

# City of Raleigh Passenger Amenity Guidelines & Transit Design Standards Final Report



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Prepared for:  
City of Raleigh, Transit Department  
PO Box 590  
Raleigh, NC 27602



Prepared By:  
Wilbur Smith Associates  
421 Fayetteville Street, Suite 1303  
Raleigh, NC 27601  
919-755-0583

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# **Chapter 1:**

## **Introduction**



## Chapter 1: Introduction

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### **Introduction**

Over the past few years, the City of Raleigh Transit Program has been working on the development of an enhanced and improved bus stop program in the Capital Area Transit service area. One result of this work is the development of this document outlining specific design, access and other related criteria. The guidelines are intended to provide City staff, other affected jurisdictional partners, and developers with passenger amenities design criteria to be integrated with local comprehensive plan policies, land use ordinances, and other local plans.

The City of Raleigh is increasing efforts to emphasize a more livable community for its residents and visitors through a number of diverse programs and projects, including a Complete Streets infrastructure plan and a comprehensive Bicycle Plan. These efforts also improve pedestrian and bicycle options and alternatives to promote a healthier lifestyle that can be accommodated in a well-planned environment.



The goals of this guidebook are to develop a set of principles, guidelines, and standards that can be used by CAT and the City of Raleigh to enhance transit and livability through bus stop and amenities planning, design, and implementation. The guidelines were developed after an assessment of the existing CAT processes, discussions with CAT staff, and a thorough review of recent literature and standards used in other metropolitan areas.

These guidelines are intended to provide general parameters for designing and placing transit amenities and related facilities. They are not intended as an engineering design manual, and do not provide site specific detailed public transit, engineering, architectural, construction, or legal information. Users of this document will need to adjust the information contained in the guidelines to site specific needs, constraints and applicable laws, regulations, and ordinances.

Some existing CAT bus stops are influenced by the underdeveloped corridors or roads they serve. In these cases, application of the design guidelines may be limited by a lack of right-of-way, constraints due to the natural terrain, unimproved roadways with no curb and gutter, drainage or sidewalks. Because of these conditions there may be a need to consider street, sidewalk and utility enhancements and a coordinated planning and design effort between CAT, other city departments and affected agencies, such as the North Carolina Department of Transportation.

The City of Raleigh, Department of Public Works currently owns approximately 1,500 bus stops within the Raleigh service area. Approximately 100 stops for the Wolfline - the North Carolina State University transit service are the responsibility of the university. In addition, Triangle Transit, the regional service provider, also has approximately 100 stops.



The City contracts with Veolia Transportation, who is the primary operator for the fixed-route service, and as part of that contractual relationship, has a subcontractor who currently completes repairs, cleaning, and general upkeep duties at all CAT-owned bus stops with shelters, benches, and unimproved stops. The City, however, is developing a Request for Proposals entitled “*Moore Square and Passenger Amenity Maintenance*” that as drafted would request janitorial services for Moore Square Transit Station, as well as a bi-annual shelter maintenance program and on-call services for general cleaning, repairs and replacement activities.

The City estimates approximately 270 benches and 59 shelters have been installed around the community. The City of Raleigh, Department of Environmental Services provides trash maintenance on all 1,500 stops served by CAT. CAT does not have a formal trash maintenance schedule; however, this existing process has worked well for many years. CAT staff estimate that every one to three days the trash receptacles are serviced. In addition, an on-call staff person is also available for immediate trash removal. For shared stops with other local providers within the City, CAT is responsible for maintenance and cleaning.

Two years ago, CAT contracted with Wilbur Smith Associates for assistance in the implementation of 100 bus stops around the community. To date, 39 stops have been completed with coordination among CAT staff, WSA, NCDOT, and other departments within the City. An additional 18 stops will be implemented over the next several months for a total of 55 stops. For the project, CAT adopted the current bus stop design, with two variations – a standard design and a slim-line version more appropriate for stops with narrow right-of-way. This guidebook

will build from these efforts and provide assistance to future design and implementation.

## **Guidebook Overview**

### **Purpose**

The purpose of the guidebook is to develop suggested criteria to be considered when designing and placing transit bus stops and amenities. The following principles, guidelines and standards will provide comfortable and convenient high quality facilities at bus stop locations, while considering the operational needs of CAT, the guidelines and requirements related to the Americans with Disabilities Act (ADA), other federal and state accessibility mandates, and public safety. Entities to benefit from this guidebook include city planners, designers, traffic engineers, developers, and other public agency staff and officials. The general public may also find this document useful in understanding the current practices for the placement of transit facilities.

This information is not intended to be used as standard site specific details on which to base a final design per se, but rather as recommended criteria and general guidance for the placement and safe design of transit facilities. It should be noted that the guidebook must be used in conjunction with sound evaluation of the facts and engineering judgment. Thus, each particular site must be thoroughly examined and each particular project must be evaluated from the aspect of safety, operational requirements, and cost-effectiveness.

Design solutions may need to be adjusted accordingly to satisfy site specific constraints and other applicable conditions. The guidebook is intended to be used for actions on new or revised stop locations and also to apply to existing stop locations.



### **Goals**

The goals of the guidebook are to:

- Promote consistency in bus stop and amenity placement and design throughout the CAT service area;
- Develop a bus stop and amenities program that meets the operational requirements of the existing and proposed fleet; and
- Encourage the members of the community to use public transit through the provision of safe, comfortable, and convenient transit facilities.

The guidebook is organized into the following sections:

- **Chapter 2: Local Planning Environment**, which includes a discussion of existing planning processes in place.
- **Chapter 3: Bus Stop Placement**, which includes design elements for bus stop spacing, street layouts, and intersections.

- **Chapter 4: Bus Stop Elements and Amenities**, which addresses the minimum characteristics and features needed in order for a bus stop to be functional for bus and customer use.
- **Chapter 5: Transit Center Design**, which discusses siting and location design aspects for on-street and off-street design elements.
- **Chapter 6: Installation of Passenger Amenities by the Private Sector**, which lists several examples of successful partnerships between transit agencies and the private sector.

## **Chapter 2:**

# **Local Planning Environment**

## Chapter 2: Local Planning Environment

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Chapter 2 presents a discussion of the local planning environment for the City of Raleigh and CAT. Through the coordination of planning and the development of partnerships among local and state agencies, neighboring jurisdictions, property owners, CAT can provide input and direction to supplement the creation of a cohesive network of bus stops and amenities throughout Raleigh and the surrounding communities.



### **City of Raleigh Policies**

The City of Raleigh currently has three policies related to bus and transit amenities, as shown in Figure 2-1:

- Shelter and Bench Threshold Policy which defines shelter and bench warrants.
- Shelter facility layout and design provisions.
- Bench facility design parameters

**Figure 2-1: Shelter and Bench Policy**

<b>Adopted:</b>	Original Date Unknown
<b>2nd Adoption:</b>	December 13, 1991
<b>Revised:</b>	June 11, 1993

<p style="text-align: center;"><b>SHELTER AND BENCH POLICY</b></p> <p>It is Authority policy that shelters and benches are warranted at bus stops when there are at least 25 and 10 boarding's a day respectively. Special facilities may be provided, if necessary, at hospital and clinics.</p>
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**Figure 2-1: Shelter and Bench Policy (cont)**

### SHELTER FACILITY

Please fill in with concrete the space directly in front of the sidewalk and a 15' x 20' waiting pad behind the sidewalk. The pad should be 6" deep and our Engineering Division recommends 3,000 PSI concrete.

If you have reinforcement available, please follow these specifications:

- Reinforcement shall be welded wire mesh 6x6-W2.9 xW2.9. Joints and splices in the mesh shall have a minimum 6" overlap.
- Mesh shall have a minimum 3" cover on the edges and shall be centered between top and bottom.
- Survey Easement and provide copy of certified survey to City of Raleigh Transit program
- Provide design of pad and shelter installation (Frontal view and cross section)
  - Provide detail of any block and fill or additional construction elements which may vary from a standard installation.

### BENCH FACILITY

Please fill in with concrete the space directly in front of the sidewalk and a 6' x 9' waiting pad behind the sidewalk. The pad should be 6" deep and our Engineering Division recommends 3,000 PSI concrete.

If you have reinforcement available, please follow these specifications:

- Reinforcement shall be welded wire mesh 6x6-W2.9 xW2.9. Joints and splices in the mesh shall have a minimum 6" overlap.
- Mesh shall have a minimum 3" cover on the edges and shall be centered between top and bottom.
- Survey Easement and provide copy of certified survey to City of Raleigh Transit program
- Provide design of pad and shelter installation (Frontal view and cross section)
  - Provide detail of any block and fill or additional construction elements which may vary from a standard installation.

In addition to these policies, there are several other local policy processes that affect the development of bus stops and passenger amenities.

### ***City of Raleigh Plan Review Process***

Historically, the CAT Transit Program had an informal role in the review of development plans that were submitted to the City. However that role has expanded over time and in 2005 the process became more formal and involved transit planners in the review process of commercial and subdivision developments. The CAT transit planner was brought into the process and plans were routed to the department at the discretion of the City planner from Development Services.

As part of this new process, a Transit Planner is now part of the City's Due Diligence Session to provide input into the process from a transit perspective. As the Transit Program has grown over the years and there have been lessons learned from past experiences in the planning process, the overall review process has improved and appears to be expanding to include the complete streets objective to incorporate transit in the planning of all City projects. With the recent multimodal initiatives adopted in the *City of Raleigh Comprehensive Plan*, CAT has the opportunity to coordinate with many of the city departments to incorporate public transit in the overall transportation network.

### ***NCDOT Encroachment Agreement***

NCDOT requires all improvements within their rights-of-way to be reviewed and approved by the Department prior to any construction beginning. This includes the use of bus shelters and benches or any other amenity that will be placed in the public right-of-way. NCDOT requires that an Encroachment Agreement (Form R/W 16.1A) be completed by the City and accompany all design plans. All planning packages need to include the completed encroachment agreement form along with plans and supporting calculations addressing clear recover zones and sight distances meeting the requirements of *A Policy on Geometric Design of Highway and Streets*, by the American Association of State Highway and Transportation Officials (AASHTO), latest edition. All plans and calculations are signed and sealed by a North Carolina Licensed Professional Engineer. Below is a list of some NCDOT requirements for bus stop amenity projects within the right-of-way of NCDOT routes:

- The posted speed limit must be 45 MPH or less.
- The proposed shelter is on a street with NCDOT Standard 2'-6" curb and gutter, with sidewalk. The proposed shelter is located behind an existing sidewalk and as close to the right-of-way line as possible.
- The proposed shelter is of a design reviewed and approved by NCDOT's Project Services.

- The encroaching party includes a statement signed and sealed by a North Carolina Licensed Professional Engineer to the effect that "the proposed shelter is outside of the clear recovery zone, as defined by the most current version of the *AASHTO Roadside Design Guide*; or the proposed shelter will not adversely obstruct sight distances, nor create an increased safety hazard within the clear recovery zone to a greater extent than existing above ground obstacles (utility poles, trees, etc.), which are in close proximity to the proposed shelter.
- An Encroachment Agreement form 16.1A shall be required. Encroachment agreements for bus shelters can only be approved for municipalities or other government agencies.
- No commercial advertising shall be allowed on bus shelters within NCDOT right-of-way.
- NCDOT reserves the right to remove any shelter found to be a hazard to the traveling public.

NCDOT requires a total of five copies of the site plans to be submitted along with one original and four copies of the encroachment agreement, supporting documents and calculations. Packages are submitted to the NCDOT District Engineer's office.

### **Design Plans**

Design plans shall be prepared under the direction of, signed and sealed by a North Carolina Licensed Professional Engineer, and shall include at a minimum, the following items:

- Existing survey file with vertical datum, control points, property lines, right-of-way lines, existing site features and sufficient topographic information to layout the proposed amenity.
- Demolition plan to include any items that will be removed from the site and items to be salvaged to the City.
- Proposed plans to show all horizontal staking points for the locations of amenities, vertical elevations to meet ADA requirements of the North Carolina State Accessibility Code, latest edition.
- Grading requirements to ensure positive and proper drainage of the site.
- Retaining walls, storm drainage improvements and utility adjustments, if required.
- Typical sections and details.
- Sight triangles.
- All design and traffic control shall meet the requirements of the City of Raleigh and NCDOT Standard Drawings and Specifications as applicable.

A sample plan is shown in Figure 2-2.

## **Easement Exhibits**

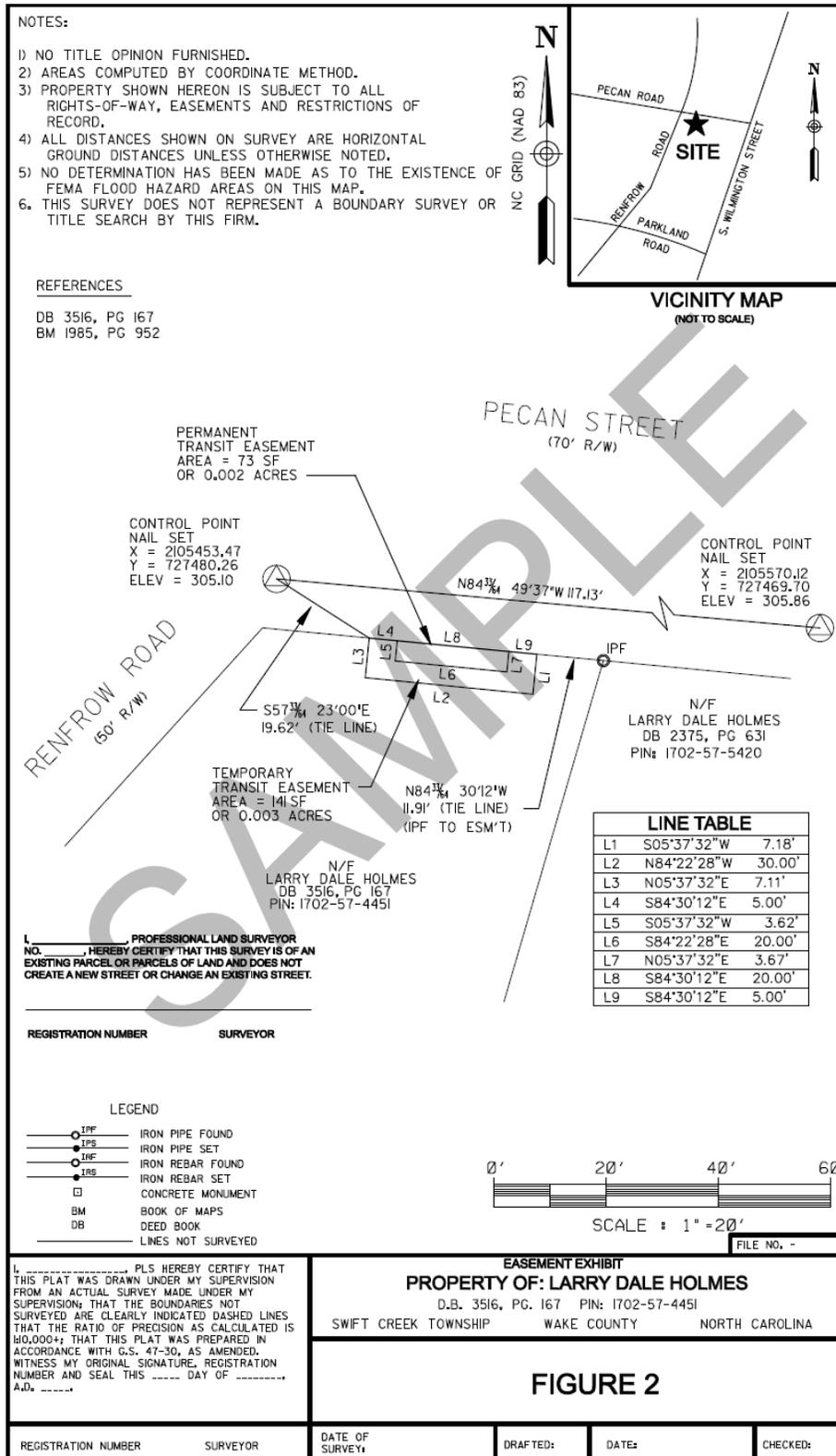
Most existing roadway right-of-way is limited to the back of the existing sidewalk or back of the existing curb and gutter. To provide a bus stop amenity at locations where these right-of-way conditions exist will require the City to purchase additional transit easements from the adjacent property owner. This will protect the area of the proposed amenity. The City will generally have to enter into negotiations with the adjacent property owner to purchase a permanent easement for the actual bus shelter or bench pad, and a temporary easement to allow the construction contractor to install the amenity and tie grades back to meet surrounding grades. Signed and sealed easement exhibits by a North Carolina Licensed Professional Surveyor are required for the City's Real Estate Department to begin negotiations with property owners. A sample easement is shown in Figure 2-3.

Other special Transit License Agreements and legal descriptions have also been requested by other state-owned property, such as North Carolina State University. Coordination between the City of Raleigh and the state agency owning the property should take place to determine appropriate language within required documents for the procurement of the easement.

Figure 2-2: Sample Design Plan



Figure 2-3: Sample Easement



## **Chapter 3:**

# **Bus Stop Placement**



## Chapter 3: Bus Stop Placement

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Chapter 3 contains strategies for installing bus stops and amenities that will delineate boarding/alighting locations and improve the passenger experience using the system. These include guidelines for appropriate bus stop placement relative to the intersection, bus stop spacing, and different types of street-side designs.



Because of the number of factors involved, each new or relocated stop must be examined on a case-by-case basis. These guidelines have been developed based on a review of typical industry performance guidelines, with some specific consideration for conditions within the City of Raleigh.

### ***Bus Stop Spacing***

Within the transit industry many agencies have adopted a general bus stop spacing guideline of one quarter mile. This spacing appears to best balance the tradeoff between maximizing passenger access and maximizing operational efficiency. A greater distance between bus stops reduces the overall operating time of the route and provides a more rapid ride. The disadvantage to having a greater distance between bus stops is the requirement of walking further to the nearest stop, which can be an inconvenience for passengers. Ultimately, bus stops should be spaced close enough for passengers to easily walk to them, but far enough apart to allow for efficient bus travel.

The distances between bus stops could be influenced by other environments, such as those listed below. Stops should be assessed on a stop-by-stop basis in these instances.

- Major trip generators:
  - Employment centers with 1,000+ employees
  - Residential areas with 500+ units or minimum population density of 5,000 per square mile
  - Retail centers with 400,000 or more square feet of leasable space
  - Education centers with 2,500+ students
  - Major medical facilities with out-patient care
  - Housing developments which cater to seniors or persons with disabilities

- Transit system transfer points

Figure 3-1 is illustrative of industry practice for bus stop spacing. Bus stops are spaced to maximize passenger accessibility, convenience, and safety and to minimize undue delay or traffic interruptions. The *Guidelines for the Location and Design of Bus Stops, Report 19*, from the Transportation Research Board suggests that stops should not exceed 8 stops per mile.

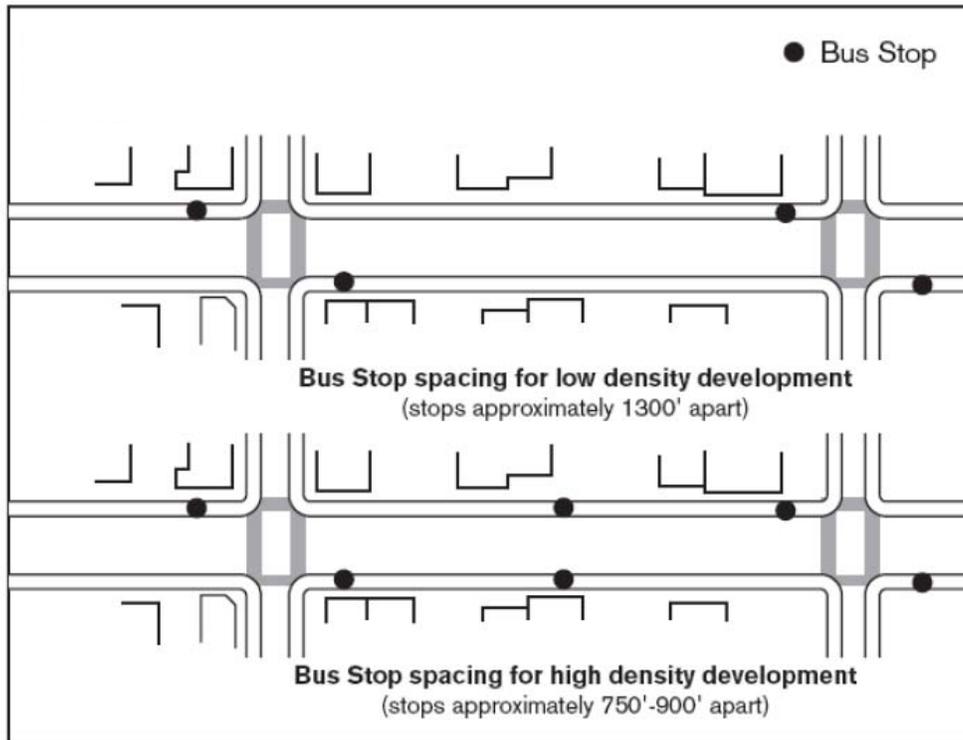


Figure 3-1: Criteria for Bus Stop Spacing

<i>Density Characteristics</i>	<i>Spacing Dimensions</i>
<p><i>MAJOR ACTIVITY CENTERS</i> – Activity centers such as hospitals and universities</p> <p><i>HIGH</i> – 5,000 persons per square mile. Apartments, seniors’ housing, offices, and commercial. Density &gt; 4 units/acre.</p>	<p>Major facilities should be served.</p> <p>Approximately every 1/2 mile</p>
<p><i>MEDIUM</i> – 2,000-4,000 persons per square mile. Density about 3 units/acre.</p>	<p>Every 1/2-3/4 mile</p>
<p><i>LOW or RURAL</i> – Less than 2,000 person per square mile. Density = 1-2 units/acre.</p>	<p>Every 3/4 -1 mile or on flag stop</p>

This recommended bus stop spacing should serve as a guide. The addition or subtraction of bus stop locations need to take into consideration the existing transit network, trip generators, land uses, and pedestrian infrastructure. As a rule, bus stops need to have adequate sidewalk connections and roadway crossing amenities (i.e. marked crosswalks, median islands, curb ramps, pedestrian signals, etc.). It is important to emphasize that these are general guidelines and should not be construed as absolutes. Figure 3-2, shown on the following page, presents the typical bus stop spacing.

**Figure 3-2: Typical Bus Stop Spacing**



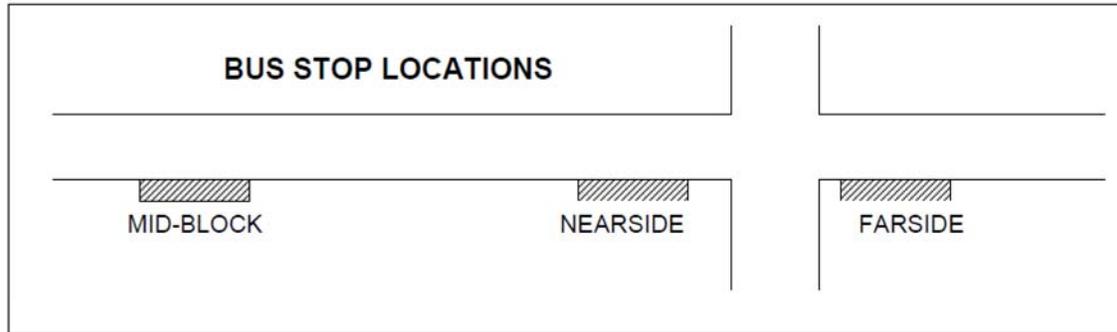
Considering all factors from the above information, it appears that a logical framework policy for Raleigh would be to plan bus stop spacing at quarter-mile intervals for the majority of the service area, but to consider shorter distances between stops within downtown and based on adjacent land use intensity as described above.

### ***Placement of Bus Stops***

After general bus stop spacing is determined, the bus stops are placed in one of three locations, as shown in Figure 3-3 on the following page:

- Nearside of the intersection
- Farside of the intersection
- Mid-block between intersections

Figure 3-3: Bus Stop Location Options



The proper location of bus stops is critical to the safety of passengers and motorists, as well as to the proper operation of the CAT transit system. Typical industry considerations for the final decision on the location include:

- Proximity to major trip generators
- Presence of sidewalks, curb ramps and access paths leading to trip generators and nearby pedestrian circulation system
- Width, placement and condition of sidewalks
- Protected crossings at signalized or stop controlled intersections, or at crosswalks
- Convenient passenger transfers to other routes
- Effect on adjacent property owners.
- Conflict between buses, other traffic, and pedestrians
- Pedestrian activity through intersections
- Open and visible spaces for personal security and passenger visibility
- Street illumination
- Ability to restrict parking if needed, feasibility to move or provide parking and truck delivery zones
- Adequate curb space for the number of buses expected at the stop at any one time
- Volumes and turning movements of other traffic, including bicycles
- Proximity and traffic volumes of nearby driveways
- Street and sidewalk grade
- Ease for bus re-entering traffic stream
- Bus route turns
- Unusual intersection angles or predominant turning movements
- Proximity to rail crossings or emergency driveways
- Sight distance at adjacent intersections and driveways



Bus stops are predominantly located at the nearside or farside of an intersection which maximizes pedestrian accessibility from both sides of the street and can provide connections to intersecting bus routes. Under certain situations, bus stops may also be placed at a mid-block location. The placement of bus stops at intersections varies from site to site. These guidelines have been developed based on traditional safety guidance from Manual of Uniform Traffic Control Devices (MUTCD), with additional input based on an understanding of conditions within the City of Raleigh. Figure 3-4, shown on the following page, summarizes the major advantages and disadvantages related to locating bus stops.

Whether the bus stop is placed nearside, farside, or mid-block, the bus stop location must have adequate sidewalk connections, and roadway crossing amenities, such as marked crosswalks, median islands, curb ramps, pedestrian signals, etc. Detailed information on the design of these accessibility factors can be found in the Americans with Disabilities Act Accessibility Guidelines (ADAAG) and the Federal Highway Administration's 2008 Pedestrian Safety Guide for Transit Agencies.<sup>1</sup>

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<sup>1</sup> <http://www.access-board.gov/adaag/html/adaag.htm>;  
<http://www.trb.org/Main/Public/Blurbs/159967.aspx>

**Figure 3-4: Bus Stop Location Advantages/Disadvantages**

Bus Stop Location	Advantages	Disadvantages	Recommended When the Following Location Conditions Exist
<b>Nearside</b> Located immediately before an intersection	<ul style="list-style-type: none"> <li>• Less potential conflict with traffic turning onto the bus route street from a side street.</li> <li>• The bus boarding door is close to the crosswalk.</li> <li>• Bus has intersection to merge into traffic.</li> <li>• Bus Driver can see oncoming buses with transfer passengers.</li> </ul>	<ul style="list-style-type: none"> <li>• Potential conflicts with right turning traffic due to cars cutting in front of the bus.</li> <li>• The stopped bus obscures the sight distance of drivers and pedestrians entering from the right.</li> <li>• The stopped bus may block visibility of the stop signs or traffic signals.</li> <li>• At signalized intersections, may result in schedule delays.</li> </ul>	<ul style="list-style-type: none"> <li>• When traffic is heavier on the farside than on the approaching side of the intersection.</li> <li>• When pedestrian access and existing landing area conditions on the nearside are better than on the farside.</li> <li>• When street crossings and other pedestrian movements are safer when the bus stops on the nearside than the farside.</li> <li>• When the bus route goes straight through the intersection.</li> <li>• When adequate sight distance can be achieved at the intersection.</li> </ul>
<b>Farside</b> Located immediately after an intersection	<ul style="list-style-type: none"> <li>• Does not conflict with vehicles turning right.</li> <li>• Appropriate after the route has made a turn.</li> <li>• The stopped bus does not obscure sight distance to the left for vehicles entering or crossing from the side street.</li> <li>• At signalized intersections, buses can more easily re-enter</li> </ul>	<ul style="list-style-type: none"> <li>• The stopped bus obscures the sight distance to the right of drivers entering from the cross street to the right of the bus.</li> <li>• If the bus stopping area is of inadequate length, the rear of the stopped bus will block the cross street (especially an issue for stops where more than one bus may be stopped at a time).</li> <li>• If the bus stops in the travel lane, it may result in queued traffic behind it blocking the</li> </ul>	<ul style="list-style-type: none"> <li>• When traffic is heavier on the nearside than on the farside of the intersection.</li> <li>• At intersections where heavy left or right turns occur.</li> <li>• When pedestrian access and existing landing area conditions on the farside are better than on the nearside.</li> <li>• At intersections where traffic conditions and signal patterns may cause delays.</li> <li>• At intersections with transit signal priority treatments</li> </ul>
<b>Bus Stop Location</b>	<b>Advantages</b>	<b>Disadvantages</b>	<b>Recommended When the Following Location Conditions Exist</b>
	<p>traffic.</p> <ul style="list-style-type: none"> <li>• The stopped bus does not obscure traffic control devices or pedestrian movements at the intersection.</li> </ul>	<p>intersection.</p>	
<b>Mid-Block</b> Located 300 feet or more beyond or before an intersection	<ul style="list-style-type: none"> <li>• The stopped bus does not obstruct sight distances at an intersection.</li> <li>• May be closer to major activity centers than the nearest intersection.</li> <li>• Less conflicts between waiting and walking pedestrians.</li> </ul>	<ul style="list-style-type: none"> <li>• Requires most curb clearance of the three options (unless a mid-block sidewalk extension or bus bulb is built).</li> <li>• Encourages mid-block jaywalking.</li> <li>• May increase customer walking distances if the trip generator is close to an intersection. Length of mid-block stops can vary due to depth of a turn-out and a bus' ability to maneuver in/out of traffic lanes.</li> </ul>	<ul style="list-style-type: none"> <li>• When traffic or street/sidewalk conditions at the intersection are not conducive to a near-side or far-side stop.</li> <li>• When the passenger traffic generator is located in the middle of a long block.</li> <li>• When the interval between adjacent stops exceeds stop spacing standards for the area.</li> <li>• When a mid-block stop is compatible with a corridor or district plan.</li> </ul>

## **Curb Clearance for Bus Stop Zones**

The preferred minimum requirements for curb clearance for a 40-foot bus are shown in Figure 3-5 on the following page. It must be noted that these clearances are not always feasible in the urban environment, but should be the goal wherever possible to ensure that buses have room to serve the bus stop parallel to the curb with comfortable space to exit and re-enter the travel lane. At an absolute minimum, an additional 25 feet would be required for pulling in and pulling out (totaling 50 feet), plus the length of the vehicle (totaling 90 feet for a mid-block stop). When a parking lane is over eight feet in width, or where turnouts are used, additional space is needed for the bus to re-enter the traffic flow; thus, the clearance area must be increased a corresponding amount.

