

# TRANSIT FACILITIES DESIGN

## A Manual for Coordinating Public Transit and Land Use in Greater Bakersfield



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## **INTRODUCTION/EXECUTIVE SUMMARY**

This manual has been prepared by the Golden Empire Transit District (GET) to assist with the selection, design and placement of various bus facilities and amenities, in areas where new bus service is proposed, or where modifications or improvements to existing service are necessary to facilitate safe and efficient transit operations. Facilities that are improperly or unsafely designed will not be served by GET. At the same time, installation of a bus facility does not ensure that transit service will be provided. The District will furnish, upon request, information on the likelihood of the provision of transit service to a particular area or development.

The ability of the Golden Empire Transit District to provide effective and efficient transit service in the greater Bakersfield area is determined by a large extent from development decisions made in the community. The recommendations in this manual are designed to help local jurisdictions and the development community to accommodate transit in their development plans. Working with GET 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 facilities also can be tailored for future users.

Transit relies on people being able to get to and from stops and stations safely and easily. Improving access to transit is essential for a successful transit system. Collaboration is a key element in order to improve safety and maximize accessibility to transit. No single agency or organization can accomplish this on its own. Transit agencies do not control the street network around stations and stops. Cities and counties usually do not make transit routing and facility choices. Moreover, a city, county, or region may face many other competing transportation needs, so improving accessibility to transit requires collaboration among a variety of agencies.

This manual aims to provide best practices to support the work of public transportation and other transportation professionals in improving safety and access to transit. The manual is organized into several sections corresponding to facility design. Chapter 1 outlines the benefits of considering transit needs in project development. Chapter 2 discusses land use and design considerations, including the elements of a livable community and transit oriented development. Chapter 4 provides design specifications for bus stops and chapter 5 discusses specific designs for transit amenities including shelters, benches, turnouts, park and ride facilities, and bicycle facilities. Chapter 6 provides information on street geometrics and vehicle characteristics. Following chapter 6 is a glossary.

# 1. BENEFITS OF CONSIDERING TRANSIT NEEDS IN PROJECT DEVELOPMENT

All parties involved in the development process can benefit by considering transit issues in the early phases of project development in Greater Bakersfield. Not only does it make good planning sense, but it is also required by state law. Dealing with traffic congestion and improving the transit system is a group effort and requires all participants to be fully aware of the impacts of decisions reached early in the development process. Everyone benefits from proactively considering transit needs in project development. Ultimately, the quality of life is improved for Greater Bakersfield residents and commuters.

## 1.1 Overall Benefits

The benefits of considering transit issues in land use and development proposals accrue to everyone, including the citizens of Greater Bakersfield who are concerned about congestion, air quality and quality of life. As a transportation mode, transit provides a positive alternative to the single-occupant vehicle. If more people would use public transit, we would see noticeable improvements to traffic congestion and air quality. Improved transit services also enhance the quality of life for the transit-dependent by increasing their mobility. Transit use has many benefits to society:

1) *Reduced energy consumption* - Public transit's energy efficiency and conservation potential are considerable. Public transportation use saves the U.S. the equivalent of 4.2 billion gallons of gasoline annually — and more than 11 million gallons of gasoline per day. Public transportation use saves the equivalent of 300,000 fewer automobile fill-ups every day.

2) *Rational development* - One only has to look at the development patterns of a metropolitan area from the air to see the relationship between development and transit. Office buildings, residential complexes or buildings, hospitals, universities, shopping areas, and large manufacturing plants all generate large amounts of traffic. High-capacity vehicle access (i.e. transit) is the only way such areas can avoid gridlock due to the limited capacity of streets, highways, and parking facilities.

3) *Mobility* - The ability to travel freely is one of the hallmarks of a free society. Yet millions of people have restricted mobility because they do not own a motor vehicle, cannot afford to drive, or are physically unable to drive. Transit is the only means of mobility for most of these people--to jobs, medical services, recreation, and shopping.

4) *Greater retail sales* - Numerous estimates have been made around the country that retail sales--especially in central business districts--are enhanced by the presence of good transit service. There are several reasons: (a) A high proportion of commuters in large cities use transit to shop near work, before or

after work, or during their lunch hours, (b) The transit-dependent shop in locations they can get to by transit, (c) Many department stores, urban malls, and commercial areas are located in congested areas adjacent to rail stations, bus terminals, and transit routes.

5) *Less traffic congestion* - One full 40-foot bus is equivalent to a line of moving automobiles stretching 6 city blocks (if traffic operates at 25 mph) and 4.5 blocks (if traffic operates at 15 mph).

6) *Creation of jobs* - In addition to the over 300,000 people directly employed by transit, tens of thousands of others are dependent on transit for their livelihood. These include engineering and construction workers planning and building transit facilities, transit consultants, manufacturers of transit vehicles, equipment and parts, retail employees serving transit passengers, and employees in all sectors of the U.S. economy indirectly supporting transit activities.

7) *Mobility during crises* - After the 1989 San Francisco earthquake the entire city was paralyzed, but the BART rail system resumed operations after just a few hours to check for damage. Service was expanded to 24 hours per day since the bridge connecting San Francisco and Oakland was closed for several weeks.

8) *Less air pollution* - Transit vehicles contribute far less pollution to the atmosphere than automobiles.

9) *Safety* - Transit is one of the safest methods of passenger travel, according to the National Safety Council.

10) *Increased Productivity* - The better facilities and services provided by the investment result in more efficient movement of people and goods which saves time, reduces costs, and increases productivity.

## **1.2 Benefits to the Development Community**

The benefits to the development community of considering transit improvements in the early phases of project development are many and differ from project to project. Generally, they can be summarized as follows: 1) increased compatibility between transit services and the internal roadways, walkways and transit facilities within a project; 2) compliance with local and regional mobility and environmental goals; and 3) a reduction in the roadway capacity needed within a project area because of better transit access.

The Bakersfield Municipal Code includes a Transit Credit as an incentive to reduce the amount of required parking in order to encourage transit usage. Except for the “central district” and properties zoned C-B and C-C, which already receive a fifty percent reduction under Section 17.58.120, required parking may be reduced by ten percent if there exists a transit facility as defined in Section 17.04.624 within one thousand feet of the front or main customer door of the building that is linked with an improved and paved pedestrian way (Section

17.58.055). “Transit facility” means a public use facility designed to provide access to public transportation services that may consist of single or multimodal functions, including but not limited to, bus, bus rapid transit, trolley, and light rail, and also contains buildings or structures that provide seating and weather protection for the public using said services (Ord. 4521 § 9, 2008).

### ***1.3 Benefits to Local Jurisdictions***

Local jurisdictions also profit from including transit improvements in new development projects. Specifically, it helps them: 1) comply with local and regional regulations; 2) contribute toward congestion relief; and 3) reduce the need to expand roadway capacity.

### ***1.4 Benefits to the Golden Empire Transit District***

The District profits from this process by being able to achieve: 1) more efficient route alignments; 2) increase in ridership and 3) improved farebox revenues. Combined, these three factors will help GET provide better service to all Greater Bakersfield residents.



## **2. LAND USE AND DESIGN CONSIDERATIONS**

Publicly owned transit should be viewed as a valuable but scarce public resource. There are never enough funds available to supply the same level of service to all locations within a given transit district. To take advantage of this scarce public resource, land use patterns and street networks should be designed to encourage rather than inhibit more efficient public transit operation.

The provision of transit service to a development depends upon three major considerations; 1) the availability of resources to provide the service; 2) actual market demand and 3) the design of the development. This section deals with the design aspects of a development. It shows how design considerations can impact the provision of service and provides recommendations for project design that would create a transit friendly environment.

### ***2.1 Livable Communities and Transit-Oriented Development (TOD)***

A “livable community” is one that is characterized as pedestrian-friendly, residential neighborhoods near to a “Main Street” featuring basic needs, goods, services, and transit facilities. Livable communities that emphasize accessibility by mass transit are also called transit-oriented developments (TODs). A TOD focuses on a mix of compatible and compact land uses that enable convenient access to/from bus routes, designed to provide effective connections to residential, employment, educational, and commercial areas. Transit-oriented development concepts include the following:

- Convenient pedestrian and bicycle access to transit facilities.
- Mixed residential and commercial land uses near transit facilities.
- Pedestrian-friendly building and street design.
- Balanced parking supply/demand
- Priority for non-motorized modes and transit vehicles in circulation plans.
- Compact development.
- Community development public and private partnerships.

In many ways, transit-oriented development describes a return to the streetcar-oriented commercial areas of the last century and the villages that grew around the rail stops. Before the proliferation of the automobile, it seemed natural to cluster commercial and residential uses within easy walking distance of each other and transit. Following World War II, freeways facilitated the exodus to suburban subdivisions that were not designed with transit service in mind. Zoning regulations, originally designed to protect residents from noxious industries, further segregated businesses from residences. Metropolitan regions throughout the country are experiencing the consequences of low density sprawl and automobile-dependent land use patterns.

From the General Plan to the final development permit, land use decisions and the expenditure of public funds should be predicated on the realization that sustained economic development requires a new development pattern that provides more than one mobility choice. In addition to the economic benefits, elected representatives should advocate for TOD because it helps people of all demographic backgrounds and mobility abilities.



Example of a mixed use development.

## ***2.2 Coordination of Land Use and Transportation Policies***

Currently, GET participates in the development review process by offering suggestions and recommendations that may improve and enhance transit services. To expedite the development review process, jurisdictions are encouraged to notify GET of its Planning review calendar, including dates, times, and places of meetings for pre-submittal conferences, Development Review Committee, Planning Commission, and City council/County Supervisor meetings. GET should also be notified of special community outreach and planning activities that may have an impact on transit services. GET should be included on Planning and Public Works Departments mailing lists for new development projects. The types of local development projects that need to be reviewed by GET include:

- Tentative Tract & Parcel Maps - Bus stops, turn outs, and pedestrian access can be recommended.
- Commercial Centers - Since these are trip generators located at potential employment nodes and activity centers, and are constructed along major arterials, it is likely there will be a need for transfer locations and bus stops.
- Institutional Uses (Schools, Public Buildings, Hospitals) - It is very important that School Districts work with GET when locating institutional developments to ensure that GET is able to provide service. Because of federal regulations on Charter Service, GET must ensure that it is in compliance with federal mandates.

- Site Plans - These plans enable GET to review developments ranging from small to major projects. Small projects may be reviewed but GET may not respond depending on its impact on transit service.
- Street Improvement Plans for Arterial Streets - Because these projects impact existing and future stops, it is highly recommended that jurisdictions coordinate these projects with GET. It may be an opportunity for GET to recommend an upgrade to an existing stop, plan for a new amenity, such as a shelter, or construct a turn out.
- Notices of Preparation, Draft Environmental Impact Reports - These should be reviewed in the early stages of the process to provide transit input.
- General Plans - This ensures that the proposed land use, circulation plans, and community designs are supportive of and conducive to transit service.
- Specific Plans - Proposals should be evaluated for consistency with the General Plan.
- Partnerships - To promote coordination of transit facilities with private and/or public sector development, GET 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.

### ***2.3 Construction Impacts***

Construction projects, such as street improvements, repaving, grading, or water line installation often impact bus operations and bus stops. These impacts to transit service can be minimized through conditions placed on private development constructions to ensure they work with GET staff. Frequently, no safe access is provided to bus stops and buses in service. The California Building Code and Americans with Disabilities Accessibility Guidelines requires that accessibility issues be addressed during construction, which includes:

- Providing advanced warning of closures
- Ensuring that temporary solutions provided conform to access standard
- Assuring that minimum vertical and horizontal clearances are maintained
- Providing barricades adjacent to work zones

To ensure the safety of all passengers who use the affected bus stops, the following actions are recommended:

- GET staff should be contacted 15 days prior to the beginning of street closures that affect transit service operation. This ensures we are able to notify passengers and bus drivers of the changes.
- All contractors must work with GET to ensure temporary bus stops are established before permanent stops are closed.
- GET 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 GET prior to the beginning of construction.
- The contractor should make every effort to schedule work to minimize impacts.
- Contractors are not authorized to remove any bus stop signs, shelters, benches, and trash containers without prior authorization from GET. GET may elect to remove these with its own personnel, who have the expertise to remove them (such as shelters) without damage.
- Contractor shall provide GET with the name and phone number of the on-site construction manager prior to the beginning of construction.
- Contractors must notify GET upon completion of construction so that permanent stops can be re-installed.



## **2.4 Location**

Ideally, all development should be located in areas where transit service already exists or where transit service is planned. If service is provided nearby, placing the development next to areas with service will ensure that the site will be served

by transit. Activity centers, such as shopping, medical and educational centers, are major trip generators and will produce transit ridership.

Another design measure is to create mixed-use developments rather than the traditional single-purpose developments. Mixed-use developments are different than activity centers because they have different uses located within the same project. On the other hand, activity centers are typically an aggregation of separate but complementary land uses. Because mixed-use developments include commercial, retail, and residential uses within the same project, automobile trips will be reduced and transit ridership could increase.

Location of a specific building within a development has a significant impact on the potential for transit use. It is therefore an important consideration in the development of site plans since greater transit use ensures continued provision of transit service.

Site plans which orient building access to bus stops and maximize their proximity, facilitate and encourage transit use. GET, therefore, recommends:

- The distance between buildings within a particular site and the transit corridor along which they are located should be minimized.
- Access points to the building should be oriented toward the bus stops.
- Location of parking lots between the buildings and the transit corridor should be avoided.
- Sidewalks, plazas, or other means of pedestrian access within the site should be placed so as to provide a direct path to the transit corridor.

Figure 1 illustrates these concepts.

## **2.5 Density**

To be cost effective, public transit depends on high densities. The density of a development has a direct correlation to the level of service it can expect to receive. High population and / or employment densities are conducive to the provision of transit service by enhancing its efficiency and cost-effectiveness. Minimum recommended densities are as follows:

- **Residential Development:** The minimum density of residential development necessary to support walk-on bus service within a ¼ mile band of a roadway where transit service exists or is planned, is 5 dwelling units (DUs) per acre. It is not cost effective to serve densities of less than 5 DUs/acre by fixed route bus service. Such low density developments are more appropriately served by alternative modes, e.g., demand response bus service, taxi service, etc.

- **Employment Centers:** To encourage potential transit ridership, the minimum building size for employment centers should be equivalent to 50 employees.

## **2.6 Access**

### *Roadway Access*

For successful transit service to a particular development, it is essential that 1) the components of the development, i.e., the homes or the employment centers or major traffic generators, have easy access to transit and 2) the transit service have direct and operationally safe access to the development. Certain forms of subdivision design impede access to transit service and the provision of transit service. Examples of such impediments include walled subdivisions, excessive use of cul-de-sacs and circuitous street patterns, undulations/speed bumps along arterials, etc. ( see Figure 2 ). GET will not, normally, provide transit service to subdivisions that include these because it is inefficient and not cost effective to do so.

The idea of clustering housing units around cul-de-sacs was the planners' answer to living with the automobile. These original concepts envisioned collector and arterial size streets on the edges of each large cluster development. Unfortunately, the cluster concept was embraced by developers throughout the country but usually without collector or large sized streets being constructed around each cluster. When these collector or larger streets are not built, it is difficult, if not impossible, to serve the area with fixed route public transit. It is GET's policy to encourage local government to require collector size streets for proper circulation within new developments.

Roadway design is critical for all types of development because transit access and efficient circulation help determine the overall level of service. The considerations which should be kept in mind when designing roads are:

- The roadway width should be wide enough for transit vehicles to use without hindering traffic. GET recommends a 12-foot lane width for the curb lane to ensure proper maneuverability.
- The roads should be as straight as possible and should not have any dead ends or cul-de-sacs.
- Roadways should be made of materials that can support large transit vehicles. Roadway pavements need to be of 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

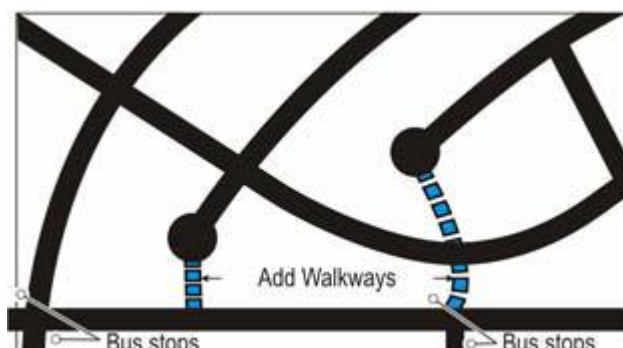
in the retention of roadway surface shape, drainage capabilities, and skid resistance.

- The curve radius should be fifty (50) feet so that all buses in our inventory can use the roadways. This curve radius of 50 feet is for both the center line and for the curb radius. This will ensure that our buses and privately-owned over-the-road coaches have ample room to maneuver when negotiating a left or right hand turn.

### *Pedestrian Access*

Pedestrian access is a key component of development design and should be considered early in the design phase. Without proper pedestrian access, foot traffic will be discouraged. Secondly, even if a development is located adjacent to an activity center, the two must be connected to each other and surrounding uses. Considerations to keep in mind when designing pedestrian accessways are:

- Pedestrian accessways should be accessible, equipped with wheelchair ramps, and must conform to ADA regulations.
- Barriers to pedestrian activity should be eliminated. This includes replacing the wall or fence around the development near the transit stop(s) along the roadway with a system of offset walls and berms which allow pedestrian passage and provide the sound-reducing qualities of walls, but restrict vehicular access. If there is restricted access, gates should be installed at access points.
- Pedestrian accessways should be safe for pedestrians, with adequate drainage and lighting.
- Pedestrian accessways should be as straight as possible.



