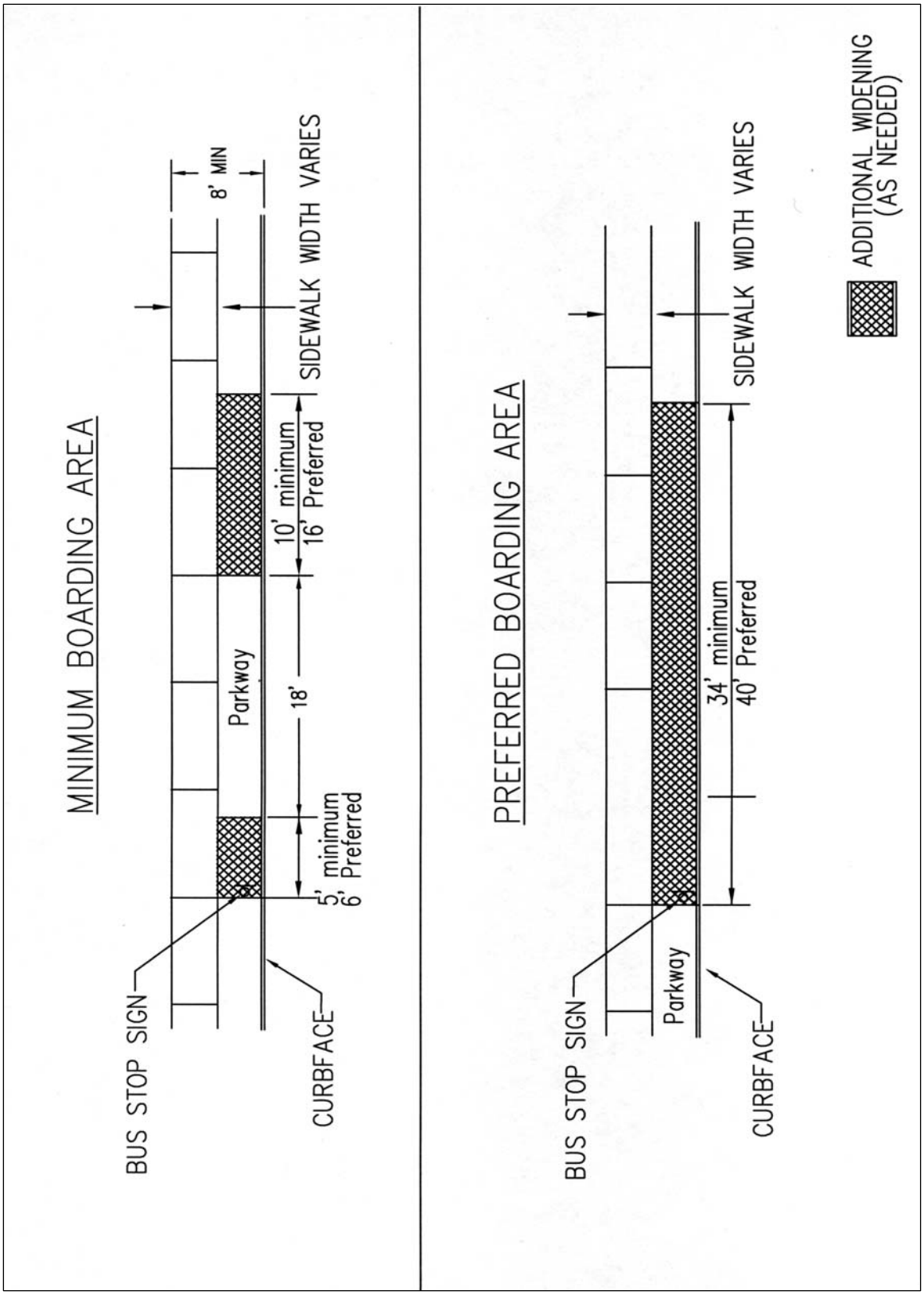


Figure 5.11 Typical Bus Stop Dimensions – Sidewalk Behind Parkway

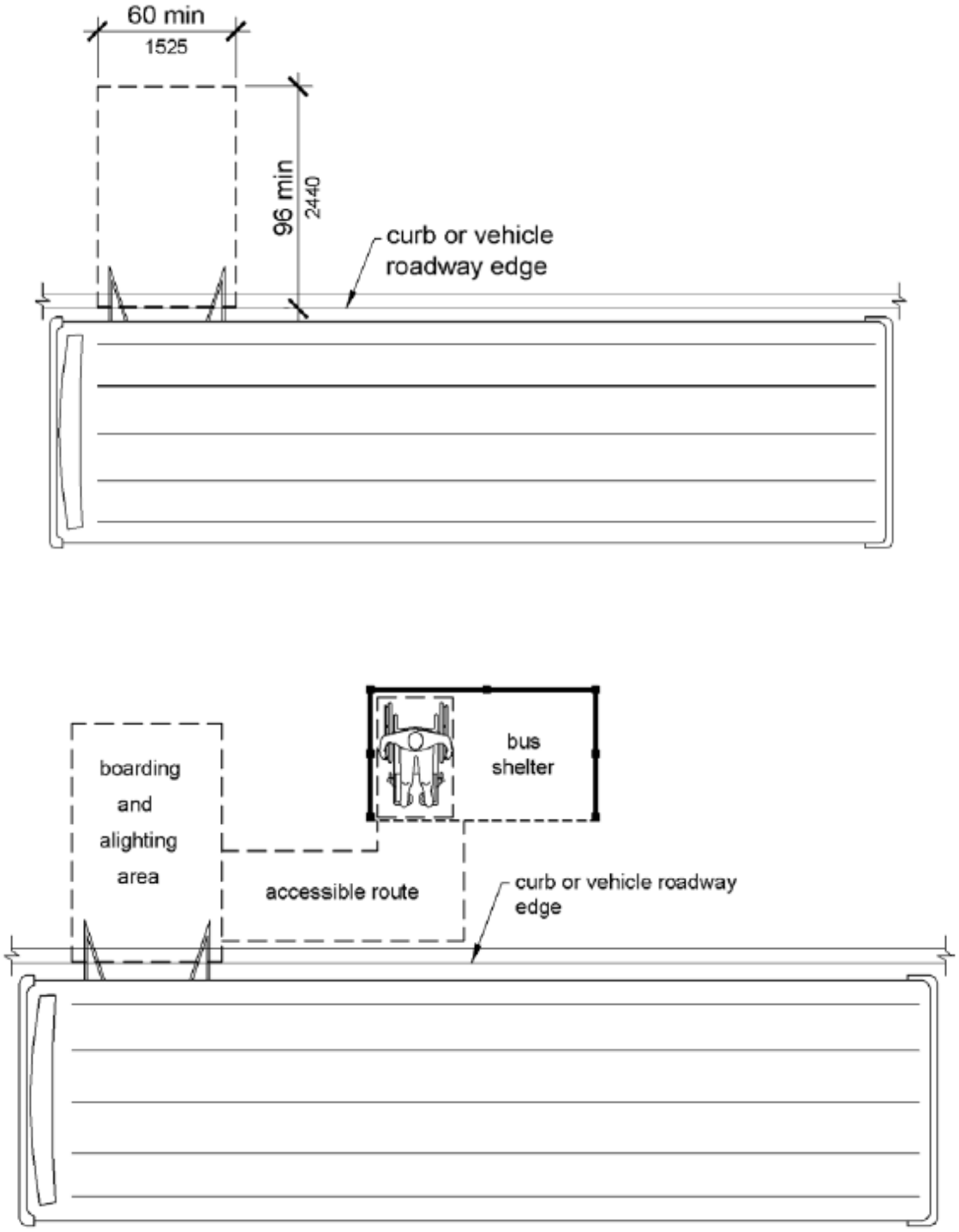


Figure 5.12 Compliant Bus Stop Pad with Shelter

Slopes:

- The slope for the landing pad must be parallel to the roadway slope to enable the bus wheelchair lift or ramp to be effectively deployed. The slope should not exceed one foot vertical over 20 feet horizontal (5%) and the cross slope should not exceed one foot vertical over 50 feet horizontal (2%).

Surface Material:

- The landing pad must be firm, stable and slip resistant. Concrete is preferred for the landing pad and is preferred over grass, dirt, and soil in a planter strip between the curb and sidewalk. The firm, slip resistant surface is safer for ambulatory passengers who may stumble on an uneven surface.
- In newer developments where a new bus stop will be placed, a continuous surface from the curb and the sidewalk should be provided for the deployment of a bus ramp or wheelchairs or other mobility devices.
- In uncurbed shoulder areas where a bus stop may be placed, if no sidewalks are available, the landing pad may be constructed using asphalt.

Height:

- It is preferable that the landing pad be elevated above street level for pedestrian safety.
- At bus stops served by low-floor buses with ramps, a standard curb can be used as an acceptable ramp slope.

Clearances:

- A horizontal clearance between obstructions of 48 inches (preferable 60 inches) and a vertical clearance of 84 inches (preferable 96 inches) should be maintained in boarding areas.