For bus stops where more than one bus may be stopped at a given time, additional curb clearance is needed. A general rule of thumb is to add one bus length plus 10 feet for each additional bus to be accommodated at the stop at the same time. Additional curb clearance will be needed for stops following right route turns and may also be needed following left turns.

## **Placement in Relation to Roadway**

On streets where the posted speed limit exceeds 45 miles per hour, at stops where buses may need to lay over longer than the time it takes passengers to board and alight the bus, and in areas where the impact of the bus blocking a travel lane creates unacceptable delay or potential hazard, the bus should not stop in the travel lane. Typical industry practice is that these conditions warrant a turnout, paved shoulder, or other area of adequate curbside clearance at least 12 feet wide. Bus turnouts have advantages and disadvantages:

### Advantages:

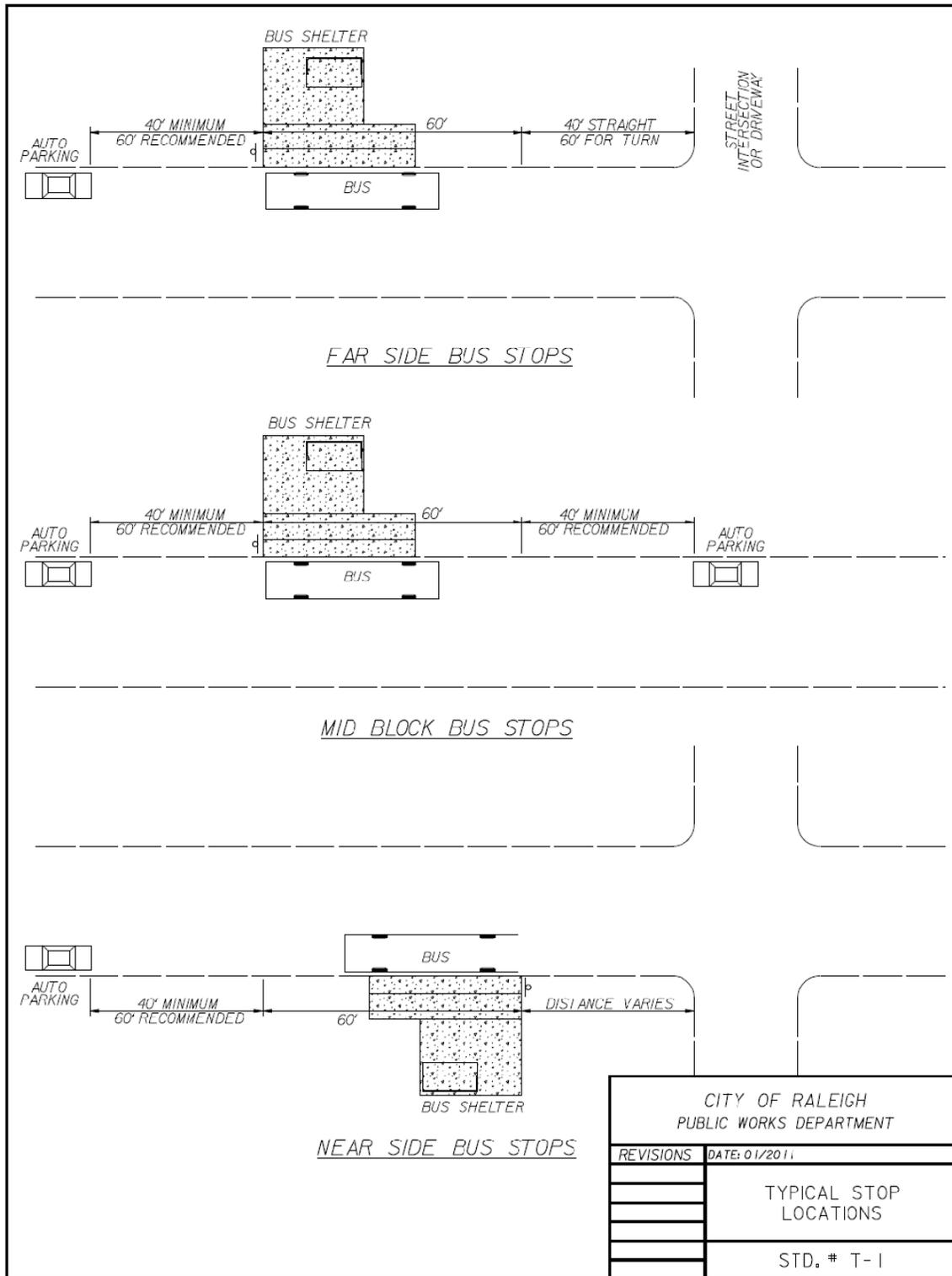
- Allows traffic to proceed around the bus, reducing delay for general traffic
- Maximizes vehicular capacity of roads
- Clearly defines the bus stop
- Passenger loading and unloading can be conducted in a more relaxed manner
- Eliminates potential rear-end accidents

### Disadvantages:

- More difficult to re-enter traffic, increasing bus delay and increasing average travel time for buses
- Uses additional space and may require right-of-way acquisition



**Figure 3-5: Dimensions for On-street Bus Stops**



After considering the above advantages and disadvantages, bus turnouts are desirable where the posted speed limit is 45 mph or more and one of the following conditions exist:

- Peak period boarding average exceeds 20 boardings per hour
- Average peak period dwell time exceeds 30 seconds per bus
- A high frequency of accidents involving buses and/or pedestrians has been recorded in the past year
- Curb lane volume exceeds 250 vehicles during the peak hour and the curb lane is less than 20 feet wide or when bus volumes exceed 10 or more vehicles per peak hour
- Bus stops are prohibited in the curb lane
- Sight distances prevent traffic from stopping safely behind a stopped bus (e.g. hills, curves)
- Stops where there are consistent numbers of wheelchair boardings
- Buses are expected to layover at the end of a trip
- There is adequate space for turnout length and depth given to allow a bus to safely exit and enter into the flow of traffic

The farside of an intersection is the preferred location for turnouts. Nearside turnouts typically should be avoided because of conflicts with right turning vehicles, delays to transit service as buses attempt to re-enter the travel lane, and obstruction of pedestrian activity as well as traffic control devices. The exception would be where buses would use a right turn lane as a queue jump lane associated with a bus signal priority treatment at an intersection (where a far-side pullout is not possible). Turnouts in mid-block locations are not desirable unless associated with key pedestrian access to a major transit-oriented activity center and subject to the general guidelines above.



Bus turnouts come in several forms, depending on land use, roadway design, traffic flows, and available right-of-way. CAT currently has bus turnouts on Creedmoor Road along Route 4, and two turnouts on Wilmington Street.

Should CAT implement bus turnouts in the future, the following guidelines are recommended. When a bus pullout is justified, it should be placed to allow buses to easily reenter the traffic flow. The design of a bus pullout should allow through vehicle and bicycle traffic to flow freely without the obstruction of stopped buses. The bays allow buses to pick up and drop off passengers outside of the travel lane. As a result, this allows traffic to flow unobstructed while the bus is stopped.

Guidelines for bus turnouts:

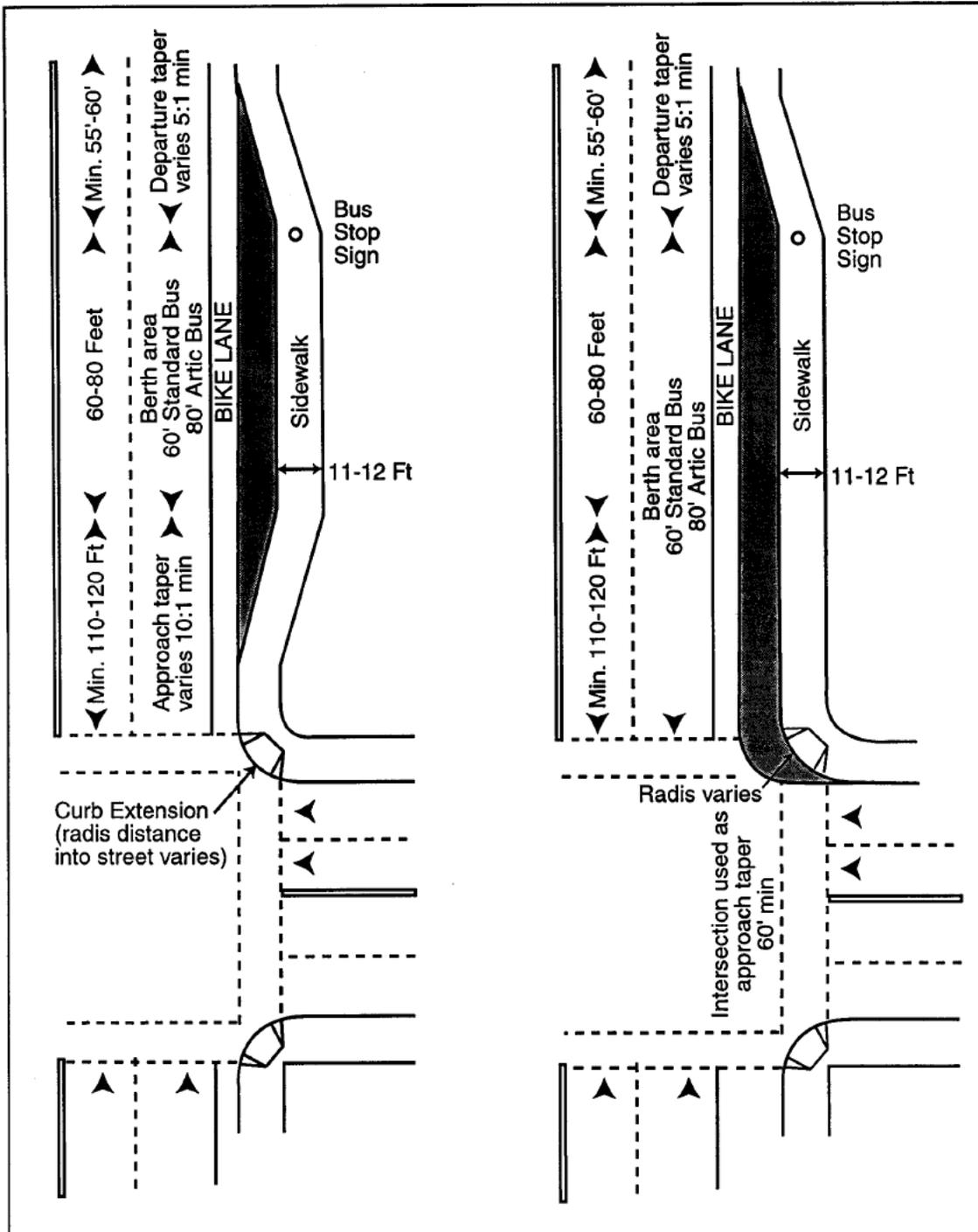
- Farside turnouts should be placed at signalized intersections where the signal can create gaps in traffic allowing the bus to re-enter the street.
- 12-foot width is desirable; 10-foot width is the minimum.
- On streets with bike lanes and where bus layovers occur, the turnout should be wide enough so that buses do not impede the bike lane.

The bus turnout design options are shown in Figure 3-6.

### ***Abutting Property Owners / Tenants***

To promote good public relations, it is desirable that bus stops be placed at locations where they will be accepted by adjacent residents or business owners. Some commercial establishments are interested in having a bus stop placed in front of their establishment, while residents may object to the presence of a bus stop in front of their home. Consideration should be taken to minimize the impact to each property owner, but vehicle and pedestrian safety should be the overriding factors in determining the final bus stop location. Supplemental Report A includes information regarding how other agencies coordinate with private property owners.

Figure 3-6: Bus Turnout Design Options



## **Parking Restrictions and Regulation at Bus Stops**

Parking restrictions (installed through 'No Parking' signs or curb painting) should be placed at bus zones. The absence of these restrictions could impact bus safety and operations, traffic movement, safe sight distance, and passenger safety and access. Potential issues include:

- The bus may have to double park when servicing a stop, which would interfere with traffic movements.
- Passengers would have to maneuver between parked vehicles when entering or exiting the bus, which can endanger the passengers.
- The bus would not be able to access to the curb/sidewalk area to board or alight persons with disabilities or other mobility limitations.

Traffic regulations prohibit parking, standing, or stopping at bus stops. These regulations must be authorized and allow the transit agency to establish bus stop locations and to designate bus stops with appropriate signage. It is important that these parking regulations be consistently implemented and then consistently enforced in an expedient manner.



The Manual on Uniform Traffic Control Devices (MUTCD), maintained by the Federal Highway Administration, includes general specifications for no parking signs at bus stops and curb markings to indicate parking restrictions, as well as guidelines for the placement of the signs. Suggested signs in the MUTCD are the R7 Series, as shown in Figure 3-7. Alternative designs discussed in the Manual may include a transit logo, an approved bus symbol, a parking prohibition, the words BUS STOP, and right-, left-, and double-headed arrows. The preferred bus symbol color is black, but other dark colors may be used. Additionally, the transit logo may be shown on the bus face in the appropriate colors instead of placing the logo separately. The reverse side of the sign may contain bus routing information.<sup>2</sup> The MUTCD also discusses the use of curb markings to indicate parking restrictions. At the option of local authorities, special colors (none are specified in the MUTCD) may be used for curb markings. When signs are not used, restrictions should be stenciled on the curb.

<sup>2</sup> [http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp\\_rpt\\_19-b.pdf](http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_19-b.pdf)

Figure 3-7: MUTCD Suggested Signage for Bus Stops



R7-107a  
12" x 30"

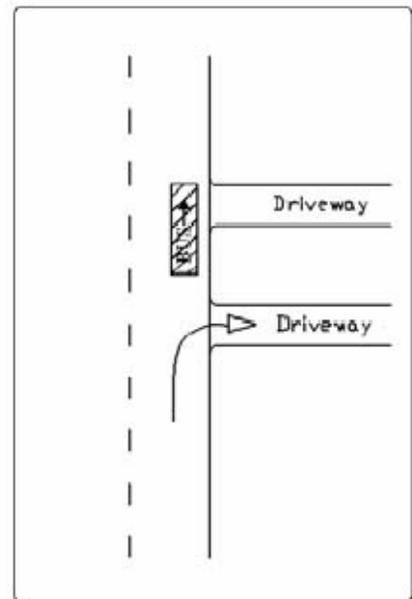


R7-107  
12" x 18"

### Bus Stops and Driveways

Whenever possible, bus stops should not be placed near a driveway. However, if a placement near 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. When there are two driveways to a parcel on the same street, the upstream driveway should be blocked forcing vehicles to turn behind the bus to access the driveway.
- It is preferable to fully rather than partially block a driveway to prevent vehicles from attempting to maneuver by the bus in a situation with reduced sight distance.
- 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.
- Ensure passengers have a safe area to wait when loading in or adjacent to a driveway.



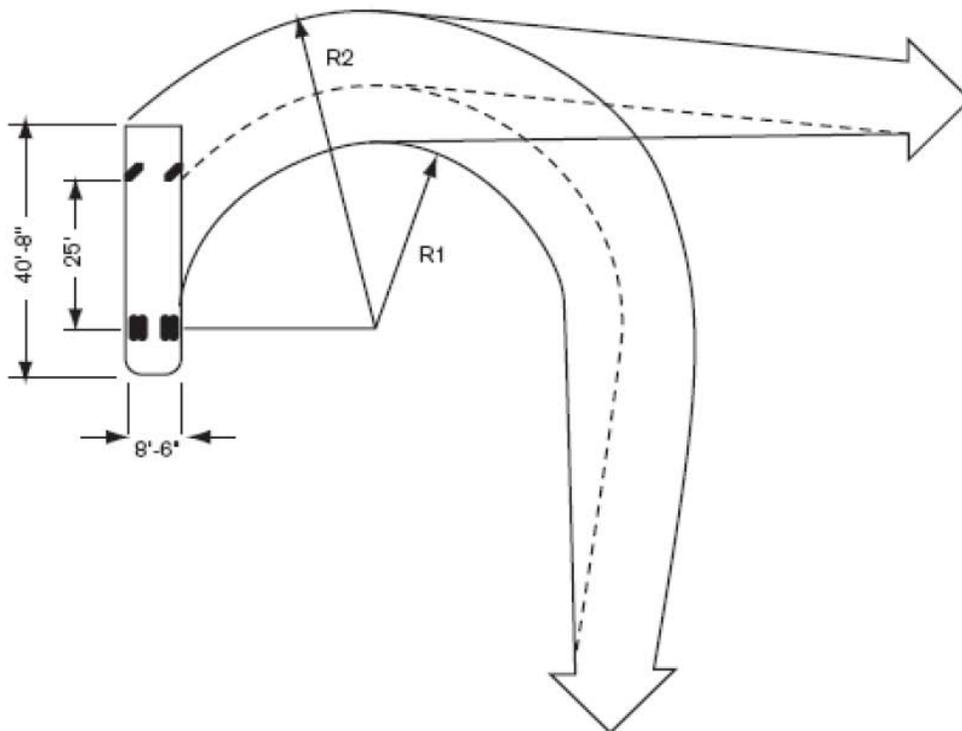
## Vehicle Turning Radii

The following turning radii are necessary for buses to safely execute all turning movements. The radii standards should be applied, whenever possible, on all streets identified as potentially having transit use. When radii below these standards are used, it could result in a degradation of smooth vehicle turning movements and damage to the curb. A minimum 50-foot radius, shown in Figure 3-8, ensures that large transit buses can safely conduct turning movements. In areas served by tourist, hotel or other heavily used buses, a 55-foot radius provides smoother maneuvering.

Figure 3-8: Turning Template for 40-ft Bus

	Radius (R1) of inner rear wheel	Radius (R2) of outer front corner
Minimum	28'	50'
Desirable	30'	55'

For 40' vehicles and articulated vehicles

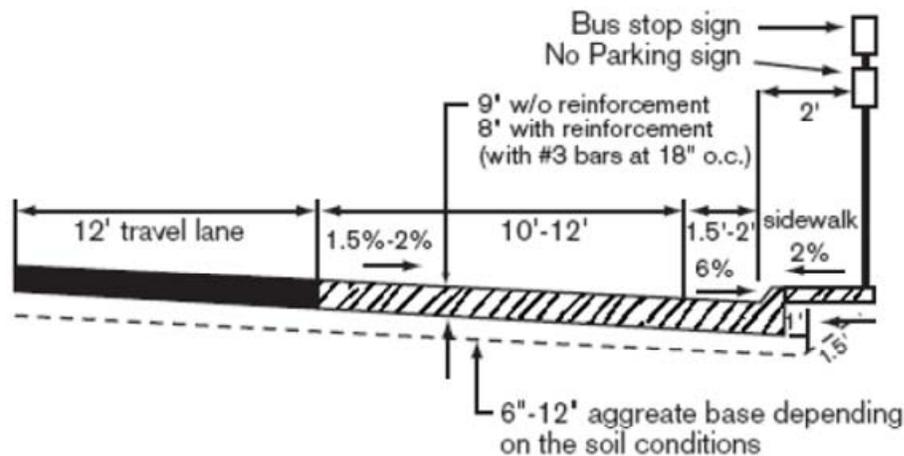


### Roadway Lane Width and Surfaces<sup>3</sup>

For both public and private roadways that accommodate larger transit vehicles, a 12-foot lane width for the curb lane to ensure proper maneuverability of the larger buses is recommended.

Roadway pavements need to be of sufficient strength to accommodate repetitive bus axle loads of up to 25,000 lbs. Concrete is preferred to avoid failure problems that are experienced with asphalt, especially where buses start, stop or turn. For bus stop areas, including bus turnouts and transit stations, concrete is recommended. Due to loads and shear forces applied to pavement surfaces during bus starting and stopping movements, concrete has the best potential for shape retention. The concrete paving should be designed with a minimum eight inches of portland cement concrete, jointed, and reinforced on a four-inch sub-base of stabilized granular material, as shown in Figure 3-9.

Figure 3-9: Roadway Width and Surfaces



The maximum slope or grade that a standard 40-foot transit bus can negotiate safely and economically is usually 6 to 12 percent. For example, in an uphill direction, the maximum sustained grade for roadways designated for bus service should not exceed six percent. For the downhill direction, the roadway should be designed with a maximum 12 percent grade.

### Intersection Design

Design objectives for the radius of a street intersection likely to be used by CAT buses should:

<sup>3</sup> TCP Report 19-a and b; ITE, Guidelines for Urban Major Street Design; Riverside Transit Agency Design Guidelines, Illinois DOT Bureau of Design, Design Manual.

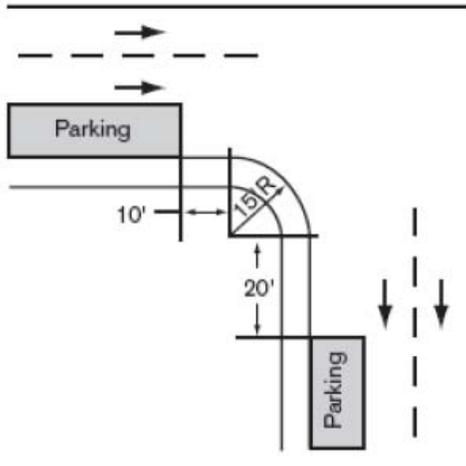
- Aid in bus turning movements;
- Minimize lane encroachment by buses;
- Allow appropriate bus operating speeds;
- Decrease conflicts between buses and other vehicles;
- Reduce travel times;
- Improve passenger comfort;
- Consider on-street parking arrangements;
- Consider the number, width and continuity of traffic lanes.

**Vehicle Parking Near Intersections:**

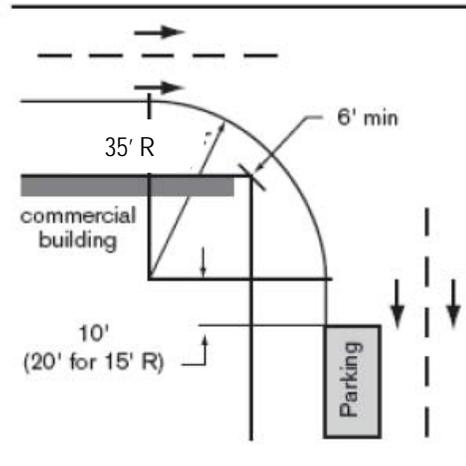
During turning movements, transit vehicle encroachment into adjacent lanes of traffic is to be avoided whenever possible. Parking setbacks (no-parking zones) will reduce conflicts between transit vehicles and parked cars thereby allowing proper transit vehicle turns.

To accommodate the 50-foot radius turn, shown previously for a 40-ft bus, parking should either be restricted or arranged to permit the bus to make smooth, unobstructed movements. A 60-foot no-parking setback zone on the bus' approach to the transit stop and a 40-foot setback zone for the entry back onto the road are recommended. These setbacks are to begin at the respective corner tangent points and are sufficient to allow a 40-foot bus to pull up to the curb just beyond the bus stop sign. Figures 3-10 and 3-11 depict various curb design alternatives for different parking scenarios.

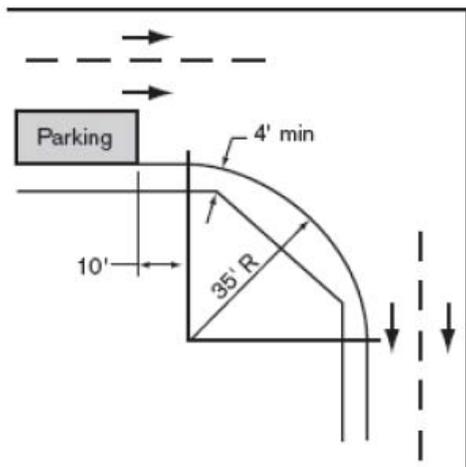
**Figure 3-10: Typical On-Center Curb Design for Buses**



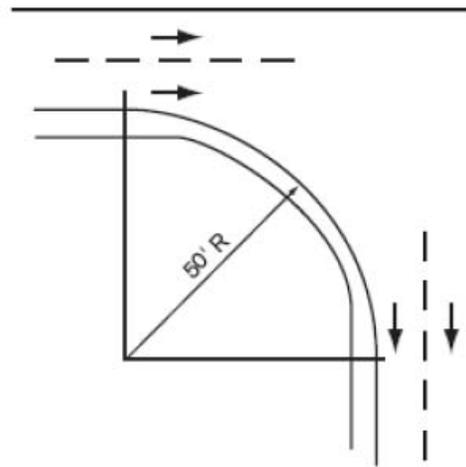
**Parking - approach & away**  
 15' radius with no encroachment



**Parking - away only**  
 35' radius with no encroachment

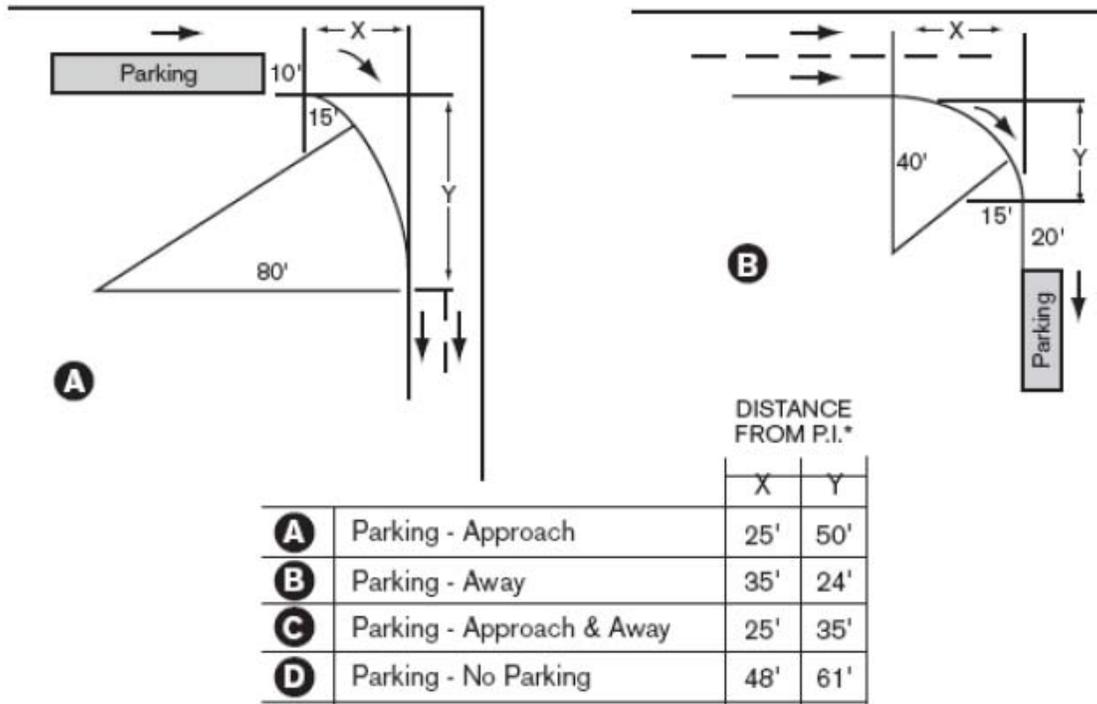


**Parking - approach only**  
 35' radius with no encroachment

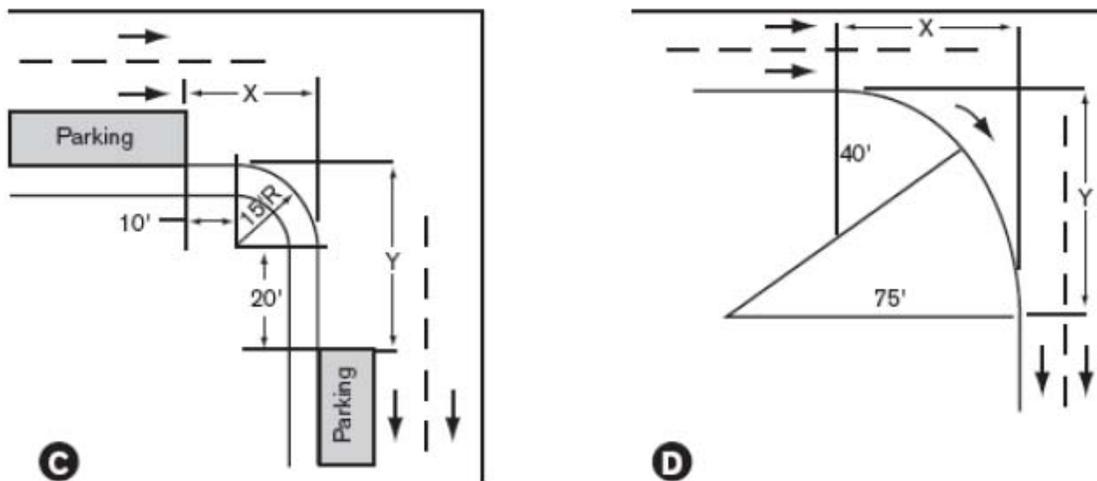


**No Parking**  
 50' radius with no encroachment

Figure 3-11: Typical Two-Center Curb Design for Buses



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



## **Chapter 4:**

# **Bus Stop Elements and Amenities**

## Chapter 4: Bus Stop Elements and Amenities

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Chapter 4 includes guidelines for bus stops and coordinated bus stop elements and amenities, such as bus stop signs, posts, accessibility, information cases, customer information, shelters, benches, lighting, landing pads, and trash receptacles. The design of bus stop waiting areas and amenities that enhance security and comfort can significantly impact a person's decision and ability to use transit. Transit agencies with a uniform program of installation and maintenance are typically viewed as having a positive image and interest in serving the community. Conversely, agencies that do not maintain stops and amenities can easily portray a negative image. Passenger amenities are typically installed at selected bus stops to improve passenger comfort and the relative attractiveness of transit, based on a number of factors, including:



- Average daily boardings
- Proximity to major trip generators
- Passenger transfer activity
- Planned neighborhood or development improvements
- Transit corridor marketing efforts
- Proximity of other nearby areas with shelters and amenities
- Customer and community requests
- Number of routes serving the bus stop

For many transit agencies and jurisdictions, resources for providing and improving passenger facilities are limited, requiring prioritization of improvements. These improvements can be for safety, accessibility, and/or comfort and convenience.