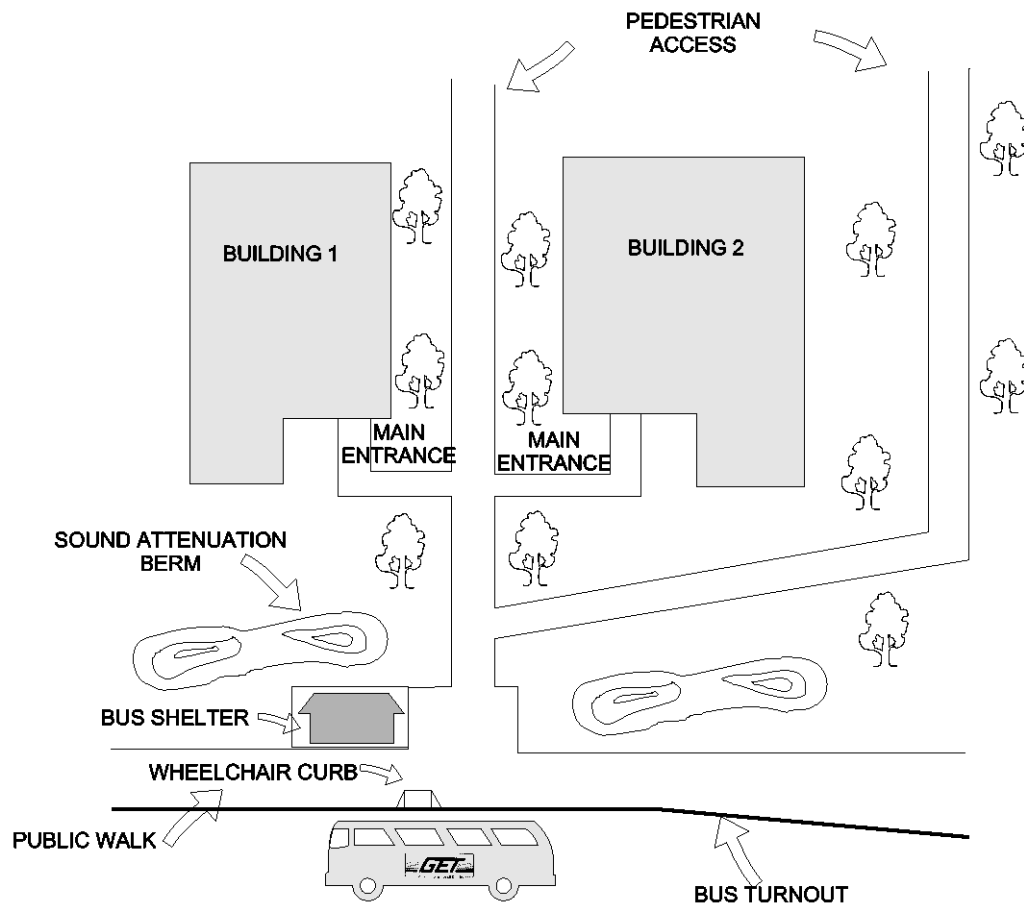
- Pedestrian accessways should be connected with adjacent arterials and bus stop locations. (See pictures below and Figure 1.)

Pathway connected to bus stop

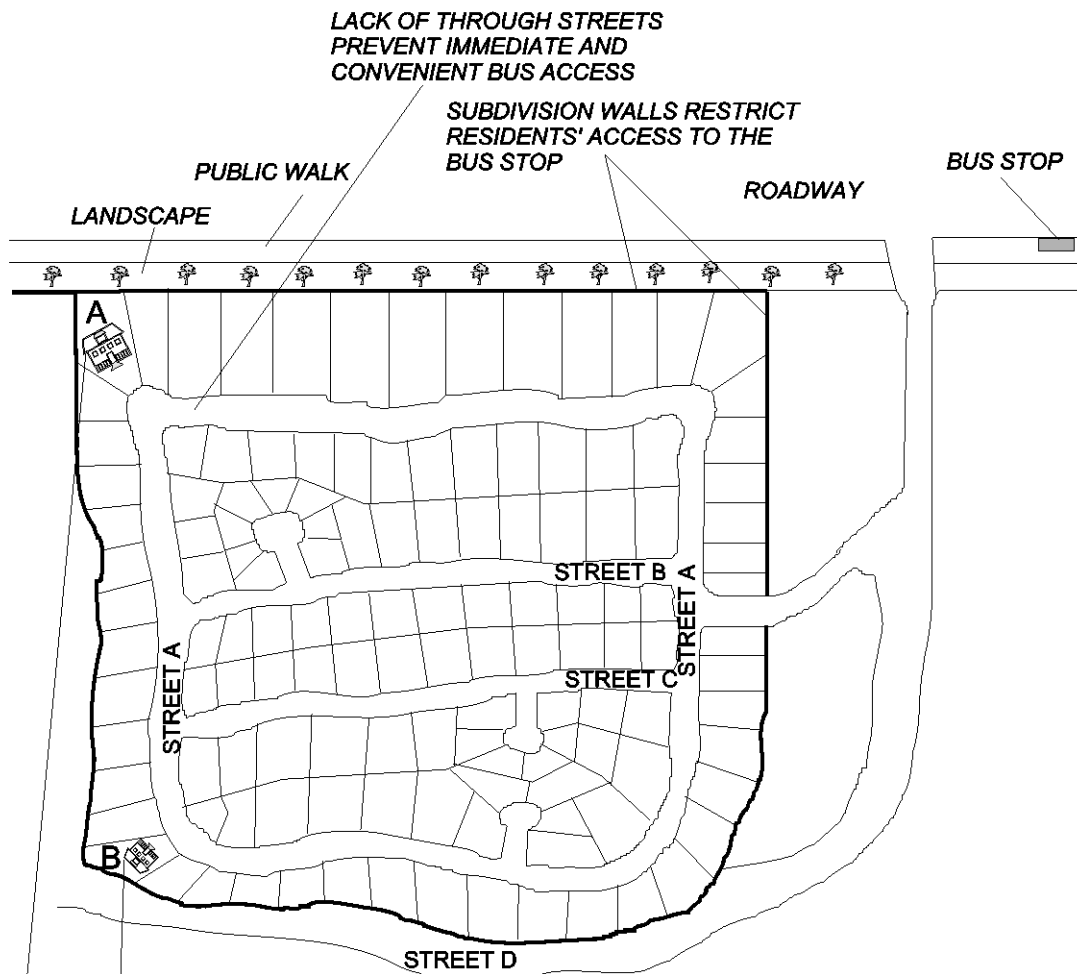


Cul-de-sac access to nearby streets





**FIGURE 1**  
**DESIRABLE PEDESTRIAN ACCESS**



NOTE HOW FAR EACH OF THESE HOUSEHOLDS MUST WALK TO REACH THE BUS. RESIDENCE "A" IS LOCATED 150 FEET FROM A POTENTIAL BUS STOP LOCATION. ACTUAL ACCESS DISTANCE DUE TO LACK OF PEDESTRIAN EASEMENT IS ABOUT ONE-HALF MILE. AN OCCASIONAL EASEMENT OR PEDESTRIAN PATH WITHIN RESIDENTIAL DEVELOPMENTS WILL ALLOW FOR CLOSE ACCESS TO GET SERVICE.

FIGURE 2  
TYPICAL SUBDIVISION DESIGN  
MISTAKES PROHIBITING BUS USE



### 3. BUS STOPS

As the first point of contact between the passenger and the transit service, the bus stop is a critical element in the District's mission and vision statements and its overall goal of providing timely, safe, and convenient transportation. Transit is an integral part of livable communities. Specifically, the efficient placement of bus stops near major destinations and within easy access provides a viable transportation alternative to the automobile by making the entire transit trip shorter and more pleasant. Thus, the key to successful and productive integration of transit into the fabric of everyday community life includes the location and design of bus stops.

The key players in bus stop facility location and design are as follows:

**Golden Empire Transit-** The transit agency is the primary provider of transit service.

**City & County Government-** The authority with jurisdiction over the streets and sidewalks in the transit service area is mostly the City of Bakersfield and County of Kern, but Caltrans is sometimes also involved.

**Developers-** Developers provide new construction and growth in the service area. Development may be either residential or commercial.

**Disability and Advocacy Groups-** Input from agencies whose clients rely on transit is an essential tool in identifying bus stop accessibility issues.

**Employers-** Employers and retail customers are potential transit riders. Employers benefit when their employees and customers can travel to work easily and efficiently.

**Neighborhood groups-** Neighborhood residents are potential consumers of transit service, and potential supporters of transit, whether they use the service or not. Amenities at stops, such as shelters and benches, may attract riders.

**Key destinations-** These are the trip generators (central business districts, schools, shopping areas, public buildings, medical facilities, etc.) for those who work at these locations, and for those who use the services provided at these locations.

While the individual priorities of these players may vary, they have the same interest in the potential benefit of bus stops with attractive and comfortable amenities. They are the stakeholders in bus stop facilities and design. The shelters, signs, benches, etc. at bus stops are among the most visible images of the transit district to the community and therefore play a vital role in public perception.

Bus passengers desire a comfortable place to wait for the bus. Providing an attractive, pleasant setting for the passenger waiting area is an important factor in attracting bus users. Important elements of a bus stop include:

- ADA Standards
- Protection from passing traffic
- Lighting & Security
- Paved surface
- Protection from the environment
- Seating or other street furniture
- Information about routes serving the stop

Bus stops can improve bus service and expedite general traffic flow when properly located, adequately designed, and effectively enforced. Decisions regarding bus stop frequency, locations and length call for careful analysis of passenger service requirements (demand, convenience, and safety), the type of bus service provided (i.e. local or express), and the interaction of stopped buses with general traffic flow.

A bus stop is commonly identified by a sign, bench, shelter or curb marking. Where on-street parking is allowed, no-parking areas should be marked so that buses can pull into or out of the bus zone without being impeded by parked vehicles. In areas of higher traffic density, turnouts may be needed since on street stops block the right-hand lane of traffic.

### **3.1 Accessible Bus Stop Design**

The contents of this manual emphasize guidelines that improve the ADA accessibility and safety of bus stops and pedestrian access to bus stops. Bus stops are a key link in the journey of a bus rider. For people with disabilities, inaccessible bus stops often represent the weak link in the system and can effectively prevent the use of fixed-route bus service. Physical, cognitive, and psychological barriers associated with bus stops can severely hamper bus ridership by the disabled community, thus limiting their mobility and potentially leading to increased paratransit costs. Following is a list of typical myths of bus stop accessibility.

***Myth 1: Only a small percentage of the transit ridership will benefit from bus stop accessibility improvements.***

Accessibility improvements for people with disabilities enhance the usability of transit systems for all riders. For example, paving a grassy surface to serve as a bus stop landing pad provides a stable surface for waiting patrons; adequate lighting alleviates the security issues of using the bus after dark; and good information reduces ambiguity of the system. Accessibility improvements also benefit people with a range of disabilities, from physical conditions affecting mobility, stamina, sight, hearing and speech to other conditions, such as

emotional illness and learning disorders. Such disabilities may or may not be evident to others. The percentage of the U.S. population affected by a condition that constitutes a disability under the Americans with Disabilities Act (ADA) is expected to increase over the coming decades, in part due to the growing elderly population. Additionally, transit users carrying packages or luggage, pushing children in strollers, or otherwise transporting items will also benefit from accessibility improvements.

***Myth 2: Bus stop accessibility and safety improvements are not our responsibility.***

As bus stops are located on the public right-of-way or on private property, transit agencies may not have jurisdiction to implement improvements. Though this may be the case, it is in the interest of the transit agency to work with its municipality, community and businesses on bus stop improvements. Bus stops advertise an image of the transit service and agency. Poorly maintained, unsafe, uninformative and inaccessible stops convey a poor image of the agency and discourage use. Rising paratransit costs are another reason bus stop safety and accessibility improvements are important. Providing an unobstructed landing pad, wayfinding signs, clear transit information at the eye level of a wheelchair user and other basic improvements can encourage some paratransit users to use fixed route transit, decreasing the agency's paratransit costs. Transit agencies are required to provide accessible transit, and accessible bus stops are an integral part of an accessible system. Similarly, public works departments are required to construct accessible facilities and ensure program accessibility of existing facilities.

***Myth 3: Once we have implemented bus stop accessibility improvements, the stop will always be accessible.***

Though accessibility and safety improvements have been implemented, the stop may not meet standards indefinitely. Many factors may decrease accessibility and safety, including construction, unregulated placement of newspaper vending machines and poor maintenance. Stops should be regularly monitored to ensure that the stop is clear of obstructions.

***Myth 4: Each new stop must have a landing pad.***

New bus stops should be accessible to all patrons. Agencies are not required to install landing pads at all stops. Where landing pads are provided, they must comply with the ADA requirements. Fixed route bus stops should be located where there is a stable, level, raised and slip-resistant surface to facilitate boarding and alighting for all passengers. If this type of surface is not available at the location chosen for the bus stop, a landing pad should be installed.

***Myth 5: We can prohibit patrons with wheelchairs from boarding and alighting at stops that are not currently accessible.***

A transit agency may not legally prohibit the boarding and alighting of passengers with wheelchairs, unless the lift or ramp would be damaged if deployed, or if temporary conditions at the stop prevent any disembarkation. If the bus stop is located in an area where conditions would damage the lift, such as a steep slope, the driver should stop at a nearby safe location that has a stable surface.

### ***3.2 Types of Stops***

Bus stops on-street are usually located along the street curb for direct, safe passenger access to and from the sidewalk, waiting and walking areas. Stops may be located either in the approach (nearside) or the exit (farside) of an intersection, or in midblock locations. Many factors influence the location of bus stops and the choice of nearside, farside, and midblock locations. These factors include availability of curb loading space, location of existing stops, convenience of passenger transfer, and proximity to passenger destinations. Equally significant are bus routing patterns (through, right, or left); the directions of intersecting streets (one-way versus two-way); the types of traffic controls (signals, stop, or yield); traffic volumes and turning movements; and the widths of sidewalks and roads.

The different types of bus stops are described below. Figure 3 illustrates the layout and dimensions for each of the bus stop types.

#### ***Farside Stops***

Farside stops are located beyond street intersections. Farside stops should be used wherever practical because they have a number of advantages over midblock and nearside stops.

The advantages of farside stops are:

- They reduce conflicts between right turning vehicles and stopped buses.
- Buses can begin their approach into the stop from the intersection.
- Buses can begin their approach into the stop from the intersection.
- They encourage pedestrian crossing at the rear of the bus.
- At signalized intersections, buses can find gaps for re-entry into the traffic stream.

### *Nearside Stops*

Nearside stops are located immediately preceding street intersections.

Nearside stops present less than desirable conditions for 1) traffic making right turns; 2) pedestrians crossing in front of buses into traffic, and 3) buses waiting in travel lanes to enter the stop.

Nearside stops may be considered where signalized intersections are frequent, and where curb parking is permitted throughout the day.

At signalized intersections, nearside stops permit buses to take advantage of the red phase in the traffic signal cycle time to load and unload passengers.

### *Midblock Stops*

Midblock stops are located between roadway intersections. Midblock stops should be accompanied by a pedestrian crosswalk.

Midblock stops should be used when 1) Changes in route direction require a right turn and the curb radius is short. 2) It is necessary to eliminate or reduce pedestrian street crossings at the intersections. 3) Large numbers of passengers assemble at the bus stop and it is necessary to avoid overcrowding at or near intersections.

Regardless of the location and type of stop, adequate clearance for greater wheelchair lifts to deploy should be provided. As shown in Figure 4, an eight (8) foot clearance is needed. However, the District prefers ten (10) feet because it allows for greater wheelchair maneuverability.

## **3.3 Bus Bulbs**

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. The buses stop in the traffic lane. They offer additional area for patrons to walk and wait for a bus and provide space for patron amenities, such as shelters and benches. Bus bulbs also reduce pedestrian crossing distances. Bus bulbs should be considered at sites with the following characteristics:

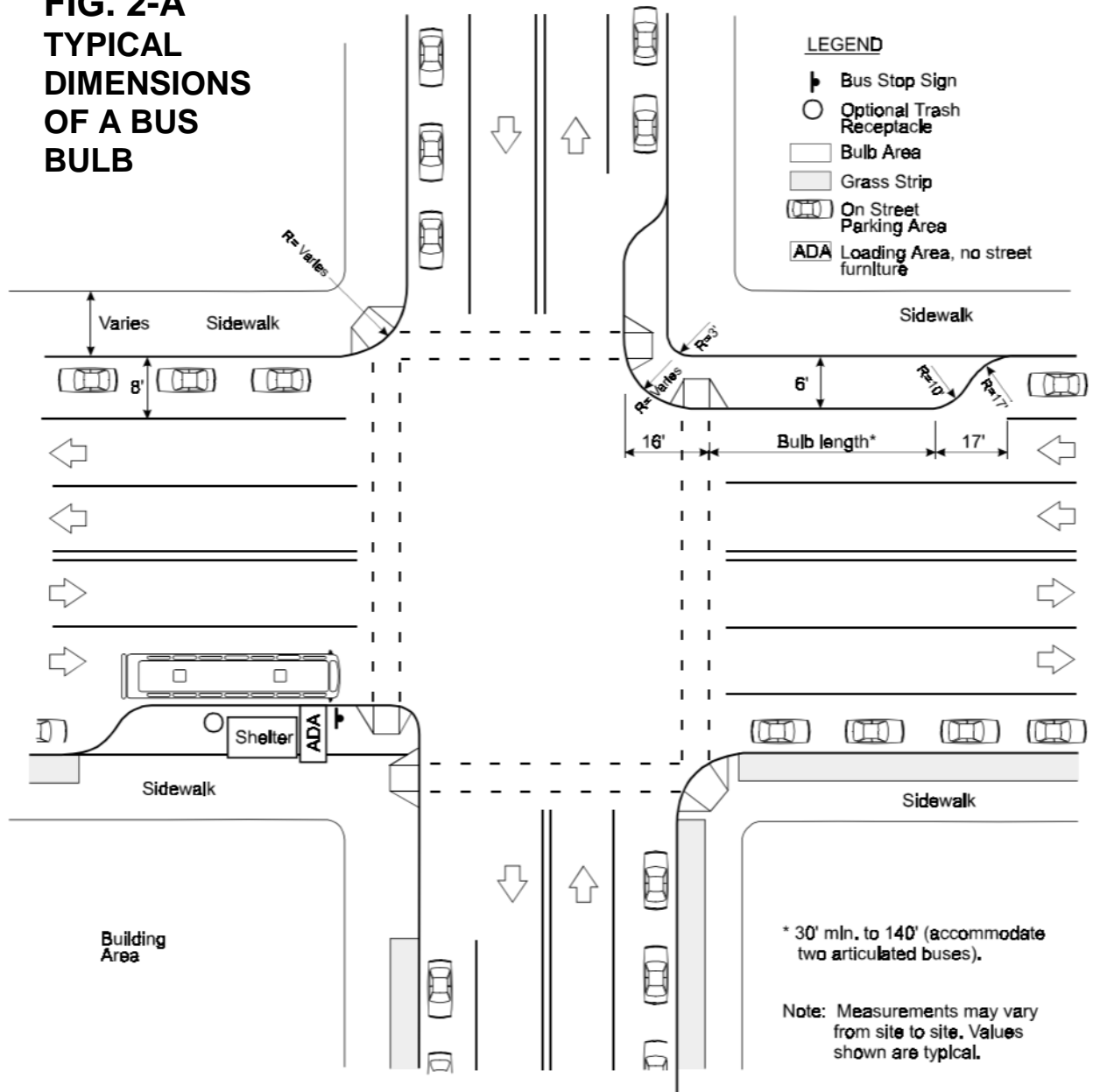
- High pedestrian activity
- Crowded sidewalks
- Need to reduce pedestrian crossing distances
- Bus stops in travel lanes

Bus bulbs have particular application along streets with lower traffic speeds and/or low traffic volumes where it would be acceptable to stop buses in the travel lane. Collector streets in neighborhoods and designated pedestrian districts are good candidates for this type of bus stop. Bulbs should be designed to accommodate vehicle turning movements to and from side streets.