5.1.9 Pedestrian Walkway Geometry

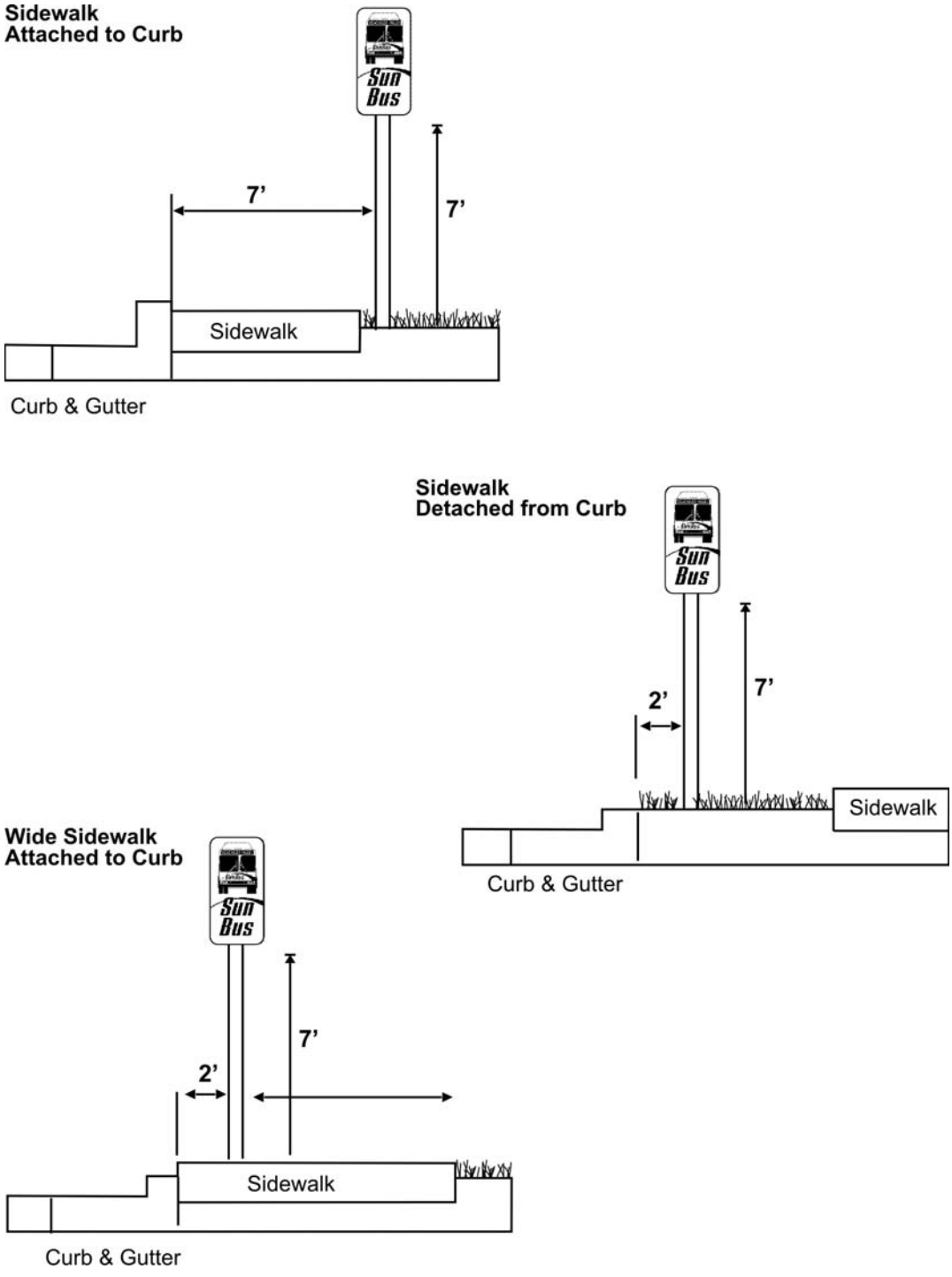
The pedestrian side of bus stop design is as important as the street side. The location of the bus stop sign and bus shelter should clearly designate the location as a bus stop and enable the sidewalk to continue its function as a pedestrian thoroughfare. To be fully acceptable, a landing pad of 5 feet wide by 8 feet in length (ADAAG 10.2.1) must be connected to a sidewalk of sufficient width and condition in order for a wheelchair person to use (ADAAG 4.3 and 4.5) the narrowest useable width of 4 feet. Curb cuts with slopes no steeper than one inch of level change across 12 inches (ADAAG 4.8.2) of distance is needed where level changes occur, such as crosswalks. If items like newspaper boxes, utility poles, trash cans, and encroaching grass or bushes constrict a portion of the sidewalk to less than 4 feet, the sidewalk is not accessible to wheelchair users.

If necessary, the existing sidewalk should be widened or a new sidewalk should be constructed to ensure that passengers are able to get to and from the bus stop. Sidewalk connections around bus stops provide a safer environment and pedestrian access to the trip generators near the bus stop. Land uses can be designed to facilitate movement and reduce the distance between the development and transit services provided in the vicinity.

Good pedestrian access can be accomplished by following the guiding principles listed on the next below:

- Pedestrian walkways to bus stops should be designed to meet the needs of all passengers, including the disabled, seniors and children. All pedestrian walkways should be designed to be direct from the street network to the main entrance of buildings.
- Pedestrian walkways should be designed to provide convenient connections between destinations, including residential areas, schools, shopping centers, public services and institutions, recreation, and transit.
- Provide a dedicated sidewalk and/or bicycle paths through new development that are direct to the nearest bus stop or transit facilities.
- Provide shorter distance between buildings and the bus stop by including transit friendly policies that address transit accessibility concerns to encourage transit-oriented development. These policies can be achieved through zoning policies, setback guidelines, building orientation guidelines, and parking requirements.
- Limit the use of elements that impede pedestrian movement such as meandering sidewalks, walled communities, and expansive parking lots.
- Eliminate barriers to pedestrian activities, including sound walls, berms, fences, and landscaping which obstructs pedestrian access or visibility. Gates should be provided at restricted areas to provided access to those using transit service.
- Pedestrian pathways should be paved to ensure that they are accessible to everyone. Accessible circulation and routes should include curb cuts, ramps, visual guides and railing where necessary. ADA compliant ramps should be placed at each corner of an intersection.
- Adequate drainage should be provided to avoid muddy conditions at the bus stops.
- Provide breaks in walls between properties in new residential development to allow pedestrian access to bus stops.
- In rural areas without sidewalks, a minimum 4 foot wide paved shoulder, compacted and stabilized should be provided if possible.
- At bus stops in rural areas, a concrete waiting area should be provided if possible. The paved area should be 35 feet long by 8 feet, with a minimum of 5 feet long by 8 feet wide needed to deploy the wheelchair lift.
- At bus stops serving as transfer points, there should be a paved connection provided to connecting route stops.
- A minimum horizontal clearance of 48 inches (preferable 60 inches) should be maintained along the entire pathway.
- A vertical clearance of 84 inches (preferable 96 inches) should also be maintained along the pathway.

Illustrated below are alternate section views of bus stop signs under varying conditions of sidewalk width.

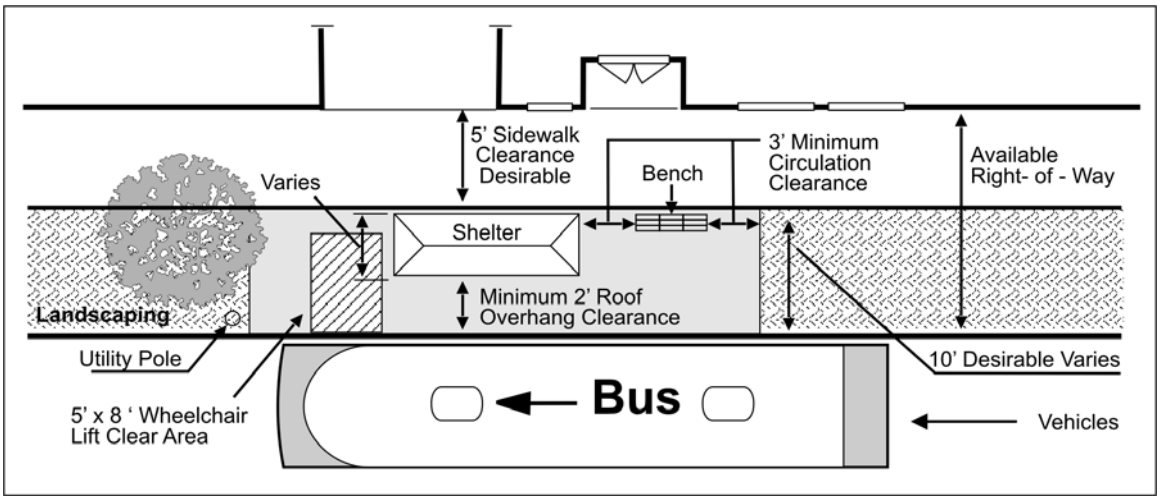


Source: Transit Cooperative Research Program, Report 19

Figure 5.13 Cross Section Views of Bus Stops

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

A plan view of a bus stop configuration with amenities is shown in the figure below.



Source: Transit Cooperative Research Program, Report 19

Figure 5.14 Bus Stop Plan View

5.1.10 Street-Side Placement Checklist

Several items should be considered when designing and locating a bus stop on a roadway. The following checklist of street-side items 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.

- **Standardization:** One of the most critical factors in the street-side design and placement of a bus stop involves standardization or consistency. Standardization results in less confusion for bus operator, passengers, and motorists.
- **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 or poor pavement.
- **Visibility:** Bus stops should be easy to see. If the bus stop is obscured by nearby trees, poles, or building, the bus operator may have difficulty locating the bus stop. More importantly, however, motorists and bicyclists may not know of its existence and will be unable to take necessary precaution when approaching and passing the bus stop. In addition, visibility to pedestrians crossing a street is also an important consideration in areas that permit "right turns on red."