As noted in Chapter 2, the City of Raleigh currently has a Shelter and Bench Policy approved in 1993 that establishes shelters at bus stops with at least 25 boardings per day, and benches are warranted at locations with 10 boardings per day. Other special facilities may also warrant shelters and benches as necessary on a case by case basis. City staff recently researched other transit agencies in North Carolina regarding bench and shelter local policies. The results are shown in Figure 4-1. It was determined the existing Raleigh policy is similar to other peer North Carolina transit agencies.

**Figure 4-1: Peer Transit Agency Bus Stop Policies**

Agency	Stops	Shelters	Benches	Policy
Durham	1600	100	50	Current Policy is 30 riders for a shelter and 20 for a bench.
Chapel Hill	607	91	142	No policy given
Charlotte	3500	239	97	Current Policy is 25 riders for a shelter and 14 for a bench.
Greensboro	800-900	55	64	No policy given
Wilmington	700	35	82	No policy given
CAT/Raleigh	1695	51	342	Current Policy is 25 riders for a shelter and 10 for a bench.

*Source: CAT, 2011.*

Other research indicated that in some urban areas such as Washington, D.C. and Mount Vernon, NY, the installation of shelters is recommended for 50 or more boardings. In other areas, such as Eugene, Oregon, the threshold is 20 daily boardings, in addition to other criteria. Based on the conditions in Raleigh, it appears the existing policy thresholds are logical.

The following text and Figure 4-2 provides guidance that some transit agencies across the country have defined for different levels of bus stops, based upon the intensity of the use of the bus stop and nearby attractions. These include:

- **Basic bus stop** – has lower boarding activity and may have one or two routes serving the stop. Improvements at the stops will have medium priority. At a minimum, there should be signage and safe, accessible pedestrian access to a landing pad. Some of these stops may become more important over time, based on land development projects, service improvements, and increased ridership. Continued monitoring of the boarding activity at these stops should be conducted to determine if amenities are needed in the future.
- **Enhanced bus stop** – has moderate or high boarding activity, which from a CAT perspective would qualify for a bench or shelter and may also include accessible pedestrian access. These enhanced bus stops should have a higher level of amenities, including the potential for lighting and additional service information.
- **Transit station** – can be formed in an area where two or more routes converge for systemwide transfers. Chapter 5 provides detailed information regarding characteristics of transit or transfer stations. At a minimum, a sheltered waiting area, lighting, schedule information, and an accessible boarding area are needed.

**Figure 4-2  
Bus Stop Amenity Guide**

<b>Amenity</b>	<b>Basic Bus Stop</b>	<b>Enhanced Bus Stop</b>	<b>Transit Station</b>
Bus Stop Sign	Yes	Yes	Yes
ADA 5' x 8' Landing Pad	Yes	Yes	Yes
Sidewalk	Yes	Yes	Yes
Lighting	Evening Service	Yes	Yes
Seating	Varies	Yes	Yes
Rear-door Landing Area	No	Varies	Yes
Bus Bay	No	Varies	Yes
Shelter	1 shelter per stop for 25+ boardings per day	1 shelter per stop for 25+ boardings per day	2 or more shelters for 25+ boardings per day
Trash Receptacle	Varies	Yes	Yes
Information Case – location, fares, bus stop ID, logo, schedule, etc.	Varies	Varies	Varies
Real-time Information	Varies	Varies	Yes

### ***Passenger Landing Pad/Waiting Area***

Passenger landing areas are valuable from an image standpoint as well as providing system access for persons with disabilities. In that regard, establishing a bus stop with just a post and sign does not necessarily suggest the need for an ADA landing pad unless other improvements such as shelters are constructed. However, in order to further increase access to transit services to all, it is recommended that ADA landing pads be installed, to the extent possible, at all bus stop locations. There are several reasons for this goal - the first is to provide a consistent system for all users, and the second is to conform with ADA regulations, which otherwise would obligate CAT to offer ADA complementary paratransit for customers who could otherwise use the accessible stop. Bus stop sites shall be chosen such that, to the maximum extent practicable, lifts or ramps can be deployed on a firm, stable surface as to permit a wheelchair or mobility aid user to maneuver safely onto or off the bus and bus stop.<sup>1</sup>

- ***Dimensions:*** The minimum landing area requirement for a bus stop (the area from which passengers board the bus and onto which passengers alight from the bus) is:
  - a continuous, unobstructed solid area contiguous to the curb that measures at least 5' parallel to the street and at least 8' perpendicular to the street at the front door

<sup>1</sup> <http://144.171.11.40/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=992>  
<http://www.access-board.gov/adaag/html/adaag.htm#tranfac>

- at least 10' parallel to the street and at least 8' perpendicular to the street at the back door
- the distance between front and rear boarding area is typically 18 feet.

These are the minimum dimensions needed to deploy a lift or ramp and allow a customer in a wheelchair to board or alight the vehicle. Typical dimensions are shown later in this chapter under shelter and bench design.

To provide for rear-door alighting from larger buses, the landing area should be at least 30 feet long for stops served by 40' buses and at least 40' long for stops served by 60' articulated buses. Stops where more than one bus is boarding/alighting passengers at the same time will need additional boarding and alighting areas to be determined by the size and placement of the buses serving each stop.

- **Slope:** The slope of the landing area must be parallel to the slope of the roadway in order for the bus wheelchair lift or ramp to be effectively deployed. The slope should not exceed 1 foot vertical over 20 feet horizontal (5%), and the cross slope should not exceed 1 foot vertical over 50 feet horizontal (2%).
- **Surface Material:** The landing area should be firm, stable, and slip-resistant. Concrete is the preferred surface for the landing area. It is possible for the lift or ramp to span an area of another material, such as a grass or soil in a planter strip between the curb and the sidewalk. However, for the safety of ambulatory customers who may stumble on an uneven surface, it is strongly recommended to construct a continuous concrete pad. In newer developments where a new bus stop will be placed, a continuous surface from the curb and the sidewalk should be provided for the purposes of deploying a bus ramp or lift for wheelchairs or other mobility devices. In uncurbed shoulder areas, the landing area may be constructed of asphalt.
- **Height Relative to the Street:** The landing area should be elevated above street level for pedestrian safety. For stops served by low-floor, ramp-equipped buses a standard curb provides an acceptable ramp slope.
- **Clearances:** A horizontal clearance between obstructions of 48 inches, and a vertical clearance of a minimum of 80 inches should be maintained in boarding area.

## **Pedestrian Connections**

To be fully useable, a landing area of 5 feet wide and 8 feet in length is needed according to the American with Disabilities Act Accessibility Guidelines (ADAAG, 10.2.1). The landing area must be connected to a sidewalk of sufficient width and condition for a person in a wheelchair to use (ADAAG 4.3, 4.5) - the narrowest useable width is four (4) feet. Curb cuts with slopes no steeper than 1 inch of level changes across 12 inches (ADAAG, 4.8.2) of distance are needed where level changes occur (such as a crosswalk). If items such as newspaper racks, utility poles, trash cans, and encroaching grass or bushes constrict a portion of the sidewalk to less than 4 feet, the sidewalk is not accessible to wheelchair users. If necessary, the existing sidewalk should be widened or new sidewalk constructed to ensure that customers are able to get to and from the bus stop. To the extent feasible, sidewalk connections around bus stops should provide safe pedestrian access to the passenger trip generators near the bus stop.

Land uses should be designed to facilitate the movement, and minimize the distances between the development and the transit services. Good pedestrian access can be achieved by considering the following guiding principles:<sup>2</sup>

- Pedestrian routes to bus stops should be designed to meet the needs of all users, particularly, but not only in consideration of persons with disabilities, the elderly, children, and bicyclists.
- To maximize customer convenience and system accessibility, minimize the distance between buildings and the bus stop through proximity and orientation. This can be encouraged by including transit accessibility in zoning policies, setback guidelines, and parking requirements to encourage transit-friendly and transit-oriented development.
- Minimize the use of elements that restrict pedestrian movement such as, walled communities and expansive parking lots. Pathways should be designed so pedestrians traverse as straight of path as possible.
- To the extent feasible within a built environment, eliminate barriers to pedestrian activity. This includes sound walls, landscaping, berms, or fences which impede pedestrian access or visibility. If there is restricted access, gates should be considered at transit access points.
- Pave continuous pedestrian pathways and ensure they are accessible to everyone. Reinforce guidelines, as applicable, from the Complete Streets policy.
- Provide accessible circulation routes that include curb cuts, ramps, visual guides, signage (visual and Braille) and railings where needed. Place ADA compliant curb ramps at each corner of an intersection.
- Adequate drainage should be provided to avoid standing water and muddy conditions. This is typically not a transit agency function, but since CAT is

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<sup>2</sup> <http://www.fhwa.dot.gov/environment/sidewalks/chap4a.htm>  
Transit Facilities Design Manual, SunLine Transit Agency.

- an entity of the City, in areas where this is an issue, this should be addressed in city staff communications and meetings.
- Provide street lighting along bus stop access routes and safety lighting at intersections to promote safety and security for transit patrons. New development should provide accessible paths to bus stops.
  - In rural areas without sidewalks, a minimum 4 foot wide paved shoulder, or other material such as decomposed granite, compacted and stabilized, is recommended if possible.
  - At rural bus stops, a concrete waiting area should be provided if possible. The paved area 20 feet long and 15 feet wide is desirable, with a minimum of 5 feet long by 8 feet wide as needed for access and ramp/lift operation. A tactile warning device should be placed between the roadway and the bus waiting area to allow visually impaired pedestrian to identify the bus stop position.
  - Where a bus stop serves as a transfer point, there should be a paved connection to the connecting route stops.
  - Pathway slope should not exceed 1 foot vertical over 20 feet horizontal (5%). Pathway cross slope should not exceed 1 foot vertical over 50 feet horizontal (2%)<sup>3</sup>.
  - A minimum horizontal clearance of 48 inches (preferable 60 inches) should be maintained along the entire pathway, as shown on the following page in Figure 4-3.<sup>4</sup>
  - Vertical clearances should have at least 80 inches of head room with unobstructed vertical passage space along a pathway.<sup>5</sup>

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<sup>3</sup> <http://www.access-board.gov/adaag/html/adaag.htm#tranfac>;

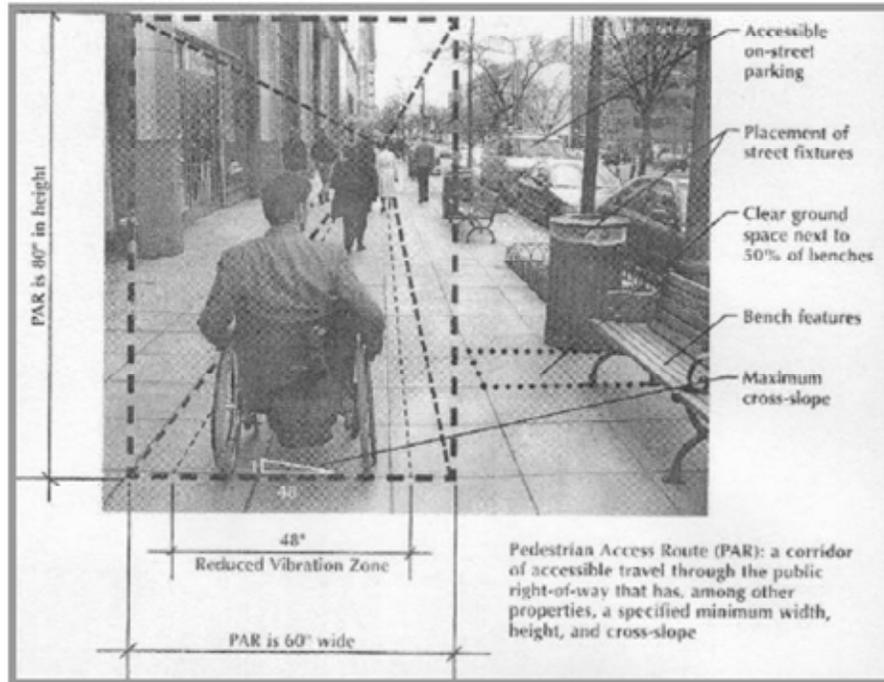
<sup>4</sup> Ibid.

Easter Seals Project Action, Bus Stop Tool Kit

<sup>5</sup> <http://www.access-board.gov/adaag/html/adaag.htm#tranfac>

**Figure 4-3: Pedestrian Clear Access Zone**

The clear access zone is shown in the photograph below.

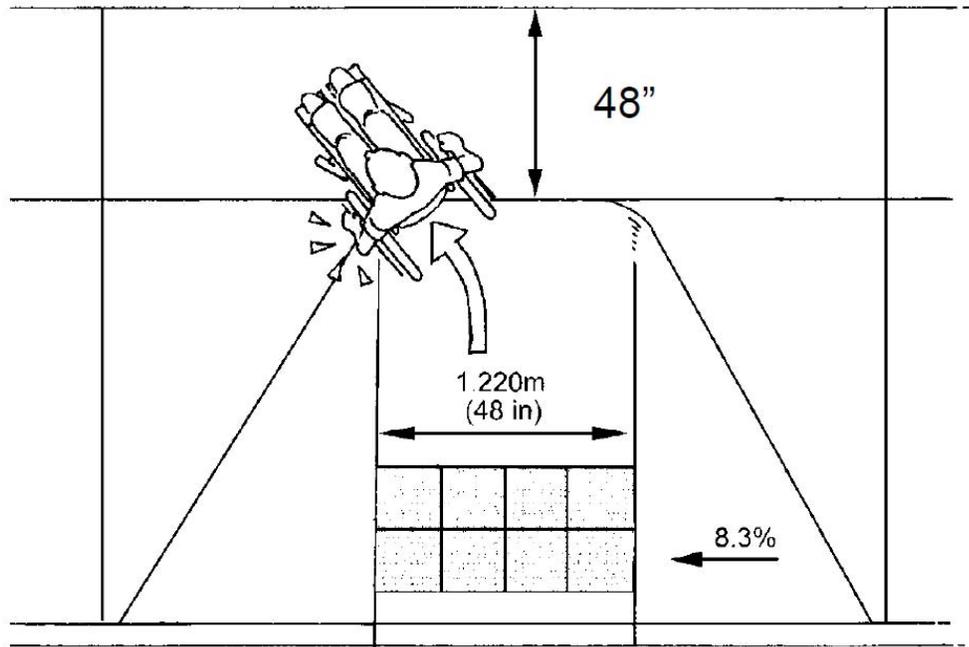


## **Curb Ramps**

Curb ramps are an integral part of the pedestrian access route leading to and from bus stop locations. Curb ramps should be installed at corners or intersections to allow entrance to the street surface. Ramps should be designed to conform to state and federal ADA design standards, as shown in Figure 4-4.<sup>6</sup>

<sup>6</sup> Policy, Design and Importance of Accessible Pedestrian Environments for Livable Communities, May 2010 Presentation, Scott J. Windley, US Access Board

Figure 4-4: Curb Ramp Design



Maneuvering Space: needed for proper use of curb ramps.

Curb ramps are usually categorized by their structural design and how they are positioned relative to the sidewalk or street. The structure of a curb ramp is determined by how the components, such as ramps and flares, are assembled. The type of curb ramp and the installation site will determine its accessibility and safety for pedestrians. Several curb ramps examples include:

- Perpendicular curb ramps
- Diagonal curb ramps
- Parallel curb ramps
- Combination curb ramps
- Built-up curb ramps
- Depressed corners

The Federal Highway Administration published a guidebook for designing sidewalks and trails for access for all users. Figure 4-5, shown below, presents the best practices identified in the report for curb design, which are also recommended for the City of Raleigh.<sup>7</sup>

**Figure 4-5: Curb Ramp Design Best Practices**

*Best Practices for Curb Ramp Design*

Best Practice	Rationale
Provide a level maneuvering area or landing at the top of the curb ramp.	Landings are critical to allow wheelchair users space to maneuver on or off of the ramp. Furthermore, people who are continuing along the sidewalk will not have to negotiate a surface with a changing grade or cross slope.
Clearly identify the boundary between the bottom of the curb ramp and the street with a detectable warning.	Without a detectable warning, people with vision impairments may not be able to identify the boundary between the sidewalk and the street.
Design ramp grades that are perpendicular to the curb.	Assistive devices for mobility are unstable if one side of the device is lower than the other or if the full base of support (e.g., all four wheels on a wheelchair) are not in contact with the surface. This commonly occurs when the bottom of a curb ramp is not perpendicular to the curb.
Place the curb ramp within the marked crosswalk area.	Pedestrians outside of the marked crosswalk are less likely to be seen by drivers because they are not in an expected location.
Avoid changes of grade that exceed 11 percent over a 610 mm (24 in) interval.	Severe or sudden grade changes may not provide sufficient clearance for the frame of the wheelchair causing the user to tip forward or backward.
Design the ramp that doesn't require turning or maneuvering on the ramp surface.	Maneuvering on a steep grade can be very hazardous for people with mobility impairments.
Provide a curb ramp grade that can be easily distinguished from surrounding terrain; otherwise, use detectable warnings.	Gradual slopes make it difficult for people with vision impairments to detect the presence of a curb ramp.
Design the ramp with a grade of $7.1 \pm 1.2$ percent. [Do not exceed 8.33 percent (1:12).]	Shallow grades are difficult for people with vision impairments to detect but steep grades are difficult for those using assistive devices for mobility.
Design the ramp and gutter with a cross slope of 2.0 percent.	Ramps should have minimal cross slope so users do not have to negotiate a steep grade and cross slope simultaneously.
Provide adequate drainage to prevent the accumulation of water or debris on or at the bottom of the ramp.	Water, ice, or debris accumulation will decrease the slip resistance of the curb ramp surface.
Transitions from ramps to gutter and streets should be flush and free of level changes.	Maneuvering over any vertical rise such as lips and defects can cause wheelchair users to propel forward when wheels hit this barrier.
Align the curb ramp with the crosswalk, so there is a straight path of travel from the top of the ramp to the center of the roadway to the curb ramp on the other side.	Where curb ramps can be ahead, people using wheelchairs often build up momentum in the crosswalk in order to get up the curb ramp grade (i.e., they "take a run at it"). This alignment may be useful for people with vision impairments.
Provide clearly defined and easily identified edges or transitions on both sides of the ramp to contrast with sidewalk.	Clearly defined edges assist users with vision impairments to identify the presence of the ramp when it is approached from the side.

<sup>7</sup> <http://www.fhwa.dot.gov/environment/sidewalk2/sidewalks207.htm>

## Shelters

Transit shelters are installed at selected bus stops to provide weather protection, as well as seating for waiting passengers. The CAT policy states bus stops with ridership exceeding 25 boardings per day are priority candidates for shelters.

Shelter designs range from an overhead canopy to a fully enclosed structure. Figure 4-6 shows the current standard bus stop design for CAT. The standard design also has a slim-line option, which is often used for bus stops with limited right-of-way. Figures 4-6 to 4-11 indicate current specifications for the CAT standard and slim-line shelter design options. CAT also has custom-designed bus shelters for stops along the R-Line transit service, which is shown in the following pages. Appendix A presents a typical retaining wall specification that is necessary and used at some bus stop locations.

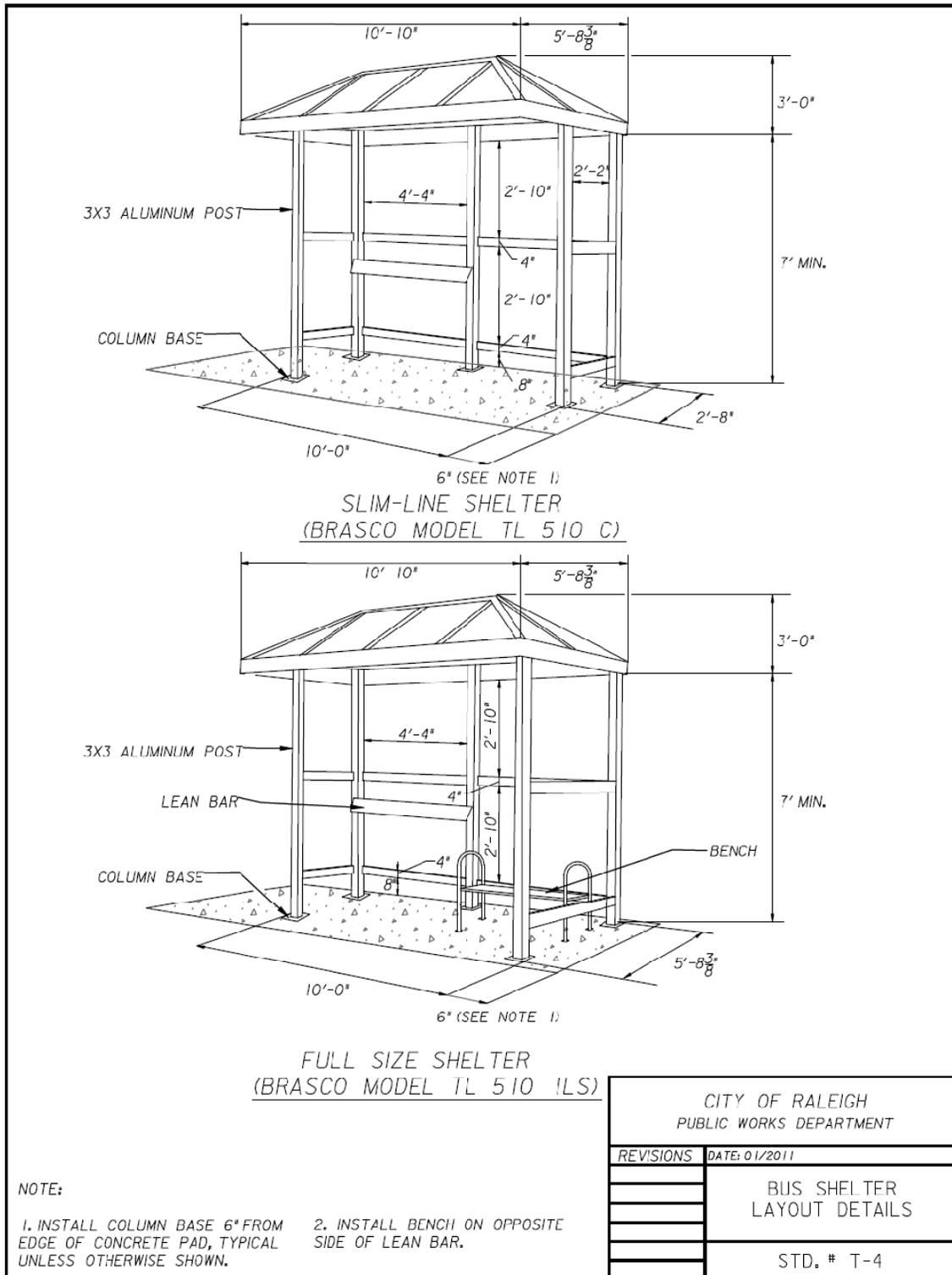


Figure 4-6: CAT Shelter

It is recommended that shelters be placed facing the travel lane at the near-side of the landing pad. Shelters should be cleaned and maintained on a regular basis. The design of passenger shelters should take into consideration the following:

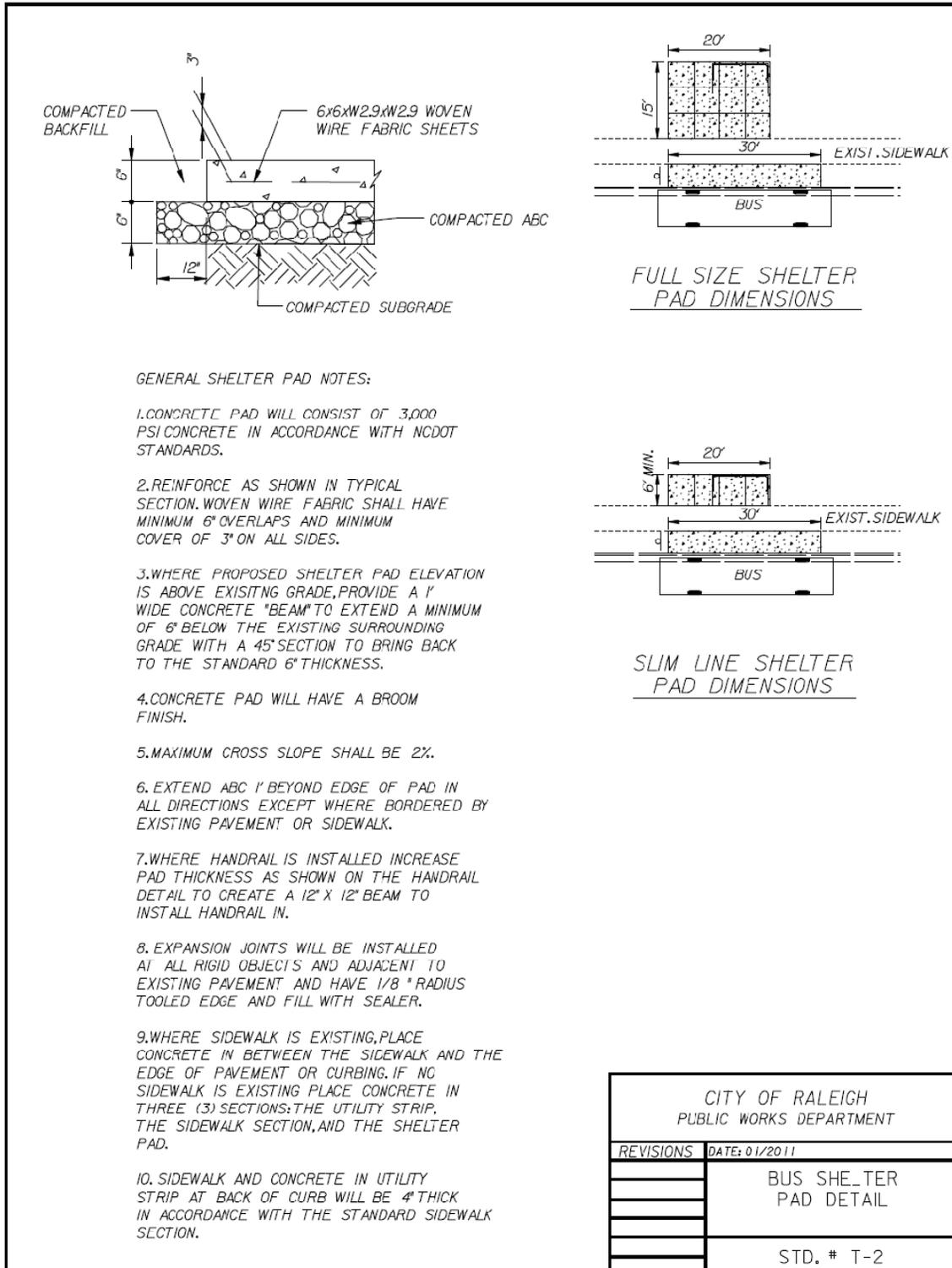
- Strength and durability of structure and materials
- Resistance of materials and paint treatments to weather conditions, graffiti, cutting, fire, and vandalism
- Potential greenhouse effect of roof design during hot weather
- Existence of, or provision of external lighting in the area, and provision of internal lighting for the shelter
- Appropriateness of the design to the neighborhood
- Required dimensions of the concrete pad to ensure wheelchair accessibility
- Accommodation of trash receptacle within the location design
- Ease of maintenance of the shelter and other amenities
- Provide communications conduits for future use
- Transparent enclosure that allows driver to see inside the shelter