Bus Bulb



**FIG. 2-A  
TYPICAL  
DIMENSIONS  
OF A BUS  
BULB**



### **3.4 Placement/Spacing Guidelines**

Bus stops are spaced to maximize passenger accessibility, convenience, and safety, while minimizing undue delay or transfer interruptions. Bus stops should be located in the curb lane on roadways. They may also be located in parking lanes and bicycle lanes. The criteria the District uses for the spacing of stops are:

Bus stops shall be placed at an average of two-thirds of a mile apart for rapid routes, one-sixth to one-quarter of a mile apart (850-1,300 feet) for crosstown routes, one-quarter of a mile apart for circulator routes, and for circulator/express routes one-quarter to one-third of a mile apart (1,300 to 1,750 feet) in circulator segments and only at major destinations in express segments.

Intermediate placement distances may be considered on a case-by-case basis depending on the density of the market area served.

The placement of stops at intersections varies from case to case. However according to the *Transportation and Traffic Engineering Handbook*, the general considerations for the placements of bus stops at intersections are:

- When the route alignment requires a left turn, the preferred location for the bus stop is on the farside of the intersection, after the left turn is completed.
- When the route alignment requires a right turn, and the curb radius is short, a midblock location is preferred. If a midblock stop is not possible, the stop should be located on the farside of the intersection, after the bus completes the right turn movement.
- If there is a high volume of right turns at an intersection, the preferred location for a stop is on the farside of the intersection.
- In circumstances where the accumulation of buses at a farside stop would spill over into the intersection and additional length is not available, the stop should be placed on the nearside of the intersection. This removes the potential for queuing buses to overflow into the intersection.
- At complex intersections with multi-phase signals or dual right or left turn lanes, farside stops are preferred because they remove the buses from the area of complicated traffic movements at that intersection.
- When transfer activity between two lines exhibits a strong directional pairing (i.e., heavy volumes from eastbound to northbound), placing one stop nearside and one farside can minimize pedestrian activity within the intersection.

- When a large percentage of passengers are going to a single trip generator, the stop should be located at a point which minimizes pedestrian activity through the intersection and which directly serves the facility.

### **3.5 Bus Stop Design Guidelines**

Bus stop lengths should reflect the number of buses that each stop will accommodate simultaneously in the peak period, the maneuvering requirements of buses to enter and leave the stop, and the type of stop. Please refer to Figure 3 for dimensions of on street stops. These dimensions assume a single 40 foot bus. Where several buses are expected to use any given stop simultaneously, 50 feet should be added for each additional bus.

<u>Bus Stop Type</u>	<u>Preferred Bus Stop Length</u>
nearside stops	130 ft
farside stops	130 ft.
midblock stops	130 ft.

### **3.6 Bus Stop Curbs**

Curbs at bus stops should be from 6 - 8 inches high to facilitate passenger boarding and alighting. If the curb is too high, it will interfere with the operation of the wheelchair lift and front kneel feature of new buses.

### **3.7 Bus Stops & Driveways**

Bus stops should not be placed within the proximity of a driveway. However if a driveway is unavoidable:

- Attempt to keep at least one exit and entrance open to vehicles accessing the property while a bus is loading or unloading passengers.
- Locate bus stops to allow good visibility for vehicles leaving the property and to minimize vehicle/bus conflicts. This is best accomplished by placing bus stops where driveways are behind the stopped bus.
- Passengers should not be forced to wait for a bus in the middle of a driveway.

Figure 5 depicts undesirable driveway situations where either visibility is restricted or the only driveway into a parking area is blocked. Figure 5 also shows acceptable driveway situations where visibility is enhanced and access is allowed.

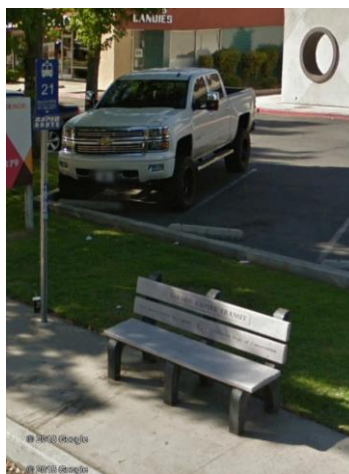
The best opportunity to eliminate driveway conflicts for passengers and buses is during early planning of development projects. New developments can then arrange their access to avoid constructing driveways within close proximity (100 feet or less) of existing or proposed bus stop locations. Each developer should contact GET for bus stop locations prior to starting the preliminary site plan for the project. Landscaping should be considered so that it complements the design of the development, including trees for shade.

### **3.8 Bus Stop Signs - Placement & Design Guidelines**

A bus stop sign should be placed at each bus stop. The following placement guidelines are recommended:

- Grouped closely with other bus stop amenities such as bus shelters and bus benches.
- Located near the front of a bus stop and away from passenger loading areas, no closer than 2 feet from the street curb and the sign facing away from the curb (unless sign is installed on middle of pole). If the post is located near the back of the sidewalk or waiting area, the sign should be mounted to face the street.
- Mounted away from trees, buildings, other signs or obstructions.
- Plainly visible, with the front of the sign facing oncoming traffic.
- Sign posts should be installed in concrete pavement where possible to prevent leaning and loose poles.
- Trash containers may be attached to posts at heavy boarding locations.

The following picture below and Figure 6 illustrate placement criteria.



The following design guidelines are used:

- To the maximum extent practicable, all bus route identification signs shall have letter and numbers with a width-to-height ratio between 3:5 and 1:1 and a stroke- width-to-height ratio between 1:5 and 1:10. (ADA Regulation 4.30.2)
- Characters and numbers on signs shall be sized according to the viewing distance from which they are to be read. The minimum height is measured using an upper case X. Lower case characters are permitted. (ADA Regulation 4.30.3)
- The character and background of signs shall be eggshell, matte, or other non-glare finish. Characters and symbols shall contrast with their background - either light characters on a dark background or dark characters on a light background. (ADA Regulation 4.30.5)
- Signs that are sized to the maximum dimensions permitted under legitimate local, state, or federal regulations or ordinances shall be considered in compliance with the preceding design guidelines.
- All signs should be made of durable and vandal resistant materials.
- The bottom of the sign should be at least 7 feet from the ground except for QR code signs, which are attached at lower levels.
- Information signs, such as schedules, timetables, or maps that are posted at the bus stop or bus bay are not required to comply with the ADA bus route identification regulations.
- Information signs should be mounted at eye level for a normal adult: approximately 5 feet, 6 inches from the ground to the center of the display. Signs should be lower if children, the disabled, or senior citizens are the predominant bus stop patrons within the area.

### ***3.9 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 up or drop off passengers, which interferes with traffic movement.

- Passengers may have to maneuver between parked vehicles when they board or deboard, which may contribute to hazardous environments that endangers them.
- The restrictions prevent the buses from accessing the curb and sidewalk area to pick up or drop off passengers. This is especially a problem for those who need to use the lifts.

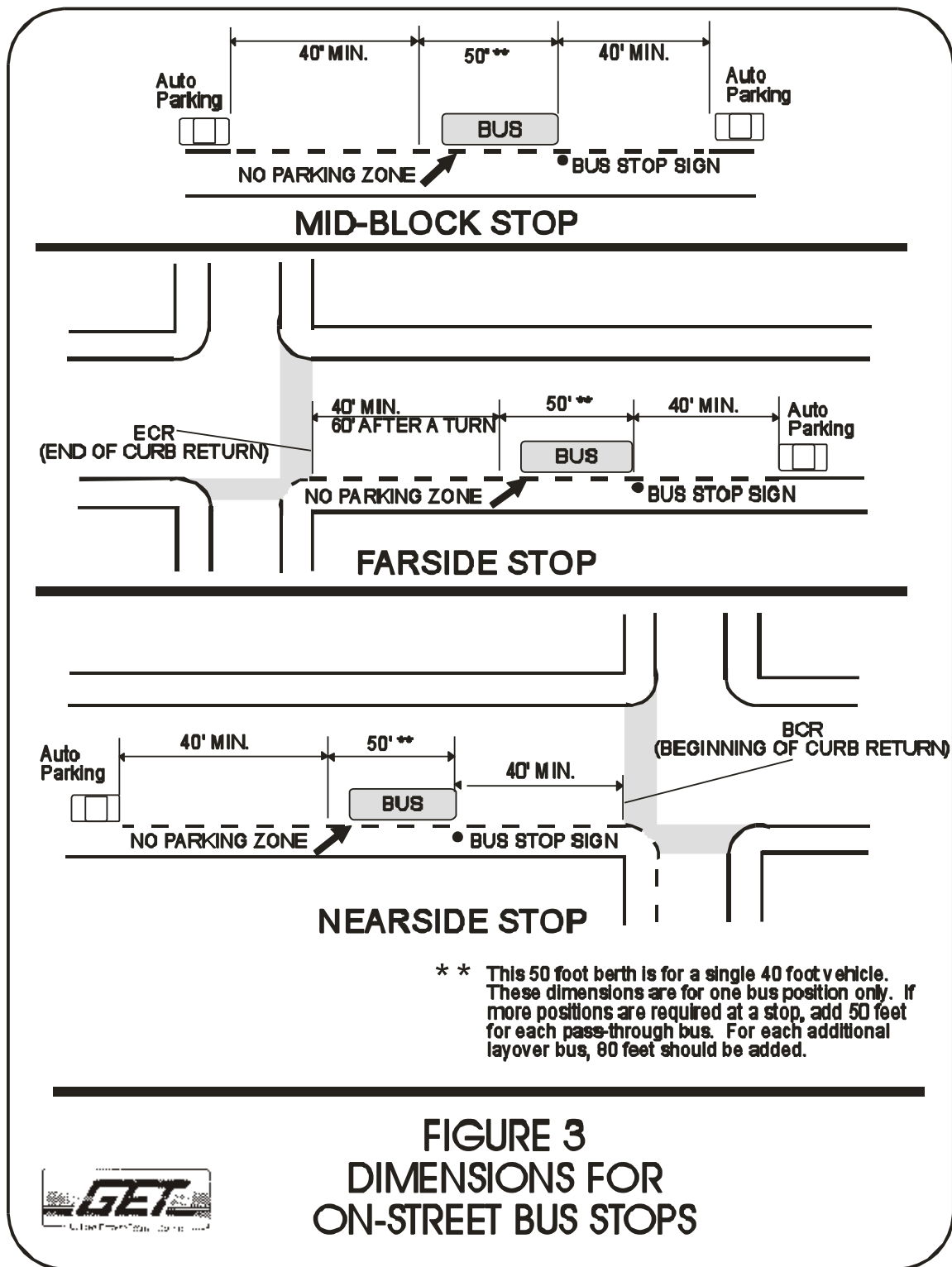
### **3.10 Dial-A-Ride Stops**

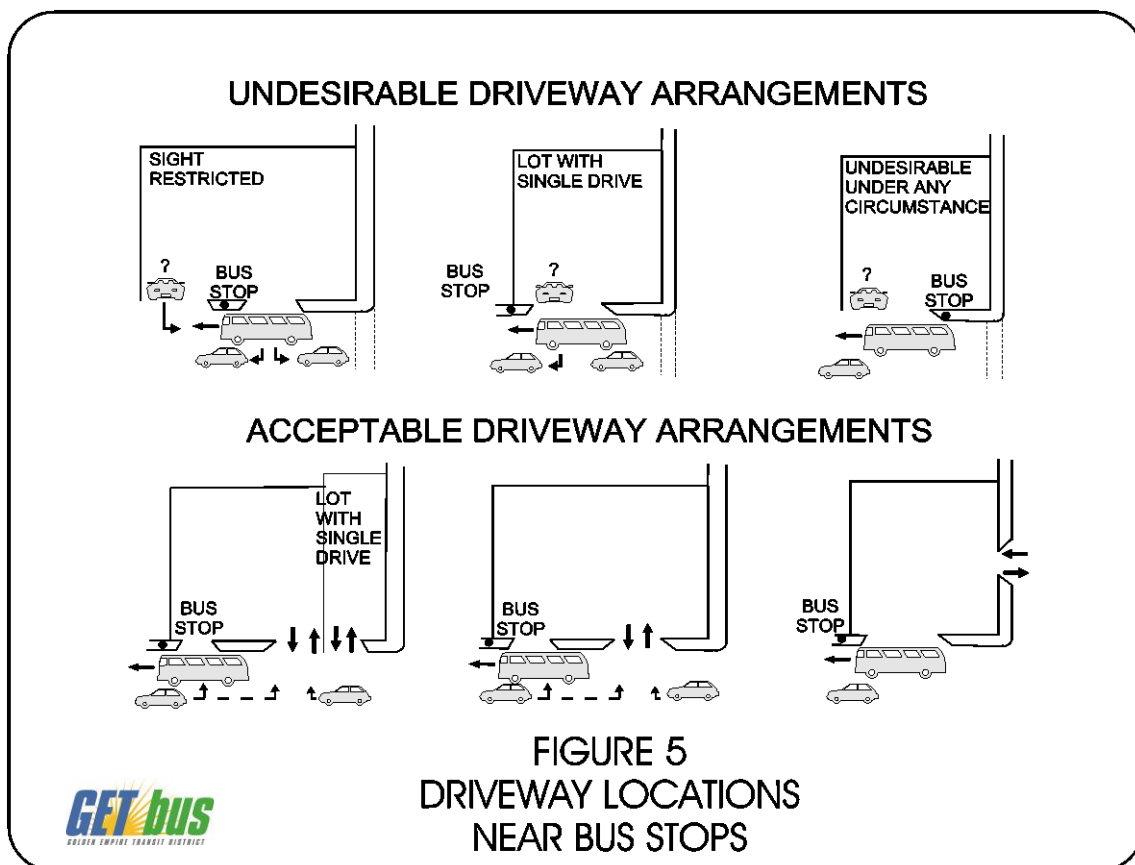
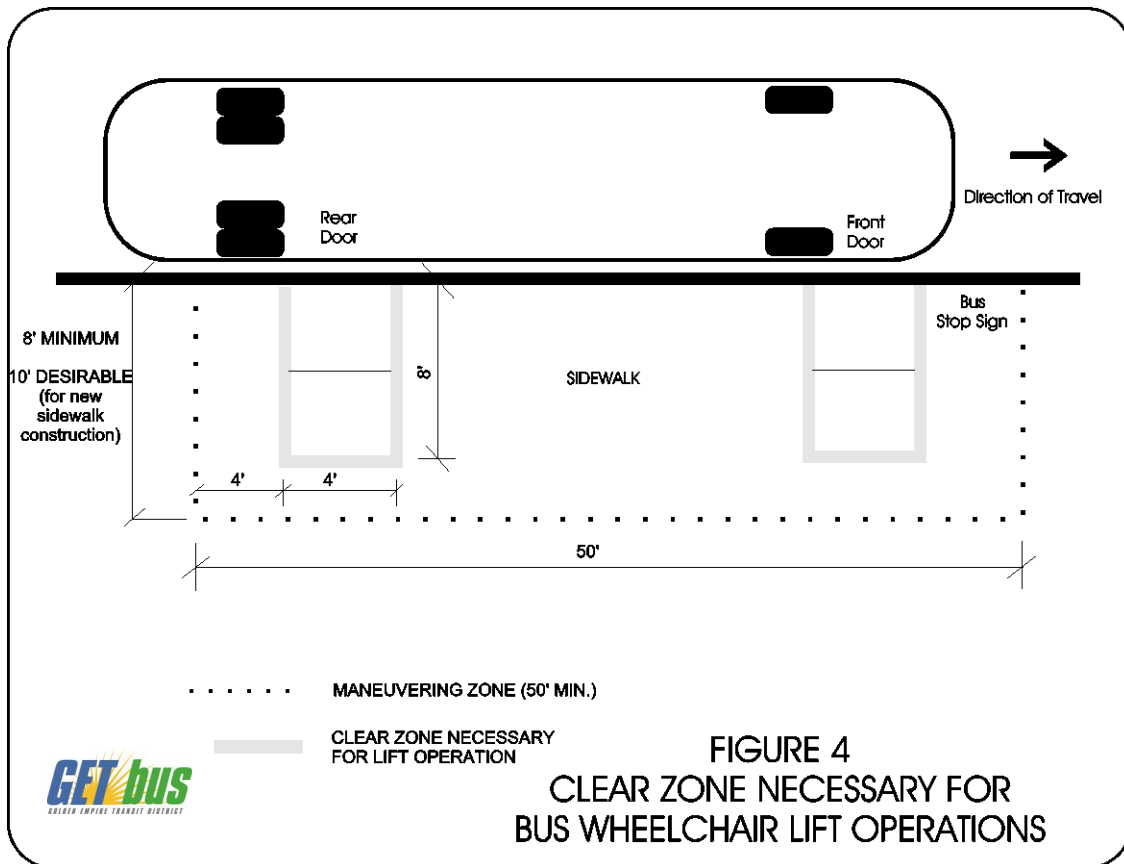
Consideration at each building should be given to loading and unloading passengers with disabilities transported via the District's GET-A-Lift service. A designated stop should be located in close proximity to the building's wheelchair accessible entrance. The pathway leading to and from the building's wheelchair accessible entrance and this stop should be level and the shortest distance possible. The requirements of this stall are similar to those for disabled parking stalls. The stall must be level front to back as well as side to side. The stall must be 20' long by 12' wide, allowing 4'6" on the passenger side for letting down the wheelchair lift and 4' feet beyond that for maneuvering. The minimum overhead height clearance is 108" to accommodate raised-top wheelchair lift vans in covered areas. A wheelchair curb cut and/or ramp should be located on the accessible path leading to the building's wheelchair accessible entrance.

### **3.11 Bus Pads**

Concrete bus pads are recommended for the most heavily used stops because they can withstand the weight of a bus better than asphalt bus pads. Concrete is stronger, more resistant to wheel rutting and erosion from diesel fuel, and reduces maintenance costs. The typical bus stop pavement pad is 10 - 12 feet wide by 50 feet long. If more than 2 bus routes use the same bus stop, a longer pad will be required. GET recommends that bus pads be considered at the earliest phase of project development possible because it is better to design and install concrete pads before road construction is done. For technical specifications and dimensions for concrete bus pads, please refer to Figure 7.

Consideration at each building should be given to loading and unloading passengers with disabilities transported via the District's GET-A-Lift service. A designated stop should be located in close proximity to the building's wheelchair accessible entrance. The pathway leading to and from the building's wheelchair accessible entrance and this stop should be level and the shortest distance possible. The requirements of this stall are similar to those for disabled parking stalls. The stall must be level front to back as well as side to side. The stall must be 20' long by 12' wide, allowing 4'6" on the passenger side for letting down the wheelchair lift and 4' feet beyond that for maneuvering. The minimum overhead height clearance is 108" to accommodate raised-top wheelchair lift vans in covered areas. A wheelchair curb cut and/or ramp should be located on the accessible path leading to the building's wheelchair accessible entrance.





