Bus Stop & Passenger Facility Design Criteria and Standards

December 2020

(Rev. 0)

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Section 1 Introduction

1.1 Overview

This 2019 VTA Bus Stop and Facilities Design Criteria and Standards manual is an update of the 2010 version and is based on the accumulation of related VTA material for transit service and design guidelines. The purpose of this document is to provide uniform criteria and standards for the design and construction of bus related facilities and amenities in the VTA transit service area. These criteria and standards are intended to satisfy specific design considerations for transit facilities rather than provide a complete engineering design solution for each facility element. It is anticipated that the final design of an individual improvement would be conducted in conjunction with other VTA requirements and in compliance with appropriate local jurisdiction standards.

The guidelines for establishing these transit facilities standards are based on the following:

- Basic bus operations and safety requirements
- Current engineering practices at Valley Transportation Authority (VTA)
- Current standards used by other transit operators in the United States
- Americans with Disabilities Act (ADA)
- Amenities necessary for attracting and maintaining transit patronage
- Anticipated benefits to developers or local agencies in providing transit services to their future residents, tenants, and customers
- Compatibility of the improvements with other roadway uses

1.2 VTA Policies and Guidelines

The standards in this manual are derived from other VTA policy, plans and guidelines. These include the following related VTA documents:

1. Transit Service Guidelines (TSG) (2007; 2010 update)

   Provides ridership criteria for existing and new bus and light rail service, stops and stations. The 2007 version includes ridership criteria numbers in context of the VTA system at the time, while the 2010 update includes higher ridership numbers in comparison to other similar transit agencies.

   This is a supplement to the TSP. It includes service guidelines and criteria for bus and light rail routes, stops and station layout with typical details for the configuration of transit stops.

2. Transit Service Guidelines (TSG) (2018)

   Establishes a framework to objectively monitor and evaluate VTA's transit services, develop service change recommendations, and develop annual service plans that move VTA toward achieving the adopted 2017 Strategic Plan goal of providing fast, frequent, and reliable transit.

3. Pedestrian Access to Transit Plan (2003)

   This information is to be used by engineers and planners to evaluate and consider the pedestrian environment consideration when planning and engineering transit projects.

4. BRT Criteria and Guidelines

   Prepared as part of the Alum Rock/Santa Clara Bus Rapid Transit Project to be used as a guideline for all VTA BRT projects.

5. Transit Passenger Environment Plan (2016)

   Guide to improving safety, comfort, and convenience of the walking environment for VTA customers. This manual is used as a guide for reference for bike lanes at bus stops and for pedestrian and bicycle ways and other subsequent updates.

6. Santa Clara Countywide Bicycle Plan (2018), Bicycle Technical Guidelines (2012)

   Countywide bicycle plan can be used by engineers as a reference for bike lanes at bus stops. See also individual city bike plans.

7. Bicycle Technical Guidelines (2012)

   Present standards and guidance for planning, designing, operating, retrofitting and maintaining roadways and bikeways. Not to be used in place of expert engineering knowledge.

8. Complete Streets Policy (2017)

   Requires VTA to incorporate planned bicycle, pedestrian, transit, green infrastructure, intelligent transportation systems into all capital projects, with limited exceptions.

9. Transit Speed Policy (2019)

   Requires VTA to work with cities, developers, and other agencies to improve transit speeds through a variety of measures including ensuring bus stops are safe and easy for operators to access and egress, and designed for passengers to quickly, safely, and easily load and unload.

10. Station Access Policy (2018)

    Provides guiding principles and access priorities for station site planning for new stations, any existing stations where site improvements are proposed, stations where changes are proposed to the surrounding development, and where transit facilities are modified to accommodate Joint Development.

1.3 Bus Stop and Passenger Facility Design Criteria

In all engineering and construction of bus related improvements, there are several key components that deserve design consideration. These considerations can be summarized by the following:

1. *Design for Safety:* Safety must be the first and foremost consideration in transportation facilities design.
2. *Design for Accessibility:* Good passenger accessibility and circulation is not only desirable, but also a requirement under the Americans with Disabilities Act (ADA) and California Title 24.
3. *Design for Ease of Operation:* Be aware that the design standards are basic minimum requirements. The design should include adequate allowances that facilitate comfortable transit vehicle circulation and operation.
4. *Design for Positive Transit Experience:* Transit has to compete with automobiles. The design of an aesthetically pleasant environment with good passenger amenities will enhance transit experience.