- **Bicycle Lane and Thoroughfares:** When a bike lane and a bus stop are both present, the operators need to be able to see cyclists in both directions while approaching the stop. Sufficient sight distance for cyclists to stop safely upon encountering a stopped bus is also needed.
- **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 bus passengers become pedestrians upon leaving the bus, pedestrian signal indicators should be considered at nearby signalized intersections.

5.1.11 Passenger Transit Amenities at Stops

A number of amenities should be provided depending on the intensity of use of the bus stop. Below are suggested amenities for each range of stops. For the purpose of illustration, the table below shows the level of daily boardings at a number of stops in the SunLine service area.

Table 5.2 Recommended Amenities by Daily Boardings

	Daily Boardings				
Feature	**<25**	**25-50**	**50-100**	**100-250**	**>250**
Sign and pole	S	S	S	S	O
Built-in sign				O	S
Public roadway	S	S	S	S	
Non-public roadway					S
Expanded sidewalk	O	O	S	S	S
Accessible	S	S	S	S	S
Seating	O	S	S	S	S
Passenger shelter	O	O	S	S	S
Permanent structure					S
Route designations	S	S	S	S	S
Timetable	O	O	O	S	S
Route map	O	O	S	S	S
System map			O	O	S
Trash receptacle	O	O	O	S	S
Telephone		O	O	O	S
Individual bus bays					S
Park and ride		O	O	O	O
Bus pads	S	S	S	S	S
Red curbs	S	S	S	S	O
Lighting	O	O	S	S	S

S -Standard feature

O – optional feature

5.2 Bus Shelters

Bus shelters are a useful passenger amenity at major transit stops and are installed at selected bus stops to provide protection from inclement weather as well as seating for waiting passengers. SunLine has developed criteria that will now be used in selecting and evaluating bus stops for bus shelter installations. Bus stops with ridership exceeding 50 boardings per day are priority candidates for new shelters. (See Appendix C for the newly developed Checklist that will be used in evaluating bus stops for the installation of bus shelters).

SunLine has a bus shelter advertising program with the proceeds used in maintaining shelters. Some cities in the SunLine service area have restrictions on outdoor advertising and do not participate in the program. SunLine will work with jurisdictions on the maintenance cost of bus shelters not provided by SunLine, but are required and provided as part of a development. In suburban areas where there is considerable land between the curb and building fronts, finding a suitable location is not difficult. However, in more densely developed areas, it is important to place bus shelters in such a way so as to not impede the use of sidewalk as a thoroughfare. This section discusses guiding principles on the layout of bus shelters.

Currently, bus shelters installed in SunLine's service area varies and dimensions for the bus shelters also differ. However, with the development of the Transit Facilities Design Manual, SunLine is working to standardize bus shelters within the service area to provide uniformity among them. As part of the process, SunLine has selected a new bus shelter design and style that will replace the existing bus shelters currently installed at several bus stops throughout the service area.

Figure 5.15 Current Bus Shelter at Most Bus Stops

Figure 5.16 New Bus Shelter Design

Figure 5.17 Example of Large Bus Shelter to be Installed at Transfer Locations

Figure 5.18 Example of New Bus Shelter to be Installed at Bus Stops

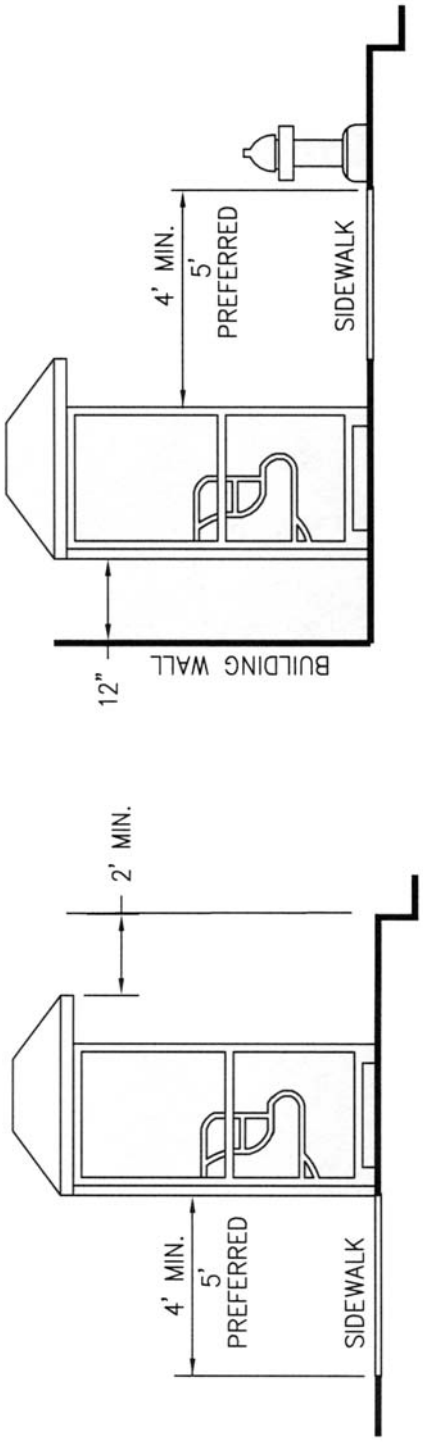


Figure 5.19 SunLine Bus Shelter Clearance

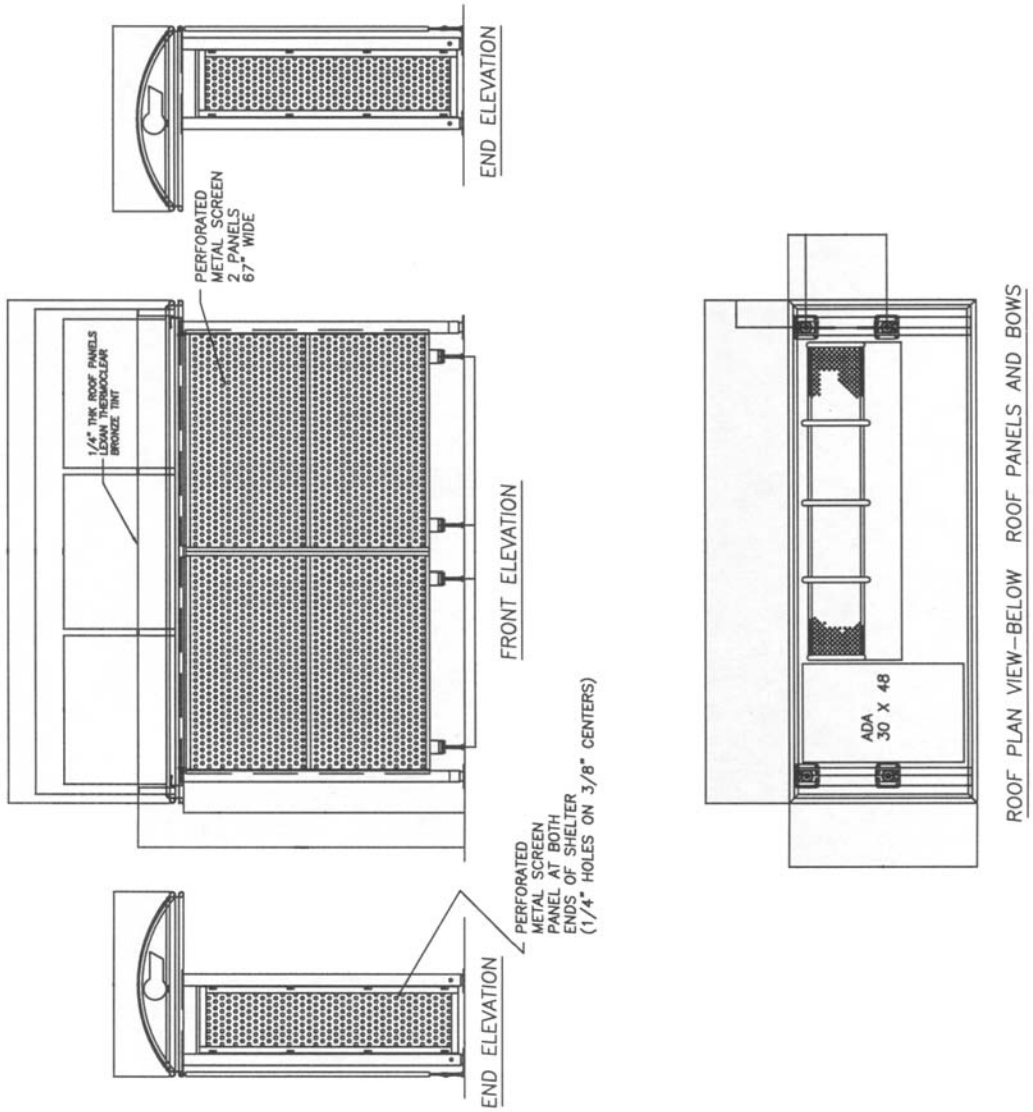


Figure 5.20 Bus Shelter Plan

Design factors and placement criteria for bus shelters that will assist local jurisdictions after it has been determined a bus shelter is needed at an existing bus stop should include:

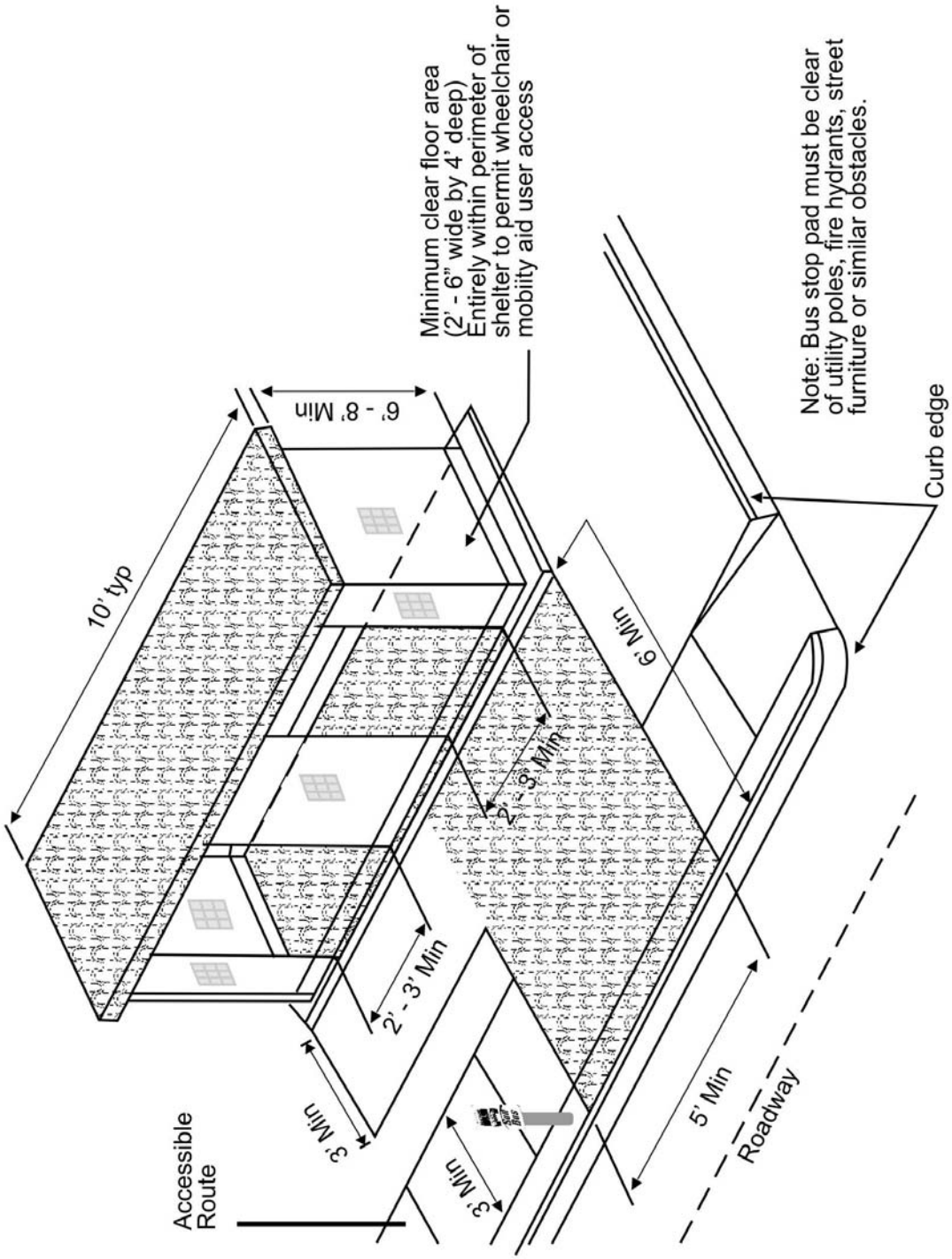
- Strength and durability of structure and materials;
- Resistance of materials and paint treatments to weather condition, graffiti, cutting, fire, and other forms of vandalism;
- Potential greenhouse effect of roof design during hot weather;
- Existence of, or provision of external lighting in the area, and provision of internal lighting for the shelter;
- Bus shelters should not be placed such that they block sight distance at intersections or driveways. This can normally be accomplished by placing the shelter more than 25 feet from the beginning or end of curb return of an intersection or driveway;
- Minimum overhead canopy of 72 square feet with a minimum width of 6 feet is desired;
- Minimum 7½ feet clearance between the inside of the roof and sidewalk surface is desired;
- Minimum two feet clearance between the overhead canopy and curb face is required;
- Bus shelter canopy should be waterproof with provisions for drainage away from waiting passengers and the boarding area;
- Seating in the bus shelter should be provided for at least three to four people located under the shelter canopy is desired;
- A minimum space of 30 inches by 49 inches of clear floor space for people in wheelchairs is required within the bus shelters per Americans with Disabilities Act (ADA) Regulations; and
- All benches installed inside bus shelters must be placed so as to allow wheelchairs passengers to easily maneuver their wheelchairs without bumping into other passengers in the bus shelter.

In cases where there is existing transit service and a new development (commercial or residential) is the dominant traffic generator, SunLine may consider the installation of a bus shelter as part of its site plan review. If a jurisdiction requires a developer to construct and install a bus shelter as part of a proposed development, the jurisdiction should consult with SunLine to determine the need for the bus shelter, and if the bus shelter is needed, the developer must coordinate the installation with SunLine. As part of this process, SunLine must approve the bus shelter design to ensure it meets our design criteria and ADA requirements prior to construction. Directions to the developer and the enforcement of any requirements are the responsibility of the jurisdictions.

As part of the development review process and as a condition of approval for some development projects, local jurisdictions require that developers construct “customized” bus shelters to match buildings in the approved development. While this may conform to design standards for the new development, jurisdictions need to be aware that the

installation of a “customized” bus shelter does not constitute an implied promise to serve or continue to provide transit serve to that facility. As part of its new process of ensuring that developer-build or “customized” bus shelters meet SunLine’s design standard, as well as meet the Americans with Disabilities Accessible Guidelines (ADAAG), all proposed “customized” bus shelters by local jurisdictions must be accessible, easily relocated and/or removable. This assures that if an existing route is realigned due to low productivity, the existing bus shelter can be removed or relocated and reinstalled along the new route. Local jurisdictions are encouraged to consult with SunLine if they feel that a new bus shelter is warranted as part of a new development. Figure 5.21 below depicts a good example of an accessible bus shelter with the required space for wheelchair passengers. Figure 5.22 on page 68 shows the dimensions for the placement of bus shelters.

Figure 5.21 Example of an Accessible Bus Shelter



Source: Transit Cooperative Research Program, Report 19

Figure 5.22 Bus Shelter Placement Dimensions

5.3 Bus Benches

Benches are installed inside all standard bus shelters. Benches may also be installed independently at bus stops that do not have bus shelters. Local jurisdictions may install benches as an element of an improved streetscape; however, efforts should be made to locate the benches near the bus stop where they do not create barriers to passengers boarding the buses or sidewalk usage. The design factors for benches should include:

- Benches should be installed facing the street;
- Strength and durability of structure and materials;
- Resistance of materials and paint treatments to weather conditions, graffiti, fire and other forms of vandalism;
- Benches should be placed on the back side of sidewalk, a minimum of four to six feet from the bus stop signage post to allow pedestrians to move past people sitting on the bench;
- Ensure that there are no conflicts with wheelchair accessibility and loading at the bus stop;
- Benches should be anchored to prevent unauthorized movement and should be anti-vagrant to prevent people from sleeping on them;
- Benches installed should be easily relocated to allow for bus route changes, street improvement projects, etc.

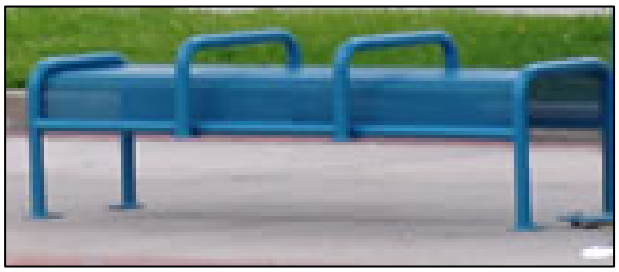


Figure 5.23 Example of Acceptable Bus Stop Bench

SunLine's new bus benches as pictured will be provided and installed at bus stops, and will also be maintained by SunLine staff through the Passenger Amenity Program. Placement of benches and receptacles must maintain proper clearances for passages and wheelchair boarding areas. While bench designs vary among manufacturers, some standards do exist. Benches usually seat three to four people and may have an upright back support. Some bench designs come with a metal bar in the middle of the bench to discourage sleeping on the bench.

5.4 Trash Receptacle

Trash receptacles are installed at all standard bus shelters and may be independently installed at bus stops that do not have shelters. Although local jurisdictions may install receptacles as part of an improved streetscape, efforts should be made to locate trash receptacles near bus stops where they do not create barriers to accessible bus boarding or sidewalk usage. The design factors for trash receptacles should include:

- Strength and durability of materials;
- Resistance of materials and paint treatments to weather conditions, graffiti, fire and other forms of vandalism;

- Ensure that there are no conflicts with wheelchair accessibility and loading at the bus stop;
- Trash receptacles should be anchored to prevent unauthorized movement;
- Construct furniture for easy relocation to allow for bus route changes, street improvement projects;
- Avoid installing trash receptacles with design features that permit liquid to pool or remain near the receptacle and attract insects.