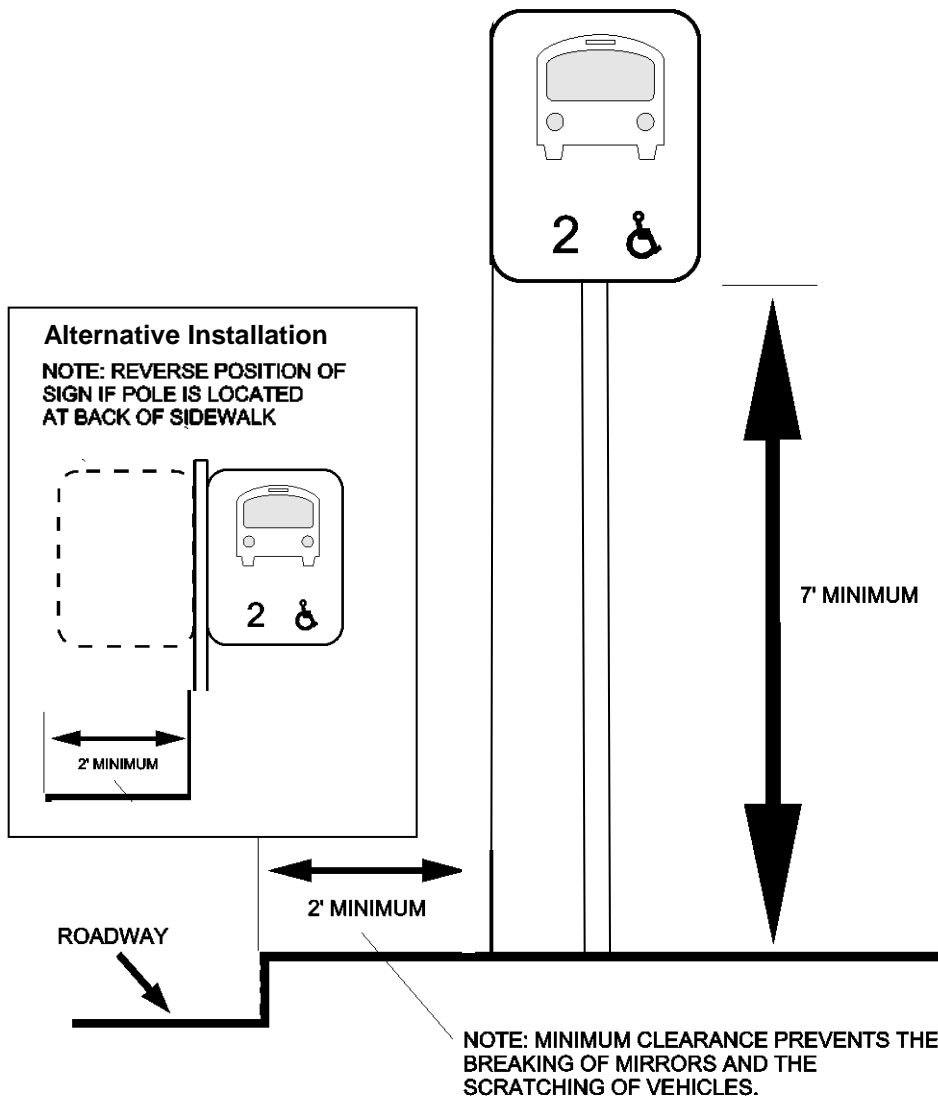


FIGURE 6  
BUS STOP SIGN  
PLACEMENT CRITERIA

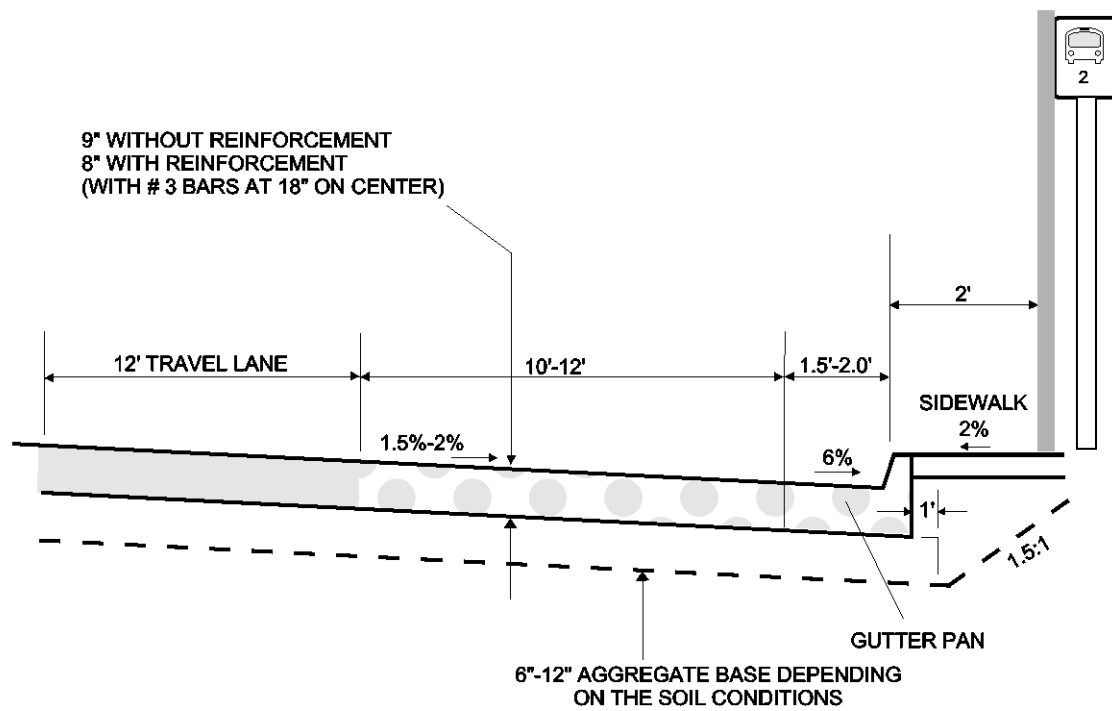


FIGURE 7  
DIMENSIONS FOR CONCRETE BUS PAD



## **4. AMENITIES & OTHER FACILITIES**

Amenities are needed at stop locations for passenger convenience and operational ease. Amenities include lighting, shelters, benches, trash receptacles, and bus turnouts.

### ***4.1 Lighting & Information Displays***

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 in bus shelters with solar lights and solar lights on posts at bus stops. The posts also can have information displays. The placement and maintenance of lighting is normally the responsibility of the local jurisdiction, except if the lighting is in the shelter or on a GET-installed solar light post.

### ***4.2 Landscape Features***

Landscaping can improve 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 are a major problem and should be trimmed back at least two to three feet from the curb. Otherwise, they become an obstacle that the bus driver may or may not be able to avoid hitting. Branches that extend into the roadway are the responsibility of the local jurisdiction. GET staff will contact the appropriate jurisdictions to request that they be trimmed.

### ***4.3 Newspaper and Vendor Boxes***

Newspaper and vendor boxes can provide waiting transit customers with convenient access to reading material. However, newspaper boxes should not be placed in a location that obstructs access to the landing area, sidewalk, shelter, or posted transit information. Newspaper boxes should not be chained or otherwise affixed to the bus stop sign pole, shelter, or bench.

### ***4.4 Bus Shelters***

Bus shelters are covered, semi-enclosed waiting areas with benches at bus stops. They offer protection from inclement weather conditions, provide for passenger comfort, and establish a transit presence within a local area.

#### ***Placement Guidelines***

Shelters should be installed at stop locations where:

- Passenger volumes exceed 40 boardings per day.

- Bus stops are located at major transfer points.
- Bus stops are located adjacent to schools, shopping, medical facilities, senior citizen housing, community and recreation centers, and disabled residents.

In cases where there is existing transit service and a new development is the dominant traffic generator, GET 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 GET to determine the need for the shelter, and if there is a need, the developer must coordinate the installation with GET. As part of this process, GET must approve the bus shelter design to ensure it meets the proper design criteria and ADA requirements. This assures that if GET assumes responsibility for the maintenance of the shelter, costs and upkeep can be minimized. The enforcement of any requirements is the responsibility of the jurisdiction.

In some cases the developer may be required by the jurisdiction to construct a “customized” shelter to match the architecture or theme of the 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 service to that facility. In order to ensure that these shelters meet GET’s design standards as well as ADA guidelines, all proposed “customized” shelters must be accessible, easily relocated, and removable. This assures that if an existing route is realigned due to low productivity, the existing shelter can be removed or relocated and reinstalled along the new route.

Shelters must meet the following minimum placement guidelines:

- Shelters located adjacent to buildings or walls should be placed a minimum 8 inches away from the wall to allow for cleaning.
- Shelters should not be placed so as to obstruct sidewalks or access to and from transit vehicles.
- Shelters should not be placed where they obstruct visibility.
- Shelters should be placed in available right-of-way.
- There should be a minimum 5 feet clearance from the face of curb to front of shelter. In unincorporated Kern County areas, 5’8” is required.
- Approval must be obtained from local jurisdiction (City of Bakersfield, County of Kern, or Caltrans).
- The shelter should be placed near the front end of the bus stop zone.

- Shelters must be connected by an accessible route to the boarding area as required by ADA. The minimum clear width of an accessible route should be 48 inches. Figures 8-A and 8-B show standard placement and design.
- Trash containers are installed at shelters.

### *Design Guidelines*

Bus shelter designs can vary considerably, from a single standardized structure, to a fully integrated design treatment when provided by developers or other sources (i.e. property owners, city, county). Bus shelters should, however, be easily recognizable as a bus stop and be consistent with the standard design specifications provided by GET, especially if GET is responsible for their maintenance. Where architectural concerns inhibit this consistency, specific designs must be submitted to GET and will be reviewed on a case-by-case basis. All bus shelters, regardless of design, should meet the following minimum guidelines:

- Bus shelters should be constructed of tough, weather-and-vandal-resistant materials (i.e. metal, tempered glass, etc.) that do not require any special cleaning solvents, painting, repair tools, etc. Components requiring routine time-based replacement should not be included. All components should be easily removable to facilitate maintenance.
- Bus shelters must be constructed so as not to pose safety hazards to passengers or to other individuals.
- The shelter should seat at least 4 people.
- The shelter should be at least 3 feet wide by 7 feet long with seating space. A minimum of 30 inches by 48 inches for people in wheelchairs is required within the shelter per ADA regulations.
- The roof overhang should be sufficient to provide inside protection and should be sloped to the rear for drainage.
- The farthest extension of the shelter facing the street should have a minimum clearance of 2 feet from the curb face to avoid being damaged by vehicles.
- The shelter's side panels should be transparent enough to allow the bus driver to see waiting passengers.
- Provisions may be included for internal lighting if it is determined that illumination is needed.

- The concrete pad on which the shelter is placed should be sloped toward the roadway for drainage. (Paved sidewalk may be utilized).
- Curb cuts and ramps should be provided for wheelchair access, as necessary.
- The bottom opening shall be at least 6 inches for ventilation and to avoid trash accumulation within the shelters.
- The shelter must include provisions for mounting schedules/map displays.

A building overhang or awning may substitute for a bus shelter. In some cases, this may be more aesthetic than a free-standing shelter and improve pedestrian access to the bus stop. The picture below is an example of a typical bus shelter.



#### **4.5 Benches**

Bus stop benches are provided for the convenience and comfort of bus passengers while they wait for their scheduled bus to arrive. GET provides, installs, and maintains bus benches at bus stops. Bench advertising is prohibited under the City of Bakersfield sign ordinance and therefore private bench firms have largely discontinued installing benches in the District except for a few locations in unincorporated county areas.

##### *Placement Guidelines*

Bus benches should meet the following placement guidelines:

- Benches should be placed a minimum of 5 feet and a maximum of 12 feet nearside of the bus sign post, and no closer than 2 feet from the street curb to adequately allow for pedestrian movement in front of the bench.
- When placed on a sidewalk, a bench should have a minimum clearance of 4 feet (5 feet is desirable) in the rear or front for wheelchairs.

- Benches should be placed to minimize obstruction of they should be placed behind the sidewalk so that the public right-of-way. Where sidewalks are narrow adequate width exists for pedestrians and wheelchair users. In this case a bench should be installed on a bench pad.
- Trash containers may be attached to benches located at high boarding locations.

### *Design Guidelines*

In the design of bus benches, the following factors should be considered:

- Benches should be constructed so that they are comfortable and safe for passengers.
- Materials should have high resistance to vandalism and weathering.
- All benches, except those constructed of concrete legs, should be anchored.
- Benches should be able to seat 3 - 4 people. A typical bench is shown below and in Figure 9.



### **4.6 Trash Receptacles**

Trash receptacles are installed at all standard bus shelters and may be installed at bus stops that do not have shelters if clearance space is available, per ADA guidelines. 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

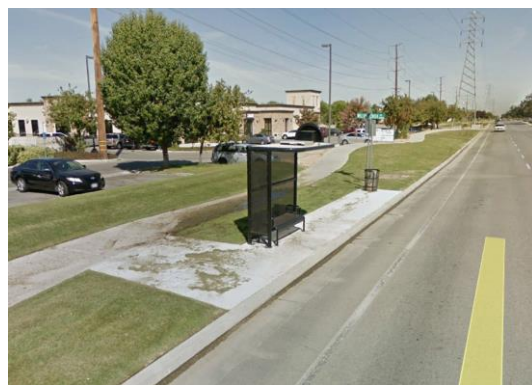
- Resistance of materials and paint treatments to weather conditions, graffiti, fire, and other forms of vandalism
- Ensure that there are no conflicts with wheelchair accessibility and loading at the bus stop
- Trash receptacles should be anchored to prevent unauthorized movement
- Avoid installing trash receptacles with design features that permit liquid to pool or remain near the receptacle and attract insects

#### **4.7 Passenger-Waiting Pads**

Bus stop pads are located at bus stops where there is no existing paved waiting area. They can also be constructed adjacent to an existing paved area to provide additional room for benches or shelters. At bus stop locations with curb and gutter and no sidewalk, ADA requires that the new bus stop pad installations have a minimum 8 feet width measured from the face of the curb to the back of pad to allow for proper loading and unloading of passengers in wheelchairs and at least 5 feet length parallel to the roadway to the maximum extent allowed by legal or site constraints. The desired minimum pad length is 30 feet. The pad must be connected to streets, sidewalks, or pedestrian paths by an accessible route. 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. The slope of the pad parallel to the roadway shall, to the extent practicable, be the same as the roadway. For water drainage, a maximum slope of 2 % perpendicular to the roadway is allowed. See Figure 10.



Boarding pad



Boarding area connected to a meandering sidewalk

#### **4.8 Bus Turnouts**

A bus turnout is a bus stop located in a recessed curb area on a roadway, separated from moving lanes of traffic. Turnouts are provided primarily on high volume or high speed roadways to provide for safe, efficient operation at the bus stops. They reduce automobile/bus conflict at stops, provide greater separation

between traffic and pedestrians waiting for the bus, and allow the bus to regain its travel speed in its re-entry into traffic.

### *Placement Guidelines*

Bus turnouts are preferred at the farside of an intersection. A concrete bus pad is recommended at heavily used stops. While turnouts are advantageous to traffic circulation, they make it difficult for buses to re-enter traffic. They should, therefore, be considered on a case-by-case basis whenever one or more of the following conditions are met:

- Traffic volume in the curb lane exceeds or is predicted to exceed 250 vehicles during the peak hour.
- Traffic speeds are greater than 40 miles per hour.
- Passenger boardings at a bus stop exceed or are predicted to exceed 20 per hour.
- Bus stops in the curb lane are prohibited.
- Right-of-way width is adequate to allow constructing the turnout without adversely affecting sidewalk pedestrian flow.
- The turnout should be placed near signalized intersections where the signal can create gaps in traffic.
- Accidents occur frequently.

An existing turnout is shown below.



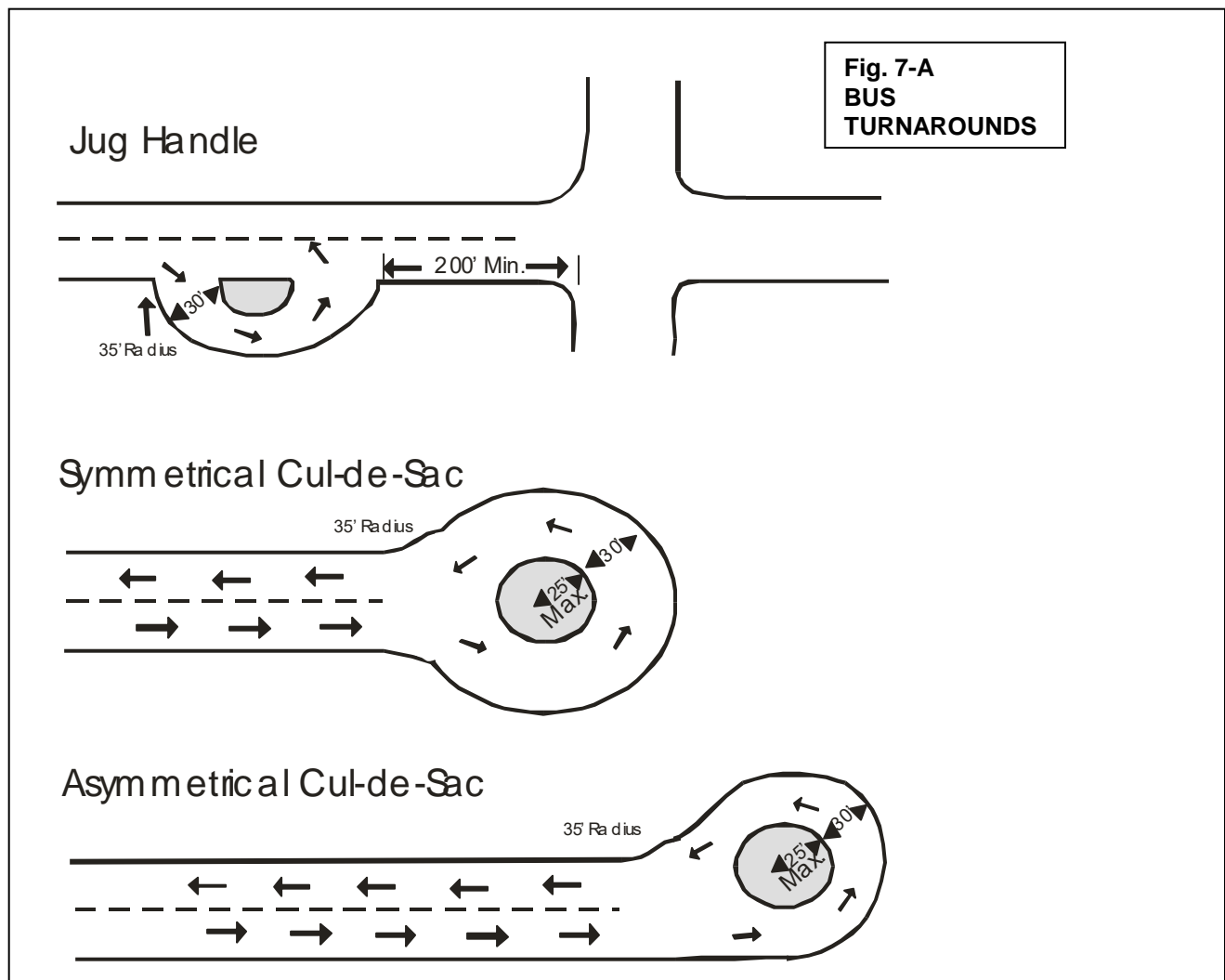
## *Design Guidelines*

Figures 11-13 detail the design guidelines for bus turnouts. The basic requirement for a bus turnout is that the deceleration, standing, and acceleration of buses be affected on pavement areas clear of and separated from the through traffic lanes. Driveways should not be incorporated in the bus turnout design. The acceleration/deceleration lanes are designed to allow the bus to leave and enter the traffic lanes at about the average traffic speed of the roadway. A 12 foot width is desirable to reduce side-swipe accidents. Bus turnouts at stops where several bus routes converge and interface should be sized to accommodate more than one bus.