5. *Design for Traffic Compatibility:* Transportation facilities, particularly the "on-street facilities", should be designed to minimize conflicts between vehicles, pedestrians and bicyclists.

6. *Design for Ease of Maintenance:* Avoid, as much as practicable, the use of unusual materials, shapes, dimensions and locations that could pose potential procurement and/or maintenance problems.

These standards provide criteria, dimensions, space requirements, typical layouts and designs for the following transit facilities and amenities:

- Bus Stops
- Bus Turnout
- Bus Stop Passenger Pads
- Pedestrian Accessway
- Bus Benches
- Bus Shelters
- Bus Stop Pavements
- Transit Centers
- Bus Boarding Islands
- Park and Ride Facility

Because transit vehicles, such as the typical large coaches used by VTA, are different than other vehicles using streets or highways, the following information related to these transit vehicles is also included:

- Vehicle Characteristics
- Bus Turning Radii
- Road Grade

1.4 Use of these Criteria and Standards:

1. VTA Staff

This manual is to be used by VTA for the engineering and preparation of construction plans for VTA bus stop and passenger facility improvements. The final layout of bus stop and passenger facilities deserve review confirmation with VTA Engineering, Planning and Operations staff.

2. VTA Requirements for Developers

Developers should use this manual for the planning and implementation of bus facilities related to proposed development. The proposed plans should be provided to VTA

Planning and Operations staff for review. The plans should include site drawings at an appropriate scale showing all existing features, existing or proposed property lines, proposed shelter details, and proposed shelter location.

3. City Assistance to VTA

When the local jurisdictions are reviewing and approving new developments, they should require dedication of suitable area for a shelter when the new development occurs at a planned shelter location. Furthermore, the local jurisdictions should require the inclusion of a shelter and other transit facilities as part of any major new development, such as a shopping center.

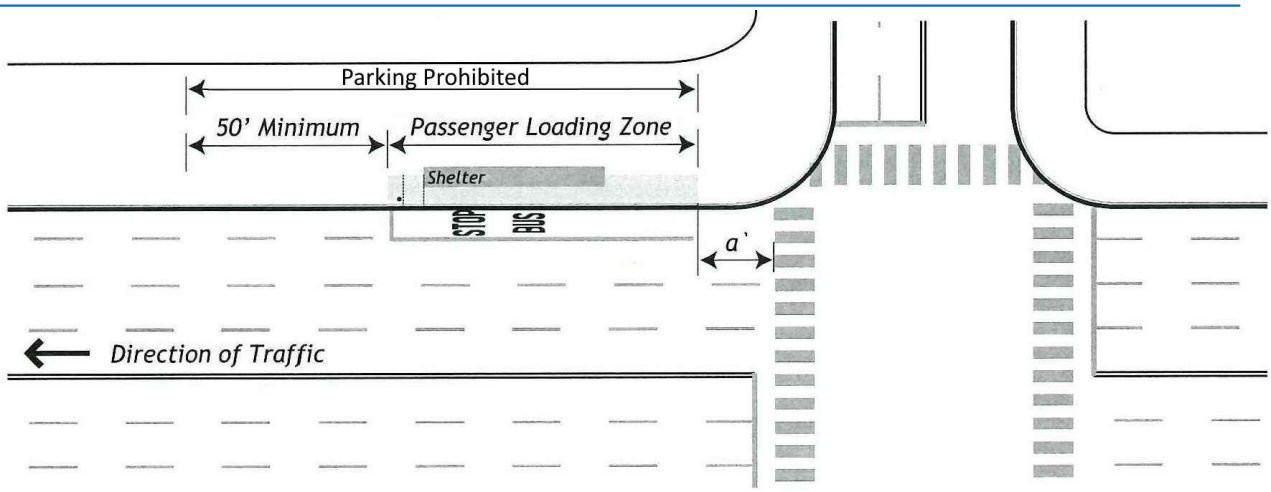
Section 2 Bus Stop Configuration

2.1 Bus Stop Location

Bus stop areas are provided in three basic configurations: Farside Stops, Nearside Stops, and Mid-Block Stops. Bus stop standards for these three configurations are shown in Figures 2.1a through 2.1g. Under normal conditions a farside Stop is preferred. Any other location must be approved as an exception. Therefore, the bus stop configuration should be used in conjunction with review of the field condition in context of the layout and the spacing guidelines provided in the VTA Transit Service Guidelines regarding the location of new stops.