Install trash receptacles in shaded areas a minimum of 3 feet from a bench. When installed in areas that receive direct sun light most of the day, the heat may cause foul odors to develop. Receptacles must be placed to maintain proper clearances for passage and wheelchair boarding areas.

5.5 Lighting

Where feasible, bus stops will be located such that they are illuminated by existing street lights. In addition to street lights, bus stops can be lit by backlighting from advertising installed at bus shelters. If a shelter is present, both interior and area lighting are recommended. The placement and maintenance of lighting is normally the responsibility of local municipality, except at advertising shelters where the interior lighting is provided and maintained along with the bus shelter. Additionally, SunLine will install solar lights in the shelter if street lights are not available.

5.6 Landscape Features

Landscaping can enhance the level of passenger comfort and attractiveness of transit; however, landscaping should be done in such a way that the safety and accessibility of passengers are not compromised by encroaching bushes, uneven grass surfaces and shrubs. Tree branches that extend into the roadway should be trimmed back at least two to three feet from the curb; or else they become an obstacle that the bus driver may or may not be able to avoid hitting. The area between the sidewalk and the curb at bus boarding areas should not have any plants for at least 5 feet parallel to the street and eight feet perpendicular to the street and must be solid to provide better accessibility.

5.7 Intelligent Transportation Systems (ITS) Features

SunLine plans to install ITS features at transfer locations and selected bus shelters, which may include:

- Real-time “next-bus” arrival information;
- Electronic posting of schedules;
- Access to route information;
- Installation of panic buttons.

In preparation for such technologies, SunLine will work local jurisdictions and developers to provide electrical and communication conduits at new bus stop locations and improvements to existing stops if warranted.

5.8 Bus Turnouts

An important but controversial transit facility is the bus turnout. Bus turnouts are bus stop areas recessed from the thoroughfare that provides an en route bus with an off-street service point which does not interfere with traffic movement, and enables traffic to move around a bus when passengers are boarding and alighting. They must be constructed thoughtfully since there are times when bus drivers have difficulty re-entering the traffic stream upon leaving the bus stop. They should be designed so that bus operators have clear rear vision necessary for safe re-entry into traffic.

Bus turnouts should be considered at selected locations where passenger volumes and the flow of traffic could be significantly impeded by stopped transit buses. Bus turnouts may also be needed at locations where traffic speed exceeds 40 miles per hour. However, this should be discussed with SunLine to determine ridership at a given bus stop before further improvements are made. Because transit is fluid and may necessitate realigning existing routes, it is important to coordinate construction of bus turnouts with SunLine to ensure that investments made along a bus route is cost effective. Other areas where speeds are less than 40 miles per hour where bus turnouts may be warranted include:

- Average peak-period bus dwell time exceeds 30 seconds per bus;
- Frequent service – 4 buses per hour or more;
- Buses are expected to layover at the end of a trip;
- Potential for auto/bus conflicts warrants separation of transit and passenger vehicles;
- History of repeated traffic and /or pedestrian accidents at stop location;
- Right-of-way width is adequate to construct the bay without adversely affecting sidewalk pedestrian movement;
- Sight distances (i.e. hills, curves) prevent traffic from stopping safely behind a stopped bus;
- A right-turn lane is used by busses as a queue jumper lane;
- Appropriate bus signal priority treatment exists at an intersection;
- Bus parking in the curb lane is prohibited; and
- Improvements, such as widening, are planned for a major roadway. (This provides the opportunity to include the bus bay as part of the reconstruction, resulting in a better designed and less costly busy bay.)

Consideration should be given to the concerns of drivers re-entering the traffic stream in the design of turnouts. Using acceleration and deceleration lanes, recommended taper, signal priority, or far side (versus near side or mid-block) placements are potential solutions. Acceleration and deceleration lanes should be considered and provided to accommodate speed changes necessary for the buses to enter and exit traffic. The lanes vary in length depending on the traffic speeds and volumes and include tapers that guide the buses moving back into and away from the roadway.

The recommended width for bus turnouts is 15 feet for arterials, which may vary depending on the available right-of-way; and 20 feet for highways. These dimensions provide sufficient space to enable bus operators to properly maneuver and stop the buses. Construction of bus turnouts on highways requires additional buffering from traffic because of increased speeds on the roadways. SunLine recommends using the American Association of State Highway and Transportation Officials (AASHTO) specifications for the construction of bus turnouts along highways. A minimum 8 foot buffer by 10 foot shoulder must be provided to separate continuous traffic flow from transit buses that are accelerating and decelerating. If passenger waiting areas are recommended and provided, they must be consistent with SunLine's bus shelters standards.

The diagrams on the next three pages show the ideal design of a mid-block, farside and nearside bus turnouts. These designs enable buses to decelerate in the turnout. Developers must ensure that the bus turnout is not the entrance to an adjacent commercial use. All figures shown are for a 40 foot bus. An additional 20' is required for a 60' articulated bus. As in the case of bus shelters, jurisdictions should consult SunLine on whether there is a need for bus turnouts, particularly in areas not currently served by SunLine.