### **4.9 Bus Turnarounds**

Bus turnaround facilities 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” turnaround design can be used at appropriate mid-block 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.





**Fig. 7-A  
BUS  
TURNAROUNDS**

#### 4.10 Bus Berths

Bus berths are designated areas for buses to pull over and load and unload passengers in major transit facilities such as a transit center or park-and-ride facility. Bus berths may be “parallel” or permit buses to park parallel to the curb; or “saw-tooth” where the buses head into the curb at a designated angle.

##### *Placement Guidelines*

Bus berths may be located in the parking lot of the transit facility served in one of the following two general alternatives:

- 1.) **At the periphery** of the parking lot
- 2.) **Within** the parking lot

The specific advantages of each of these alternatives are given below. These should be considered when selecting the appropriate location.

### Peripheral Location

- 1.) Minimizes land requirements.
- 2.) Reduces automobile/bus conflicts.
- 3.) Reduces bus operating time.
- 4.) Minimizes pavement design to accommodate buses.
- 5.) Reduces pavement maintenance cost.

### Within Lot Location

- 1.) Reduces walking distances for passengers transferring from bus-to-bus or auto-to-bus.
- 2.) Minimizes curb frontage requirements.

### *Design Guidelines*

The bus berthing area should be designed to make the most efficient use of the land on which it is to be located. Factors to be considered in developing the design are:

- Size and shape of parcel
- Available curb frontage
- Local traffic characteristics

### Parallel Berths

Required roadway widths and berth lengths for parallel berthing are provided in the table below. These dimensions are given for selected pull-out and pull-in distances for a standard 40-foot long bus. They are based on the assumption that the bus will pull out from, and pull in to, the berth around a parked bus.

Road Width	Pull-In Distance	Pull-Out Distance	Berth Length	Tail Out
24'	52'	10'	102'	1'
23'	40'	15'	95'	2'
22'	26'	20'	86'	3'
21'	20'	30'	90'	4'

The berth length equals Pull-In distance plus Pull-Out distance plus bus length.

Figure 13A illustrates the parallel berth guidance for a standard 40-ft. bus.

## Sawtooth Berths

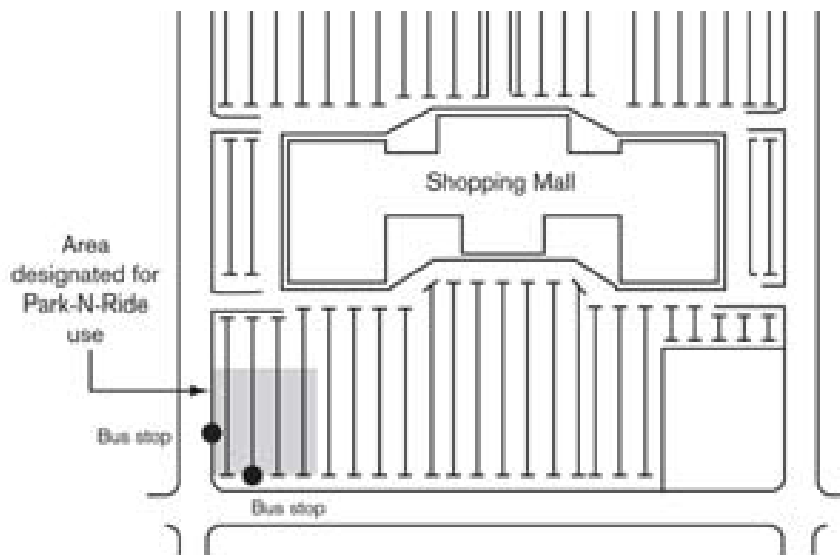
Sawtooth berths are recommended for major, off-street, boarding locations. They are most suitable for sites that do not have adequate length for parallel berths. The minimum length for a sawtooth berth is 45 feet. The picture below and Figure 13B illustrate the sawtooth berth guidance for a 40-ft. bus.



### **4.11 Park and Ride Facilities**

Park and Ride (P n' R) facilities are specially designated parking areas, often tied to transit or rideshare that potentially could serve bus, train, vanpool and car pool users to help them complete their trip. Major community and regional shopping centers and institutions such as hospitals, colleges, and universities are the best candidates for Park and Ride facilities. Some of these facilities are formal and maintained such as officially designated sites near freeways. Informal sites also exist on privately-owned properties.

Parties using the reserved Park and Ride spaces will likely frequent the adjacent commercial uses and other businesses, which is an additional income benefit to the developer and tenants at the facility. When a developer provides a significant amount of transit or Park and Ride infrastructure for a project, a slight reduction in site plan parking requirements from the overseeing jurisdiction would be justified. Design criteria for Park and Ride lots do not detract significantly from standard lot design. Bus loading and vehicle drop off (i.e. "kiss and ride") areas are good components for the Park and Ride facility. Shelters, benches, and other amenities may also be included. The number of spaces to be assigned for Park and Ride purposes is usually quite modest, such as 15 to 30 stalls, but the number is best determined by coordination between GET staff, the city or county, and development partners. A typical joint-use Park and Ride facility is shown in the figure below.

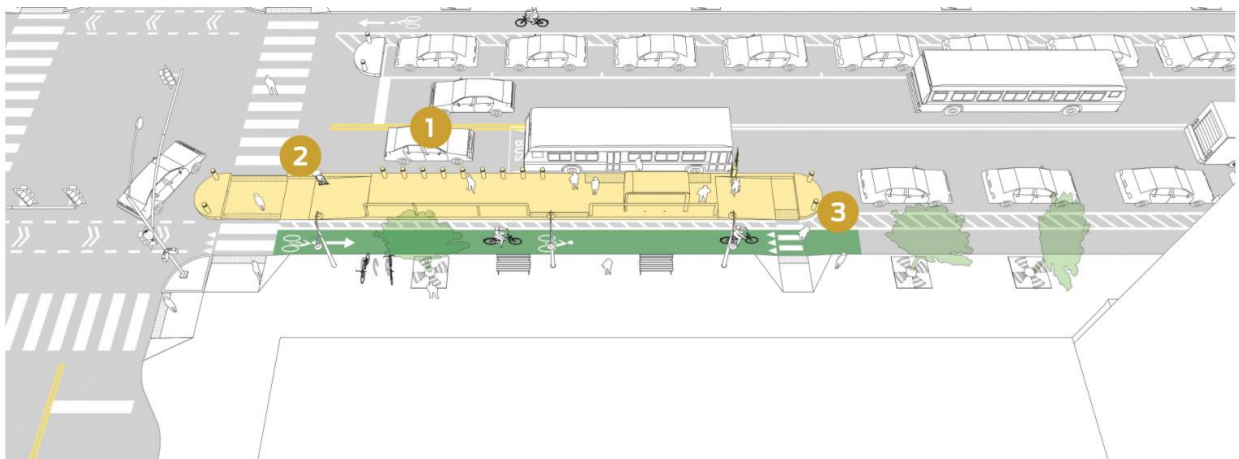


#### **4.12 Bicycle Facilities**

The farther people can safely and comfortably walk or ride a bicycle to or from transit, the more useful the transit system is to more people. This serves to extend the reach of the transit system and expand the potential rider base.

Buses may need to pull across or into a bike lane to access a stop and, in many instances, buses stop for passengers while in bike lanes. One solution is to build an island bus stop and place the bike lane between the sidewalk and the island bus stop, known as a floating bus stop (see following pictures). Bicycles will permanently stay to the right of a bus and will have their own dedicated space to the right of a bus when it approaches a stop. In some cases, bike traffic and transit service can be funneled to parallel corridors, contributing to an overall multimodal network.

When bicycle and bus traffic cannot be separated into separate streams, bus stop locations that provide ample room for bicyclists to safely pass on the left are preferred. Pavement markings and signs can be used to encourage safe passing, which may include highly-visible routing bicycle lanes (such as with the use of colored pavement). Wide shared bus and bike lanes at stop locations are another approach that can provide passing opportunities for bicyclists.



**1** If high turn volumes are present, include a rear storage area so cars are less likely to queue into the intersection while the bus dwells. More storage space may be necessary on streets with only one lane per direction.

**2** Accessible ramps should be paired with crosswalks to direct users to safe crossings. If the bike channel stays at street grade, ensure that ramps, landings, and detectable warnings are provided whenever pedestrians cross into another “modal zone” (i.e. bikeway or travel lane).

**3** At high passenger volumes, channelize pedestrian movements on and off the platform to reduce conflicts.

If a lean bar or railing is installed continuously along the back of the platform, the island must be at least 9 feet wide to accommodate the 8-foot deep accessible landing. If the accessible landing opens directly to an accessible crossing (either flush or raised), the island may be 8 feet wide.

A crossing over the bike channel may be raised to provide a flush path to the sidewalk. Install yield teeth and “YIELD TO PEDESTRIANS” signs. Bicycle ramps should not exceed a 1:8 slope.

Bicycle storage facilities, such as bike racks, may be provided at bus stops for the convenience of bicyclists using transit. Designated storage facilities discourage bicycle riders from locking bikes onto the bus facilities or on an adjacent property. Proper storage of bicycles can reduce the amount of visual clutter and ensure a clear pathway. Various bike facilities include:

- Bike & Ride Facility (Transit center with bike parking facility): Access with a Key Card. Park bike for pennies per hour.
- Bike Hubs: provide short-term secure bike parking 24/7 access. Consecutive parking limit is 72 hours to maximize availability of space. \$1 charge of every 24 hours parked in excess of 72 hours. Pass discounts (approx. 50%) available for Seniors (62+), Disabled, Medicare and K-12 Students with valid ID. Self-Repair and Assisted repair provided.
- Bike stations: Offer 24-hour indoor bicycle parking (free during regular business hours), bike rentals, professional repair services, a retail bike shop, free air, and more.

The following pictures show various types of facilities.



Bike Depot Shelter   Dero Bike Locker   Pocket Shelter   Bike Lid

The guidelines for the placement of bicycle parking facilities are:

- Bike racks or lockers should be located away from other pedestrian or bus patron activities to improve safety and reduce congestion.
- The location of bicycle parking facilities should be coordinated with existing on-site or street lighting, if available.
- To ensure parked bikes are visible at all times, the bicycle parking should not be located where views are restricted by a bus shelter, landscaping, or existing site elements, such as walls.

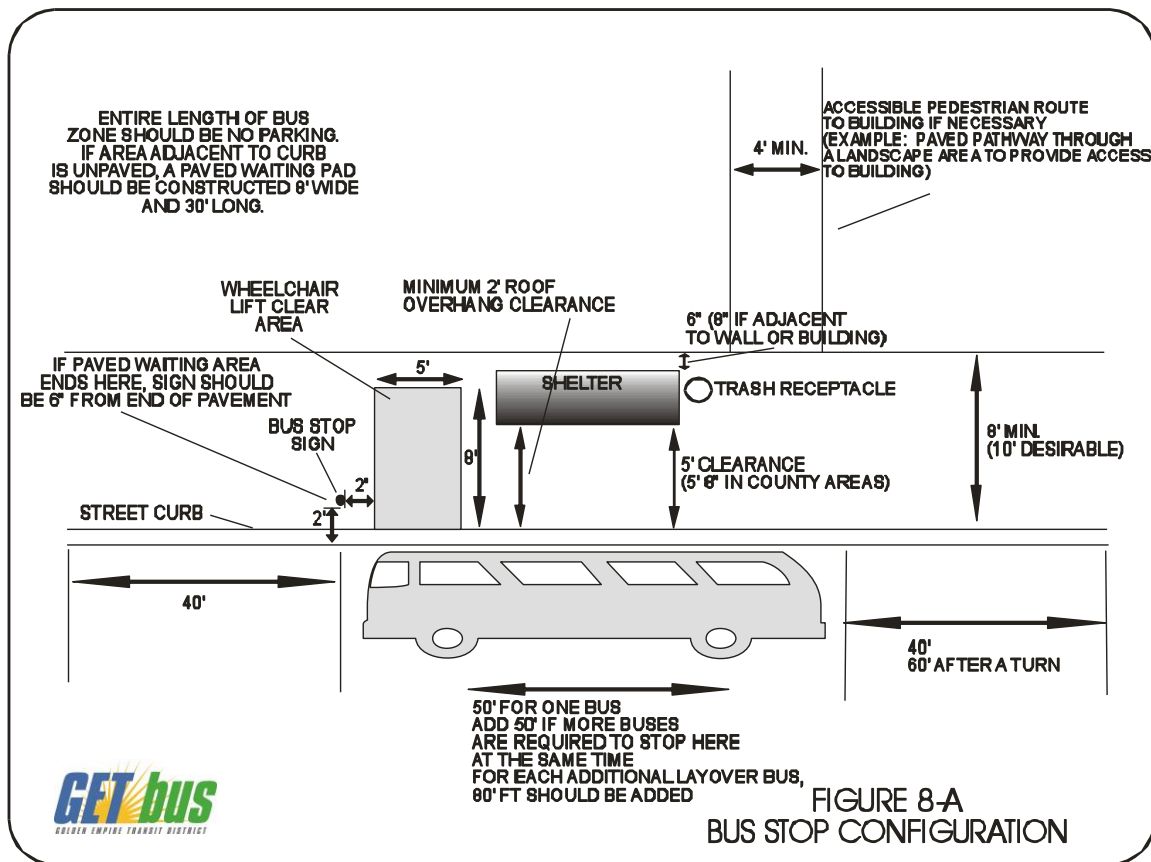
When selecting bicycle rack or locker devices, consider the following:

- Ability to lock bicycle frame and at least one wheel should be provided.
- Bicycles should be supported without pinching or bending the wheel. If the wheel slot is too narrow, a mountain bike tire will not fit.

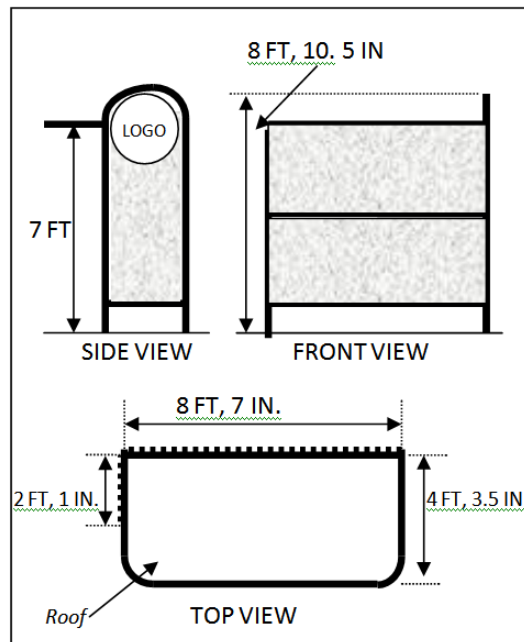
- Scratching of the paint on the frame of the bike should be avoided.
- A place to lean the bike while locking the bike should be provided.
- Locking procedure should be quick and easy to identify.
- It should require minimal space as possible.
- Design of bike rack or lockers should not trap debris.
- Bike racks or lockers must be located in a manner that maintains access to paths of travel and other features consistent with the minimum standards of the ADA.

Bike Share is another means of extending the transit system out from the transit stop or station. The ability to access transit by using bike share can expand the reach of transit, and the ability to substitute transit trips with bike share (and vice versa) gives users options and redundancy that can be particularly useful in times of service outages, between scheduled service, and in varying weather conditions. Space often is limited, so there may not be enough space. Many transit centers have not been designed to accommodate bike share. However, with some planning, these elements can remain accessible to passengers, such as locating Bike Share stations (see picture below) within sight of a bus stop, if not on the same corner as the bus stop. Visibility is essential, and Bike Share riders need to know to what location they are riding.





**FIGURE 8-B TYPICAL BUS SHELTER DESIGN**



Shelter constructed with bent pipe and perforated steel vertical shade screens.

**Frame:** 3.5" standard pipe, coped, welded pipe chasis.

**Shade Screen Panels:** 16 gauge 42% perforated steel panels, rivet fastened to C-channel frames.

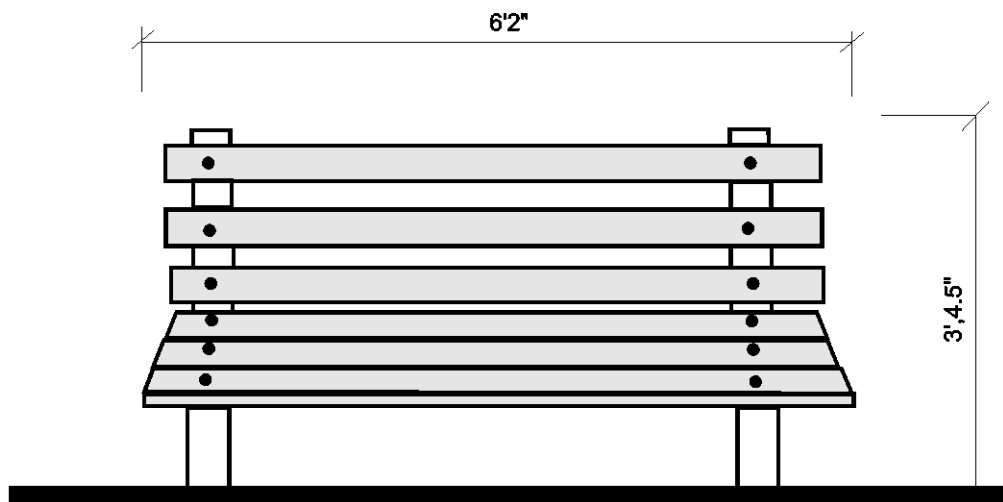
**Coating:** V-Thane, high bond, chemical resistant marine poly paint. Complete epoxy undercoating primer.