**Figure 4-6: Standard Design Specification**

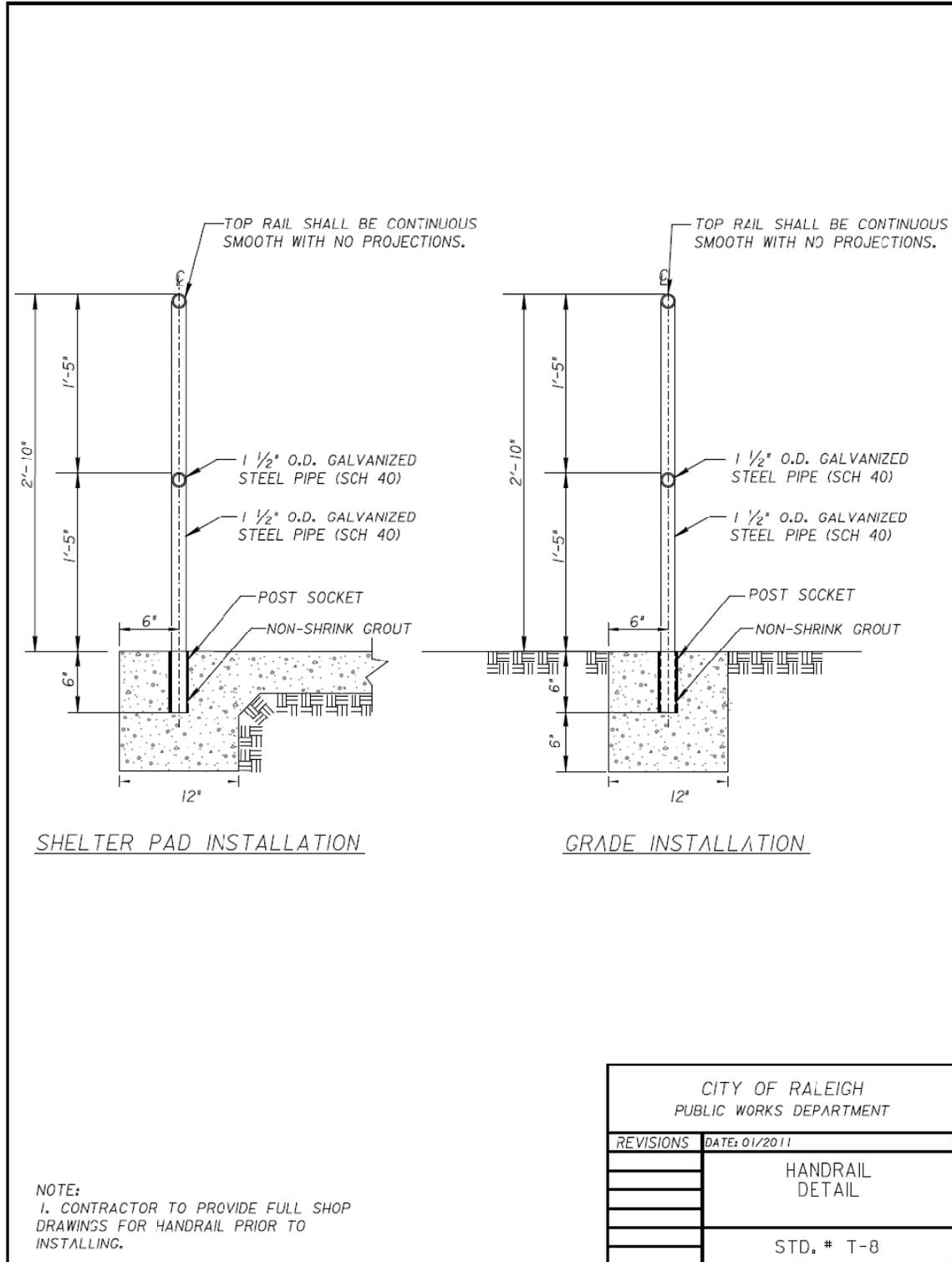




**Figure 4-8: Bus Shelter Pad Detail**



**Figure 4-9: Handrail Detail for Shelter Pad**



**Figure 4-10: Bollard Detail for Bus Stops**

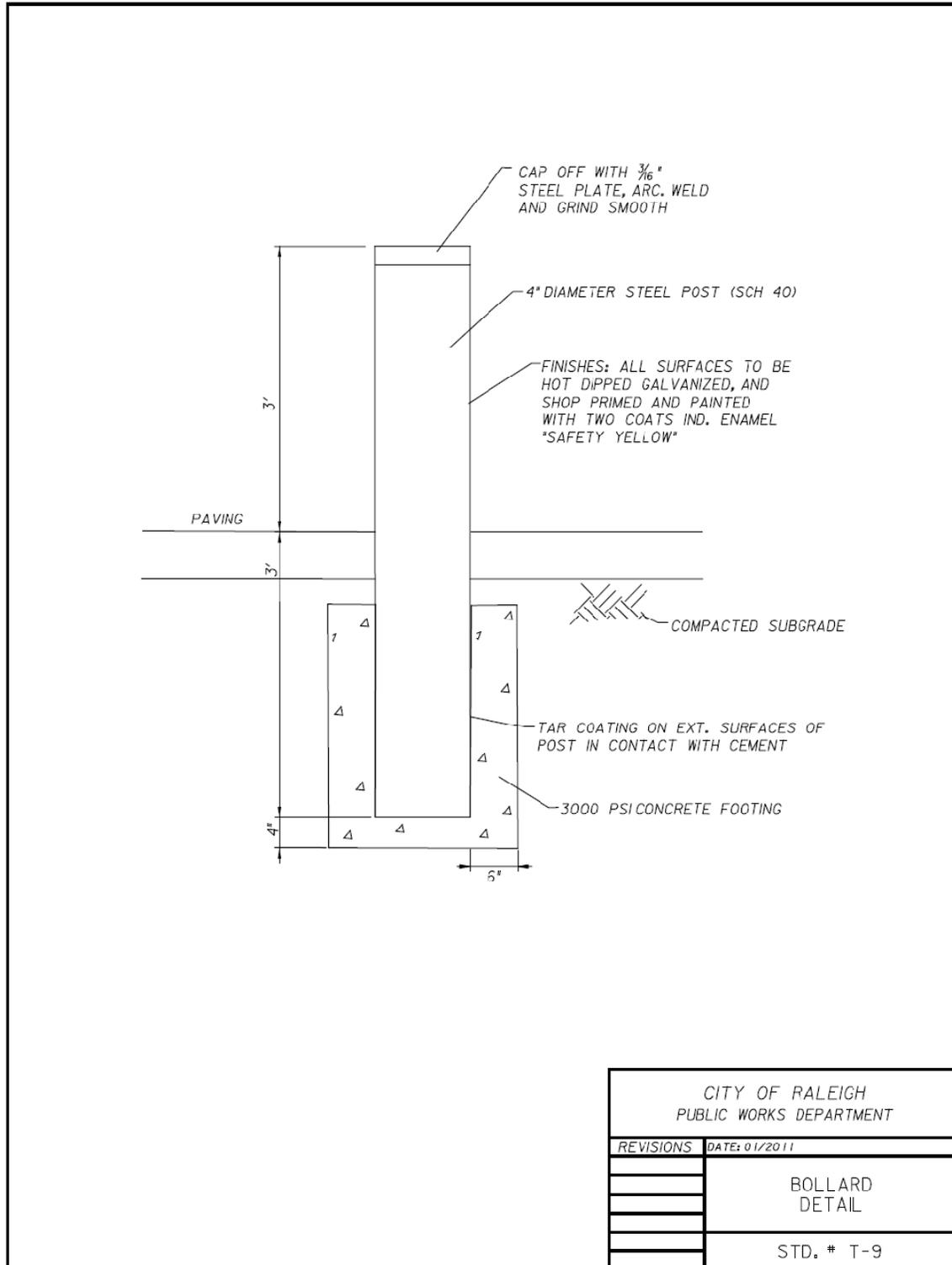
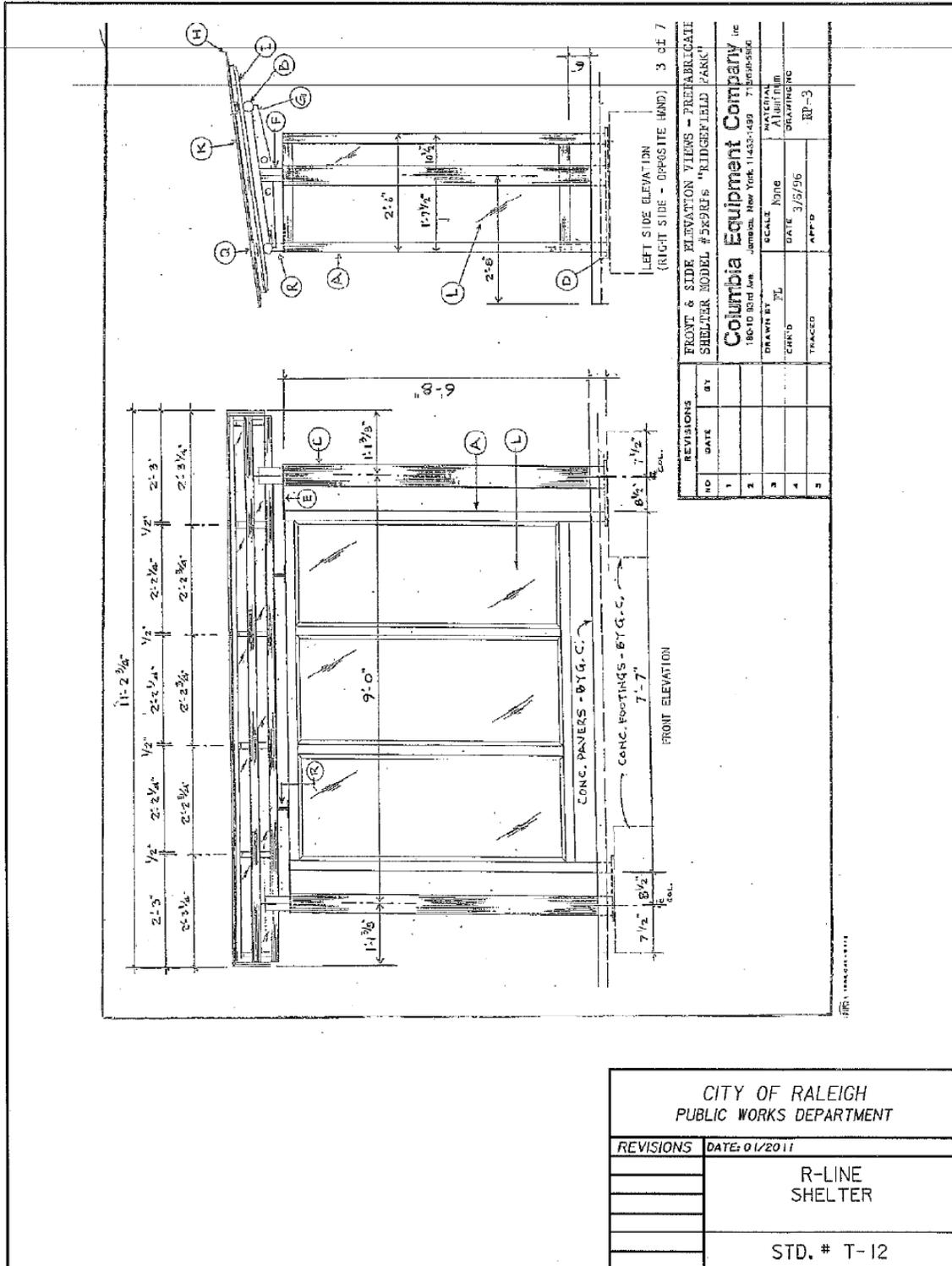


Figure 4-11: R-Line Shelter Detail



CITY OF RALEIGH PUBLIC WORKS DEPARTMENT	
REVISIONS	DATE: 01/20/11
	R-LINE SHELTER
	STD. # T-12

## **Bus Benches**

Bus benches may be freestanding or part of a shelter design. Benches are often viewed as an important amenity for passengers who may have difficulty walking and standing, and as previously indicated are warranted at locations with over 10 boardings per day.

All 59 CAT shelters have benches. In addition, approximately 270 benches are installed independently at 1,500 CAT bus stops that do not have shelters. The majority of existing CAT benches do not have an attached back since there have been difficulties encountered by passengers sitting on the back of benches. Figures 4-12 and 4-13 show the typical bench layout and design.

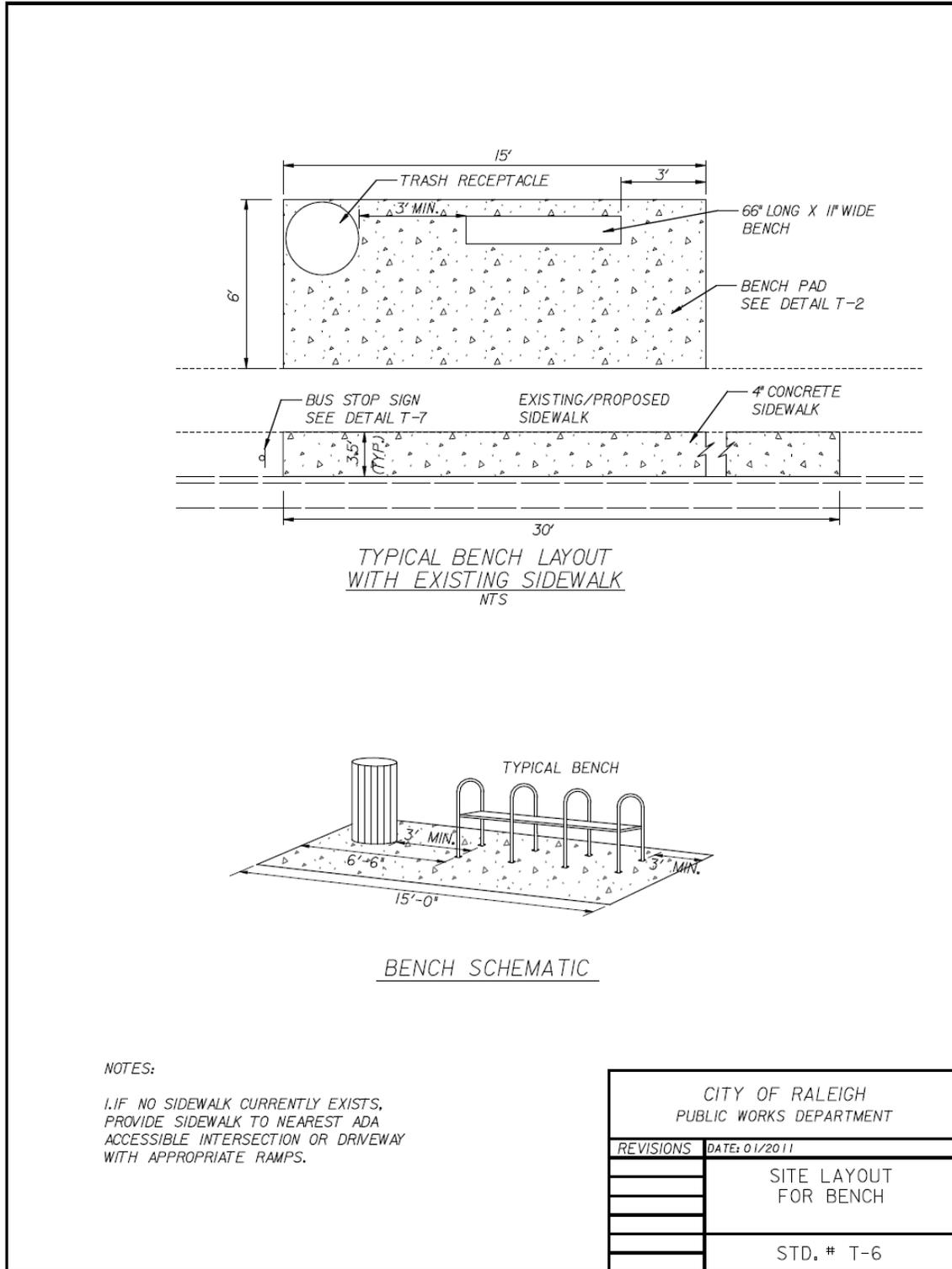
Local business may want to install benches as one element of an improved streetscape. When this occurs, the benches should be located near bus stops and should be located where they do not create barriers to accessible bus boarding or sidewalk usage. The process to ensure consistency in this process should be: The business or commercial establishment should call City transit staff who, in coordination with the private establishment, city traffic department, and NCDOT (if in state right-of-way), will determine where the appropriate location should be.



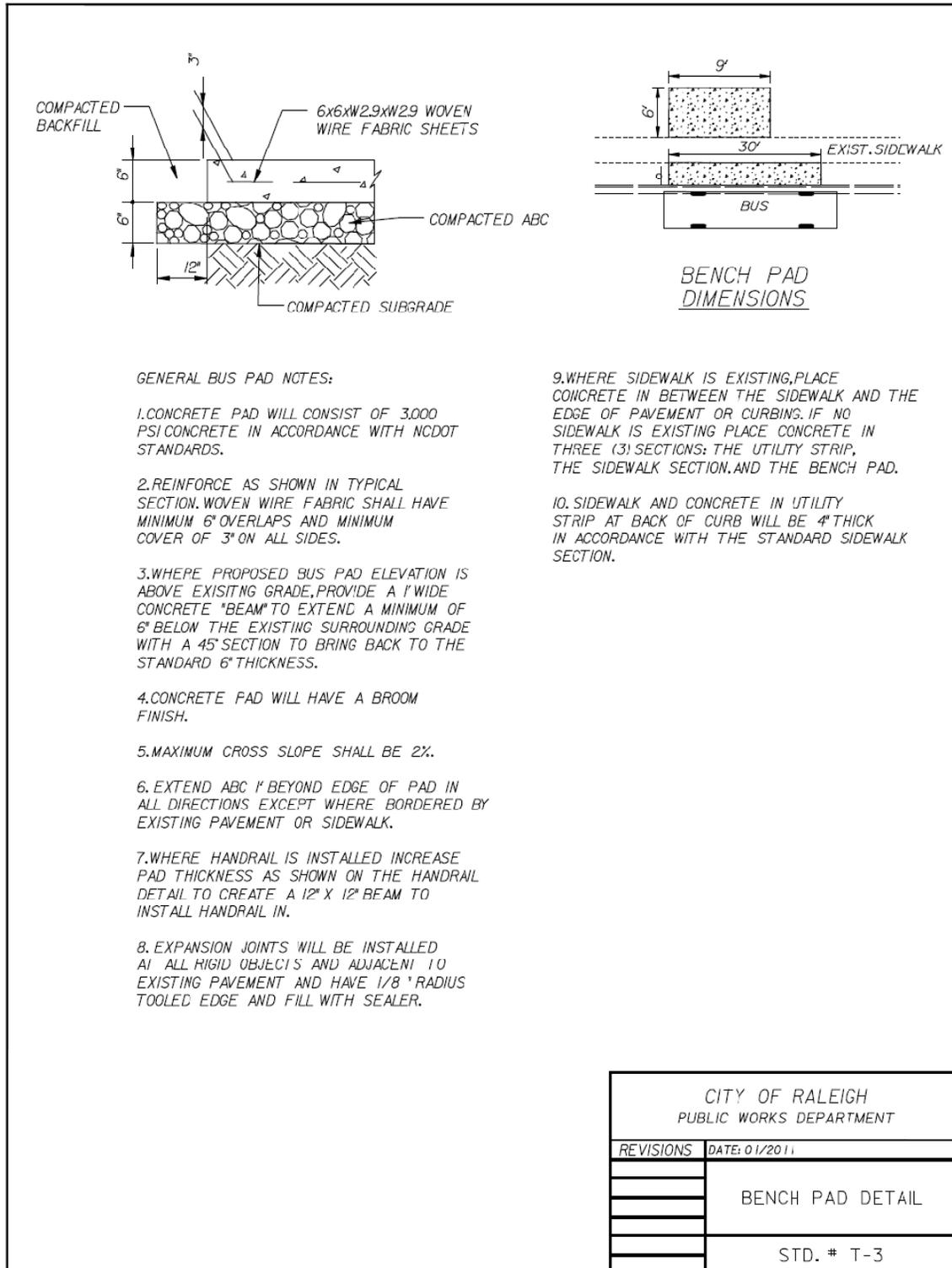
Benches should be fabricated with durable materials. The benches should include the following attributes:

- Placed facing the street
- Strength and durability of structure and materials
- Resistance of materials and paint treatments to weather conditions, graffiti, cutting, fire, and vandalism
- Appropriateness of the design to the neighborhood
- Benches should be placed on the back side of sidewalk, a minimum of six to nine feet from the bus sign post, to allow pedestrians to move past people sitting on the bench.
- Ensure no conflicts with wheelchair accessibility and loading at the bus stop
- Benches should be anchored to prevent unauthorized movement
- Construct furniture for easy relocation to allow for bus route changes, street improvement projects, etc.

**Figure 4-12: Bench Layout**



**Figure 4-13: Bench Pad Detail**



Specific design elements for benches typically include:

- Allow for proper water run off
- Seat should be 11 to 12 inches in depth and minimum 48 inches in length; back support minimum of 18 inches high, positioned at a maximum of 2 inches above seat; seat height to be 17 to 19 inches above ground
- Installed at least 9 feet from the back of the curb, unless right-of-way or other circumstances prohibit
- Locate on non-slip, concrete pad
- Do not obstruct sidewalk access

### **Trash Receptacles**

Trash receptacles help control litter at bus stops. It is important to properly maintain the receptacles and the trash collection. Trash receptacles should be provided at bus stops served by enhanced bus service, transit centers, and bus stops near fast food establishments and convenience stores. The receptacles should be secured to the ground or pole to prevent accidental tipping or unauthorized movement. Trash receptacles should be installed where they do not create an obstruction or interfere with the:

- ADA landing pad
- audio push button for real time bus information



The City of Raleigh has trash receptacles available throughout the CAT service area. These are currently installed without a specification. The majority are round receptacles attached to the bus stop pole. All shelter locations have trash receptacles and some bench locations have trash receptacles. Basic bus stops do not typically have a trash receptacle. The receptacles are either connected to bus stop pole or bolted to the waiting pad.

The recommended design factors for trash receptacles include:

- Strength and durability of materials
- Resistance of materials and paint treatments to weather conditions, graffiti, cutting, fire, and vandalism
- Appropriateness of the design to the neighborhood
- Ensure that there are no conflicts with wheelchair accessibility and loading at the bus stop
- Trash receptacles should be anchored to prevent unauthorized movement
- Use furniture designs with easy relocation to allow for bus route changes, street improvement projects, etc.
- Avoid installing trash receptacles with design features that permit liquids to pool or remain near the receptacle and attract insects
- Install trash receptacles in shaded areas a minimum of three feet from a bench

The City Environmental Services Department provides trash pickup for all CAT bus stops. As waste trucks are servicing areas of the community, the drivers will stop at bus stops to empty the trash receptacles.

## Signage<sup>8</sup>

- **Bus Stop Header Sign:** Each bus stop must be marked with a sign indicating CAT service or other providers in the region. Bus stop signs indicate to passengers and drivers where buses stop, as well as publicize the availability of the service. The sign must be securely mounted on its own post, at an angle perpendicular to the street. The sign must be easily visible to the approaching bus driver, ideally between two and four feet of the edge of the street. The bus stop sign should neither block, nor be blocked, by other jurisdictional signs. To prevent the sign from being struck by the bus, mirrors, signs should be placed at a sufficient distance not to impede with bus mirrors and affect the pedestrian path of travel.

Bus stop signs come in various shapes and forms.<sup>9</sup> The signs usually display route name, number, bus stop name if applicable, and transit agency logo. General guidelines recommended for the design of bus stop signs are:

- Use the standard 'bus' symbol in the upper left corner and transit system logo in the upper right corner.
- List route numbers in ascending numeric order, when appropriate. If more than five routes serve a stop, use two sign boards.
- Position route numbers consecutively on the sign.
- Align route numbers flush left and text flush left to the route numbers.

One example is TriMet, in Portland, Oregon, who uses the following bus stop placement and bus stop sign dimensions as a guideline for current bus stop design.<sup>10</sup> The bus stop design measurements are consistent with Transportation Cooperative Research Board Report 19 and ADAAG recommendations. TriMet uses two types of signs – a 12" x 18" sign, and a 12" x 30" sign, as shown in Figure 4-14 on the following pages. The sign post layout recommendation for CAT is shown in Figure 4-15.

The header sign is the point at which the front of the bus should be aligned when the bus is servicing passengers and thus should be placed

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<sup>8</sup> ADAAG Section 4.3

TCRP Report 12, Guidelines for Transit Facility Signing and Graphics.  
Guidelines for the Design and Placement of Transit Stops, Washington Metropolitan Area Transit Authority, 2010.

<sup>9</sup> TCRP Report 12, Guidelines for Transit Facility Signing and Graphics.

<sup>10</sup> TriMet Bus Stop Guidelines, 2002.

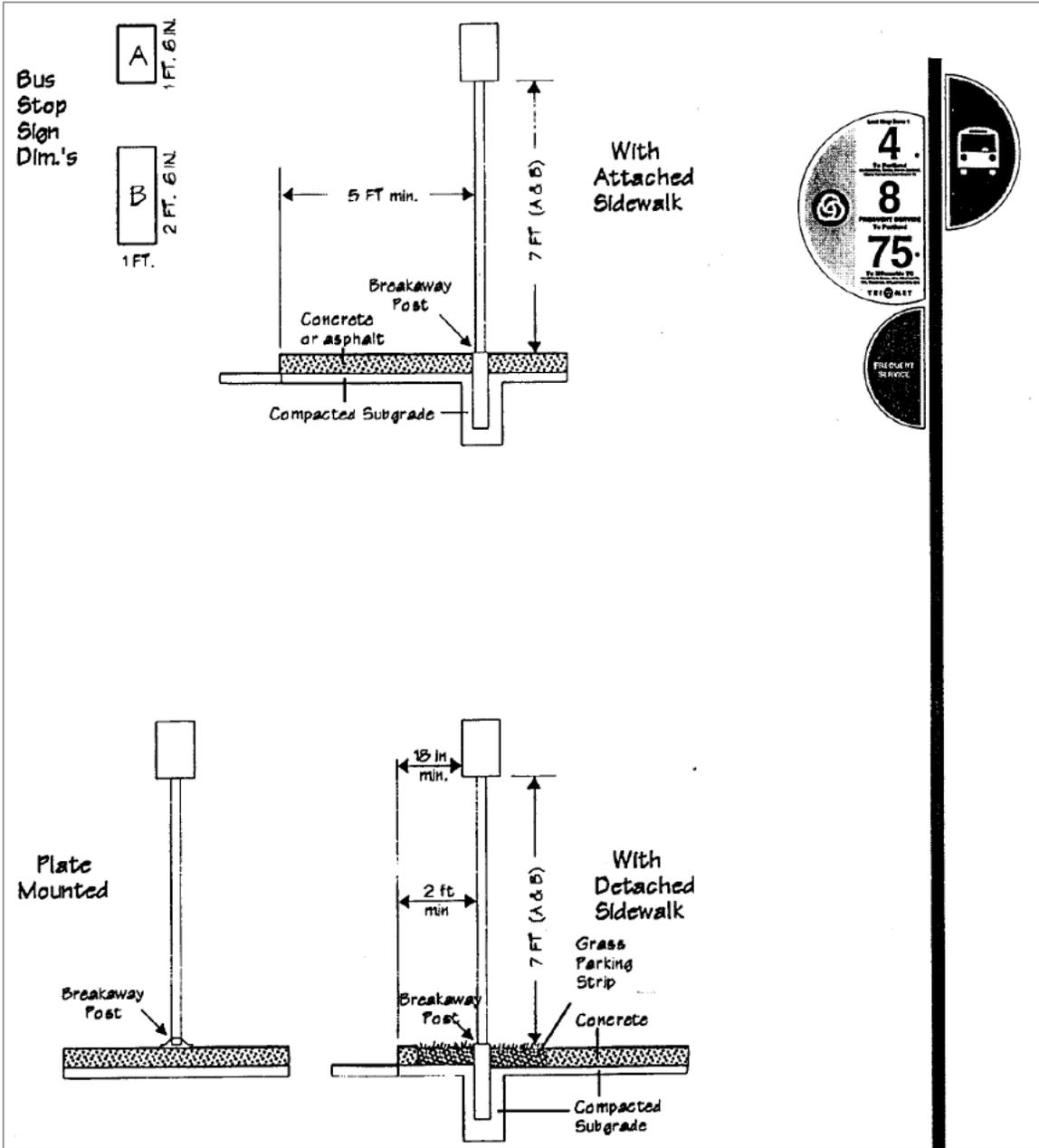
approximately two foot beyond the far side of the landing area. The bottom edge of the sign should be positioned at a height of at least 84 inches from the ground, meeting minimum ADA requirements.

Bus stop signs should conform to ADAAG requirements for height, width, and visibility. The bottom edge of the sign should be positioned at a height of at least 84" above the ground. Signs mounted on bus stop shelters should also have a space of 84" to 98" from the base of the sign to the ground. ADAAG requirements for information related accessibility include:

- Non-glare finish for characters and background
- Characters contrasted with background with either light characters on a dark background or dark characters on a light background
- Fonts must be of appropriate size, proportion
- Character spacing between individual characters must be between 10 to 35 percent of character height
- Spacing between lines must be between 135 to 170 percent of the character height. For more information on the accessibility of signs refer to the ADAAG Section 4.3.

The recommended header sign should contain the names of routes that service the stop as well as the telephone number to call for more information. To meet ADA minimum specifications for signs posted at 84 inches, the letters and numbers should be at least 3" high. The ADA standards further specify that the characters have a width-to-height ratio between 3:5 and 1:1, and a stroke-to-width ratio between 1:15 and 1:10. These standards make signage accessible to persons with low vision. These requirements do not apply to route and schedule information posted at bus stops.

Figure 4-14: TriMet Bus Stop Sign Placement





- **Sign Post.**<sup>11</sup> Various types of sign posts are available, such as steel U-post, steel pipe post, square steel post, etc. To assist persons with visual impairments, it is recommended to have a unique square post that can be used consistently throughout the service area. Bus stop sign posts should be installed far-side of the boarding area and be rust resistant, and uniform in design.

At warranted locations, the route number serving the stop and street location should be presented on a tactile plaque or panel with Braille. The height should be 48 inches, as shown previously in Figure 4-15.