A bus duckout is a specifically constructed area provided for bus loading and unloading which takes the bus completely off the normal roadway. The bus must be able to leave and enter the traffic lane at comfortable deceleration and acceleration rates. For this reason, the duckout is classified based on roadway operating speed. Specific lengths of the duckout are shown in Figures 2.1a through 2.1c according to three speed classifications:

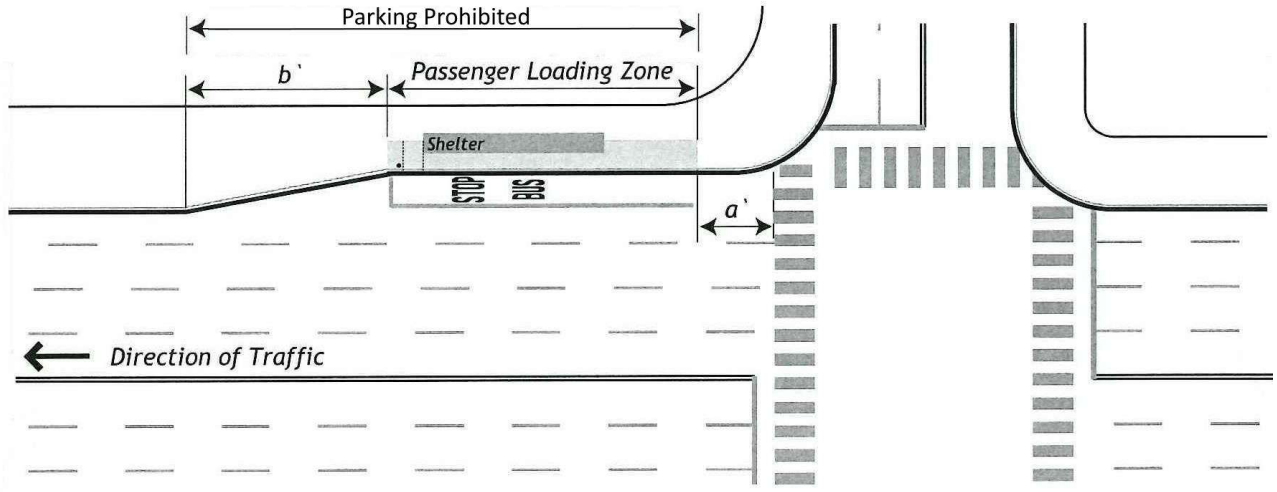
1. Less than 20 mph approach speed
2. 20 to 30 mph approach speed
3. 30 to 40 mph approach speed



Conventional Curbside Configuration

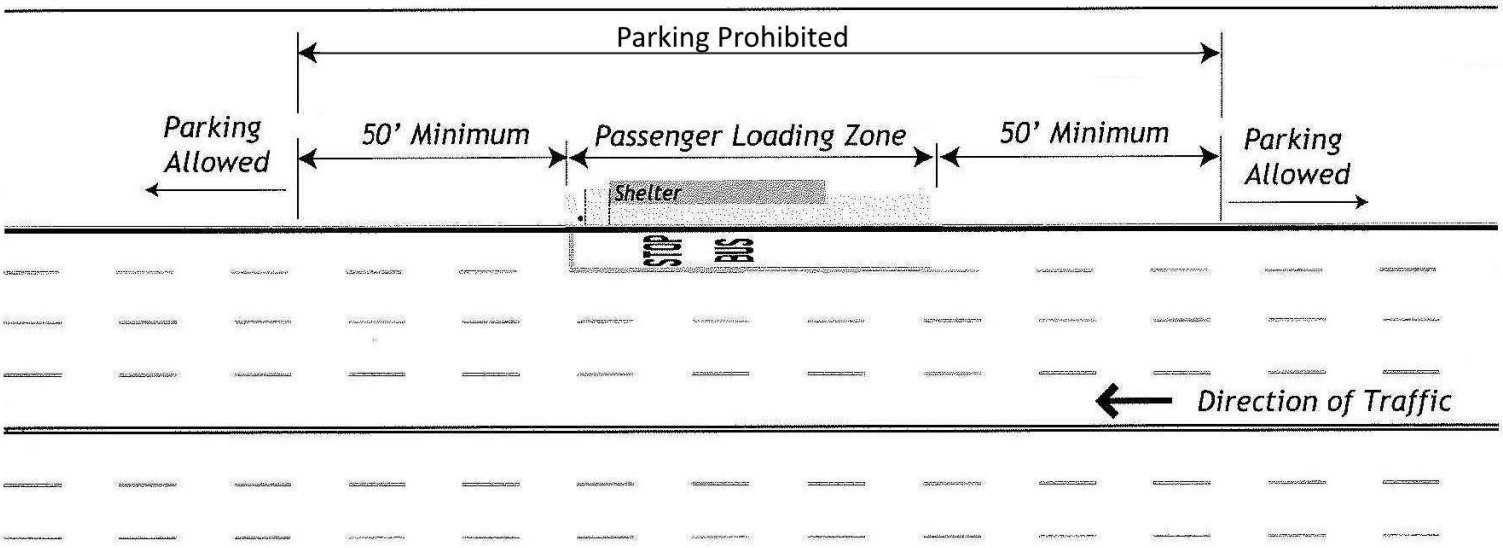
Dimension a`		Dimension b`	
Straight Approach	20ft	< 20 mph approach	50ft min
After Right Turn	75ft	20-30 mph approach	80ft min
After Left Turn	50ft	30-40 mph approach	125ft min