**Solid Roof Ceiling:** High strength F.R.P. Smooth surface top and bottom.

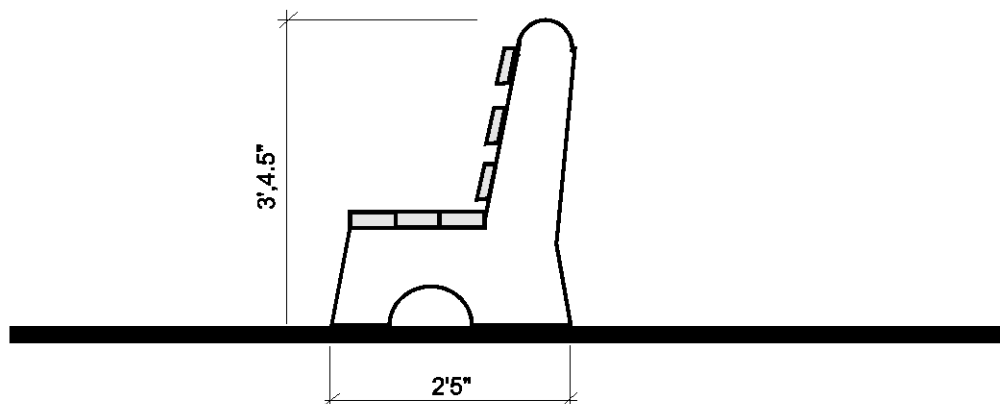
**Lighting:** Ceiling mounted dawn to dusk solar light.

**Anchoring:** Welded footing plates with holes for ½" diameter anchor bolts.

**Logo Panel:** Plexiglass panel with vinyl decal.



FRONT VIEW

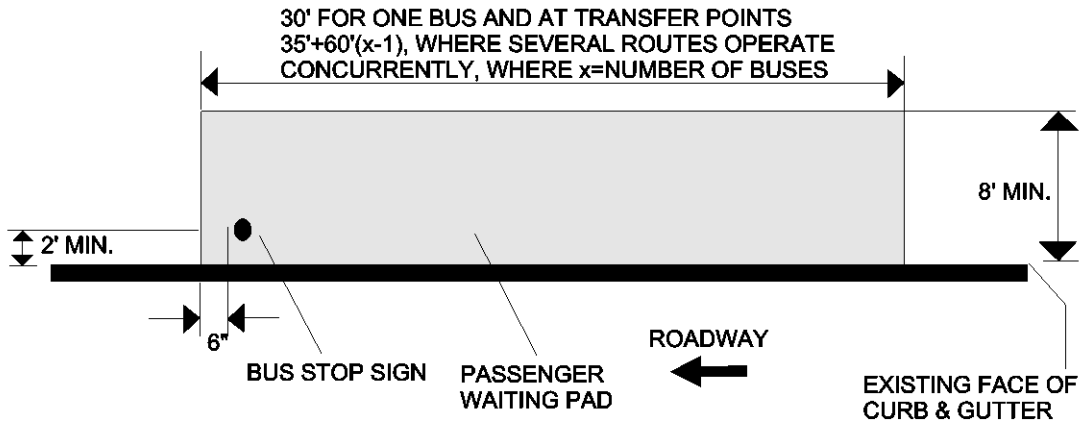


SIDE VIEW



FIGURE 9  
TYPICAL BUS BENCH DESIGN  
WITH BACK SUPPORT

## NO EXISTING SIDEWALK



## EXISTING DETACHED SIDEWALK

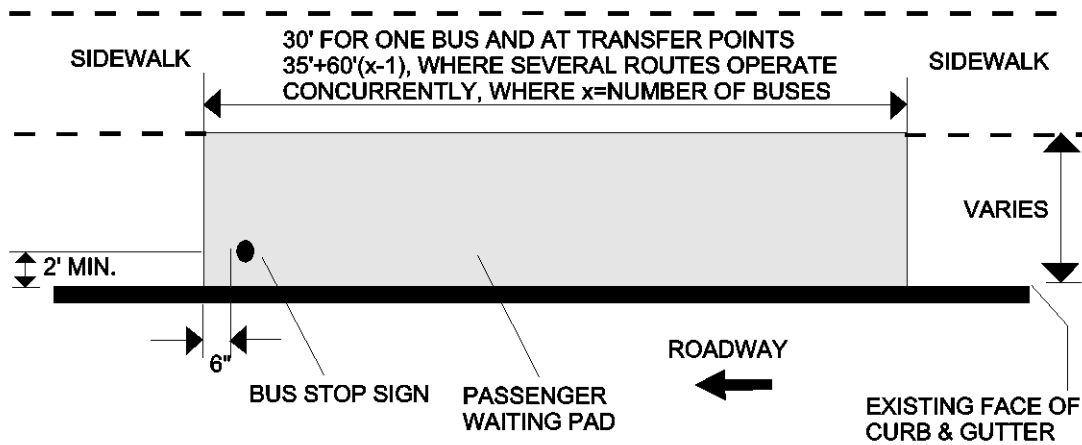
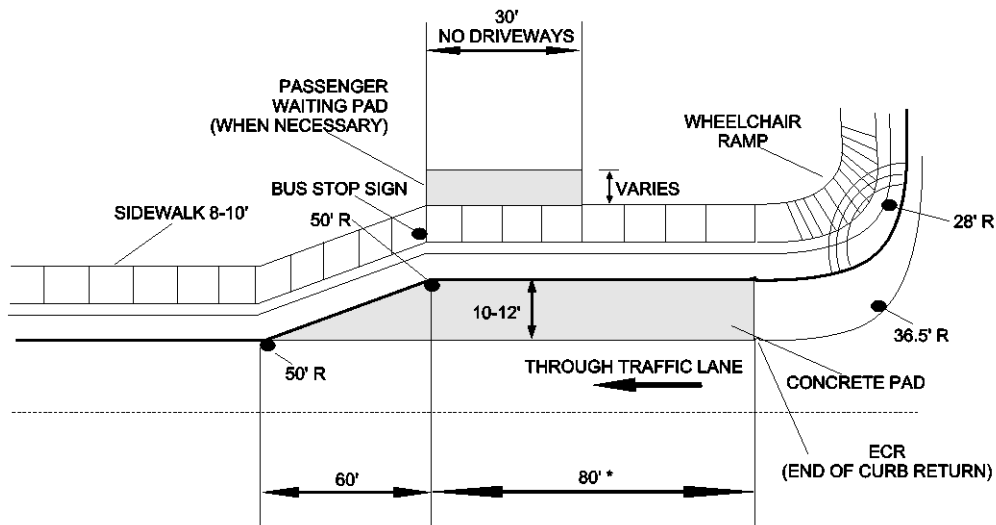


FIGURE 10  
PASSENGER WAITING  
PAD

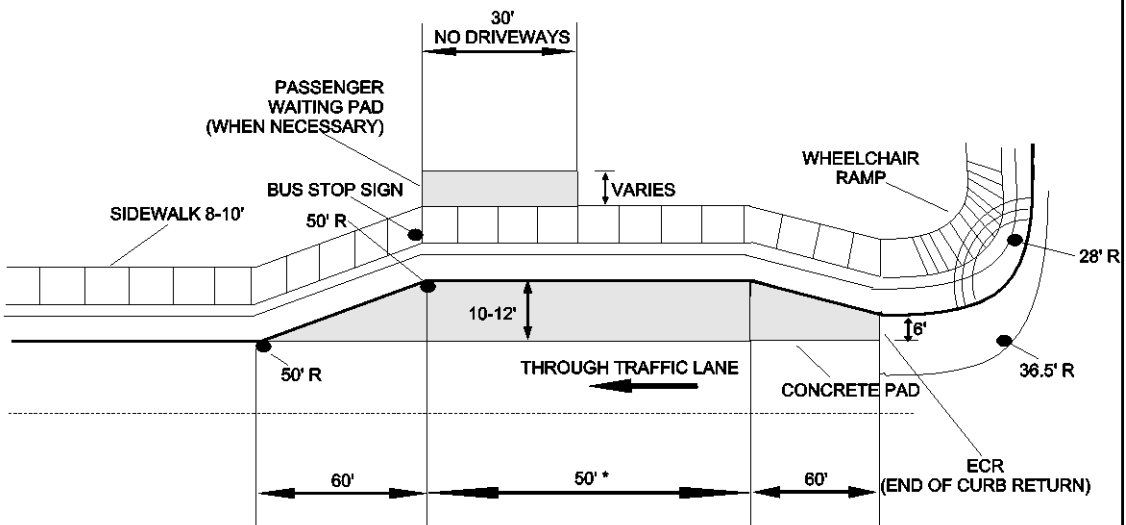




NOTE: DRIVEWAYS SHOULD BE AVOIDED WITHIN THE BUS BAY. A DRIVEWAY SHOULD NOT BE PLACED WITHIN THE WAITING PAD AREA.

\* THESE DIMENSIONS ARE FOR ONE BUS POSITION ONLY. IF MORE POSITIONS ARE REQUIRED AT A STOP, ADD 60 FEET FOR EACH ADDITIONAL PASSTHROUGH BUS AND 80 FEET FOR EACH ADDITIONAL LAYOVER BUS.

FIGURE 11  
FARSIDE TURNOUT DESIGN  
(OPEN BUS BAY)

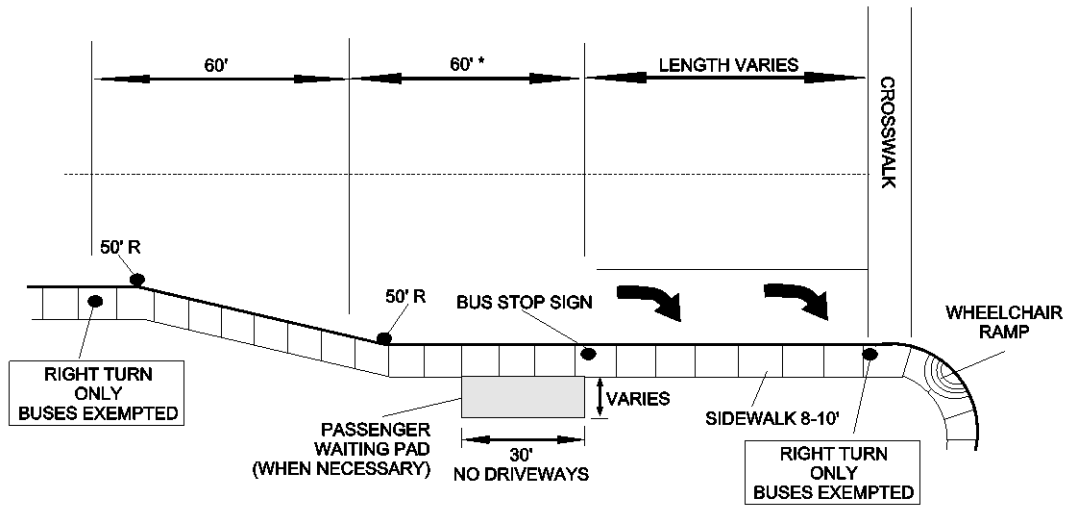


NOTE: DRIVEWAYS SHOULD BE AVOIDED WITHIN THE BUS BAY. A DRIVEWAY SHOULD NOT BE PLACED WITHIN THE WAITING PAD AREA.

\* THESE DIMENSIONS ARE FOR ONE BUS POSITION ONLY. IF MORE POSITIONS ARE REQUIRED AT A STOP, ADD 60 FEET FOR EACH ADDITIONAL PASSTHROUGH BUS AND 80 FEET FOR EACH ADDITIONAL LAYOVER BUS.

FIGURE 11-A  
FARSIDE TURNOUT DESIGN  
(PARTIAL OPEN BUS BAY)



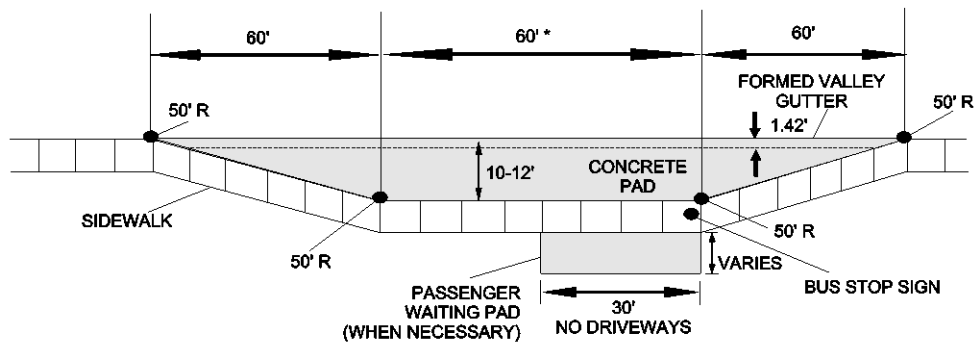


NOTE: DRIVEWAYS SHOULD BE AVOIDED WITHIN THE BUS BAY. A DRIVEWAY SHOULD NOT BE PLACED WITHIN THE WAITING PAD AREA.

\* THESE DIMENSIONS ARE FOR ONE BUS POSITION ONLY. IF MORE POSITIONS ARE REQUIRED AT A STOP, ADD 60 FEET FOR EACH ADDITIONAL PASSTHROUGH BUS AND 80 FEET FOR EACH ADDITIONAL LAYOVER BUS.



FIGURE 12  
NEARSIDE TURNOUT DESIGN



NOTE: DRIVEWAYS SHOULD BE AVOIDED WITHIN THE BUS BAY. A DRIVEWAY SHOULD NOT BE PLACED WITHIN THE WAITING PAD AREA.

\* THESE DIMENSIONS ARE FOR ONE BUS POSITION ONLY. IF MORE POSITIONS ARE REQUIRED AT A STOP, ADD 60 FEET FOR EACH ADDITIONAL PASSTHROUGH BUS AND 80 FEET FOR EACH ADDITIONAL LAYOVER BUS.



FIGURE 13  
MID BLOCK TURNOUT DESIGN

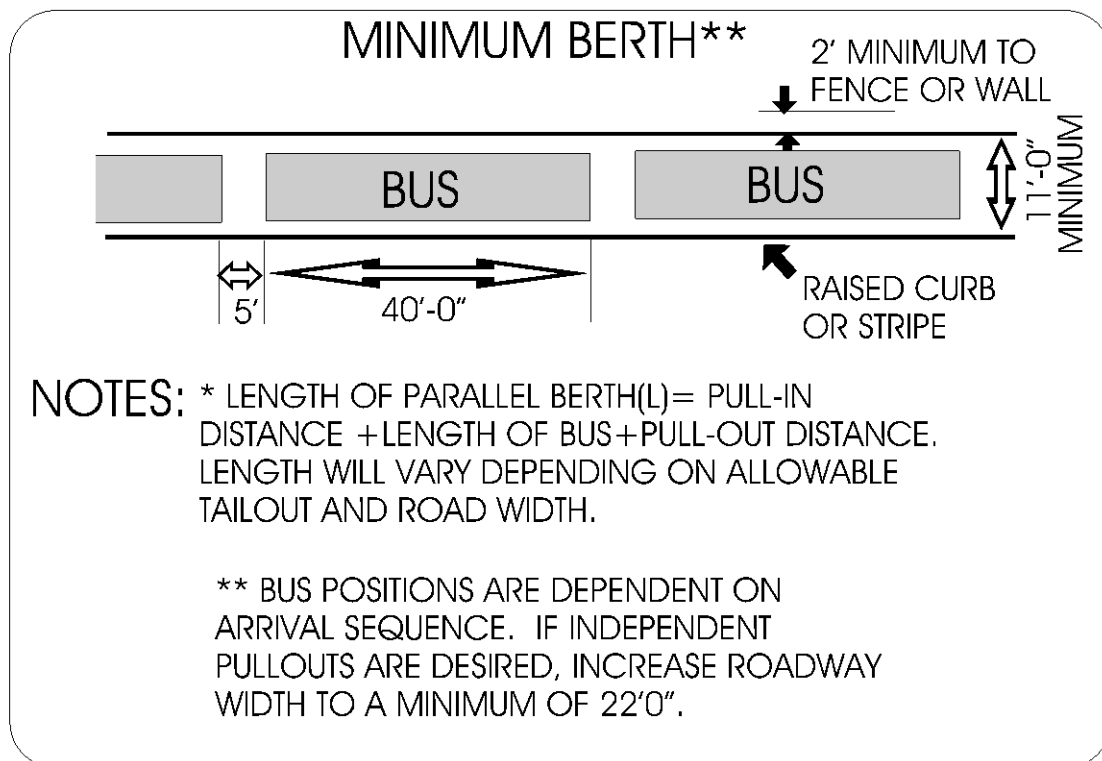
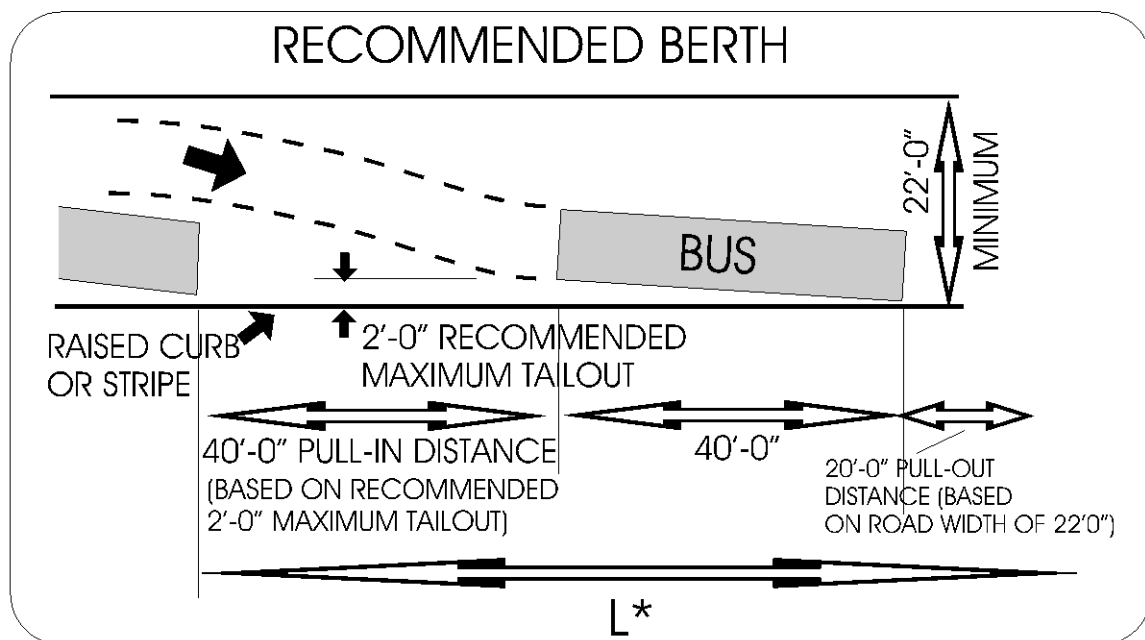


FIGURE 13-A PARALLEL BERTH





## 5. STREET PRIORITY MEASURES

There are several concepts and technologies widely used to improve bus service and reduce travel time. Transit priority measures seek to improve bus service by reducing travel time. The components of travel time include getting to and from bus stops, time waiting for the bus to arrive, and the time spent traveling on the bus. Additional time is required if a transfer is necessary. Transit priority measures primarily seek to reduce the in-vehicle component of travel time by giving buses priority over other types of vehicles on streets. These measures include reserved bus lanes and priority treatment for buses at traffic signals. The planning and implementation of bus priority measures works best in areas with a high concentration of bus services, high levels of traffic congestion, and good community support for transit service. To be successful, transit priority measures must be coordinated with the local jurisdictions responsible for traffic control and roadway planning and operations. Transit priority measures should effectively:

- Alleviate existing bus service deficiencies
- Achieve attractive and reliable bus service
- Serve demonstrated existing demands for transit
- Provide reserve capacity for future growth in bus trips
- Attract auto drivers to transit.