Bus stop sign posts that are not protected by a guardrail or other feature should be a break-away type to minimize injuries and vehicular damage, and to facilitate replacement of the post.



## **Safety and Security**

In this section, traffic safety issues are discussed within the context of bus stop placement considerations. Curbside safety and security issues include:

- Location of storm drains and catch basins, which put passengers at risk when boarding or alighting the bus
- Uneven surfaces, which could result in a fall
- Slope of the terrain surrounding the landing area, either sloping away or towards the travel lane
- Presence of hazardous objects, such as broken street furniture
- Surface traction (for example, stone aggregate can be exceedingly slippery when wet for wheelchair users)
- Water accumulation areas, which can also result in muddy and slippery surfaces
- Overgrown bushes, which could potentially present a security hazard as well as encroach on the sidewalk and landing area
- Other obstacles in the sidewalk that, in addition to making it inaccessible, force pedestrians to walk in the street
- Inadequate area lighting

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<sup>11</sup> TCRP Report 12, Guidelines for Transit Facility Signing and Graphics.

## **Lighting**

Where feasible, bus stops should be located such that they are illuminated by existing street lights or other outside facility lighting. If a shelter is present, both interior and area lighting are recommended for safety of passengers. Street lighting should be provided along bus routes and safety lighting at intersections to promote safety and security for transit patrons at the bus stops. The existing CAT standard bus stops do not have lighting features. However, solar lighting should be provided when on-street lighting is not feasible. It is recommended that lighting be added, with a minimum standard of putting in a stub for future services, including ITS.

In other communities, transit agencies use existing lighting provided by a nearby streetlight, ambient light from the adjacent businesses, lighting installed within the shelter, or a stand-alone light pole. CAT transit stops without sheltered lighting should be located within 30 feet of an overhead light source if available. Bus stop light fixtures or shelter illumination should be between 2.0 to 5.0 foot-candles if possible.<sup>12</sup> However, shelter lighting should be on the lower range as to not create a spotlight affect, where it is difficult for passengers waiting inside the shelter to see outside. Solar lighting is suggested in areas where there is currently no utility service or as a temporary measure until utilities can be established for the shelter or stop. Portable solar lighting may be used when transit service is detoured during construction projects.

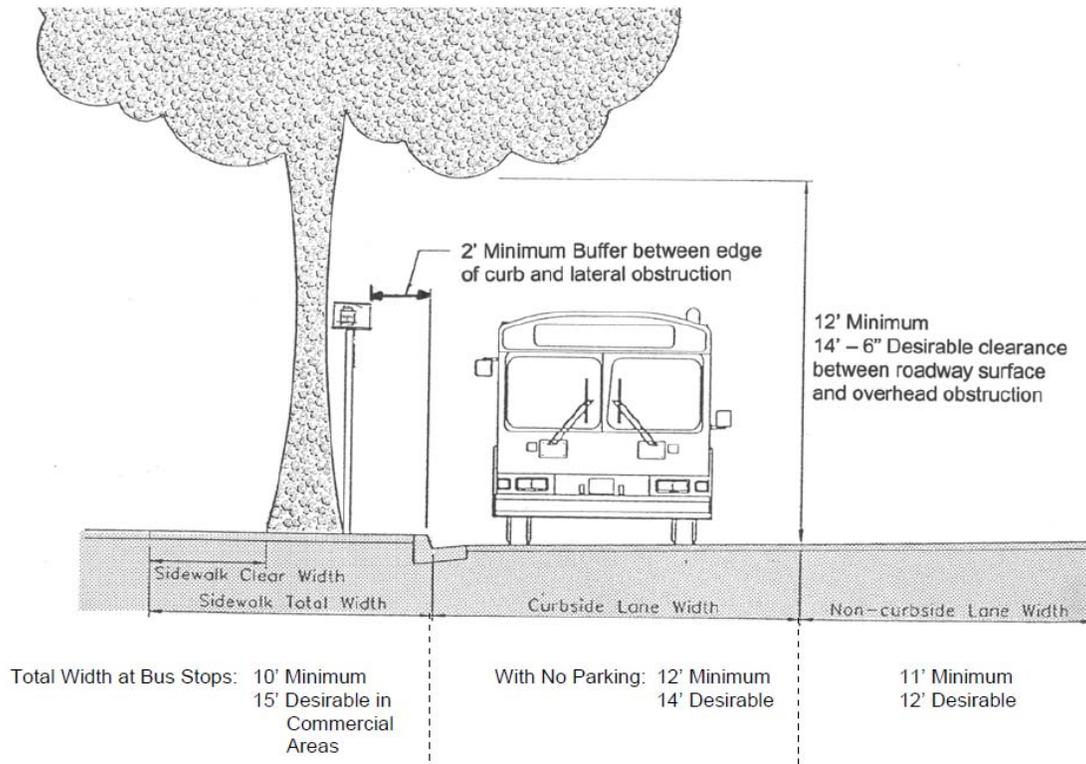
## **Landscape Features**

Landscaping can enhance the level of passenger comfort and attractiveness of transit, but should be positioned and maintained so that safety and accessibility are not compromised by encroaching bushes, uneven grass surfaces, etc. Tree branches that extend into the roadway below 12' should be trimmed back at least two feet from the edge of the street to avoid being struck by a bus mirror. The area between the sidewalk and the curb at bus boarding areas should not be planted for at least 5 feet parallel to the street; and 8 feet perpendicular to the street must be solid to provide accessibility. Figure 4-16 illustrates the recommended clearance for buses.

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<sup>12</sup> [http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp\\_rpt\\_19-c.pdf](http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_19-c.pdf)

**Figure 4-16: Bus Stop Clearance**



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

Transit agencies are introducing advanced computer and communications technologies, known as Intelligent Transportation Systems, or “ITS” for a variety of relatively new services that improve convenience and safety. Transit ITS includes Automated Vehicle Location technologies, such as roadside sensors or satellite-assisted geographic positioning systems (“GPS”), to track the location of vehicles.

GPS processing supports real-time electronic “next vehicle” displays at transit stops, stations, and even aboard moving buses. Some “next stop” and “next arriving bus” information can be conveyed in the form of bilingual voice announcements. These systems can also display current traffic conditions and emergency notifications. Installation of ITS features is recommended to be in place to enhance the transit service and provide optimal services.



These may include:

- Real-time “next-bus” arrival information
- Electronic posting of schedules
- Access to route information
- Installation of panic buttons or call boxes

In preparation for such technologies, new bus stop locations and improvements to existing stops should provide for electrical and communications conduits.

It is recommended that communication conduits with at least two electrical feeds be provided at each bus stop where a shelter exists or one is proposed. One of the feeds can be used for future lighting improvements and the other can be used for ancillaries. Although there is a cost involved with the provision of communication conduits, in the long term the provision of this equipment saves time, money and prevents the bus stop being reconstructed in the future.

Opportunities also exist for CAT to incorporate recycled or renewable materials into shelters and their components. Renewable energy technology, such as solar power, can be adapted to provide shelters with electricity for illumination. Solar lighting for shelters and/or benches is suggested in lieu of electric lighting as appropriate. Self-contained, solar-powered bus stop signposts can be retrofitted with existing schedule displays and signs while providing security lighting and on-demand sign illumination with a renewable energy source.

In February 2010, real-time arrival information for CAT buses and the R-Line was implemented through [www.RaleighRides.org](http://www.RaleighRides.org). Automated vehicle locations (AVL) and projected real-time arrivals are available for viewing on the interactive map, which displays bus location and stops. Smart phone and text-based alerts are also available. In addition, [www.gotriangle.org](http://www.gotriangle.org) also has a link to view real-time arrival information for Chapel Hill Transit and NCSU Wolfline routes DATA and TTA.

### **Bicycle Parking**<sup>13</sup>

Bicycle parking facilities, such as bike racks and storage lockers, may be provided at bus stops for the convenience of bicyclists using transit. CAT does not have any existing bicycle racks or stations on any existing facilities. In the future, bicycle parking should be planned and coordinated near existing trails or bike routes and other high use areas.



<sup>13</sup> TCRP Report 19-c

Bicycle parking facilities discourage the practice of locking bicycles onto bus facilities or onto adjacent property. By confining bicycles to one area, the racks or lockers can reduce visual clutter and maintain appropriate pedestrian clearances. The recommended guidelines for the placement of bicycle parking facilities are:

- Locate bike rack or lockers away from other pedestrian or bus patron activities to improve safety and reduce congestion.
- Coordinate the location of bicycle parking facilities with existing on-site or street lighting.
- Ensure parked bikes are visible at all times. Do not locate bicycle parking where views are restricted by a bus shelter, landscaping, or existing site elements, such as walls.
- Design and placement of bicycle parking facilities should complement other transit furniture at bus stop.
- Covered or weather protected parking locations are an important bonus to bicyclists.

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

- Provide ability to lock bicycle frame and at least one wheel.
- Support bicycle without pinching or bending the wheel, e.g. if the wheel slot is too narrow, a mountain bike tire will not fit.
- Avoid scratching the paint on the frame of the bike.
- Provide a place to lean the bike while locking the bike.
- Locking procedure should be quick and easy to identify.
- Minimize the amount of space required.
- Design of bike rack or locker devices should not trap debris.
- Device should be easy to install but difficult to steal.



### ***Newspaper and Vendor Boxes/Racks***

The City of Raleigh does not currently allow vendor boxes at bus stops. Should this policy change in the future, the discussion below regarding a corralled space is recommended.

In other communities, newspaper and vendor boxes provide transit customers with convenient access to reading material. To ensure the vendor boxes are appropriately placed, the use of “corrals/condos” should be considered. Vendor

box corrals/condos will provide a designated location and/or storage of publications at the bus stop. However, newspaper boxes that obstruct access to the landing area, sidewalk, shelter, or posted transit information should be removed or relocated.

The vendor boxes need to comply with the ADAAG requirements in regard to its placement. Vendor boxes cannot reduce the clear spaces required by the ADAAG, and therefore, cannot be located on the 5'x8' ADA landing pad, or obstruct access to the stop, the shelter, or any customer information. In addition, vendor boxes cannot be secured to any bus stop feature such as the bus stop post, trash receptacle, bench, or shelter. Vendor boxes in violation of these guidelines must be relocated or removed. Vendor boxes for free publications should be discouraged as they contribute to trash related problems at bus stops.



## **Chapter 5:**

# **Transit Center Design**

## Chapter 5: Transit Center Design

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### ***Transit Center Examples and Designs***

#### **Overview**

Successfully planning for a transit center requires many considerations including siting and location, transportation and circulation, and design and placemaking. The transit center design is influenced by both the number of buses as well as parked vehicles to be accommodated, traffic and pedestrian movements and the surrounding development. Although most transit centers are off-street facilities, low volume needs can be sometimes be accommodated with minimal on-street improvements. Other factors to consider include vehicle dwell time, passenger waiting areas and amenities, and noise and exhaust from vehicles.

The different responsibilities and roles played by CAT and local jurisdictions to determine transit center locations require close coordination between site designers and local staff, who can best collaborate to consider potential impacts on neighborhoods, existing conditions and future plans for the area, and the transit value of the facility.

Transit facility projects typically are submitted and approved by local governing bodies, which may include any combination of a Planning Board, Planning and Zoning Commission/Committee, Public Works/Engineering, City Council or County Commissioners. Local approval of a transit facility project will likely include the following reports/plans:

- Concept Plan
- Master Plan, Subdivision Plat
- Drainage Report
- Traffic Impact Study
- Soils Report
- Utility Report
- Geologic Hazards
- Archeological and Historic Artifacts Report
- Others, such as landscape plan, construction detail, grading plan, etc.

Each transit center site will likely be unique; therefore having flexible guidelines or standards that are used holistically can be an effective proactive approach

when conducting site selection and initial design. The following categories are involved in the development of a successful transit center:<sup>1</sup>

- Functional zones (access, transfer, circulation, plazas, boarding, seating, lighting, utilities, drainage, information and fare collection) of a transit facility
- Designing a community integrated facility
- Providing for the design needs of pedestrians and bicyclists
- Compliance with ADA requirements and guidelines
- Providing for the design requirements of transit vehicles, automobiles and maintenance equipment
- Design considerations for facility access management
- Design considerations for convenient, efficient and cost effective maintenance
- Design considerations for safety and security management

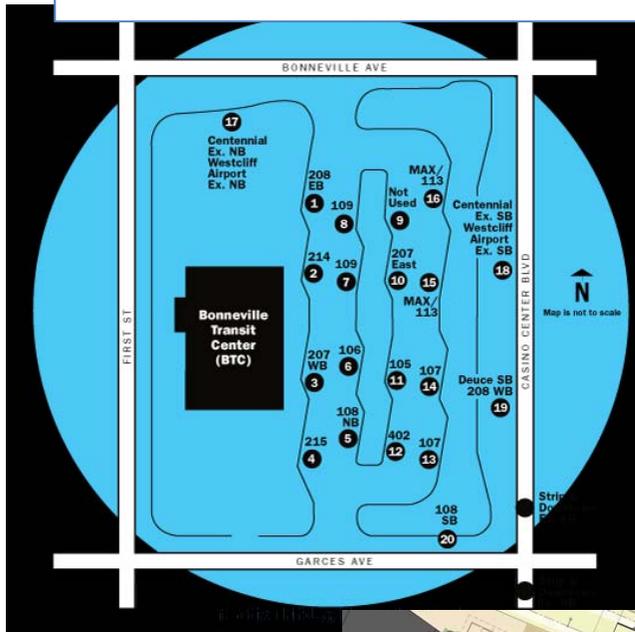
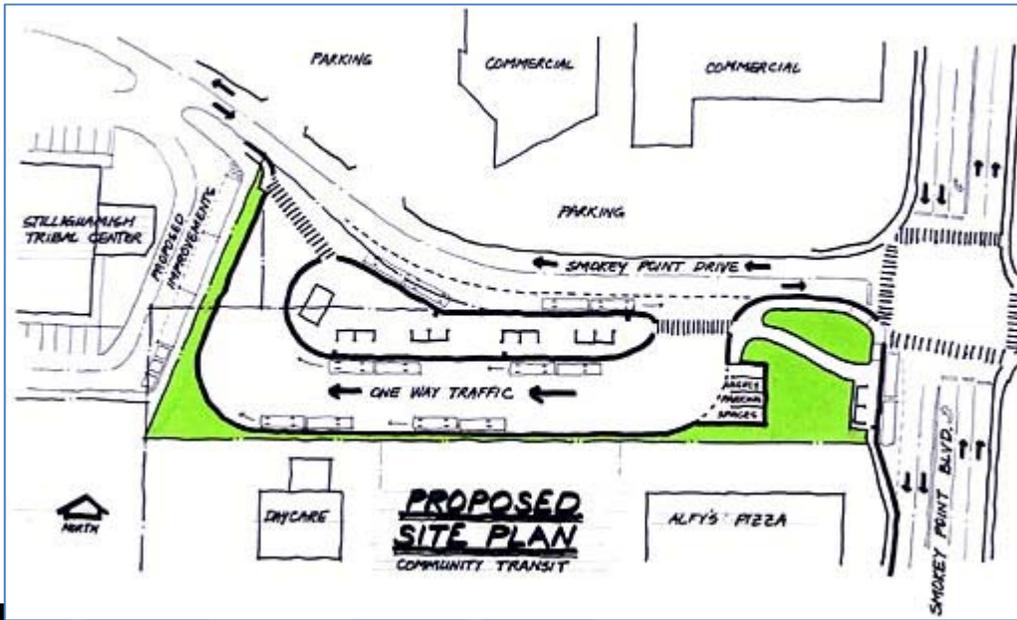
Local communities expect well-designed and well-built public works projects, and are very attentive to projects in their neighborhoods. A transfer or transit center will vary in size depending upon functionality, specific planning, community needs, and environmental requirements. In addition to the transit component, the facility usually consists of four areas:

- personal vehicle (car, motorcycle and bicycle) accommodation
- passenger facilities
- pedestrian access space
- open space (detention and landscaping)

All these areas should be harmonious to provide a smooth and seamless transition from the personal vehicle, via the pedestrian mode, to the transit system. At the site-specific level, the design shall include: the general site layout, pedestrian and vehicle circulation routes, and the bus plaza area. The design of the transit center will consider the separation of competing modes, pedestrian pathways, adequate pedestrian waiting areas, compliance with the ADA requirements, adequate lighting and shelter for a safe environment, and management of conflict points between pedestrian, bus and vehicle movements. Adequate service roadways and features, both external and internal to the transit facility, are important to assure efficient transit access to the proposed facility.

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<sup>1</sup> <http://www3.rtd-denver.com/elbert/Criteria/index.cfm>



Upper Site Plan: Smokey Point  
 Transit Center, Everett, WA.

Middle Site Plan: RTC Booneville  
 Transit Center, Las Vegas, NV.

Lower Site Plan: Tempe  
 Transportation Center, AZ.



The facility design often includes the following features:

- Allowances for minimum horizontal and lateral bus clearances, including bike racks
- Allowances for minimum turning radii, movements and curb returns
- Accommodation of acceleration needs and grade issues
- Provision of adequate clear sight distances
- Construction of adequate pavement
- Incorporation of appropriate roadway and driveway widths for transit operations
- Allowances for underside road clearance at driveways, speed humps, dips, speed tables, raised pedestrian paths and railroad crossings

Bus access to the facility is generally separated from private vehicle access to eliminate points of conflict. Similarly, the bus loading area shall be separated from general purpose traffic. (Note: timed transfer scheduling typically require more bus bays to accommodate multiple vehicle transfers). Bus parking space requirements shall be based on the maximum number of transit vehicles requiring independent pull-in and pull-out bays at the same time. If all buses operate independently and access the transit facility simultaneously, curb space sufficient to park all vehicles must be provided.

Bus bay and desirable drive lane configurations at transfer stations include:

- Linear bays with successive transit vehicle lining up in single file
- Sawtooth bus bays providing individual bays for specific routes (generally preferred configuration)
- Angled or diagonal bays require back outs, and are typically used only when buses have extended dwell times (e.g., intercity bus terminal)
- Drive-through bays are used in compact areas, and allow bus front destination signs to face arriving passengers
- Bus lane desirable drive lane width – 30 feet minimum
- Bus lane radius – 35 feet minimum
- Bus turn lane – 30 feet minimum (inner)
- Bus turn lane – 55 feet minimum (outer)
- Bus turnaround – 65 feet minimum (outer)

Operationally, the transit center must also consider layover space for scheduled down time, and necessary driver amenities, which may include a driver relief station, vending machines, break areas, etc. Adequate layover space is determined by the number of buses to be stored at the site and the physical dimensions transit vehicle. The layover space length is also determined by clear line of sight requirements. Typical layover spaces require:

- 40 to 60 feet layover length per dwelling transit vehicle
- 7:1 taper for pull in and 4:1 taper for pull out
- 10 feet clearance between dwelling transit vehicle
- 12 feet layover stall width

## **Chapter 6:**

# **Installation of Passenger Amenities by the Private Sector**

## Chapter 6: Installation of Passenger Amenities by the Private Sector

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### ***Installation of Passenger Amenities by the Private Sector during Site Plan Development Review***

#### **Overview**

Recent federal and state studies indicate public transportation contributes to a community's overall livability, and significantly impacts economic development and the quality of life. Among other results, these studies have included examples of transit agencies that have partnered with the private sector for various activities that have benefitted the communities and also been successful from an investment perspective.

#### **Informal Survey**

There has been considerable activity in recent years regarding private sector participation in the installation of bus stops, shelters and other amenities. Chapter 2 of these guidelines provides the current review process for the City of Raleigh and the NCDOT State process. To expand upon the process described in Chapter 2, WSA contacted other transit agencies to compare how other communities incorporate private sector involvement through the development review process. As the results indicate, although there has been some mention of the negotiations with the private sector for the installation of amenities in industry publications, it appears there are not many examples of specific agreements and formalized processes. Rather, most agencies negotiate the terms and agreements on a case by case basis.

A summary of this survey and a listing of responses and responding agencies is presented in Figure 6-1 on the following page.

Figure 6-1

Transit Involvement in Development Review Process									
AGENCY	Broward Co Transit (BCT), Broward County FL	Charlotte Area Transit System (CATS), NC	Citrus Connection, Lakeland, FL	IndyGO, Indianapolis, IN	Palm Tran, W Palm Beach, FL	Tulsa Transit, OK	Winston-Salem Transit Authority, NC		
1	How is your agency actively involved in the review of new development and/or infill development site plans?	BCT is 1 of 23 approving agencies in the development review process. BCT staff does not attend weekly technical review committee meetings. However, staff attends a weekly FDOT Access Management meeting through which developers makes request for new or modified access and BCT is given the opportunity to request any required improvements.	All bus stop requests for new or relocated sites are reviewed by the Bus Stop Committee. The Committee determines that site decisions and coordinates with City planning review staff.	The transit agency does not regularly attend development review meetings because of the great efforts of existing planning staff. Transit is contacted as needed for additional information depending on the site. The City Planning staff are transit advocates and the City mandates transit amenities, which may be a landing pad, shelter, park & ride, etc.	City suggests that developer contact IndyGO regarding bus stop requirements. IndyGO attends meetings, as requested.	Palm Tran sits on Palm Beach County's Design Review Office.	City has process for new development for existing bus routes or those recognized in an adopted plan.		
2	Do you have a written policy which includes required transit improvements?	The Florida Land Development Code allows us to make request for improvements needed for Transit Infrastructure.	Adopted standards	Design guidelines are distributed to developers	The written policy/thresholds are listed in our Unified Land Development Code	Shelter and bench standards	No, only shelter standards		
3	What type of designs, amenities, agreements do you request of the developer?	BCT typically requests a shelter easement and dedication of ROW to enable the construction of ADA landing pad or bus bay.	Standard detail design for shelters, pads, etc.	Adopted guidelines.	Shelter, benches	Shelter, benches	Shelter requests		
3a	Is there a written policy with transit requirements?	No	Adopted standards	Adopted guidelines.	ULDC	Shelter and bench standards	No, a memo is prepared.		
4	How are the requirements communicated to the developers?	The requirements are communicated to the developers via the development review process.	Through City Planning staff	Typically emailed to developer.	Through the Design Review Office	Hard copy or emailed.	Construction company calls transit agency		
5	If your agency needs to approach a private property owner or business to place a bus stop not in the public right-of-way, what process do you go through?	Coordination is typically done between staff from the relevant city in which the property is located and the property owner.	Verbal agreements, unless City implements facilities; then, an easement or license would be in place.	Verbal communication, followed by written correspondence with requests.	Verbal agreement. If infrastructure installed, then an easement is required.	Verbal communication, followed by written correspondence with requests.	Very rare that easement is requested.		
5a	Do you have a written process?	No	Typically verbal agreement, unless City facilities in place.	No	City easement process	No	No		
NOTES: Other agencies contacted, but no response: Greater Bridgeport Transit, Columbus Ohio Transit Authority, Sunline Transit Agency, Central Midlands Regional Transit Authority, Columbia, SC, Knoxville Area Transit, Nashville, MTA, Santa Clara Valley Transportation Authority, Jacksonville Transportation Authority, Utah Transit Authority, King County Metro									

As indicated above, in general, the City of Raleigh development review process is similar to many of the peer transit agencies who responded to the survey.

*The common pattern is that a transit planner reviews, as requested, or via scheduled development review meetings a future development change or new development. Recommendations are made by the transit agency based upon existing transit routes or those stops along a planned future route. Adopted shelter, bench, and pad standards are distributed to the developers who incorporate into final required drawings to the City.*

With the adoption of this guidebook, CAT will have a tool to guide and recommend solutions to future development patterns. Several sample documents used successfully at other agencies are shown on the following pages.

### **Examples of Private Sector Agreements for Installation of Amenities**

Research efforts did, however, result in finding two specific examples of private sector participation in the installation of bus stops and amenities. The first example outlines the process used by the Town of Cary, NC for recent modifications to their Land Development Ordinance, which was approved by the Town Council on December 16, 2010. This ordinance requires the developer to install the applicable amenities based on the processes developed by the Town.<sup>1</sup>

As indicated below, the Town establishes the basic requirements for the installation and the developer is responsible for the actual installation.

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<sup>1</sup> Land Development Ordinance Text Amendments, 10-LDO-01, Approved by City of Cary Town Council, December 16, 2010.

#### 7.10.6 STANDARDS FOR PUBLIC TRANSIT ACCESS AND AMENITIES

**(A) Purpose**

Shopping centers (general and small), and other uses similar in size, including but not limited to office, group living, and hospital facilities as defined by Section 12.3, are required to be designed to accommodate the safe movement of public transit vehicles in such a manner whereby vehicles can be accessible to passengers in close proximity of the building entrances. Existing uses subject to the requirements of this section (as described above) may be exempt from these standards unless re-development or expansion occurs.

**(B) Amenity and Location Requirements**

All uses subject to the requirements of this Section (as described above) and served by general public fixed route transit services or in corridors identified for future fixed route transit service in the Comprehensive Transportation Plan shall install at least one (1) transit access location ~~in accordance with the following~~ if the Town has determined that there are no traffic movement, passenger safety, and topographical constraints or concerns. No transit access location shall be required if there is an alternate transit stop or facility that serves the same function as a transit access location. If required, a transit access location shall be built in accordance with the following:

- (1) A The concrete pad shall be at least eight (8) feet wide by ~~eighteen (18)~~ twenty (20) feet long and ~~four (4)~~ six (6) inches in depth, and meet a 3,000 PSI threshold (see Town's Engineering Department Standard Detailed Drawing for Transit Shelter Specifications).
- (2) The pad shall be located within close proximity of one of the main entrances to the building(s);
- (3) The pad ~~must~~ shall be connected with sidewalks and meet Americans With Disabilities Act (ADA) specifications;
- (4) A bus stop shelter, or bench, or other amenities meeting Town specifications (See Town's Engineering Department Standard Detailed Drawing for Transit Shelter Specifications), appropriately sized for the potential passengers at that location, must ~~shall~~ be installed by the developer. If a bus stop shelter is required, it ~~must~~ shall meet Town specifications and also be installed on the concrete pad. Benches ~~must~~ shall meet Town specifications for size and color. No shelter or bench location ~~can~~ may be installed within ninety (90) feet of an intersection;
- (5) A solar lighting system for bus shelters is also required for passenger safety and security purposes. Solar lighting is not required for stops with benches or without any existing bus shelters;
- (6) Trash receptacles and one bike rack ~~may~~ shall be required and shall meet Town specifications;
- (7) There shall be no advertising on benches, shelters, and bus stop signs;
- ~~(8) The Town can also exclude benches and shelters. If it is determined that an existing bus stop shelter can serve the site then benches and shelters may not be required.~~
- ~~(9) (8)~~ The Developer shall ensure that all necessary NCDOT right-of-way encroachments to ensure connectivity to NC DOT right-of-way are included with any other encroachment agreements required.
- (9) Vegetation within a distance of fifteen (15) feet of the shelter or bench concrete pad shall not exceed thirty (30) inches in height at full maturity in order to promote passenger visibility, safety, and security.

**(C) Maintenance Responsibility and Costs of Associated Signage**

The Town will be responsible for maintaining the shelter, solar lighting, and other amenities that may be added after installation. ~~The owner of the property~~ Town will be responsible for emptying the trash receptacle if installed. The Town reserves the right to install a bus stop sign adjacent to the shelter or benches. All costs associated with sign installation and procurement is the responsibility of the Town.

**(D) Timing of Installation**

Installation of all transit amenities, including shelters with solar lighting, benches, bicycle rack, trash receptacles and signs, if required, ~~must~~ shall be completed by the developer prior to the issuance of the first (or only, if applicable) Certificate of Occupancy within the development. In instances where a development is adjacent to a future route not in operation at the time the last CO is requested, the Town may allow the developer to install only the concrete pad ~~only~~ and submit a payment-in-lieu for the remaining amenity requirements prior to issuing the first (or only) Certificate of Occupancy for the development; If a development will require more than one CO (e.g. multiple buildings on the same site) and is adjacent to a future route not in operation at the time the last CO is requested, a payment-in-lieu for the remaining amenity requirements shall be submitted prior to issuing the last CO. If the adjacent future route becomes operational during the construction of the development, the developer shall install all remaining amenity requirements prior to the Town issuing the final CO.

The second process, developed by SunLine Transit Agency in Thousand Palms, California, specifically relates to bus stops and amenities on private property.

### ***Overview of SunLine Process***

- The transit agency is contacted by private property owner for a potential installation on private property. The agency coordinates with the owner by researching and verifying ownership, property boundaries, and the site description for the proposed bus stop and amenities.
- The transit agency and private property owner prepare a general use agreement at the identified location. The agreement addresses transit, pedestrian and other vehicular flow on the private site. Maintenance, insurance, and other contractual issues are typically negotiated and included in a draft agreement from the transit agency's attorney.
- The agreement is signed by both parties and filed.
- The bus stop and amenities are then implemented.

The text for the agreement is shown on the following pages.