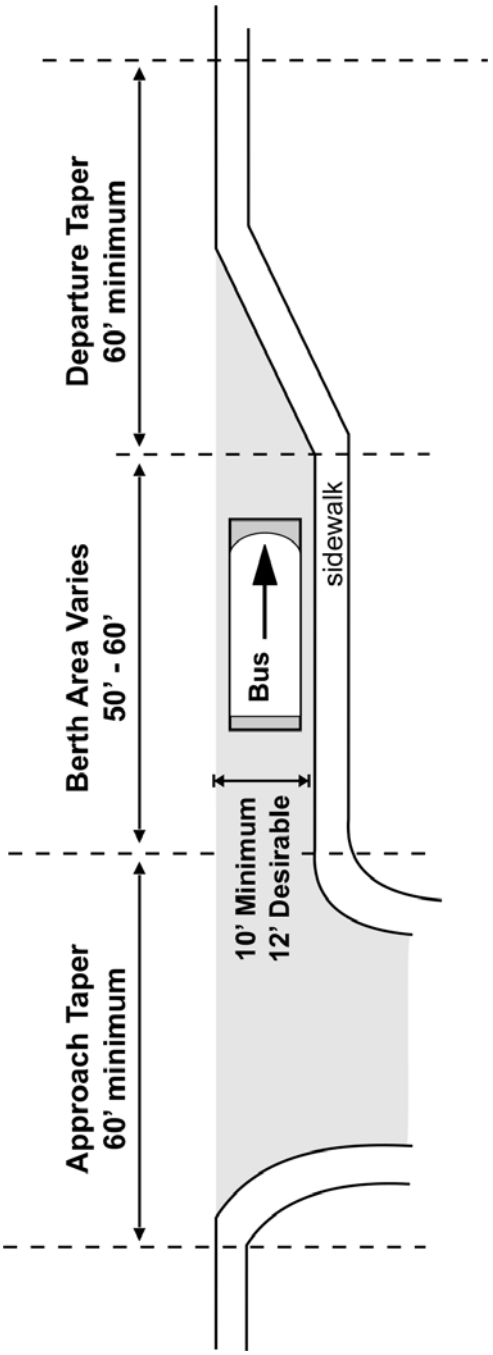


Figure 5.24 Far-side Bus Turnout Design

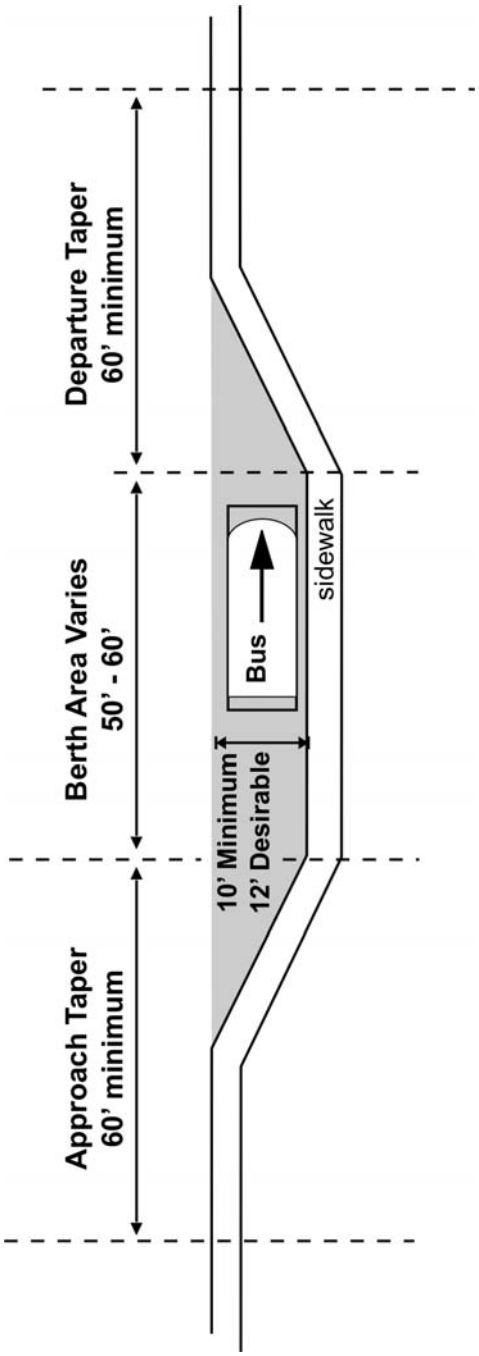
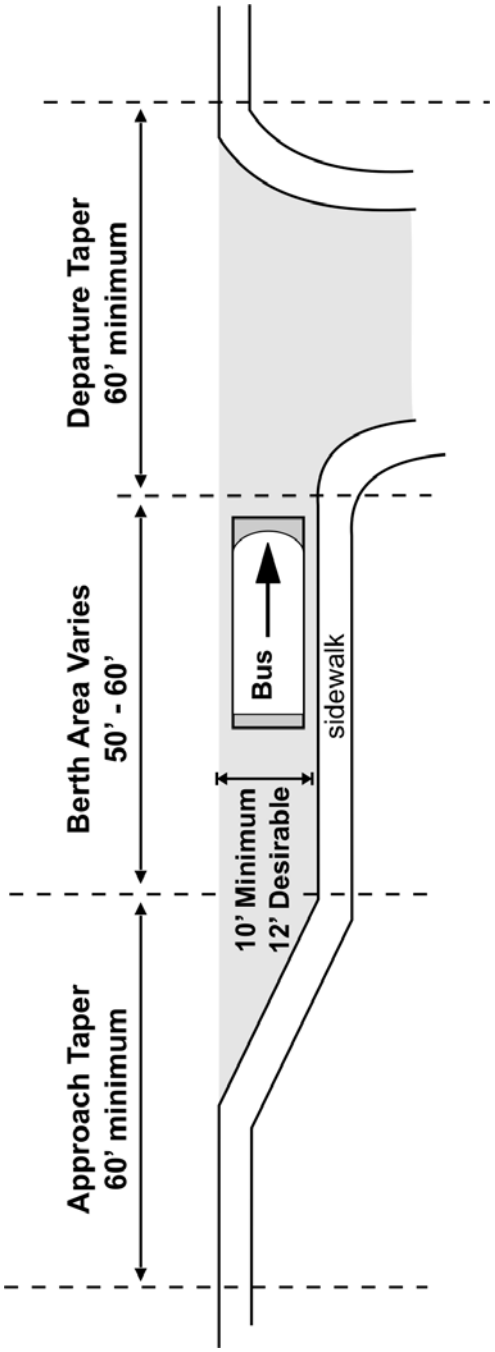
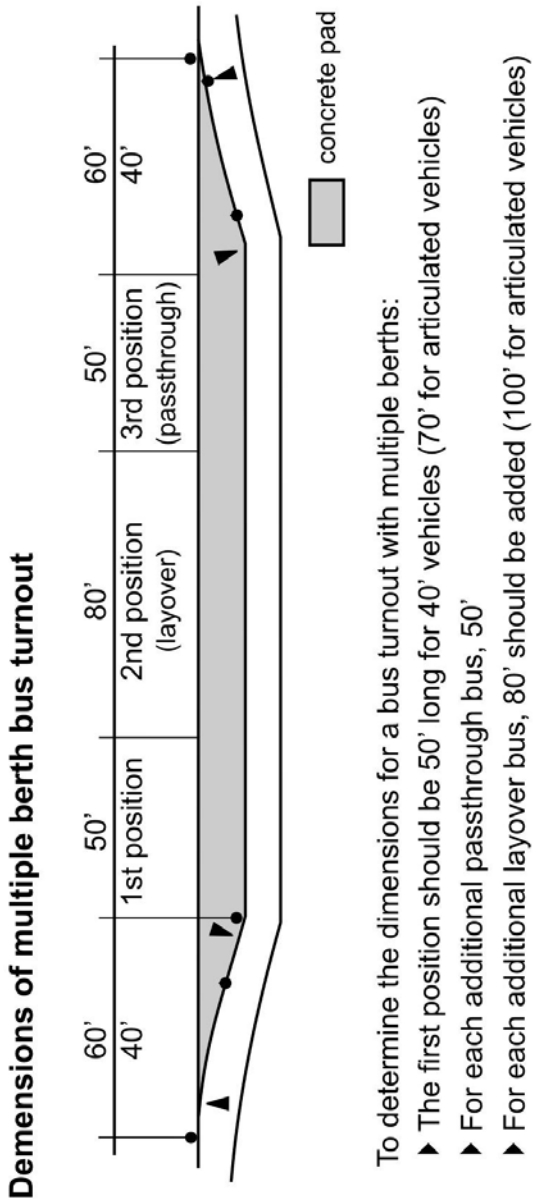


Figure 5.25 Mid-Block Bus Turnout Design



Source: San Diego Metropolitan Transit Development Board

Figure 5.26 Near-side Bus Turnout Design



Source: Riverside Transit Agency

Figure 5.27 Multiple Bus Turnouts

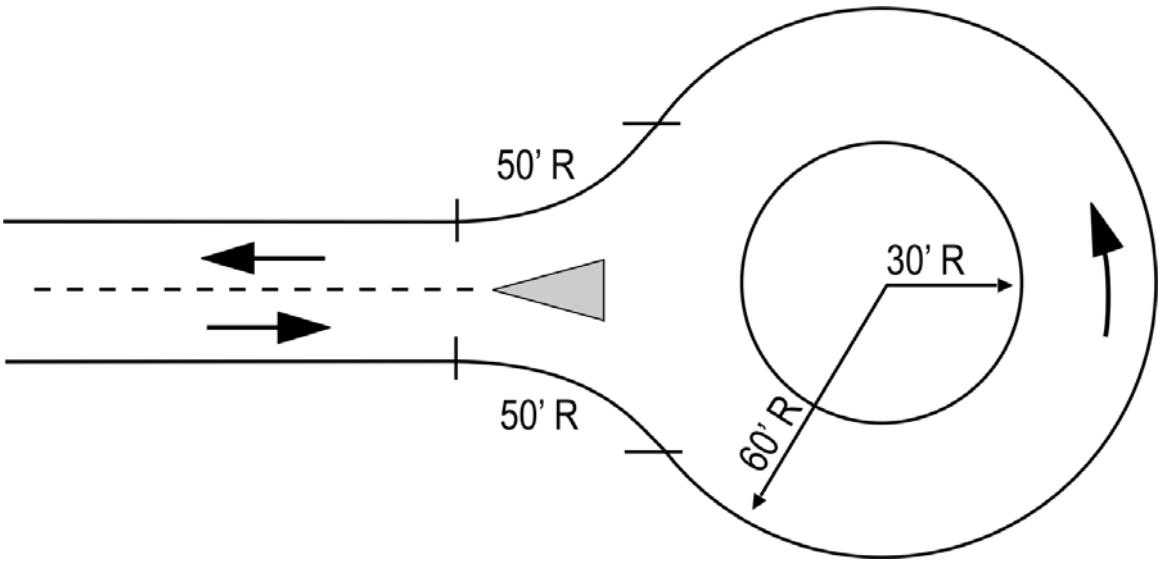
5.8.1 Bus Turnout Pavement

Since the bus turnout will be subject to acceleration and deceleration by heavy vehicles, it is prudent practice to construct a concrete bus pad at the bus turnout location. The width of the turnout should be about 14 feet, allowing for a 12 foot lane and a 2 foot clearance between the bus and the curb.

5.9 Bus Turnarounds

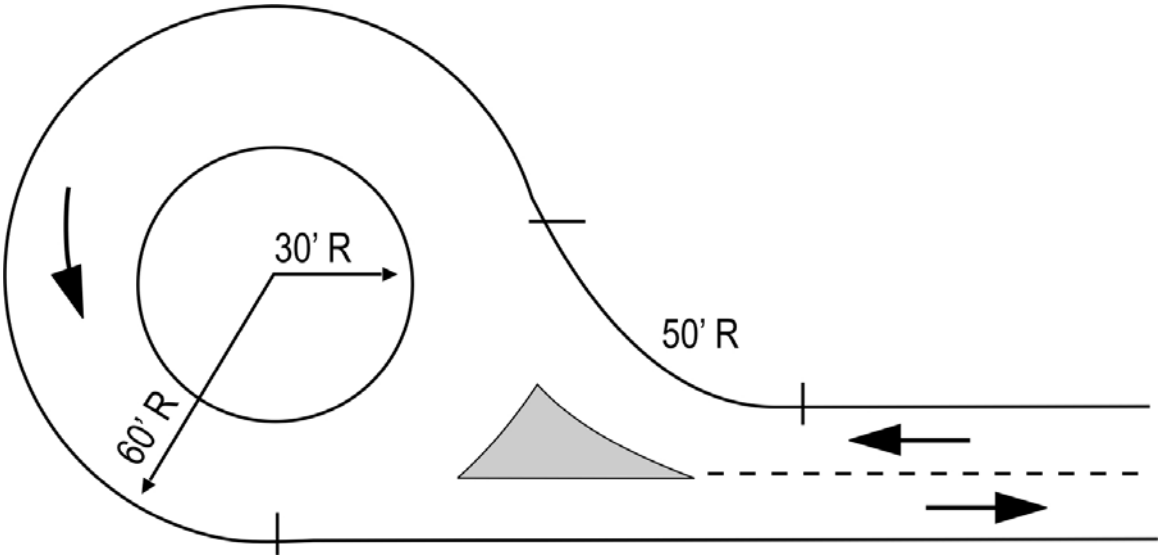
At the end of a route, a bus turnaround should be provided to enable the buses to return to the service routes. Ideally, this should be beyond the last stop at an off street location. A bus turnaround is a roadway facility that expedites a bus' return to the roadway or bus route, and can be incorporated into designs for new developments to allow the buses to operate onto the site. Bus turnarounds can be used for schedule adherence and service reliability since a continuous route is available for the buses. Bus turnaround facilities may be used as an off-street waiting and service area for transit passengers, and should be designed so the bus can be turned in a counter-clockwise direction for better visual capabilities for bus operators. They should also be designed for adequate space for a bus to pass a standing transit bus.