The following sections generally describe some of the transit priority measures either currently in use in Bakersfield or that may be implemented in the future.

### 5.1 Queue Jumpers

A queue jumper is a type of roadway geometry used to provide preference to buses at intersections, often found in *bus rapid transit* systems (BRT). Queue jumper lanes are a way to minimize the travel time delays through special priority lanes, often right hand turn lanes that permit transit through movements. Queue jumper lanes are typically installed at heavily congested intersections, with priority given to those intersections offering the greatest benefits to transit. A queue jumper lane is accompanied by a signal which provides a phase specifically for vehicles within the queue jump. Vehicles in the queue jumper lane get a "head-start" over other queued vehicles and can therefore merge into the regular travel lanes immediately beyond the signal. The intent of the lane is to allow the higher-capacity vehicles to cut to the front of the queue, reducing the delay caused by the signal and improving the operational efficiency of the transit system. The Transportation Research Board conducted a study that showed travel time savings to buses ranging from 0 to 14 seconds with an average of 6.5 seconds. Queue jumpers at arterial street intersections should be considered when:

- High-frequency bus routes have an average headway of 15 minutes or less;

- Forecasted traffic volumes exceed 500 vehicles per hour in the curb lane during the peak hour and right turn volumes exceed 250 vehicles per hour during the peak hour.
- Intersection operates at an unacceptable level of service (defined by local jurisdiction).
- Cost and land acquisition are feasible.

Potential design features of queue jumper lanes include the following:

- Generally intended for straight-ahead movements only.
- Built to a length that exceeds the average queue length observed in adjacent mixed traffic lanes during the peak period so that buses can enter the lane prior to the start of the queue itself.
- Combined with Bus Signal Priority at particularly congested intersections causing severe delay.
- Adequate distance should be provided on the far side of the intersection to enable easy reentry of the bus into mixed-flow traffic.
- The lanes are distinctively identified by special pavement delineation.

**ADVANTAGES:** Advantages include travel time savings, increased transit competitiveness, improved image of transit, and increased corridor carrying capacity. Furthermore, time savings can be achieved if the lane is integrated with a bus-only lane and/or Bus Signal Priority.

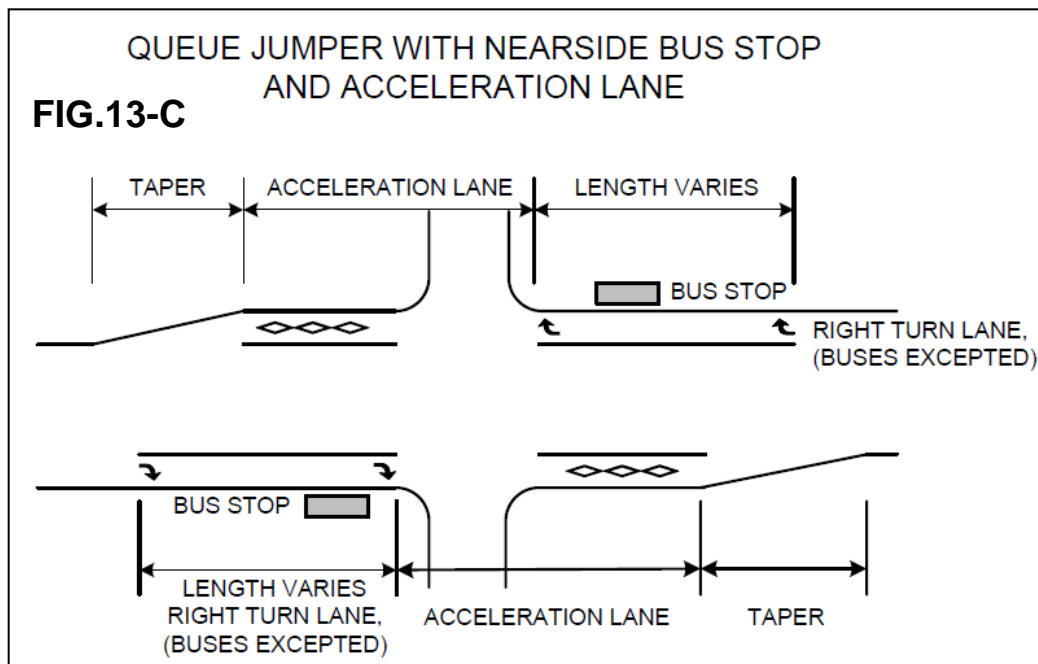
**DISADVANTAGES:** Installation may result in: (1) a small increase in traffic delay; (2) a decrease in roadway width for mixed traffic lanes; (3) displacement of parking, pedestrians, and/or traffic; and (4) increased danger for motorists and pedestrians, especially if they are unaccustomed to early entry of the bus into the intersection. Insufficient roadway width may prevent the installation of queue jumper lanes at key congested intersections. Without other improvements (e.g., Bus Signal Priority) queue jumper lanes may be ineffective in reducing bus delay. Lanes require constant enforcement.

**ESTIMATED COSTS:** The costs can range from the low end, where no land acquisition is required (concurrent flow lane), to the moderate, which requires reprogramming of signals and detectors, to the high end, which includes both signal and detector installation and land acquisition. Capital costs are relatively low compared to large-scale physical measures, such as grade separation, to reduce intersection delay.

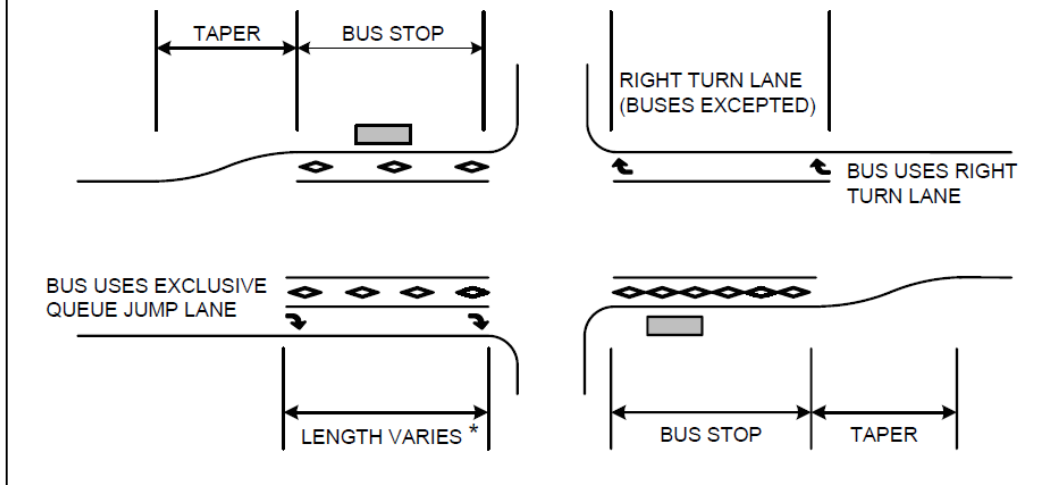
**POTENTIAL APPLICATION TO GET:** Various transit systems have implemented queue jumper lanes on a limited, as needed basis, at primary intersections,

where delay significantly impacts bus performance, where adequate right-of-way exists to place a queue jump lane, and where benefits to transit are potentially the highest. Queue jumper lanes provide the greatest benefits to buses when combined with Bus Signal Priority and/or bus-only lanes. However, some transit systems do not recommend queue jumper lanes due to safety concerns and conflicts with other vehicles.

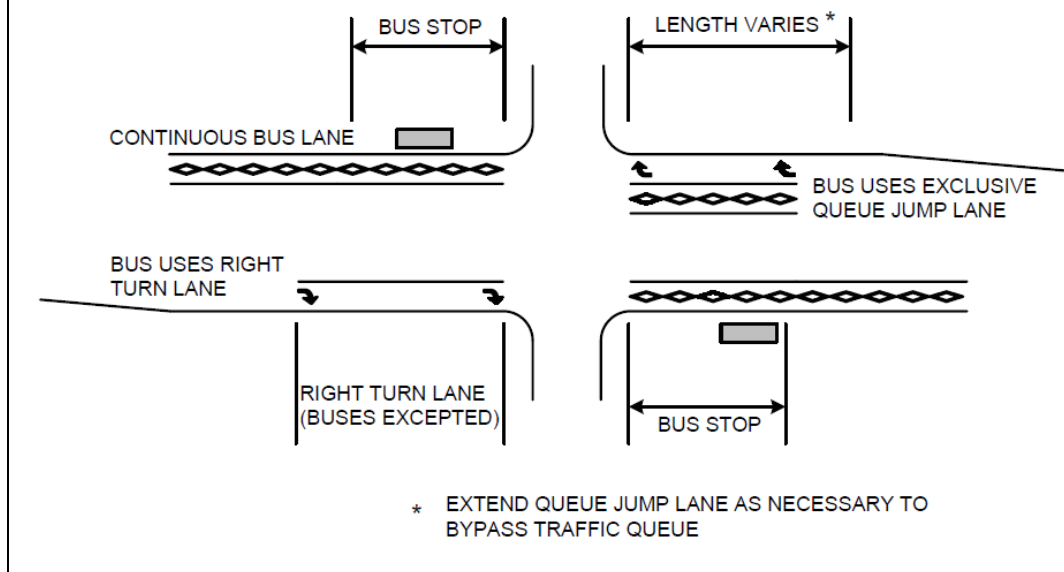
**EXAMPLES OF QUEUE JUMPERS WITH VARIOUS BUS STOP DESIGN TYPES :** The majority of conflicts between through vehicles and buses occur at bus stops with curbside designs. Conflicts occur when drivers change lanes to avoid a stopped bus or queuing behind a stopped bus. Far side stops result in less delay to buses when compared to near side or midblock stops. One of the reasons for the minimal delays at the far side stops is due to the breaks in traffic caused by the upstream signalized intersection. For stops that are designed as bus bays, delay is minimized with acceleration lanes, which provide bus operators with an area to merge smoothly with the traffic. Travel time savings can result when buses can use a queue jumper to access a far side open bus bay. The following figures show examples of queue jumpers with nearside and farside stops with curbside and bus bay designs.



**FIG.13-D** QUEUE JUMPER WITH FARSIDE BUS STOP

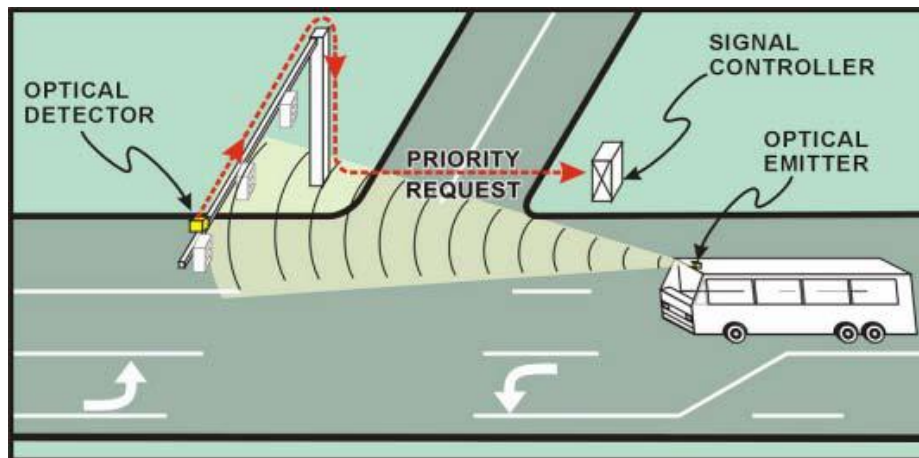
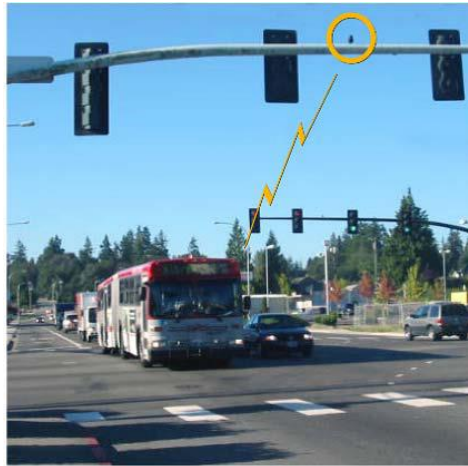


**FIG.13-E** QUEUE JUMPER WITH CONTINUOUS BUS LANE AND FARSIDE BUS STOP



## 5.2 Transit Signal Priority (TSP)

The goal of TSP is to provide transit vehicles with an advantage when crossing traffic signal-controlled intersections. It achieves this by providing a system that detects transit vehicles in traffic (by receiving a “call” from the vehicle) and communicates with traffic signals to conditionally provide more green light time for these vehicles. Transit Signal priority is not the same thing as pre-emption, which is often used by emergency vehicles. Emergency vehicle pre-emption and railroad crossing signals over-ride TSP.



In preparation of such technologies, GET will work with local jurisdictions and developers to provide electrical and communication conduits at selected locations if warranted.

### **5.3 Bus Rapid Transit (BRT)**

Conventional urban bus operations often are characterized by sluggish vehicles inching their way through congested streets, delayed not only by other vehicles and traffic signals, but also by frequent and time-consuming stops to pickup and discharge passengers. Buses travel on average at only around 60 percent of the speeds of automobiles using the same streets due to the cumulative effects of traffic congestion, traffic signals, and passenger boarding. Low cost investments in infrastructure, equipment, operational improvements, and technology can provide the foundation for Bus Rapid Transit systems that substantially upgrade bus system performance. Conceived as an integrated, well-defined system, Bus Rapid Transit would provide for significantly faster operating speeds, greater service reliability, and increased convenience, matching the quality of rail transit when implemented in appropriate settings. Improved bus service would give priority treatment to buses on urban roadways and would be expected to include some or all of the following features:

- **Bus lanes:** A lane on an urban arterial or city street is reserved for the exclusive or near-exclusive use of buses.
- **Bus streets and busways:** A bus street or transit mall can be created in an urban center by dedicating all lanes of a city street to the exclusive use of buses.
- **Bus signal priority:** Preferential treatment of buses at intersections can involve the extension of green time or actuation of the green light at signalized intersections upon detection of an approaching bus. Intersection priority can be particularly helpful when implemented in conjunction with bus lanes or streets, because general-purpose traffic does not intervene between buses and traffic signals.
- **Traffic management improvements:** Low-cost infrastructure elements that can increase the speed and reliability of bus service include bus turnouts, bus boarding islands, and curb realignments.
- **Faster boarding:** Conventional on board collection of fares slows the boarding process, particularly when a variety of fares are collected for different destinations and/or classes of passengers. An alternative would be the collection of fares upon entering an enclosed bus station or shelter area prior to bus arrivals.

#### ***5.4 Intelligent Transportation Systems (ITS)***

Intelligent Transportation Systems (ITS) are technologies that are designed to move transit more effectively, improve operations, and convey information to the traveling public. Installation of ITS features provides the following benefits:

- Improved marketing of transit.
- Improved access to information for existing and potential customers.
- Increased attractiveness of transit to choice riders.
- Potential for more up-to-date, accurate, and complete information.

Examples of ITS features are:

- Real-time “next bus” arrival information. All GET buses are equipped with an automatic vehicle location (AVL) system to track bus locations. The AVL data is converted to bus arrival times, which is displayed at bus stops, kiosks, or transmitted over information networks.
- Electronic posting of real time. (See following pictures)



- Access to route information.
- Installation of panic buttons



## 6. STREET GEOMETRICS & VEHICLE CHARACTERISTICS

### 6.1 Bus Turning Radii

Adequate roadway clearances are required for buses to safely execute turning movements without crossing more than one traffic lane or striking the street curb. These clearances are based upon bus turning radii. Bus turning radii refer to an outside and inside turning arc, both of which must be allowed for in designing intersection and driveway turns.

#### *Placement Guidelines*

These radii should be used whenever possible on all streets identified as transit streets. If radii not equal to these standards are used, they will result in a degradation of smooth vehicle movements through an area.

#### *Design Guidelines*

For safe turning movements, allowing for driver reaction, bus turning radii to be considered are:

	<u>Minimum</u>	<u>Recommended</u>
Radius of inner Rear Wheel	28'	30'
Radius of Outer Front Corner	50'	55'

While minimum dimensions are given, facility design should be based on the recommended dimensions, especially in new developments, to allow for proper vehicle movement and driver reaction while the bus is in motion. See Figure 14 for details.

### 6.2 Curb Radius Design

The corner radius at street intersections is a common transit related design problem. Some intersections are difficult to negotiate with a bus. Several advantages of a properly designed corner curb radius are:

- Less bus/auto conflict at heavily used intersections.
- Higher bus operating speeds and reduced travel time.
- Improved bus rider comfort.

The design of intersection radii for buses should consider the following elements:

- On street parking.
- Right-of-way/building restrictions.
- Allowable bus encroachment into other traffic lanes traveling in the same direction.

Figure 15 shows curb radius requirements for four different conditions. A curb radius of 50 feet is desirable for buses turning into a single 12 foot traffic lane without encroachment into opposing traffic. A curb radius as low as 20 feet is acceptable when on-street parking exists on a multi-lane arterial street. However, a minimum of 30 foot radius needs to be seriously considered to allow for possible parking removal in the future.