## **SAMPLE AGREEMENT FOR BUS STOP PLACEMENT ON PRIVATE PROPERTY**

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

### **PRIVATE PROPERTY BUS STOP PLACEMENT USE AGREEMENT**

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

#### **WITNESSETH:**

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

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

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

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

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

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

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



2. **Usage Rights Granted.** SunLine, at its expense, may install signs, paint markings, and other traffic control devices and make other improvements. All other changes shall require the consent of the Owner.
3. **Owner's Rights.** The Owner reserves the right to make other uses of the Premises that do not interfere with SunLine's use.
4. **Term.** The term of this Agreement shall be ongoing commencing on this day of 2006. At any time, either Party may terminate this Agreement by giving two (2) months' notice to the other party of its intent to terminate.
5. **Access.** SunLine may authorize the use of the Owner's driveways, walkways and improved surfaces surrounding the Premises for vehicular and pedestrian access to the Premises.
6. **Maintenance.** SunLine shall only be responsible for maintenance of markings and improvements that it installs and will not be responsible for any roadway maintenance and repairs at the Premises location. Owner agrees that they have inspected the location of the bus stop and the adjacent roadway and have determined that the location of the bus stop is a safe location and that the roadway is adequate to accommodate public transit vehicles. Further, Owner will hold SunLine harmless from any damage, claims, actions or losses to the roadway connection with the use of the Premises unless a result of SunLine's sole negligence and to the extent permitted by law.
7. **Towing of Vehicles.** SunLine's may order vehicles to be towed away at its own expense and risk. Special consideration, however, shall be provided for vehicles displaying a government-issued "handicapped" license plate or decal.
8. **Insurance.** SunLine will procure and maintain, for the duration of the Agreement, insurance and/or self-insurance against claims for injuries to persons or damage to property that may arise from or in connection with the use of the Premises.
9. **Indemnification/Hold Harmless.** SunLine will defend, indemnify and hold harmless the Owner, its officers, officials, employees, and volunteers from and against any and all claims, suits, actions or liabilities for injury or death of any person, or for loss or damage to property, which arises out of the use of Premises or from any activity, work or things done, permitted or suffered by SunLine in or about the Premises, except only such injury or damage as shall have been occasioned by the sole negligence of Owner.
10. **Governmental Charges.** SunLine shall not be responsible for any, taxes, assessments, or governmental charges of any kind that may be levied against the Premises.



11. Termination. SunLine will discontinue its use of the Premises on termination of this Agreement; will remove all signs and structures placed on the Premises by SunLine; will repair any damage to the Premises caused by the removal; and will restore the Premises to as good a condition, less reasonable wear and tear, as existed prior to the execution of this Agreement.
12. Accommodation. The parties agree to make reasonable accommodations with and to work together to resolve problems that may arise from time to time. Upon reasonable advance notice to SunLine and its users, the Owner may secure the Premises on a limited number of dates to allow for construction on surrounding property or special events. The Owner agrees to provide special consideration for vehicles displaying a government-issued "handicapped" license plate or decal.
13. Entire Agreement. This document contains the entire agreement between the parties and supersedes all other statements or understandings between the parties.

SunLine Transit Agency

Private Property Owner

\_\_\_\_\_

\_\_\_\_\_

Printed Name

Printed Name

\_\_\_\_\_

\_\_\_\_\_

Signature

Signature

Date

Date



## **Other Private Sector Involvement in Public Transportation**

In addition to the specific examples regarding bus stops and amenities there have been other examples of private sector involvement in public transportation that could result in additional opportunities for partnering. The term most often linked with coordinated public and private development supporting accessible communities during the past decade is *Transit Oriented Development*. TOD refers to residential and commercial districts designed to maximize access by public transit, with planned walkability facilities and an efficient parking management system within a community.<sup>2</sup> The recent adoption of the *City of Raleigh 2030 Comprehensive Plan* identifies several strategies supporting future TOD design elements that need to be adapted if the City will be able to provide a high quality lifestyle for local residents.<sup>3</sup>

As indicated in the Cary Transit Standards example above and in other guidelines developed around the country, clear linkages have been developed between general planning processes and the specifics of transit amenity implementation. The process usually includes a comprehensive plan and a local development code. The comprehensive plan contains policies that prioritize transit-friendly land use patterns. Research indicates that the plan must clearly provide the policy foundation for transit development as part of the development review process; otherwise local ordinances will lack effectiveness.<sup>4</sup>

The following development processes include features of existing joint development, zoning, impact fees, etc., where funds are raised by private developers through the development process for public transportation. Capital needs for transit may include buses, shelters, accessible features at bus stops, such as sidewalks, adequate right-of-way, curb cuts, pull-out bays, bus stop signage and amenities, etc. These amenities have been included in a range of projects from bus, light rail, streetcar and BRT services and also include specific investments at stops.

- **Joint Development:** coordinated venture by the public agency and private sector for the development of land above, below, or along transportation facilities. Each entity typically has a voluntary arrangement with something to gain by combining resources.
- **Land Development Regulations:** LDRs for a municipality usually include, at a minimum, a zoning ordinance and a subdivision ordinance and

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<sup>2</sup> John S. Adams and Barbara J. VanDrasek (2007), *Transportation as Catalyst for Community Economic Development*, Center for Transportation Studies, University of Minnesota ([www.cts.umn.edu](http://www.cts.umn.edu)) for the American Institute of Architects.

<sup>3</sup> <http://planningraleigh2030.com/>

<sup>4</sup> *Land Developer Participation in Providing for Bus Transit Facilities and Operations*, Center for Urban Transportation Research, March 2002.

specify what a developer must do in order to receive a Certificate of Occupancy. Local ordinances provide the foundation to engage private sector land developers to contribute to public bus transit capital facilities and operations costs.

The land development code implements and carries out the intent of a comprehensive plan. LDRs are instruments that ensure a minimum result and are difficult to craft in a way that promotes the best possible outcome for all parties. The regulations can specify standards for transit accessibility, such as providing a location and construction of bus stops and the development of a sidewalk system that provides easy access from the development to transit stops.

- **Tax Increment Financing (TIF):** Tax increment financing (TIF) harnesses public money for funding public improvements in an area slated for redevelopment, typically with commitment of a land developer. Funds are captured, for some period of time, all or a portion of the increased tax revenue that may result if the redevelopment stimulates private investment. The TIF is financed by subsidizing one city's developments with taxes from another municipal taxing authority. Typically, a redevelopment agency is established to oversee the TIF district and who solicits developers to perform the public improvements.
- **Conditional Zoning:** A conditional use district is one in which a permit to develop is issued only when certain conditions are met, in exchange for allowing a use of the property not otherwise applicable to land similarly zoned. For example, uses that may be subject to conditions are those that attract a lot of people, or may create traffic congestion or noise, place burden on infrastructure or cause some adverse effect to public welfare or safety. These include schools, churches, hospitals, assisted living facilities, clubs, open-air recreation facilities and shopping centers. Specific conditions might include access requirements or the placement of transit-oriented design requirements. Conditional zoning is also applied in the form of planned unit developments (PUD).
- **Impact Fees:** An exaction is the general term used to describe the arrangement in which the developer must provide or finance the provision of certain public facilities, in exchange for project approval. The exaction covers the costs of growth attributable to the project. Impact fees are a type of exaction. Impact fees are a police power regulation, the primary purpose of which must not be to raise revenue. The revenues that are raised by the impact fee from a land development must be spent for the benefit of that development or within a designated impact fee zone or subdivision.

Impact fees can be arranged as flat fees, variable fees and negotiated fees. In programs nationwide, they can also be called a variety of names, such as infrastructure fees, system development charges, capital facility fees, building occupancy taxes, and connection fees. Impact fees for transportation have almost exclusively been used for road improvements but this may change.

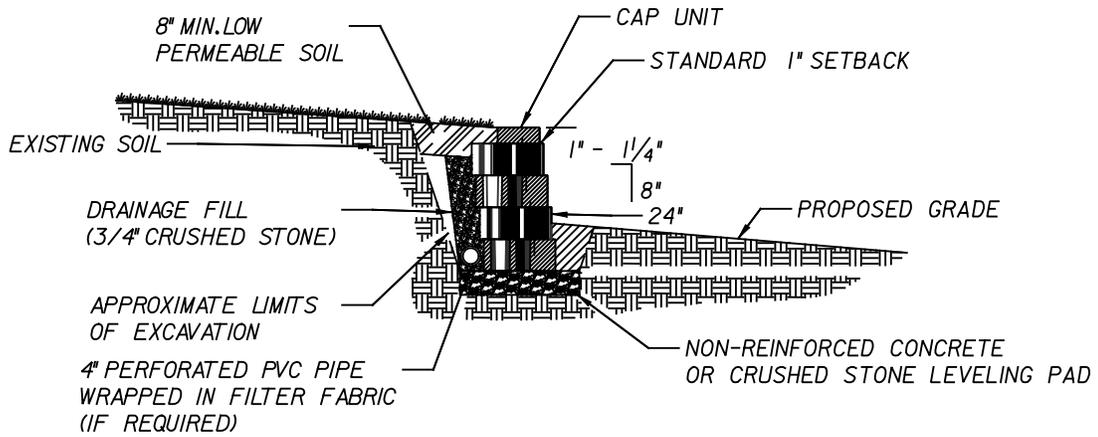
- **Employment Park Foundations:** The concept of an employment park foundation has been used as companies located within employment parks may depend upon transportation improvements to their sites and so may be willing to fund transit improvements.
- **Cost Sharing Programs:** Partners in these arrangements can include private developers, but also other entities with benefits to gain from public transportation, such as colleges and universities.
- **Trip Reduction Ordinances:** Trip reduction ordinances are regulations passed by a local government, which require developers, property owners and employers to participate or assist in financing transportation management efforts. Ordinances may specify a target reduction in the number of vehicle trips expected from a development based on standardized trip generation rates. Ordinances may also establish peak periods for travel reduction, establish time tables for compliance, and penalties for non-compliance. In practice, trip reduction ordinances primarily enlist the participation of property owners and employers, but they can also target land developers.



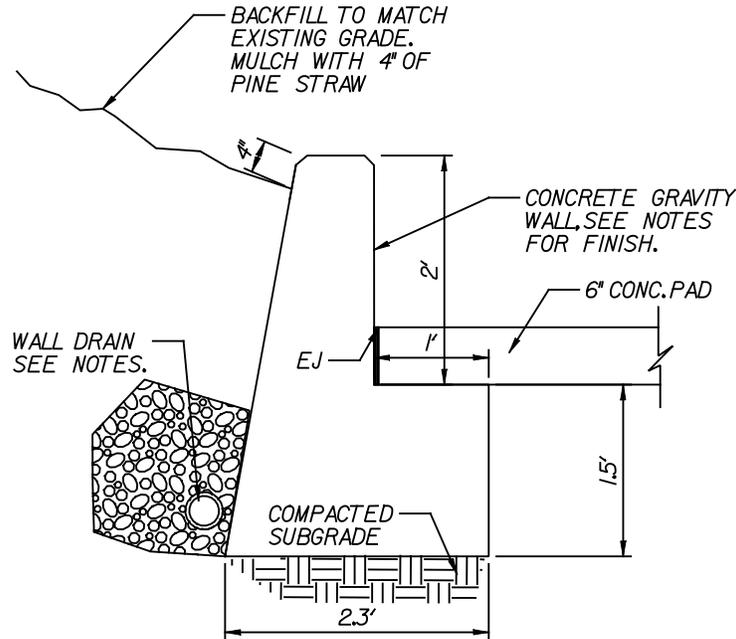
# **Appendix A:**

## **Retaining Wall Specification**





SEGMENTAL BLOCK  
RETAINING WALL



**NOTES:**

1. USE CLASS A CONCRETE AND PROVIDE CLASS I SURFACE FINISH ON ALL EXPOSED SURFACES.
2. PROVIDE GROVED CONTRACTION JOINTS EVERY 10'-0".
3. PROVIDE 4" PERFORATED PVC DRAIN PIPE THE LENGTH OF THE WALL. WRAP PIPE WITH FILTER FABRIC AND PROVIDE 1' WIDE BY 1' DEEP WASHED STONE AROUND PIPE. TIE TO STORM DRAIN OR DAYLIGHT AT ENDS AND PROVIDE SOCK AROUND END OF PIPE.
4. DO NOT BACKFILL WALL UNTIL CONCRETE DEVELOPS A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI. COMPACT BACKFILL AND COMPACT WITH HAND OPERATED EQUIPMENT.
5. TAPER ENDS OF WALL TO 6" ABOVE GRADE IN 3' OR TO 6" ABOVE SIDEWALK IF TIED TO SIDEWALK.
6. WALL SIMILAR TO NCDOT STANDARD DRAWING 453.01.

REINFORCED CONCRETE  
GRAVITY RETAINING WALL

CITY OF RALEIGH PUBLIC WORKS DEPARTMENT	
REVISIONS	DATE: 01/2011
	TYPICAL RETAINING WALL DETAILS
	STD. # T-10



# City of Raleigh Capital Area Transit Handbook Supplemental A



March 2011

## City of Raleigh Capital Area Transit Handbook

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### **Introduction**

Over the past few years, the City of Raleigh Transit Program has been working on the development of an enhanced and improved bus stop program in the Capital Area Transit service area. One result of this work is the development of this document outlining specific design, access and other related criteria. The guidelines are intended to provide City staff, other affected jurisdictional partners, and developers with passenger amenities design criteria to be integrated with local comprehensive plan policies, land use ordinances, and other local plans.

### **Overview**

The Capital Area Transit Program (CAT) has the responsibility for providing transit services for the City of Raleigh and surrounding areas. CAT encourages developers and local municipalities to follow guidelines and recommendations set forth in the Passenger Amenity Guidelines and Transit Design Standards Guidebook and to work with CAT staff when planning new developments or changes to existing developments. This teamwork and collaboration will create transit oriented environments that will meet the City's initiative to foster Complete Streets infrastructure and to support the mandates of the Americans with Disabilities Act (ADA).

This Handbook will guide developers and planners in the preparation and design of bus stops for the CAT system. The following steps will provide a checklist to follow throughout the planning and design phases:

### **Planning Phase**

The following questions can be used in planning and evaluating accessibility of a development to public transit and a new or improved bus stop. Proposed developments can be evaluated by the responses provided. A "Yes" response is required and will determine if the proposed development will accommodate transit vehicles and will provide access to public transit. Refer to the Passenger Amenity Guidelines and Transit Design Standards Guidebook for appropriate layout and design suggestions, if a "Yes" is not received. CAT planning staff will review all development sites and provide transit related design recommendations and technical assistance if additional assistance is required.

- \_\_\_\_\_ Is this a Major Activity Center (hospitals and universities)?
  
- \_\_\_\_\_ Is this a High Density development (5,000 person per square mile, apartments, senior housing, office or commercial, Density > 4 units/acre)?
  
- \_\_\_\_\_ Is this a Medium Density development (2,000 – 4,000 person per square mile, Density 3 units/acre)?
  
- \_\_\_\_\_ Is this a Low/Rural Development (< 2,000 person per square mile, Density 1-2 units/acre)?
  
- \_\_\_\_\_ Will roadways within and around the development be accessible to buses?
  
- \_\_\_\_\_ Do radii for driveways and intersections meet bus turning radius designs?
  - \_\_\_\_\_ Are roadway lane widths 12' wide?
  - \_\_\_\_\_ Is curb and gutter provided?
  - \_\_\_\_\_ Are vertical grades 6% or less?
  
- \_\_\_\_\_ Are residential developments designed with a central collector street that will provide access for buses?
  
- \_\_\_\_\_ Have bus stop locations near the proposed development been identified by CAT planning staff?
  
- \_\_\_\_\_ Has CAT planning staff reviewed the proposed transit stop location?
  
- \_\_\_\_\_ Are passenger amenities such as a shelter or bench required as part of this development?
  
- \_\_\_\_\_ Are sidewalks, ramps, bus pads and other development features designed to meet ADA guidelines?
  
- \_\_\_\_\_ Are direct access paths provided from building entrances to the bus stop?
  
- \_\_\_\_\_ Have the plans been reviewed and approved by CAT planning staff for all transit related amenities?

## **Design Phase**

Once the planning work has been completed and approved by CAT planning staff, design efforts may begin. Construction Standard Drawings, shown on the following pages in Appendix A, T-1 through T-12, are available to assist in the design and layout of required bus stop amenities. Design elements will include the following steps:

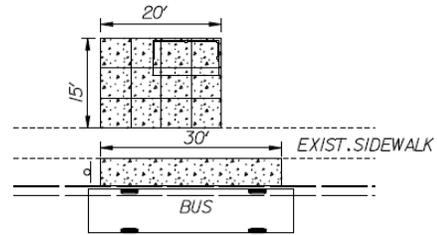
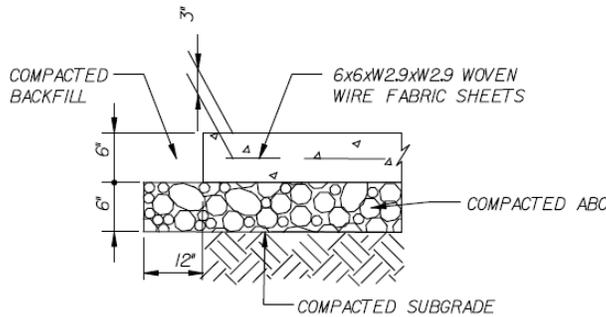
1. Provide enough topographic survey information to properly layout the site. Include nearest intersection and/or driveway turnouts to determine if sight distance and clear recovery requirements are in violation. Sight distance and clear recovery requirements will follow the guidelines of the AASHTO "Green Book" - A Policy on Geometric Design of Highways and Streets.
2. Provide utility information and show street rights-of-way and property lines to determine if easements will be required.
3. Provide CAT planning staff with twenty-five percent (25%) design plans with all amenities approved during the planning phase. Design plans should include existing conditions topographic survey to determine grades of pad and surrounding areas meet ADA and if retaining walls are needed.
4. Prepare NCDOT Encroachment Agreements (Form R/W 16.1A) and provide appropriate number of copies of plans to Division for review. Coordinate with NCDOT Division 5, District 1 Office.
5. Prepare Easement Exhibits on legal size sheet, sealed and signed by a North Carolina Registered Surveyor and provide to City Real Estate Department.
6. Provide technical specifications for all construction items to be reviewed by the City to ensure that they meet the current standards.

# APPENDIX A

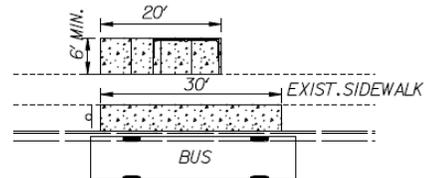
## LIST OF TYPICAL STANDARD DETAILS

<u>STANDARD</u>	<u>DESCRIPTION</u>
T-1	TYPICAL STOP LOCATIONS
T-2	BUS SHELTER PAD DETAIL
T-3	BENCH PAD DETAIL
T-4	BUS SHELTER LAYOUT DETAILS
T-5	SITE LAYOUT FOR SHELTER
T-6	SITE LAYOUT FOR BENCH
T-7	SIGN POST LAYOUT
T-8	HANDRAIL DETAIL
T-9	BOLLARD DETAIL
T-10	RETAINING WALL DETAILS
T-11	SITE LAYOUT FOR BIKE PAD
T-12	R-LINE BUS SHELTER





FULL SIZE SHELTER  
PAD DIMENSIONS

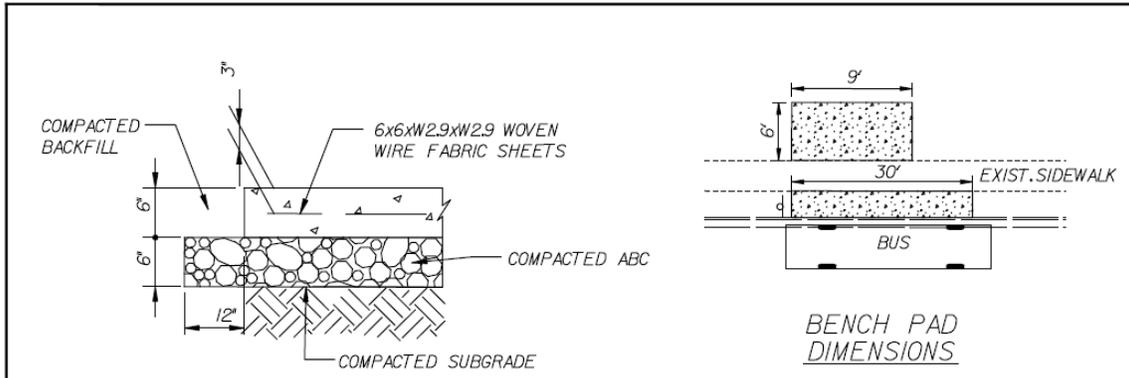


SLIM LINE SHELTER  
PAD DIMENSIONS

GENERAL SHELTER PAD NOTES:

1. CONCRETE PAD WILL CONSIST OF 3,000 PSI CONCRETE IN ACCORDANCE WITH NCDOT STANDARDS.
2. REINFORCE AS SHOWN IN TYPICAL SECTION. WOVEN WIRE FABRIC SHALL HAVE MINIMUM 6" OVERLAPS AND MINIMUM COVER OF 3" ON ALL SIDES.
3. WHERE PROPOSED SHELTER PAD ELEVATION IS ABOVE EXISTING GRADE, PROVIDE A 1' WIDE CONCRETE "BEAM" TO EXTEND A MINIMUM OF 6" BELOW THE EXISTING SURROUNDING GRADE WITH A 45° SECTION TO BRING BACK TO THE STANDARD 6" THICKNESS.
4. CONCRETE PAD WILL HAVE A BROOM FINISH.
5. MAXIMUM CROSS SLOPE SHALL BE 2%.
6. EXTEND ABC 1' BEYOND EDGE OF PAD IN ALL DIRECTIONS EXCEPT WHERE BORDERED BY EXISTING PAVEMENT OR SIDEWALK.
7. WHERE HANDRAIL IS INSTALLED INCREASE PAD THICKNESS AS SHOWN ON THE HANDRAIL DETAIL TO CREATE A 12" X 12" BEAM TO INSTALL HANDRAIL IN.
8. EXPANSION JOINTS WILL BE INSTALLED AT ALL RIGID OBJECTS AND ADJACENT TO EXISTING PAVEMENT AND HAVE 1/8" RADIUS TOOLED EDGE AND FILL WITH SEALER.
9. WHERE SIDEWALK IS EXISTING, PLACE CONCRETE IN BETWEEN THE SIDEWALK AND THE EDGE OF PAVEMENT OR CURBING. IF NO SIDEWALK IS EXISTING PLACE CONCRETE IN THREE (3) SECTIONS: THE UTILITY STRIP, THE SIDEWALK SECTION, AND THE SHELTER PAD.
10. SIDEWALK AND CONCRETE IN UTILITY STRIP AT BACK OF CURB WILL BE 4" THICK IN ACCORDANCE WITH THE STANDARD SIDEWALK SECTION.

CITY OF RALEIGH PUBLIC WORKS DEPARTMENT	
REVISIONS	DATE: 01/2011
	BUS SHELTER PAD DETAIL
	STD. # T-2



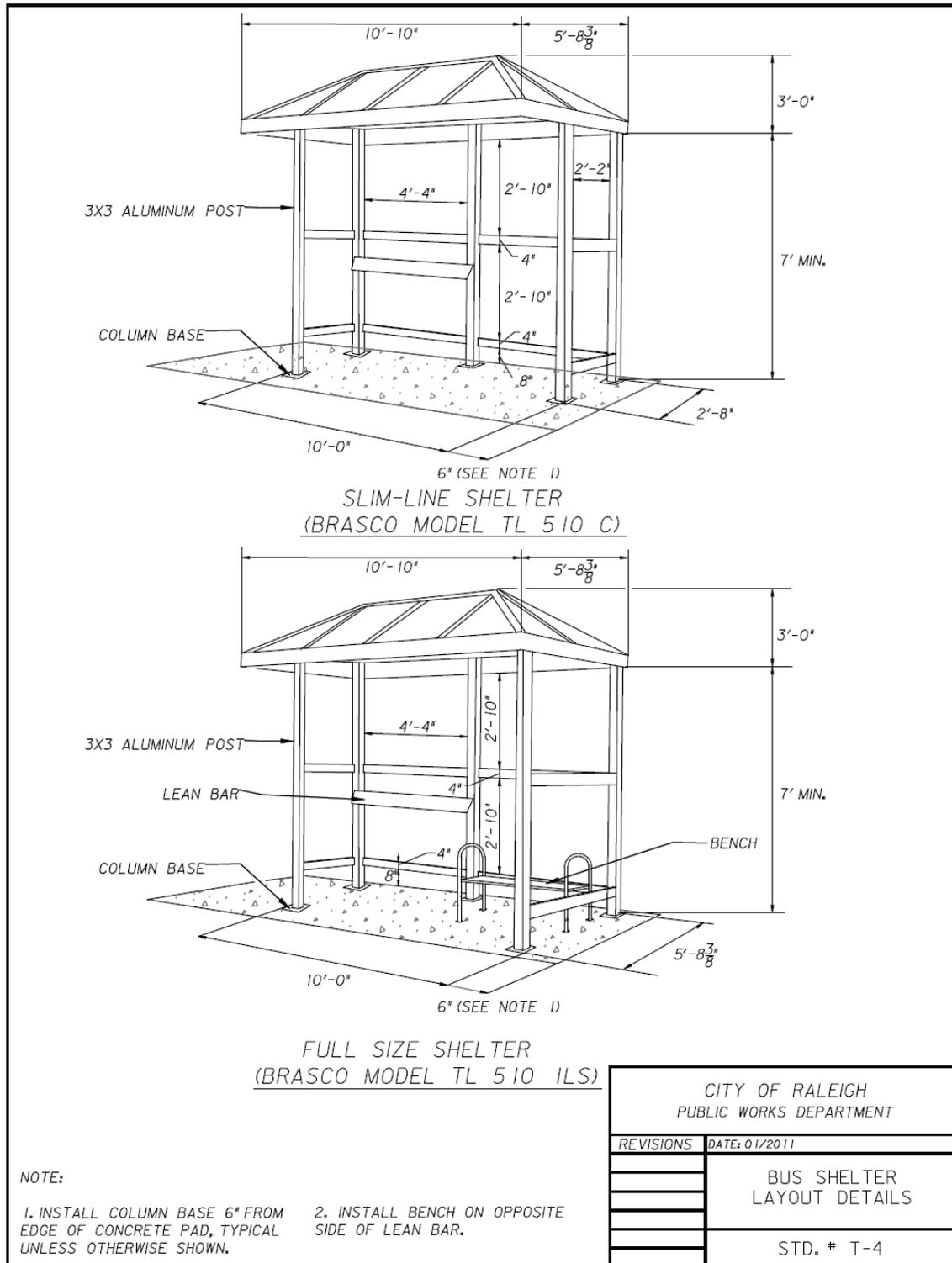
BENCH PAD DIMENSIONS

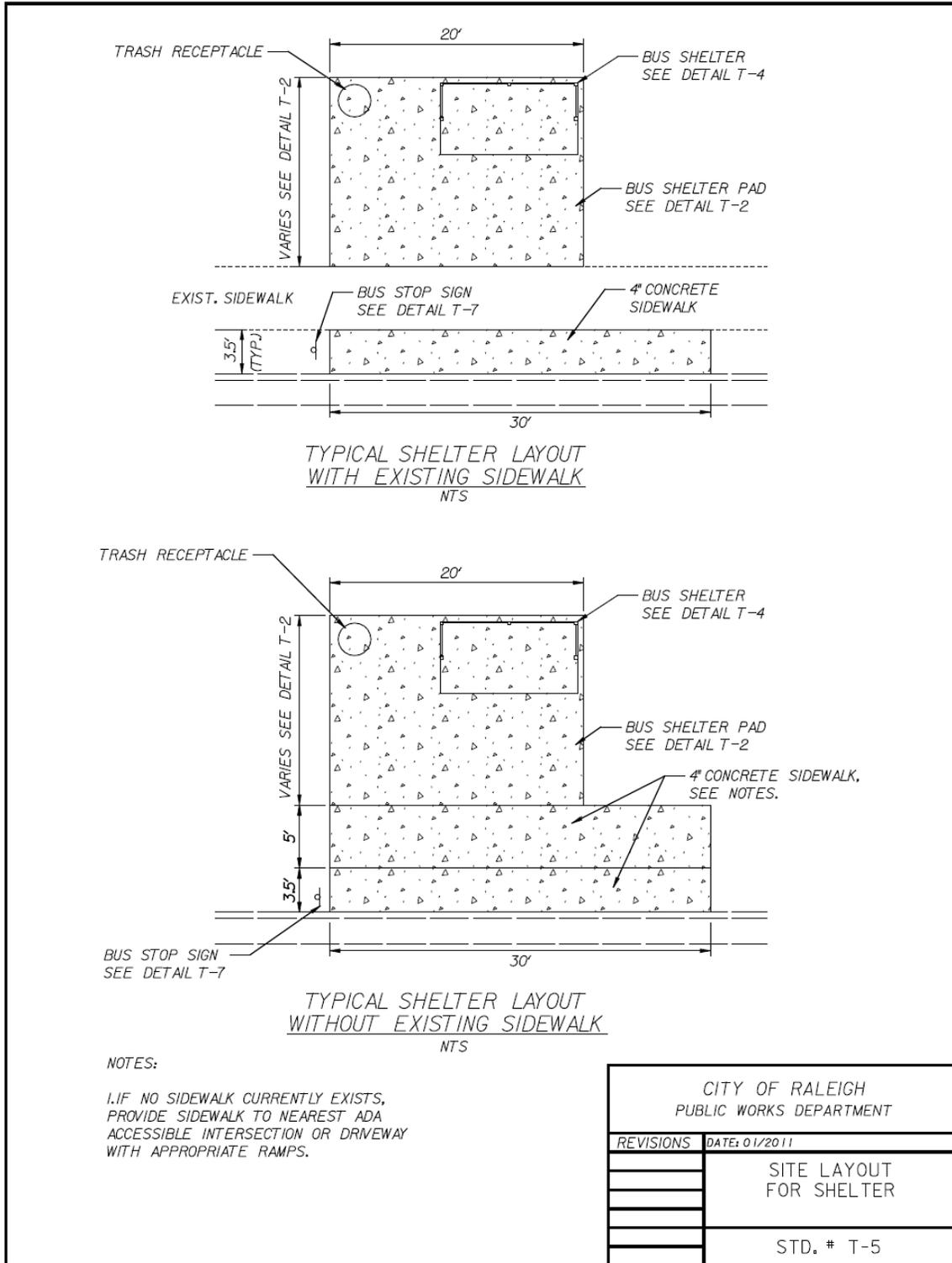
GENERAL BUS PAD NOTES:

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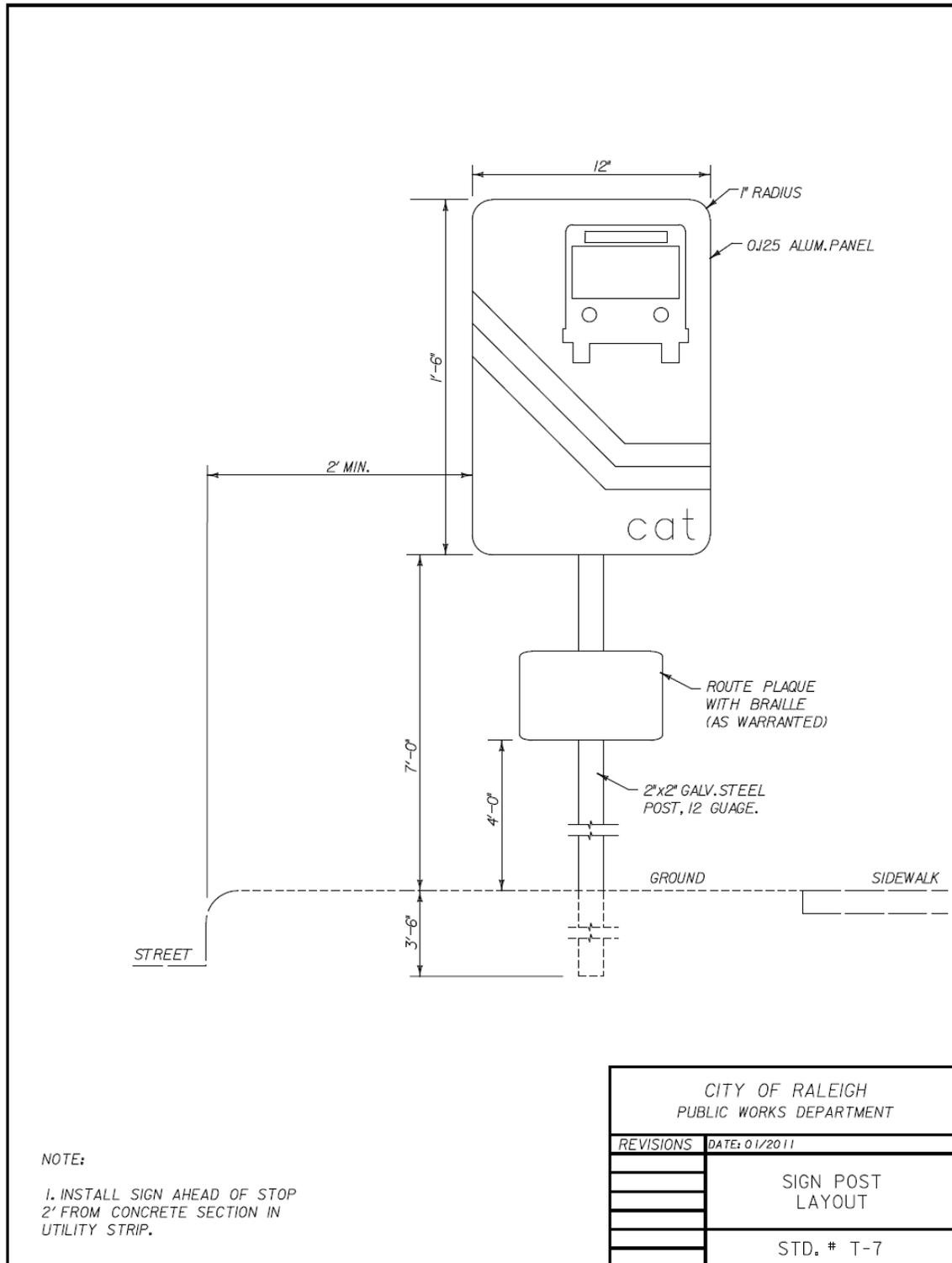
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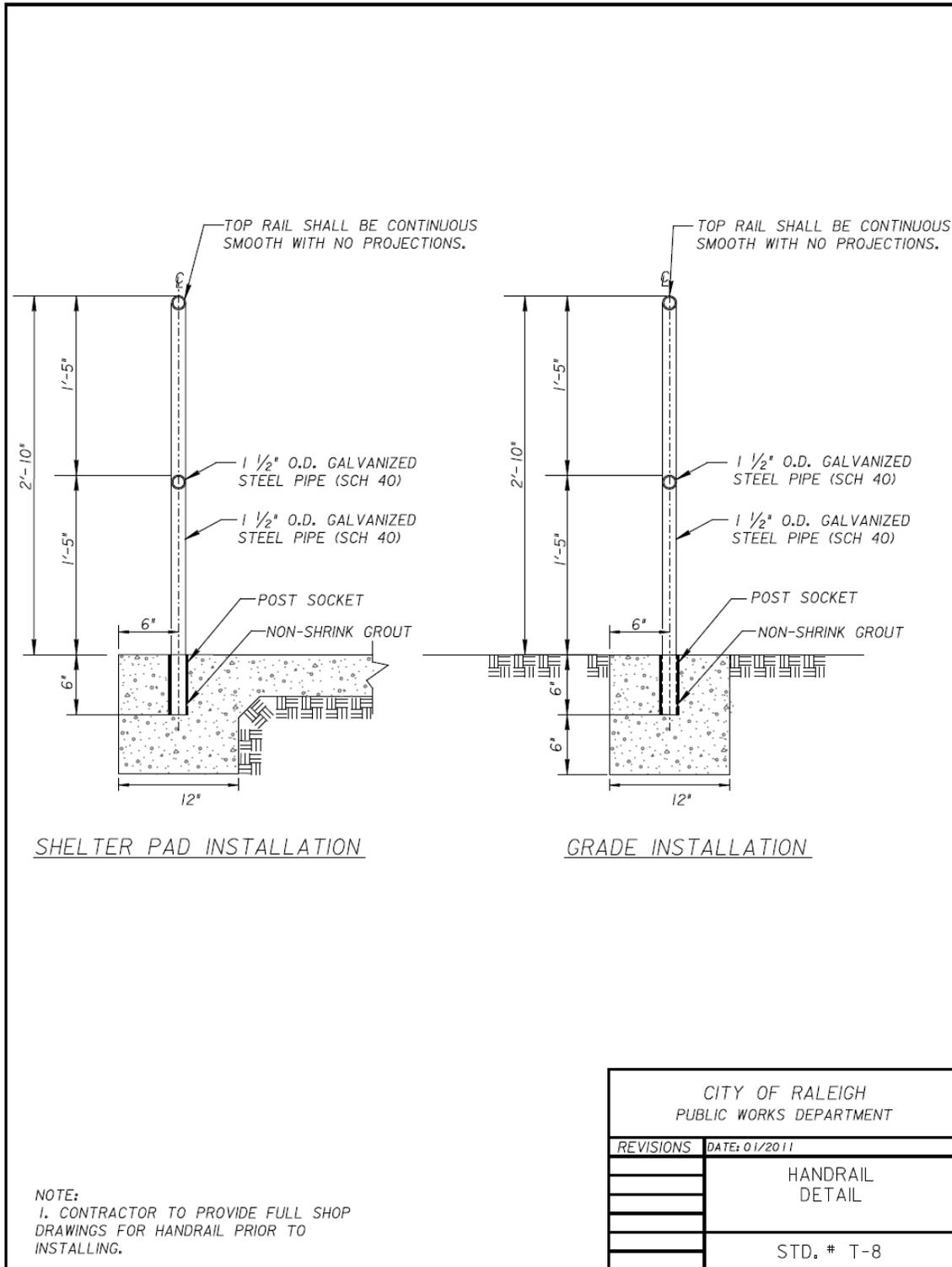
CITY OF RALEIGH PUBLIC WORKS DEPARTMENT	
REVISIONS	DATE: 01/20/11
	BENCH PAD DETAIL
STD. # T-3	

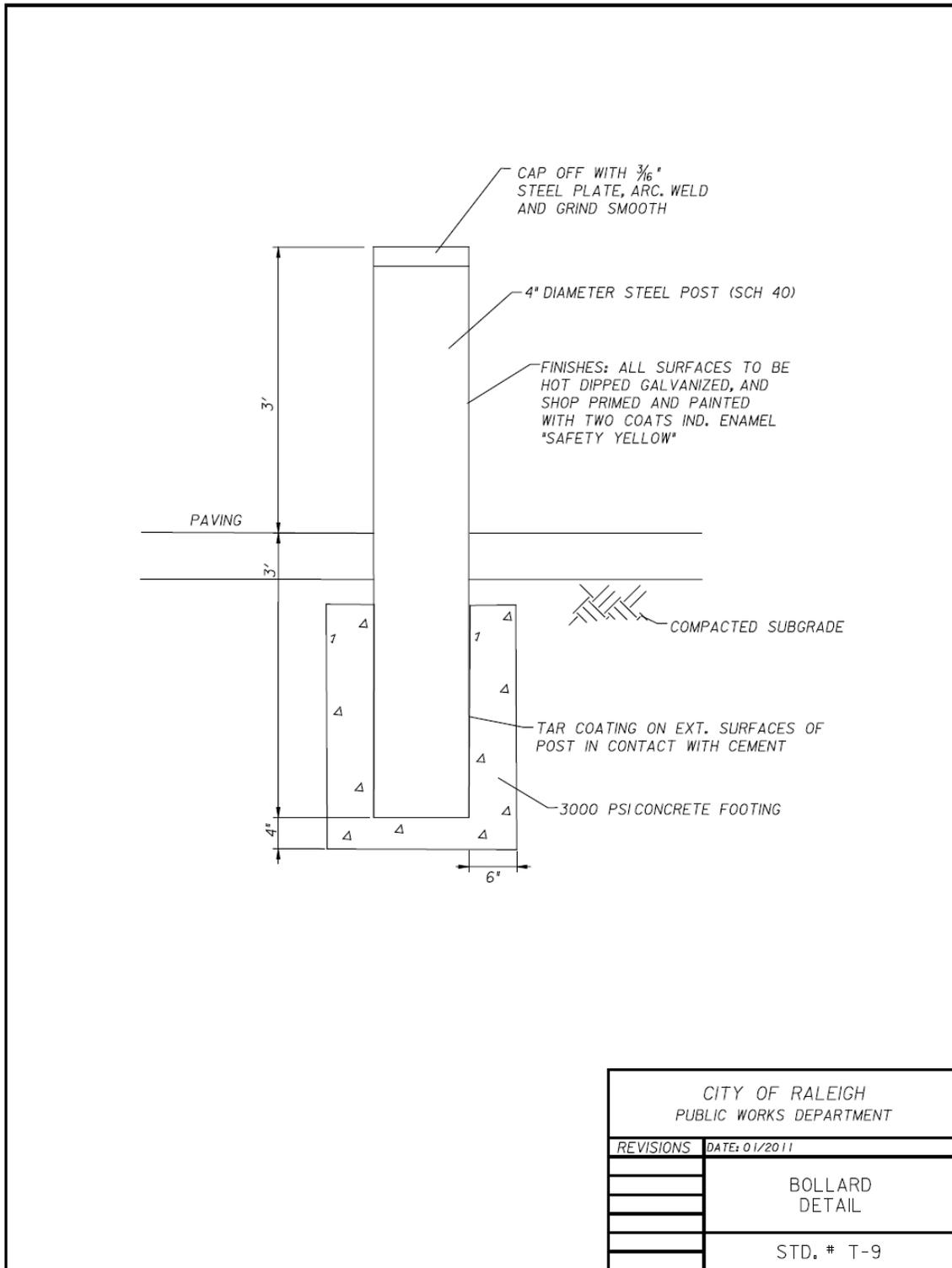


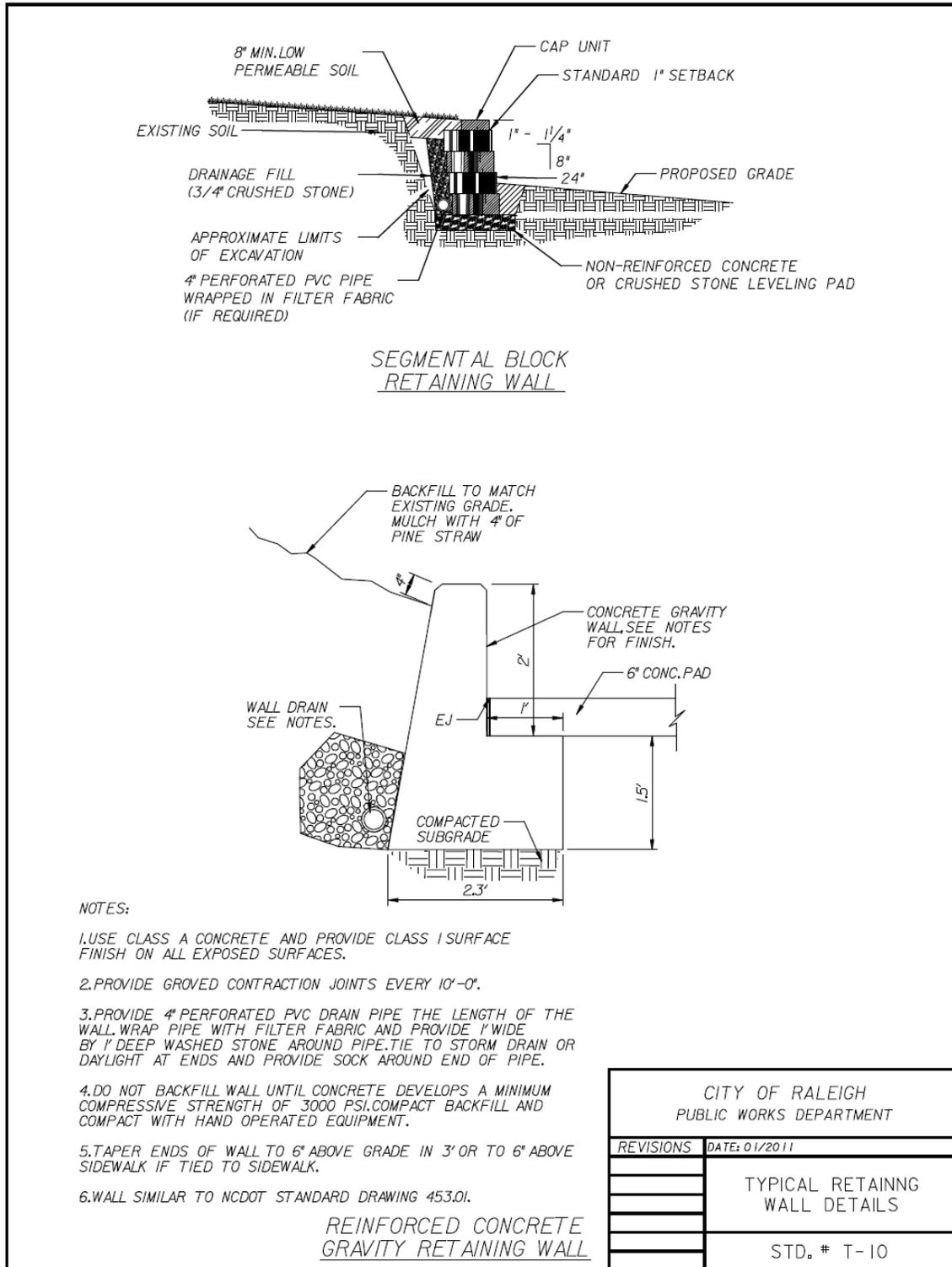


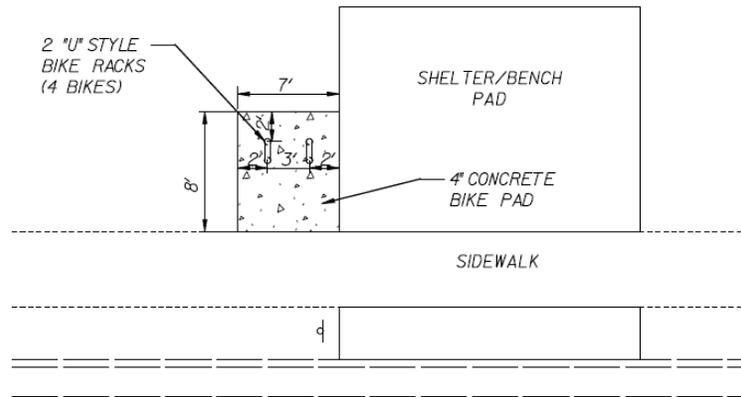




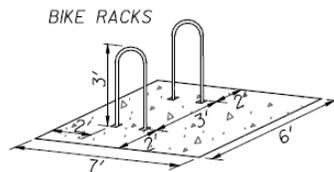








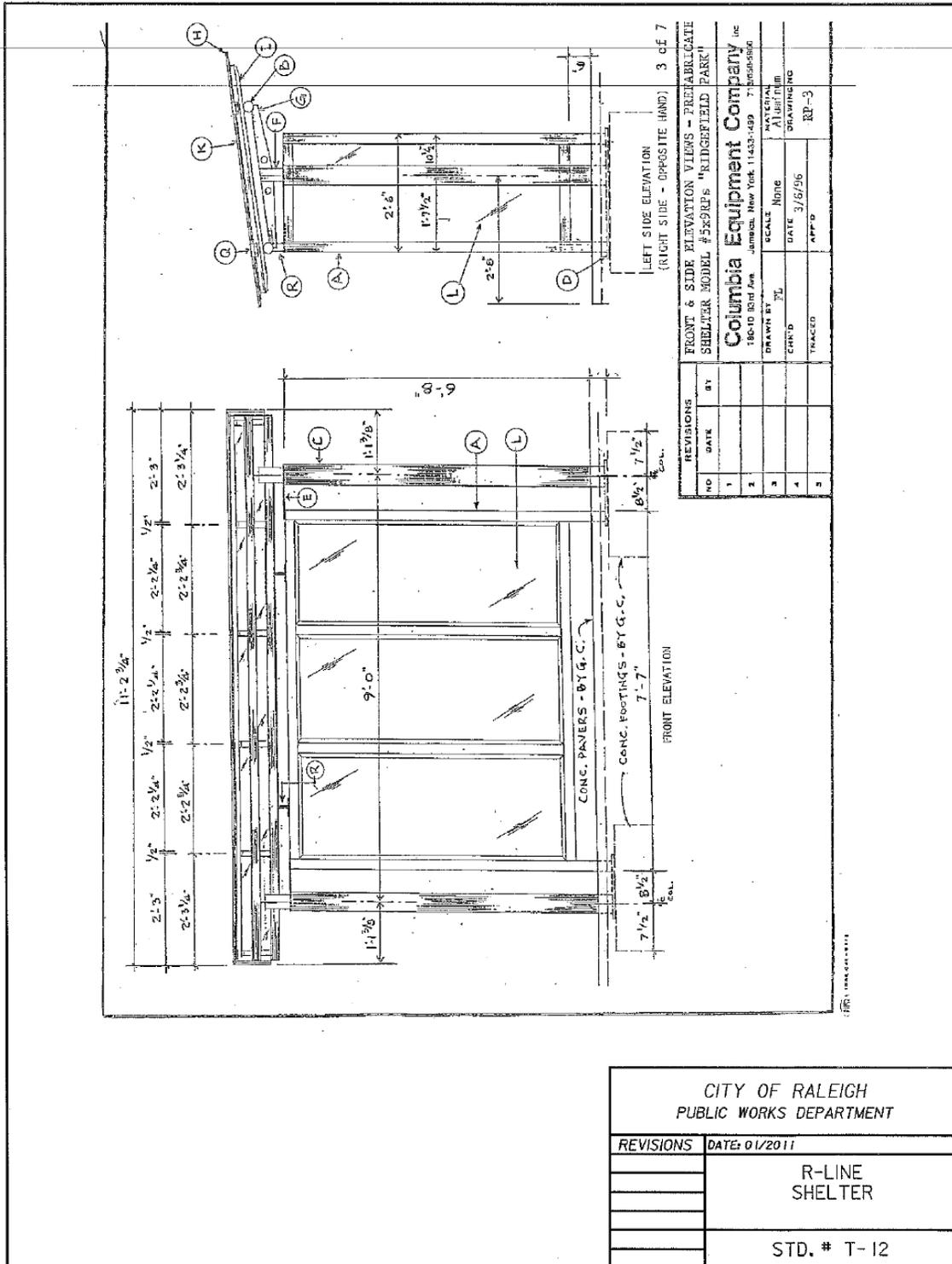
TYPICAL BIKE PAD LAYOUT  
NTS



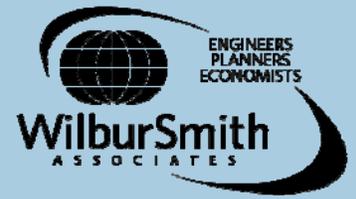
BIKE RACK SCHEMATIC

NOTE:  
1. BIKE RACK TO BE 2" SCHEDULE 40 STEEL  
POWDER COATED BRONZE.  
2. COORDINATE LOCATION WITH CAT PRIOR TO  
INSTALLATION.

CITY OF RALEIGH PUBLIC WORKS DEPARTMENT	
REVISIONS	DATE: 01/2011
	SITE LAYOUT FOR BIKE PAD
	STD. # T-11



CITY OF RALEIGH PUBLIC WORKS DEPARTMENT	
REVISIONS	DATE: 01/2011
	R-LINE SHELTER
	STD. # T-12



# City of Raleigh Other Passenger Amenities Information Supplemental B



March 2011

## Supplemental B: Other Passenger Amenities Information

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### ***Agency Coordination for Cleaning and Maintaining Shelters***

#### **Overview**

Well-maintained bus stops and shelters are important to the image of the transit system. It is generally the first link to the system by its customers; therefore, in addition to the priority of safety, presenting a positive public area of shelters and stops is critical for maintaining existing riders as well as attracting new riders. Thus, damaged shelters and street furniture, as well as trash build-up should be addressed in a proactive manner.

#### **CAT Experience**

The City of Raleigh currently owns approximately 1,500 bus stops within the Raleigh service area. Maintenance of shelters and stops is currently part of the contractual responsibility of Veolia Transportation, the CAT contract service operator, who currently completes repairs, cleaning, and general upkeep duties as part of its responsibilities. This process, however, is scheduled to change, as the City is currently completing a bus stop cleaning and maintenance Request for Proposal.

From a regional standpoint, CAT has multiple partners that share stops, shelters, and right-of-way jurisdictions. Partners include other transit providers such as Triangle Transit and the Wolfline, in addition to other City Departments and private commercial businesses. In that regard, it may be beneficial from a management and control perspective to consider the development of interagency and/or inter-local agreements by which maintenance responsibility is detailed and defined.

#### **Industry Experience**

From an industry perspective, interagency agreements are commonplace when transit authorities serve multiple jurisdictions and can be used in the management of a range of functional areas including maintenance of traffic signalization and other IT system components, street and sidewalk maintenance, snow removal, etc.

In each of the above instances it is typical for a lead agency or most affected party to develop a standard interagency communication such as a memorandum

of understanding or agreement. The memorandum of agreement should do the following:

- Recognize that public transportation and access to public transportation is an important regional activity which provides local connections to commercial and other activities in each of the jurisdictions it serves.
- Understand that as a regional service there is a need to provide consistent, safe, clean amenities to customers.
- Recognize that each partner should retain authority to control resources under their own jurisdiction.
- Emphasize that the purpose of the agreement is to acknowledge the cooperation of all participating agencies to commit to work together to maintain the highest level of safety and access to the systems.
- Reinforce that the MOU/MOA is not a legally binding contract – it constitutes solely a guide to the intentions and policies of the partnering entities.
- Develop and define the roles and responsibilities of the participating agencies in the installation and maintenance of shelters, stops and access to the transit services in the region.
- Establish that the agreement is not intended to authorize funding.



Manufacturers of shelters and other amenities include recommended Original Equipment Manufacturer developed practices for standardized maintenance, operation, and upkeep. At a minimum, these should be referenced in any shared agreement.

From an industry perspective, general maintenance guidelines include the following minimum policies:

- Full wash down of shelter and accessories at an agreed upon frequency, often once a month.
- Removal of all dirt, graffiti, and pasted material as needed.
- Wipe down of glass surfaces on at least a weekly basis.
- Removal and replacement of trash once a week. This standard should be performed more than once a week if trash accumulates frequently and particularly at high traffic locations.
- Litter pick up around stop or shelter/accessories to a distance of 15 feet.

- Manual or chemical removal of weeds on at least a monthly basis.
- Pruning of obstructing foliage when necessary.
- Touch up of marred paint as needed.
- If shelters have lighting, verify foot candle light levels and replace bulbs and other related material as necessary and appropriate.
- Repair of items that pose a safety problem should be performed as soon as possible.

It should be noted the above items are representative of policies from other jurisdictions and provide a basic menu of possibilities for consideration. In Raleigh, additional issues, such as snow removal policies, frequency of trash collection, etc. would need to be specifically addressed. However, the main process remains the same, assemble the affected agencies, receive input on priorities, develop a specification for services to be performed, and evaluate the proposals received. Similar to other service-related agreements, a process for monitoring results should also be developed to ensure that the anticipated quality of service is delivered. The process also should include notices for improvement, potential penalties and correction activities and the ability to terminate the agreement for cause.

## ***Advantages and Disadvantages of Contracting for Shelter Installation and Maintenance in Exchange for Advertising Space***

### **Overview**

The process for determining who should install and maintain benches and shelters varies from community to community based on a number of factors, including cost, policies and preferences. Many cities and transit agencies have used this opportunity to bring in an outside vendor or contractor to offset the costs for installing and maintaining shelters in exchange for providing advertising space. Currently, other communities, such as Raleigh, do not have the opportunity to advertise on shelters or benches based on the mandate of no advertising within the state Department of Transportation right-of-way and City right-of way.

### **Use of Advertising Agreements**

Many transit agencies take advantage of the opportunity of bench and shelter installation to bring in supplemental revenues to the agency, through paid advertising. The revenues of this type of program may be modest, but in concert with the typical cost of the shelter incurred by the vendor and the installation, transit agencies have used this mechanism to assist in obtaining additional funding for the agency. Several years ago it was believed that significant revenue could be created for jurisdictions with these types of agreements; however, the interest from potential vendors and advertisers has decreased as part of the recent economic downturn. In addition, there have been instances where legal

and other concerns have been raised regarding the rights of the advertisers, the rights of the agencies, etc. that have been the subject of public scrutiny which has resulted in some additional concerns about these programs.

In some jurisdictions, such as the MBTA service area in Boston, agreements have been signed by a shelter advertising company which is responsible for placing and maintaining shelters. The MBTA process was to have the shelter vendor install approximately 10 shelters which they would maintain twice a week. After the 15 year contract term, the City could either retain the shelters or request removal. The anticipated revenue to the City would be \$1,400 per year per shelter.

This type of agreement is the most common which trades off a certain number of shelters for advertising opportunities. In some instances the shelter company selects the stops for sites, in others those sites are selected by the public agency and in a third variation some stop sites are selected by each entity.

With regard to maintenance, there are a number of potential variations. In the example above, the jurisdiction has required a maintenance frequency. In other agreements a standard of cleanliness (no overflowing trash receptacles etc.) is established. In each instance, there should be some form of monitoring developed by the public agency to ensure that the negotiated level of maintenance is provided.

The advertisements are placed on panels attached to the bus shelter to take advantage of the visibility that the bus stop receives from passing traffic. Backlighting is sometimes used to display the images at night. Advertisements do not necessarily have to be attached to the shelter. In some areas, kiosks are used to display advertisements. Depending on design, the kiosk may provide additional protection from the elements at a bus stop.

Disadvantages associated with advertisements placed on shelters and kiosks include compatibility with local land uses, ordinances, and safety. The signs can conflict with color schemes or limit views of adjacent store fronts. Advertising at bus stops must also comply with local sign ordinances, which may hinder installation in some communities.



Passenger and pedestrian safety and security should also be considered. The advertising panels may limit views in and around a bus stop, making it difficult for

bus drivers to see patrons. The panels can also reduce incidental surveillance from passing traffic. To prevent restricted sight lines, advertising panels and kiosks should be placed downstream of the traffic flow. An approaching bus driver should be able to view the interior of the shelter easily.

Based on information from TCRP Synthesis 51, Transit Advertising Sales Agreements, most transit agencies do accept and display advertising. New graphics technology has made it easy and cost-effective to apply on different types of surfaces. In addition, the majority of the large transit agencies have bus advertising programs with full-service and long-term outside contracts with companies specializing in bus advertising. In mid to small markets, nearly half of transit agencies sold some or all of their advertising space using in-house staff. On average, the transit agencies receive either a guaranteed amount of revenue or approximately 55 percent of the ad sale revenue, whichever is greater.<sup>1</sup> This equates to an average of 1.5 percent of total operating funds of an agency. Until the recent economic downturn, the revenue stream from advertising sales had been growing at a steady rate for most agencies.<sup>2</sup>

Transit agencies deciding whether to embark upon an advertising program face a number of important decisions, such as:

- Should they sell advertisements in-house or contract out the function? If contracted, what should be the contract terms and how should a request for proposals be structured?
- What types of displays should they sell?
- Should they pursue nontraditional forms of advertising such as bus and train wraps, station dominance, in-vehicle and in-station video screens, and electronic signs and in-tunnel advertising?
- Should they accept noncommercial and public service advertising? How can the agency avoid becoming entangled in controversy over advertisements that address emotionally charged issues such as abortion and other sexual topics or that portray graphic violence?
- How should staff strike a balance between maximizing revenues and using advertising space to promote the agency and help the community through public service advertisements?
- Should shelter and stop advertising be a separate contract or part of the overall advertising program for the agency?