The "jug handle" bus turnaround design can be used at appropriate mid-block bus terminal locations to turn a transit bus. Proper signage or traffic signals along the roadway and at the turnaround are needed for traffic control and to expedite the bus to its route. The "cul-de-sac" and "loop" designs may be acceptable for developments that do not have roadway networks to return a bus efficiently to an arterial roadway. The "cul-de-sac" and "loop" turnarounds are only preferred at the end of bus routes at appropriate and approved locations. Suggested alternative configurations are illustrated below.



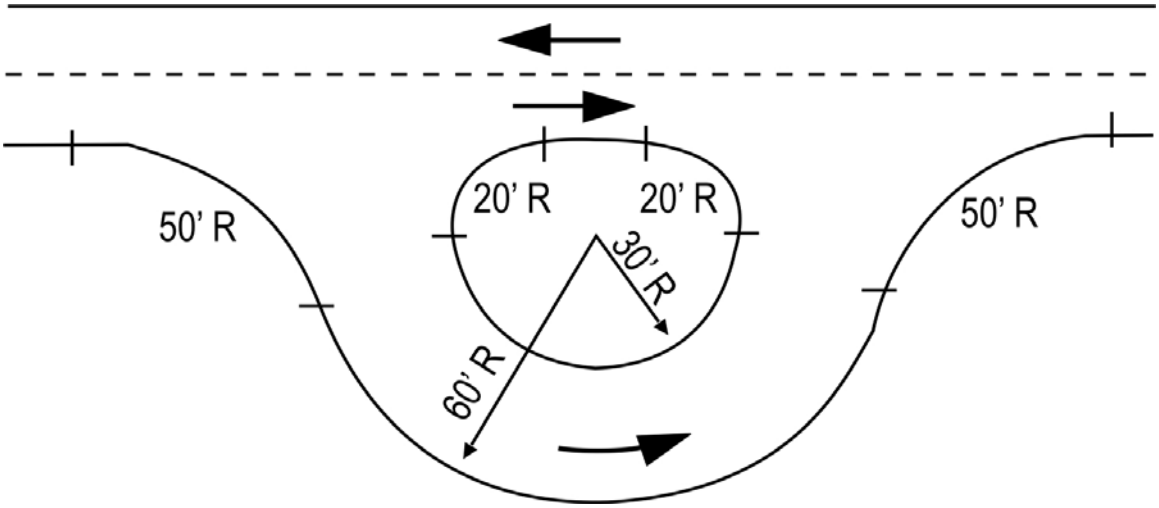
Source: PalmTran, Palm Beach County, Florida

Figure 5.28 Design of a "Cul-de-Sac" Bus Turnaround



Source: PalmTran, Palm Beach County, Florida

Figure 5.29 Design of a "Loop" Bus Turnaround



Source: PalmTran, Palm Beach County, Florida

Figure 5.30 Design of a "Jug-Handle" Bus Turnaround

5.10 Bus Stop Signage

Each bus stop must be marked with a sign that indicates that SunLine buses serve the stop. These bus stop signs identify the location and indicate to passengers, motorists, and bus drivers where the bus stop is located, and publicize the availability of transit service. The sign also provides information about the route and displays telephone number for passengers to SunLine's Customer Service Department about service related issues. The signs are installed at over six hundred (600) bus stops located through SunLine's service area. The signs must be securely mounted and be easily visible to passengers and approaching bus drivers. To prevent the sign from being hit by the bus and mirrors, the bus stop signs should be placed at a distance not to block bus mirrors and impact pedestrian's travel path.

There are a number of factors involved in installing a bus stop sign which contributes to passenger and public safety, convenience, comfort and visibility. The following highlights general guidelines for installing bus stop signs:

- Whenever possible, the bus stop signs should be placed independently of other street signage to maintain its identity.
- Installed bus stop signs should be visible from either direction
- Trees, buildings, and other signs and structures should not obstruct the stop signs
- Whenever possible, the bus stop sign pole should be installed away from the curb, preferably at least 4 feet (48 inches), in from the curb face or road edge.
- The outside edge of the bus stop sign must be no less than three (3) feet from the curb or road edge.
- Always check for existing utility lines (gas, water, etc) prior to installing sign pole.

Installation of Bus Stop Poles:

The following hardware is needed for pole installation**:**

10' x 2" Quick-Punch Pole = 1

2" ¼ Pole Sleeve = 1

2" ½ Pole Anchor = 1

5 ¼ Drive Rivets = 7

a) Attach and secure anchor and sleeve to pole, using a 5 ¼ Drive Rivet.
b) Pole should be 9' from top of pole to ground level, after assembly and installation.
c) Use Ready Mix Concrete to secure pole. Use level to insure accuracy.
d) Install ID Sign at top of pole (flush). Install number plate using two drive rivets.
e) Install schedule backing(s), 36" from ground**.** Install additional backings when applicable.
f) Spray paint pole & schedule backings (allow 3-5 minutes to dry).

Install schedule(s) and Lexan cover, securing with T-15 Tamper Proof screws and Nut Inserts.

Installation of Schedules and Schedule Backing:

a) Mount Schedule Backings (18x9) 36” from bottom of backing to ground.

b) Use two 5 ¼ Drive Rivets to install to Quick Punch Pole.

c) Use Nut Insert Tool to install four nut inserts.

d) Using Double Sided Tape, affix schedule to backing.

e) Install 18x9 Lexan Cover over schedule, using four T-25 Tamper-Pruf screws.

f) Do not paint pole or backings with Lexan Cover installed.

g) Additional backings should be mounted behind the original; thereafter, below existing backings (Poles only).

h) Install Schedule and Signs on bus shelters at the same height. However, additional schedules should be installed next to the original. Always use level to insure proper adjustments (Shelters with back walls).

i) Bus shelters with posts only, use the same format used with poles, for the exception of drive rivets. Use flathead screws, instead.

Installation of Bus Stop Identification Sign:

a) Bus Stop Identification Sign should be installed at the very top of pole.

b) Two 5 ¼ Drive Rivets should be used to secure sign to pole.

c) Two flathead screws should also be used to install sign to bus shelters.

Installation of Rider Alert Sign on Bus Shelters:

a) Apply Double Sided Tape to back of Alert Sign and tape Alert Sign to backing.

b) Install Lexan Cover over Alert Sign using four T-25 Tamper-Pruf Screws.

Installation of Rider Alert and Detours Signs:

a) Apply double-sided tape to back of Alert Sign and tape Alert Sign to backing.

b) Install Lexan Cover over Alert Sign, using four T-25 Tamper-Pruf Screws.

Installation of Bus Stop Number Plates:

a) Two 5 ¼ Drive Rivets should be used to install bus stop identification number to bus stop poles. There are no exceptions

b) Two flathead screws should be used to install bus stop identification numbers on shelters.

Contact for Information on Transit Facilities Design Manual

SunLine's *Transit Facilities Design Manual* was developed by Transportation Design Management (TMD) with assistance from SunLine Transit Agency (SunLine) Planning staff. The manual was developed as part of the recommendations in the Comprehensive Operational Analysis which was approved by the Board of Directors in February 2006. This document was reviewed by senior management and presented to the Board of Directors in December 2006 prior to distribution to all jurisdictions, the development and building community, and other interested parties. Future updates are planned periodically.

TMD relied on planning and transit operations experience, and consulted with SunLine staff on how best to address transit facilities design issues that impacts transit service operation in the Coachella Valley. TMD also consulted several reliable and available engineering and transit standards accepted throughout the transit industry. Copies of the *Transit Facilities Design Manual* are available by contacting the Planning Department. The whole document or selected sections may be mailed, faxed, or sent electronically in Word or by PDF.

For additional information, all interested parties may contact SunLine's Planning staff at 760-343-3456. This document may also be downloaded from SunLine's website at www.sunline.org.

Appendix A

SAMPLE AGREEMENT FOR BUS STOP PLACEMENT ON PRIVATE PROPERTY

SunLine Transit Agency (SunLine) in Thousand Palms, California will sign a Bus Stop/Bus Shelter Placement Use Agreement with owners of private property to locate a stop. The agreement is provided below.

PRIVATE PROPERTY BUS STOP PLACEMENT USE AGREEMENT

THIS USE AGREEMENT, made and entered into in triplicate, this day of 2006, by and between SunLine Transit Agency, hereinafter called "SunLine" and which represents the ownership and maintenance of a private property, hereinafter called the "Owner".

WITNESSETH:

WHEREAS, Owner represents the ownership and maintenance of a private road physically located at and further depicted on attached Exhibit "A"; and

WHEREAS, the Owner has requested that SunLine place a bus stop adjacent to the private road and in a location agreed to by the adjacent property owner, and in accordance with the provisions of this agreement; and,

WHEREAS, the parties herein desire to enter into a general use agreement to allow SunLine access to the described private property to allow placement and use of a bus stop by the public to access public transportations services offered from the described location; and,

WHEREAS, SunLine agrees to provide transportation services to this location in consideration of this access and agreement subject to SunLine’s operating requirements; and,

WHEREAS, this agreement does not guarantee the delivery of any public transportation services to the property.