### **6.3 Street Pavements**

Roadway pavements need to be of sufficient strength to accommodate repetitive bus axle loads of 25,000 pounds. Exact pavement designs will depend on site specific soil conditions. Areas where buses start, stop and turn will be of particular concern for pavement design. Concrete pavement is desirable in these areas to avoid failure problems that are experienced with asphalt.

### **6.4 Clearance Requirements**

Buses usually travel in the curbside traffic lane and make frequent stops to pick up and drop off passengers. Therefore, it is important to consider bus clearance requirements as shown in Figure 16.

- Overhead obstruction should be a minimum of 12 feet above the street surface.
- For future street improvements, obstructions should not be located within 2 feet of the edge of the street to avoid being struck by a bus mirror. (This lateral clearance is not only important at ground level, but it is also necessary at the top of the bus).
- A traffic lane used by buses should be wide enough to permit adequate maneuvering space and to avoid sideswipe accidents. The desirable curb lane width (including the gutter) is 14 feet and the minimum width is 12 feet for future street improvements.

### **6.5 Fleet Characteristics**

The District's fleet consists of 40 and 45 foot buses (length). A 40-ft. bus is shown on the following page. All buses are equipped with bicycle racks and wheelchair lifts. All buses are fueled with compressed natural gas (CNG).

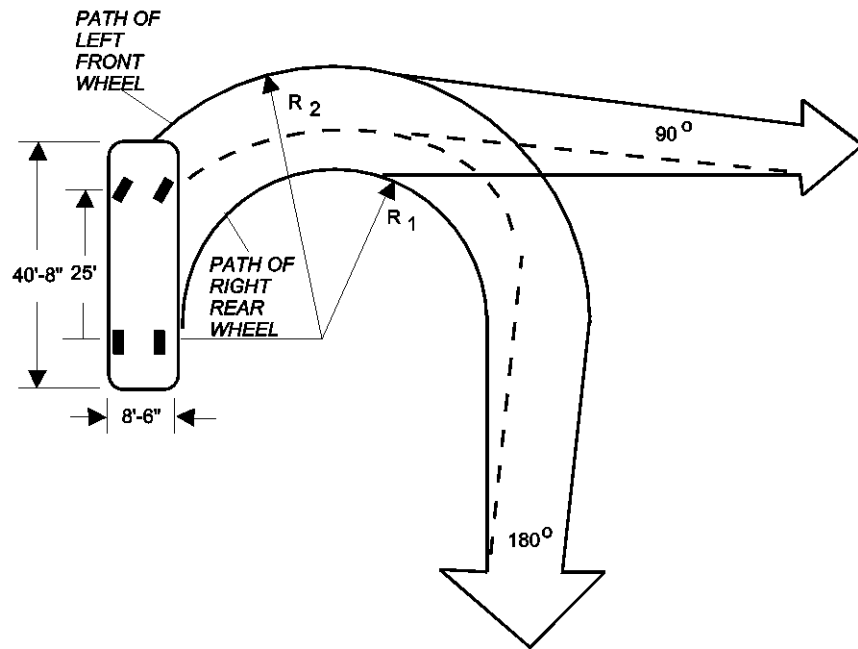
Vehicle height, width, weight, and turning radius are among the key items that factor into roadway, curbside, and transit facility design.

	<b>New Flyer</b>		<b>MCI</b>
	<b>C40LF</b>	<b>Orion VII</b>	<b>D4500</b>
<b>Length:</b>	<b>40 Ft.</b>	<b>40 Ft.</b>	<b>45.42 Ft</b>
<b>Width:</b>	<b>102 Inches</b>	<b>102 Inches</b>	<b>102 Inches</b>
<b>Height:</b>	<b>132 inches</b>	<b>132 inches</b>	<b>137 inches</b>
<b>Wheelbase:</b>	<b>293 Inches</b>	<b>286 Inches</b>	<b>318 Inches</b>
<b>Turning Radius:</b>	<b>44 Ft.</b>	<b>43.25 Ft.</b>	<b>50.75 Ft.</b>

GET uses vans for all of its demand-responsive (GET A Lift) services. These vehicles are approximately 25 feet long. Obviously, smaller vehicles easily fit where a large bus can go, but have an added advantage of greater maneuverability and therefore are welcome on site at retail centers, medical facilities, and higher density residential developments.



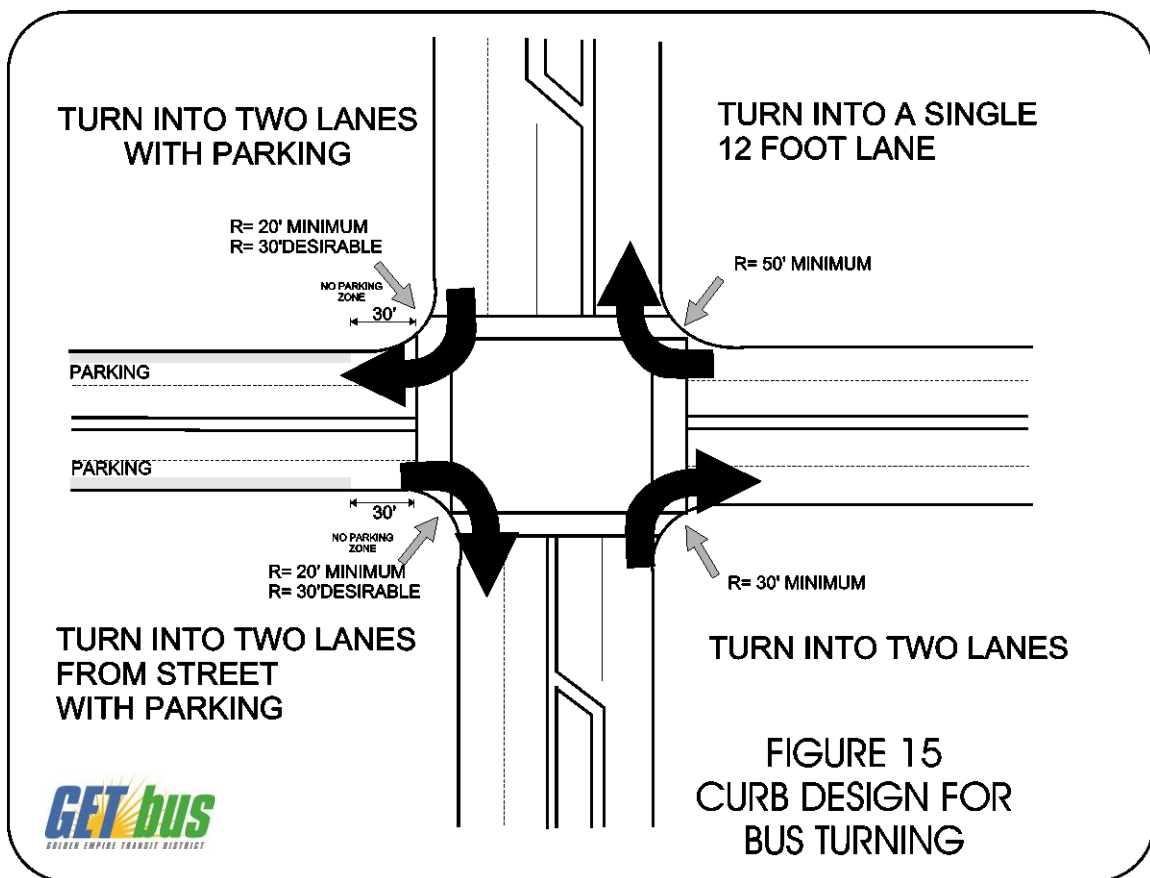
	Radius (R1) of Inner Rear Wheel	Radius (R2) of Outer Front Corner
Minimum	28'	50'
Desirable	30'	55'



TEMPLATES FOR RIGHT -TURN ONLY.  
REVERSE FOR LEFT TURN.



FIGURE 14  
BUS TURNING RADII



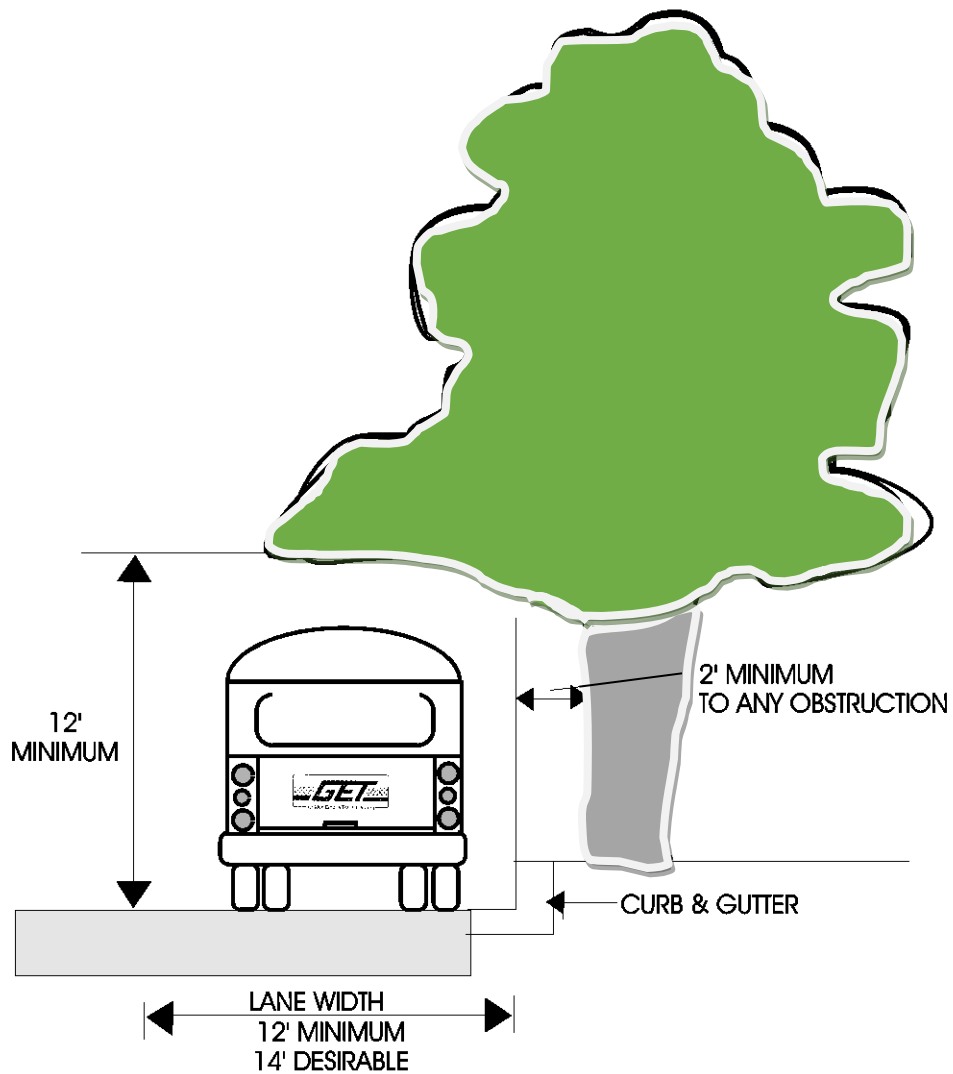


FIGURE 16  
CURB LANE CLEARANCE FOR BUSES

## GLOSSARY

<i>Accessibility</i>	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.
<i>ADA</i>	Americans with Disabilities Act. This is a federal regulation relative to facilities design to ensure accessibility. The ADA requires that fixed route transit be accessible and that complementary paratransit service be provided in the same geographic area (within $\frac{3}{4}$ mile) of a fixed route.
<i>Activity Center</i>	A small geographic area with a high concentration of activity, such as retail. High demand for services, including transportation is characteristic of activity centers. Greater Bakersfield is a multi-nucleated community with activity centers scattered throughout.
<i>Amenities</i>	Specific passenger or bus features that enhance public transportation, including: lighted, paved, handicapped accessible walkways; shelters and benches; waiting pads; bus turnouts; trash receptacles; bus pads; bus stop signs; and bus information signs.
<i>Arterial Street</i>	A major street or high capacity highway, primarily for through traffic, usually on a continuous route with unlimited access to adjacent streets.
<i>BCR</i>	Beginning of curb return. Where the tangent of the curve meets with the curb. It is at this point that measurements are taken to determine the distance between the intersection and the bus stop location and/or turnout.
<i>Berm</i>	A landscape mound or wall of earth.
<i>Bike Share</i>	Bike share is an innovative transportation program, ideal for short distance point-to-point trips providing users the ability to pick up a bicycle at any self-serve bike-station and return it to any other bike station located within the system's service area.
<i>BRT</i>	Bus Rapid Transit refers to a concept that seeks to achieve a high quality transit service similar to light rail but at a lower cost using buses. BRT vehicles are generally low-floor, high

capacity, low-emission buses, with exclusive rights-of-way, rapid fare collection, and infrastructure development.

<i>Bus Bench</i>	A bench that can accommodate three or more persons and is placed at a bus stop for use by waiting passengers.
<i>Bus Berth</i>	A designated area for buses to pull over and load/unload passengers in major transit facilities. Bus berths may be “parallel” to the curb or “sawtooth” where buses head into the curb at a designated angle.
<i>Bus Bulb</i>	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 Nub or curb extension.
<i>Bus Layover</i>	A designated bus stop for buses to park and to allow for breaks to make driver changes, to wait between the end of one bus schedule to the beginning of the next.
<i>Bus Pad</i>	A 12' x 50' x 8" (min. size) thick concrete section installed at existing bus stops to replace damage to pavement caused by buses serving bus stop.
<i>Bus Shelter</i>	A covered passenger waiting area, often semi-enclosed, with bench, that provides protection from the sun, wind and rain.
<i>Bus Stop</i>	A linear curbside area that is specially designated for bus passenger boardings and alightings. Bus stops can be located nearside, farside or midblock.
<i>Bus Stop Spacing</i>	The linear distance between individual bus stops.
<i>Bus Turning Radii</i>	The turning radii necessary to accommodate bus turning movements.
<i>Bus Turnout</i>	A bus stop located in a recessed curb area, separated from moving lanes of traffic.
<i>Collector Streets</i>	Streets that gather and disperse traffic between larger arterial highways and local streets.
<i>Complete Streets</i>	Complete streets is a transportation policy and design approach that requires streets to be planned, designed,

operated, and maintained to enable safe, convenient and comfortable travel and access for users of all ages and abilities regardless of their mode of transportation. Complete Streets allow for safe travel by those walking, cycling, driving automobiles, riding public transportation, or delivering goods.

<i>Curb Lane</i>	A travel, parking or bike lane that is adjacent to the curb.
<i>Demand Responsive</i>	A transportation service characterized by flexible routing and scheduling of relatively small vehicles to provide door-to-door or point-to-point transportation at the user's demand by prior arrangement, either by telephone or "Dial-A-Ride" service or other prescheduling arrangements.
<i>Dwell Time</i>	The time, in seconds, that a transit vehicle spends waiting to pick up or drop off passengers.
<i>ECR</i>	Ending of curb return. Where the tangent of the curve meets with the curb. It is at this point that measurements are taken to determine the distance between the intersection and the bus stop location and / or turnout.
<i>Egress</i>	Motion of a person or vehicle leaving or exiting a place. Both passengers and buses make egress movements.
<i>Far side bus stop</i>	A location for bus stop placed immediately beyond the intersection.
<i>Fixed Route</i>	Transit service provided on a repetitive, scheduled basis along a specific route with transit vehicles stopping to pick up and discharge passengers at the same locations each time they traverse the route.
<i>Floating Bus Stop</i>	Bus bulbs which have a bike lane running behind the bus stop. This simple configuration allows transit vehicles to stay in their own lane without jumping in front of cyclists, and gives cyclists added protection from vehicular traffic at the bus stop.
<i>Front-Kneel</i>	Driver-actuated device that lowers the front end of the bus during loading and unloading to reduce the effective first step height, i.e., from ground level.
<i>HOV Lane</i>	A traffic lane in a street or highway reserved for high occupancy vehicles, which may include two person vehicles in some applications.

<i>Information Signs</i>	Signs which display a variety of transit information, including bus routes, numbers, maps and schedule information, transit riding tips and other related information.
<i>Ingress</i>	Motion of a person or vehicle entering a place. Both passengers and buses make ingress movements.
<i>Mid-block bus stop</i>	A transit stop located between distant intersections.
<i>Mixed-Use Development</i>	A development which has a variety of land uses placed together in one project area (commercial, residential, industrial). Mixed use developments are different from activity centers because they are in one project area while activity centers have separate but complementary land uses.
<i>Near side bus stop</i>	The location for a bus stop that is placed on the approach side of an intersection.
<i>Park-and-ride-lot</i>	A designated parking area provided for bus, van pool, and car pool users to park and leave their cars and to continue their trip in a multi-occupant vehicle, such as a car pool, van pool or bus.
<i>Passenger Waiting Pad</i>	Bus stop pads are paved areas located at bus stops. They can be constructed adjacent to an existing paved area to provide additional room for benches or shelters. The pad must be connected to streets, sidewalks, or pedestrian paths by an accessible route.
<i>Pedestrian Accessway</i>	A lighted, paved, and handicapped accessible walkway that provides convenient access to transit facilities and bus stops from adjacent residential, office, or retail developments.
<i>Queue Jumper</i>	A queue jumper is a type of roadway geometry used to provide preference to buses at intersections, often found in bus rapid transit systems (BRT). Queue jumper lanes are a way to minimize the travel time delays through special priority lanes, often right hand turn lanes that permit transit through movements. Queue jumper lanes are typically installed at heavily congested intersections, with priority given to those intersections offering the greatest benefits to transit. A queue jumper lane is accompanied by a signal which provides a phase specifically for vehicles within the queue jump. Vehicles in the queue jumper lane get a "head-

	start" over other queued vehicles and can therefore merge into the regular travel lanes immediately beyond the signal.
<i>Red curb area</i>	A street curb, painted red to designate the zone for bus use only, that prohibits parking or stopping by all other vehicles.
<i>Transit Center</i>	A bus facility which acts as a hub for transit routes within a region.
<i>Transit furniture</i>	Objects provided at a bus stop or transit center for the comfort and convenience of waiting passengers, such as a shelter, bench, trash receptacle, or other components.
<i>Transit Oriented Development</i>	A design approach to residential or commercial that densifies around high quality transit service with high frequency service, safe and comfortable transit stops, clean fuel vehicles, to attract new and higher transit ridership.
<i>Travel Lane</i>	A lane devoted exclusively to vehicular traffic.
<i>Turning Radius</i>	The turning path of a vehicle established by the outer front overhang and the inner rear wheel.
<i>Van Stop</i>	A linear curbside area that is specially designated for van passenger boardings and alightings.