The primary areas for consideration include legal, operational, safety, and aesthetic issues.<sup>3</sup> Transit agencies may opt to limit the size or placement of advertisements. Bus wraps, for example, in particular generate a variety of reactions and are often limited in number, time, or place, or banned altogether. In

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<sup>1</sup> TCRP Synthesis 32, Transit Advertising Revenue: Traditional and New Sources and Structures.

<sup>2</sup> TCRP Synthesis 51, Transit Advertising Sales Agreements, 2009.

<sup>3</sup> TCRP Project B-10, Role of Passenger Amenities and Transit Vehicle Characteristics in Building Ridership. TCRP A12, Passenger Information Services.

restricting advertising sales, transit agencies may be motivated by aesthetic considerations, often driven by the preferences of the governing board. Agencies may also seek to create a clean and uncluttered appearance on their property and vehicles to maximize the prominence of agency logos and other branding. Other cities, such as Seattle, who similar to Raleigh, limit advertising in the right-of-way and effectively preclude display of advertising on bus shelters. However, the potential for revenue generation in difficult economic times may influence agencies that do not accept advertising to reexamine local policies.

Another example is Lakeland, Florida; the service is called Citrus Connection. In this community, private developers contribute to the cost of the installation of shelters. This community does not allow advertising on shelters; however, the contributing promoter is allowed to put a small signor plaque within the shelter on which the name of the company is inscribed.

### **Maintaining Agency Control**

Should the City of Raleigh consider private advertising as a revenue generator on public property, the legal question to most likely arise first is how can the city retain maximum control over the advertisements that are displayed on public property?

The answer, most often provided and apparently determined by a large body of case law, is: *promulgation and consistent enforcement of a policy that identifies the advertising space as a nonpublic forum and prescribes objective eligibility criteria for participation in the program.* Through such action, a city can ensure the profitability of its private advertising program by minimizing the civil rights liability exposure presented by its managerial decisions.

Any government entity should expect to have an advertisement they wish to not display based on aesthetics, politics, or some other reason. Excluding the advertisement may violate the First Amendment rights of the advertiser and result in a civil rights liability. To prevent this scenario, a private advertising program should be implemented with four strategies listed below.<sup>4</sup>

- The advertising space must be declared a nonpublic forum.
- An eligibility policy must be established to restrict the types of advertisements that may be exhibited through the program.
- The eligibility policy must be consistently enforced.
- Lastly, the advertisement should never be excluded from the program because of the viewpoint that it advocates. It must be a neutral viewpoint.

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<sup>4</sup> <http://archive.calbar.ca.gov/calbar/2cbj/01aug/mclestdy.htm>

## **Examples of Other Advertising Programs and Practices:**

### ***Central Florida Regional Transportation Authority (LYNX), Orlando, FL***

LYNX began its advertising program in 1992. The transit agency has seen extensive growth over the past decade, much contributed to aggressive service expansion, along with a comprehensive marketing and outreach program. In the past few years, LYNX ridership decreased, primarily due to the decreasing job market, the decline in gas prices, and various service efficiencies. In FY2009, LYNX received approximately \$1.1 million in revenue from advertising. This amount has decreased over the past two years from \$2.3 million, primarily due to non-renewal and/or reduction of several contracts, and some contracts have been declined.<sup>5</sup>



Two full-time commissioned staff people are responsible for the advertising program that includes: surface of the buses, interior bus space, bus shelters, print advertisements in the schedules and schedule books, and sponsorships. LYNX makes 10 percent commission on the buses and 15 percent on the shelters. LYNX provides marketing services for other agencies that come to them for help and has an artist under contract to paint their own fleet and on other agency vehicles.

The decision to operate the advertising program in-house was an economic decision based upon management belief that by using commissioned sales people, they could net more than by contracting with an outside agency.

### ***Washington Metropolitan Area Transit Authority (WMATA), Washington, D.C.***

WMATA, the regional bus and rail transit agency for the Washington metropolitan area, has held many staff and Board discussions whether to permit a quality advertising program and how to present it in a professional manner that is in the best interest for the community. An outside agency was chosen by WMATA based upon the belief that full-time advertising specialists would have a broader network of clients and buyers to capitalize on a national client base interested in the Washington area. In March 2010, the agency released a Request for Proposal for a three-year marketing contract, with two optional years. WMATA has formal written policy guidelines regarding the content of ads.

WMATA contracted with Transportation Displays, Inc. for a 5-year contract period with 58 percent return from bus advertisements and 60 percent for rail advertisements. The agency advertising revenue has grown from \$7.7 million in

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<sup>5</sup> LYNX FY2009 Annual Report.

1997 to \$38 million for FY2008.<sup>6</sup> This reflects the amount in the Minimum Annual Guarantee between WMATA and the contractor of \$35 million, plus an estimated \$3 million from new advertising activities which are new advertising inventory, including station pylons and pillars, floor graphics, trash receptacles, larger backlit dioramas, interior railcar doors, rail ceilings, wall-scapes and website advertising. In 2007, WMATA and Clear Channel, Inc. agreed to provide management and maintenance for the shelters, which include maps, grooved benches, and real-time bus information.

### ***Metropolitan Transit Authority of Harris County (METRO), Houston, TX***

METRO is one example of a large transit agency without an advertising program. When METRO began in the 70s, advertising was determined to have negative connotations. Since that time personnel within the agency has tried to broach the topic, and in 2005, put out a request for bids for bus shelter ads. However, the effort was stopped when it appeared that there was insufficient momentum to overturn an existing city ordinance prohibiting commercial advertising in city right of way. In 2009, METRO looked at advertising strictly on buses, but information indicated that a relatively small amount of revenue would be generated.

With the recent economic downturn and funding reductions, METRO began advertising the Houston Zoo on the side of three light rail vehicles in 2010. It is a cooperative agreement between the Houston Zoo and METRO, and no revenue is generated.

It should be noted with regard to naming rights, that the Cleveland GRTC has negotiated an agreement with two medical facilities and has named its BRT the "Health Line". Other agencies are also pursuing naming rights for services and stations.

### ***Charlotte Area Transit System, Charlotte, NC***

The Charlotte Area Transit System was anticipated to start advertising on buses and light-rail cars, according to the Metropolitan Transit Commission who approved the policy in September 2010. CATS has had a 10-year-old policy prohibiting exterior, but decreasing revenues from the half-cent sales tax for transit resulted in reconsideration of that policy. CATS estimated that the ads on buses and trains could generate approximately \$4.7 million over 5 years, after expenses, or approximately \$1 million per year.

The revenue projections are based on smaller ads that could be placed in between bus windows and the wheels, and on assumptions that advertising could be sold on half of CATS buses and train cars. CATS estimated bus ads could generate \$2.4 million over five years and Lynx rail line ads could bring in \$1.3 million. Ads on the back of Lynx tickets, electronic kiosks at train stations,

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<sup>6</sup> [http://www.wmata.com/about\\_metro/docs/FY2008\\_Budget\\_Book\\_final.pdf](http://www.wmata.com/about_metro/docs/FY2008_Budget_Book_final.pdf)

and electronic ads on ticket-vending machines could bring in nearly \$1 million over five years.

CATS recommended against expanding ads to bus benches and shelters, in part because they would negatively impact neighborhoods.

## ***Implementation Plan for the Regional Adoption of the Passenger Amenities Standards***

### **Overview**

The following section contains information regarding the regional network of services that connects with and includes shared stops and information within the CAT service area and includes several recommendations for short and long term incorporation of these guidelines and standards into that regional process.

### **Go Triangle**

Go Triangle is a partnership of public transportation agencies and organizations funded to promote commuter benefits in the Triangle. The organization website is [www.GoTriangle.org](http://www.GoTriangle.org) and assists people to find information they need to “get out from behind the steering wheel and find other travel options that are safe, convenient, inexpensive, more sustainable.” Participating public transit agencies in various areas include:

**Raleigh:** Capital Area Transit (CAT) and NC State University’s Wolfline

**Cary:** Cary Transit (C-Tran)

**Durham:** Durham Area Transit Authority (DATA) and Duke University’s Duke Transit

**Chapel Hill:** Chapel Hill Transit (also serves the University of North Carolina’s campus)

**Regional Service:** Triangle Transit provides service to Raleigh, Cary, Apex, Hillsborough, RTP, Durham, Chapel Hill, Garner, Wake Forest, Wendell, Zebulon and RDU Airport.

In addition to the website information above, participating agencies have agreed to a common marketing and advertising program, a regional telephone number (919.485.RIDE) and information center, and have services listed on Google Transit. As part of the marketing and advertising program, the development of a regional services bus sign has been proposed.

Within the industry, there have been several types of regional service campaigns for information that have been discussed and implemented, with varying degrees of success. Particularly in larger metropolitan areas there may be a number of different operators, each with different size bus stop signs and information. Thus, at joint stops there can be a proliferation of “street furniture” which may not be pleasing visually and may also be difficult to maintain. Therefore, some regions have developed processes to list multiple services on a single sign, sometimes including the logos of the various agencies along with the route number and destination.

### **Role/Adoption of These Standards**

The intent of this Passenger Amenity Guidelines & Transit Design Guidebook is to implement a consistent set of stops, shelters and amenities within the CAT service area, which includes the use of shared stops and facilities. These standards are intended to be communicated to government agencies, commercial and residential developers, employers, and others to provide safe and attractive transit facilities. The standards can then inform individuals and business leaders throughout the CAT service area how best to interact with the system, including incorporating land uses and road networks that support public transportation, while providing transportation infrastructure that supports overall community goals.

As indicated above, there is also logic to incorporating a broader regional transit perspective into the process. Thus, it would appear that in the short term, based on the Town of Cary process discussed above, that CAT and Cary staff work collaboratively to compare these guidelines with the Cary planning process. The results of that effort could then be communicated to the other Go Triangle partners to provide a short term review and conceptual approval of these guidelines and standards.

In the long-term, all of the Go Triangle participants could develop some collaborative policies with regard to stops, shelters and amenities including finalizing sign design and placement and other issues.



# City of Raleigh Route 1 and 2 Bus Stop Amenities Inventory and Overview Supplemental C



March 2011

## Supplemental C: Route 1 and 2 Bus Stop Amenities Inventory and Overview

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### **Introduction**

Time spent at the bus stop constitutes the first and last experience each rider has with the CAT transit service each time they board the bus. Thus, the customer experience at the bus stop is a critical component of the overall perception of the service. The City identified two bus routes to analyze regarding current characteristics. For example, consistent spacing of stops can reduce trip times, thus benefiting the majority of current riders and also attracting new users to the system.

Supplemental C provides a review of these bus routes and general recommendations for improvements.

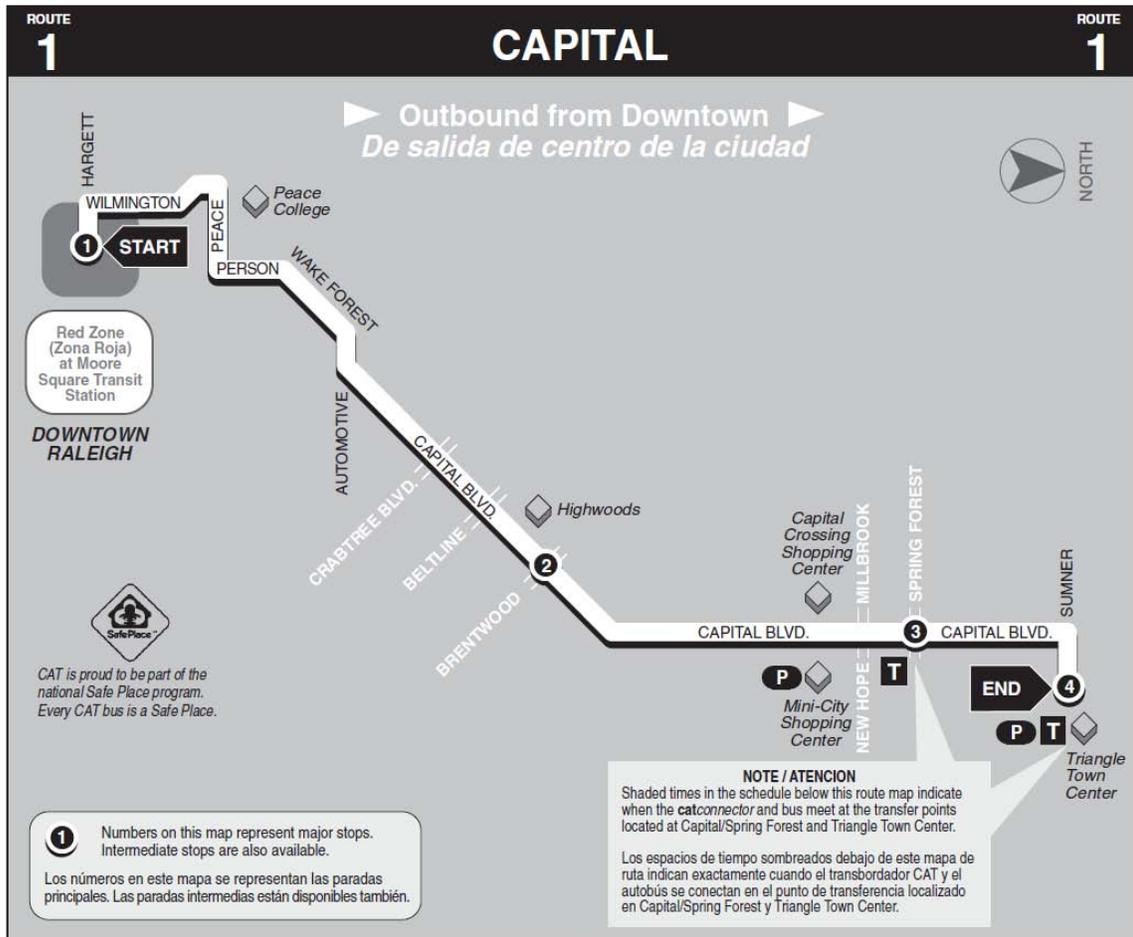
- **Route 1 – Capital** is one of the busiest and most productive routes, operating between the Moore Square Transit Station and the Triangle Town Center. Figure 1, shown on the following page, displays Route 1. In addition to Triangle Town Center, this route serves Capitol Park, Peace College, Highwoods, Tarrymore Square, Mini City, and numerous other shopping centers along Capital Boulevard. Route 1 operates every 30 or 60 minutes on weekdays from 5:45 a.m. to 11:28 p.m., every 60 minutes on Saturdays from 5:45 a.m. to 11:28 p.m., and every 60 minutes on Sunday from 8:00 a.m. to 7:28 p.m. Weekday ridership ranks in the top five of CAT routes. During the September 2002 passenger boarding and alighting count, it carried 869 passengers per day on weekdays, with an average of 36.2 passengers per hour. The survey also disclosed that over half the riders have no vehicles available in their household.<sup>1</sup> Route 1 currently has 64 bus stops.



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<sup>1</sup> CAT 2002 TDP.

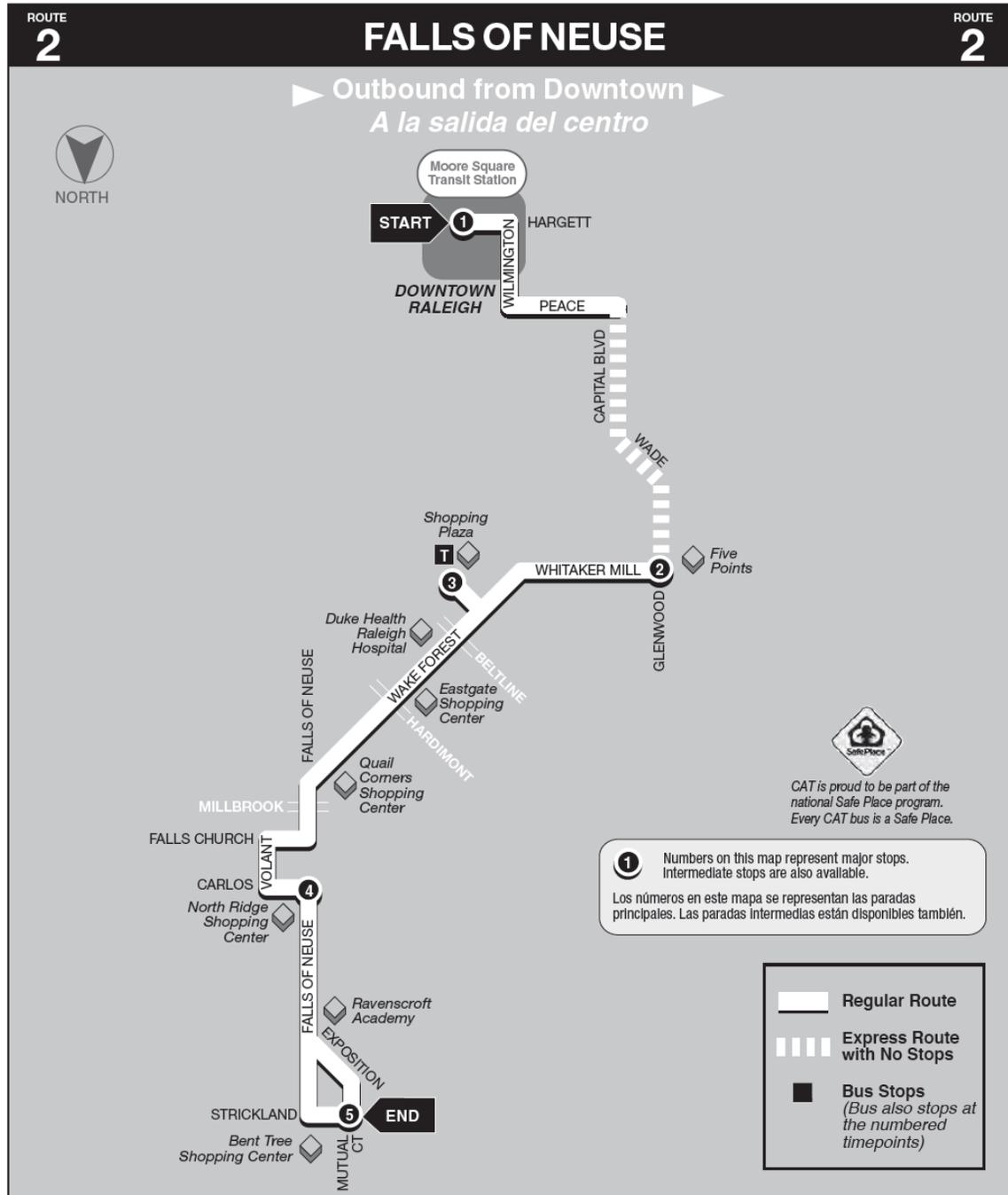
Figure 1: Route 1 - Capital



- Route 2 – Falls of the Neuse** operates between the Moore Square Transit Station and the Bent Tree Shopping Center on Falls of Neuse Road. The route traverses Glenwood Avenue, Whitaker Mill Road, Wake Forest Road and Falls of Neuse Road, as shown on Figure 2 on the following page. Other locations served by this route include Five Points, Lowes Food Plaza, Eastgate Shopping Center, Raleigh Community Hospital, Quail Corners Shopping Center, and the North Ridge Shopping Center. Route 2 operates every 30 or 60 minutes on weekdays from 5:00 a.m. to 7:12 p.m., and every 60 minutes on Saturdays from 5:30 a.m. to 7:12 p.m. Weekday ridership on Route 2 is also ranked in the top five of CAT routes. During the September 2002 passenger boarding and alighting count, there were 913 passengers per day on weekdays, with an average of 21.1 passengers per hour. Approximately half of Route 2’s riders also have no vehicles available.<sup>2</sup> Route 2 currently has 128 stops.

<sup>2</sup> CAT 2002 TDP.

Figure 2: Route 2 – Falls of Neuse



One of the goals of this guidebook is to develop a toolkit for the City of Raleigh so there would be consistency with bus stop and station locations as well as in the amenities which would be provided. One of the outcomes of the bus stop and amenity program is to balance the spacing of the stops to facilitate travel, while providing access for potential riders in a consistent manner that also includes a pleasant streetscape. Several of the important attributes of a bus stop program, such as accessible paths and an area for the stop and amenities require coordination with other City departments as well as other agencies.

Some existing CAT routes traverse underdeveloped areas, streets, and roads. In these cases application of the design guidelines may be limited by a lack of public right-of-way, constraints due to the natural terrain, unimproved roadways with no curb and gutter, drainage, or sidewalks. Lack of access also impacts riders with disabilities and increases the demand for comparable ADA paratransit services. Thus, a coordinated planning and design effort between CAT, other city departments and affected agencies, such as the North Carolina Department of Transportation, would be beneficial. In addition, incorporation of new Raleigh policies regarding “Complete Streets” will provide more consistent and comprehensive directions for overall access issues.

### **Bus Stop Inventory**

A comprehensive bus stop inventory for Route 1 and Route 2 was conducted in the fall of 2009 as part of this study effort. The stop by stop inventory is included as a separate attachment to this report due to the file size. The inventory includes information on activity at each stop with regard to bus stop amenities, including signage, shelter, information, and the pedestrian environment. This information was utilized for developing general recommendations in this report.

Figure 3 presents a sample inventory for the Wilmington and Polk bus stop along Route 1. In addition, boarding and alighting information from 2002 was used to gauge order of magnitude activity at each stop. The bus stops along Route 1 and 2 with 10 or more daily boardings (the CAT typical threshold number for bench installation) and with 25 or more daily boardings (the typical CAT threshold for shelter installation) are shown below.

<b>Route 1 and 2 Daily Boardings</b>			
<b>10 or More Boardings</b>		<b>10 or More Boardings</b>	
<b>Route 1 Outbound</b>	<b>Route 1 Inbound</b>	<b>Route 2 Outbound</b>	<b>Route 2 Inbound</b>
	Capital & Deana	Salisbury & Edenton	Falls of Neuse & Hunting Ridge
	Capital & New Hope Church	Glenwood & Hillsborough	Falls of Neuse & Ridgefield
	Capital & Mayflower	Glenwood & Peace	Fall of Neuse & Millbrook
	Capital & Huntleigh	Wake Forest & Six Forks	Wake Forest & Ollie
	Capital & Brentwood	Carlos & Falls of Neuse	Wake Forest & Colby
	Capital & Highwoods		Wake Forest & Dresser
	Blount & Cedar		Wake Forest & Wake Towne
			Wake Forest & Schlotzsky
			Noble & Pine
			Pine & Whitaker Mill
			Glenwood Ave & Glen
			Glenwood Ave & Johnson
<b>25 or More Boardings</b>		<b>25 or More Boardings</b>	
<b>Route 1 Outbound</b>	<b>Route 1 Inbound</b>	<b>Route 2 Outbound</b>	<b>Route 2 Inbound</b>
Triangle Town Center	Capital & Calvary		Strickland & Mutual
	Capital & Greywood		Wake Forest & Hardimont
			Wake Forest & Navaho
			Wake Forest & Lowes Food

Source: CAT TDP, 2002.

**Figure 3: Sample Bus Stop Inventory – Route 1: Wilmington/Polk Stop**

CAT BUS AMENITY GUIDELINE STUDY	
SITE:	3
LOCATION:	WILMINGTON ST. AND POLK ST. OB
NEW SHELTER:	
OLD SHELTER:	
NEW SHELTER W/ BENCH DOUBLE:	
OLD SHELTER W/ BENCH DOUBLE:	
SHELTER WO/ BENCH:	
BENCH:	SINGLE, WOODEN
TRASH CAN:	
STAND ALONE SIGN:	
TRANSIT SIGN ON NON STANDARD POLE:	BEHIND CURB
SHARED USE OF TRANSIT POLE WITH OTHER CITY INFORMATION:	NO PARKING
SHARED USE OF TRANSIT POLE WITH OTHER NON CAT SERVICES:	TRIANGLE TRANSIT
SIDEWALK:	8' PAVED TO C&G
CONCRETE PAD (DIMENSIONS, CONDITION):	
CURB AND GUTTER:	YES
PROXIMITY TO DRIVEWAYS:	
NEAR SIDE/FAR SIDE:	MIDBLOCK
EXISTING TOPOGRAPHY:	30' MAPLE TREE BEHIND STOP, 4:1 BACKSLOPE
PARKING RESTRICTIONS:	NPAT, BUS ZONE
DISTANCE TO NEAREST STOP LOCATION:	750'
DISTANCE TO NEAREST INTERSECTION:	50'
RIGHT TURN LANE, BUS TURN OUT LANE:	BUS LANE
SIGNALIZED INTERSECTION:	
CLOSEST CROSSWALK OR AT CROSSWALK LOCATION:	75'
ABUTTING PROPERTY:	PARKING LOT, FEDERAL BLDG.
UTILITY RESTRICTIONS:	TELCOM. MH IN SIDEWALK AT STOP
R/W CONDITIONS:	AT SIDEWALK
NOTES:	

## Recommendations

The following recommendations provide guidance for CAT, based on the bus stop amenity recommended guidelines shown below. Key goals of the analysis include:

- Improve the consistent application of stops and amenities for a more efficient transit system.
- Improve the transit rider experience through visibility of CAT services via accessible bus stops, attractive signage, reliable schedule information, etc.
- Coordinate with affected parties and local stakeholders during the planning process to be proactive in developing accessible and safe bus stops.
- Consider long-term goals of the services and system when implementing changes.

### Bus Stop Amenity Guide

Amenity	Basic Bus Stop	Enhanced Bus Stop	Transit Station
Bus Stop Sign	Yes	Yes	Yes
ADA 5' x 8' Landing Pad	Yes	Yes	Yes
Sidewalk	Yes	Yes	Yes
Lighting	Evening Service	Yes	Yes
Seating	Varies	Yes	Yes
Rear-door Landing Area	No	Varies	Yes
Bus Bay	No	Varies	Yes
Shelter	1 shelter per stop for 25+ boardings per day	1 shelter per stop for 25+ boardings per day	2 or more shelters for 25+ boardings per day
Trash Receptacle	Varies	Yes	Yes
Information Case – location, fares, bus stop ID, logo, schedule, etc.	Varies	Varies	Varies
Real-time Information	Varies	Varies	Yes

The categories are based on boarding activity, bus frequency, and number of bus routes served.

- **Basic bus stop** – has lower boarding activity. Improvements at the stops will have medium priority. At a minimum, there should be signage and safe, accessible, pedestrian access. Some of these stops may become more important over time, as land development projects, and service improvements with increased ridership occur. Continued monitoring of the boarding activity at these stops should be conducted to determine if amenities are needed in the future.

- **Enhanced bus stop** – has moderate or high boarding activity, and at a minimum, should have a bus shelter; map, route and schedule information and safe, accessible pedestrian access. These enhanced bus stops should have the highest level of amenities, including signage, a shelter or bench, and route and schedule information.
  - **Transit station** – is an area where two or more routes converge for systemwide transfers. Chapter 5 provides detailed information regarding characteristics of transit or transfer stations. At a minimum, a sheltered waiting area, lighting, schedule information, and an accessible boarding area are needed.
- 

## **Overview of Recommendations by category for Routes 1 and 2**

**Accessibility** - The current access board guidelines should be used for all bus stops along the corridor and future bus stops. These include:

- The bus stop boarding area should be 13 feet wide, allowing for the 8 foot wide vehicle plus a 5 foot wide alley for accessing the side of the bus.
- Access between the bus boarding area and the sidewalk should not require any movement in a traveled way of a road.
- If there is a bench, provide a 30-inch by 48-inch clear approach area adjacent to the bench and connect to bus boarding and alighting area.
- Keep signage from protruding into clear approach areas.

Many of the existing Route 1 and Route 2 bus stops do not fully meet these requirements. Modifications necessary to attain the requirements should be made as future street and sidewalk improvements are implemented by the City.

**Signage** - At a minimum, each bus stop should be clearly marked with a sign. The following features are recommended:

- Signs should be visible to pedestrians along the street.
- The signs should include information about which routes stop at each location.

**Bus Shelters** - The existing CAT standard shelters are similar to those found in many locales within the transit industry. The R-Line shelters, shown in Chapter 4, are one example of a more highly branded design. In the future, as CAT upgrades its family of services to include Bus Rapid Transit and other similar services, they should look to include additional amenity upgrades.

**Information** – As shown earlier in the Amenity Guide, information will vary at each location. There should be consistency and clarity in what is provided, as follows:

- Bus stop sign should include the route number.
- Bus shelters should provide additional system information.
- The use of other IT components should be considered at transfer locations.

### **Priority Improvements**

The following table provides recommended improvements that should be a priority for CAT. The table below concentrates on bus stops with over 25 boardings per day.

<b>Route</b>	<b>Stop</b>	<b>Improvement</b>
1 Inbound	Capital and Greywood	ADA access to curb with landing pad, shelter, trash receptacle, route and schedule information
2 Inbound	Strickland and Mutual	Sidewalk and ADA connections to shopping areas, shelter, route and schedule information
2 Inbound	Wake Forest and Hardimont	Shelter scheduled for installment. Sidewalk, connections to shopping center, route and schedule information
2 Inbound	Wake Forest and Navaho Drive	ADA access to curb with landing pad, shelter, route and schedule information, accessible path to hospital

In addition to the above priorities, CAT should aggressively coordinate within the City infrastructure to improve access along Capital Boulevard, Wake Forest Road, and Falls of Neuse Road, which should also be consistent with the City's Complete Streets policy. Currently, CAT has approximately 20 stops with over 10 boardings per day on these three main roadways, many which are currently non-ADA accessible without landing pads or sidewalk access.