NOW THEREFORE, in consideration of the covenants and agreements the parties hereinafter set forth, Owner does hereby grant unconditional access and use of the private roadway described above including the placement of a bus stop on Owner's property.

1. Premises. The Owner grants to SunLine the right to use that portion of the Owner's premises shown (called the "Premises") for a public bus stop.

2. Usage Rights Granted. SunLine, at its expense, may install signs, paint markings, and other traffic control devices and make other improvements. All other changes shall require the consent of the Owner.

3. Owner's Rights. The Owner reserves the right to make other uses of the Premises that do not interfere with SunLine's use.

4. Term. The term of this Agreement shall be ongoing commencing on this day of 2006. At any time, either Party may terminate this Agreement by giving two (2) months' notice to the other party of its intent to terminate.

5. Access. SunLine may authorize the use of the Owner's driveways, walkways and improved surfaces surrounding the Premises for vehicular and pedestrian access to the Premises.

6. Maintenance. SunLine shall only be responsible for maintenance of markings and improvements that it installs and will not be responsible for any roadway maintenance and repairs at the Premises location. Owner agrees that they have inspected the location of the bus stop and the adjacent roadway and have determined that the location of the bus stop is a safe location and that the roadway is adequate to accommodate public transit vehicles. Further, Owner will hold SunLine harmless from any damage, claims, actions or losses to the roadway connection with the use of the Premises unless a result of SunLine's sole negligence and to the extent permitted by law.

7. Towing of Vehicles. SunLine's may order vehicles to be towed away at its own expense and risk. Special consideration, however, shall be provided for vehicles displaying a government-issued "handicapped" license plate or decal.

8. Insurance. SunLine will procure and maintain, for the duration of the Agreement, insurance and/or self-insurance against claims for injuries to persons or damage to property that may arise from or in connection with the use of the Premises.

9. Indemnification/Hold Harmless. SunLine will defend, indemnify and hold harmless the Owner, its officers, officials, employees, and volunteers from and against any and all claims, suits, actions or liabilities for injury or death of any person, or for loss or damage to property, which arises out of the use of Premises or from any activity, work or things done, permitted or suffered by SunLine in or about the Premises, except only such injury or damage as shall lime been occasioned by the sole negligence of Owner.

10. Governmental Charges. SunLine shall not be responsible for any, taxes, assessments, or governmental charges of any kind that may be levied against the Premises.

11. Termination. SunLine will discontinue its use of the Premises on termination of this Agreement; will remove all signs and structures placed on the Premises by SunLine; will repair any damage to the Premises caused by the removal; and will restore the Premises to as good a condition, less reasonable wear and tear, as existed prior to the execution of this Agreement.

12. Accommodation. The parties agree to make reasonable accommodations with and to work together to resolve problems that may arise from time to time. Upon reasonable advance notice to SunLine and its users, the Owner may secure the Premises on a limited number of dates to allow for construction on surrounding property or special events. The Owner agrees to provide special consideration for vehicles displaying a government-issued "handicapped" license plate or decal.

13. Entire Agreement. This document contains the entire agreement between the parties and supersedes all other statements or understandings between the parties.

SunLine Transit Agency	Private Property Owner
_____	_____
_____	_____
Printed Name	Printed Name
_____	_____
Signature	Signature
_____	_____
Date	Date

Appendix B

SunLine Transit Agency

Transit Service Checklist

This transit checklist can be used in evaluating accessibility of a development to public transportation provided by SunLine in the Coachella Valley. Proposed developments can be critiqued by answering questions on the checklist, which are designed to receive a "Yes" response. The responses provided will determine if the proposed development will accommodate transit vehicles and will provide access to public transportation. Refer to the appropriate section for design suggestions or characteristics if a "Yes" response is not received. If additional information or further assistance is needed, SunLine Planning staff will review the development site plans and provide transit related design recommendations and technical assistance.

- Do roadways within and around the development include design features to make the development accessible to transit buses?
- Are the intersection radii for driveways and intersections designed using design recommendations provided in this Manual?
  - i. Roadway grades that are 6% or less;
  - ii. Bus loading pads designed with a minimum 8 feet Portland cement concrete jointed reinforced pavement and a 4 foot sub- base of stabilized granular material;
  - iii. Lane widths of 12 feet; and
  - iv. Curb heights of 6 inches.
- Are the residential development designed with a central collector street that will provide access for transit buses?
- Have bus stop locations near the proposed development been identified by SunLine staff?
- Are passengers amenities required as part of the development and has SunLine staff been contacted to determine if the amenities are needed?
- Will a bus turnout and bus shelter be constructed as part of this project and has SunLine staff reviewed the proposed location and design?
- Are pedestrian walkways, curbs, bus stops, building entrances, parking areas and transit amenities designed for persons with disabilities?
- Do the pedestrian walkways provide direct access or path from the building entrances to bus stop?
- Have SunLine staff approved design for transit-related amenities proposed for this project?

Appendix C

SunLine Transit Agency

Bus Shelter Placement Rating Checklist

Route #: _____ Location: _____

Cross Street: _____ Direction: ☐ N ☐ E ☐ S ☐ W

Priority: ☐ High ☐ Medium ☐ Low Requested by: _____

Evaluated by: _____ Date: _____

CURRENT AMENITIES

☐ (25) Improved Sidewalk ☐ (20) Curb Cut ☐ (10) Bus Pullout

☐ (5) Concrete Landing Pad ☐ (5) Bus Stop Zone ☐ (5) Bike Lane/Route (Bonus Point)

☐ (0) Unimproved Sidewalks

NEXT SHELTERED STOP

☐ (20) Over 1,000 ft. ☐ (15) Within 1,000 ft. ☐ (10) Within 750 ft. ☐ (5) Within 480 ft

SERVICE POPULATION

☐ (5) Seniors & Persons with Disabilities ☐ (5) Public Facility (school, park, etc)

☐ (5) Commercial/Retail Facility ☐ (5) High Density Residential Areas

☐ (5) Medical & Nursing Facility

Site Ridership Statistics:
☐ More than 100 ☐ 75 – 99 ☐ 50 – 74 ☐ 25 – 49 ☐ 0 – less than 25

SITE PREPARATION/FEASIBILITY

☐ (10) No Hazard ☐ (5) Hazardous to Traffic & Pedestrian

Site located in: ☐ Public Right-of-Way ☐ Private Property Please explain: _____

_____

☐ (20) Very Accessible ☐ (15) Needs Minor Improvement

☐ (10) Site Moderately Accessible ☐ (5) Site Not accessible (major improvements needed)

TOTAL SCORE _____ REQUESTED GRANTED _____ DENIED _____

Please provide additional information (use other side if necessary): _____

_____

_____

Appendix D

Glossary

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

Accessory Pad – A paved area that is provided for bus patrons and may contain a bench shelter and/or other amenities.

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

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

ADAAG – Americans with Disabilities Act Accessibility Guidelines from the US Access Board. See: http://www.access-board.gov/adaag/html/adaag.htm

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

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

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

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

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

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

Bus Route Spacing – The distance between adjacent, parallel bus routes.

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

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

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

Bus Stop Spacing – The distance between consecutive transit stops.

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

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

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

Bus Turnout – See definition for Bus Pull-Out Bay.

Central Business District (CBD) – The downtown retail trade and commercial area of a city or an area of very high land valuation, traffic flow, and concentration of retail business offices, theaters, hotels, and services.

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

Collector Street – A roadway that serves internal traffic movements in an area by connecting several local streets with an arterial roadway.

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

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

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

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

Downstream – In the direction of traffic.

Dwell Time – The time a bus spends at a stop, measured as the interval between its stopping and starting.

Far-Side Stop – A bus stop that is located immediately across an intersection.

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

Floor to Area Ratio (FAR) – Land use analysis quotient determined by dividing the gross floor area of all buildings on a given lot by the total area of the lot.

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

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

Headway – The interval between the passing of the front ends of successive buses moving along the same lane in the same direction, usually expressed in minutes. Also known as Frequency.

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

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

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

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

Major Local Transit Stop – Similar to Standard Local Transit Stops, except with higher passenger boarding/alighting volumes. These stops typically are located at major activity centers or where routes intersect.

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

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

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

Nub – A stop where the sidewalk is extended into the parking lane, which allows the bus to pick up passengers without leaving the travel lane. Also known as a curb extension or Bus Bulb.

Open Bus Bay – A bus bay designed with bay "open" to the upstream intersection.

Overhang – The portion of the vehicle body that extends beyond the front or rear axle.

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

Paratransit – Comparable transportation service required by the American with Disabilities Act of 1990 for individuals with disabilities who are unable, because of their disability , to use traditional fixed-route transportation systems.

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

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

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

Queue Jumper Lane – Right-turn lane upstream of an intersection that a bus can use to bypass queue traffic at a signal.

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

Shelter – A curb-side amenity designed to provide protection and relief from the elements and a place to sit while patrons wait for the bus.

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

Sight Distance – The portion of the highway environment visible to the driver.

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

Standard Local Transit Stop – Bus stops that have the lowest passenger boarding/alighting volumes. These stops account for the majority of bus stops and provide for system access over a large geographical area.

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

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

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

TCRP – Transit Cooperative Research Program of the Transportation Research Board.

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

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

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

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

Upstream – Toward the source of traffic.

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

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

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

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