Notes:
1.) Duckout taper length varies according to appoach speed.
2.) Duckout width is 10'.
3.) Assume 12' adjacent Lane, and 10' wide min bus stop.



Duckout Configuration

Figure 2.1a – Far side configuration conventional & duckout

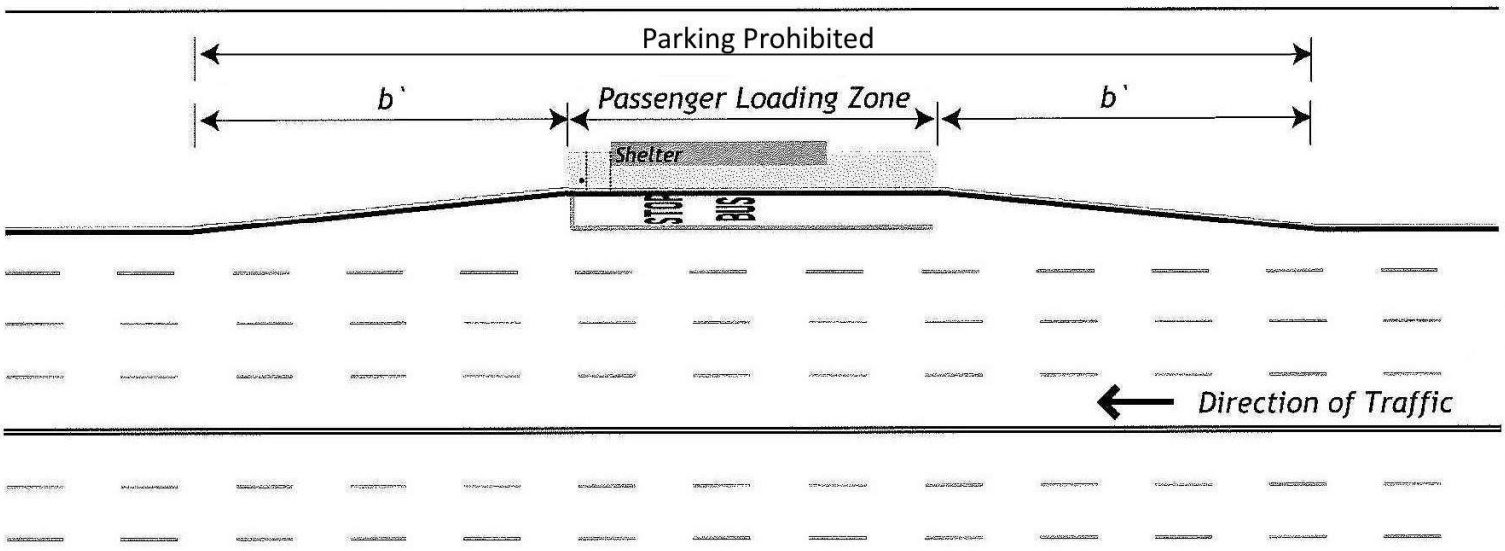


Conventional Curbside Configuration

Notes:

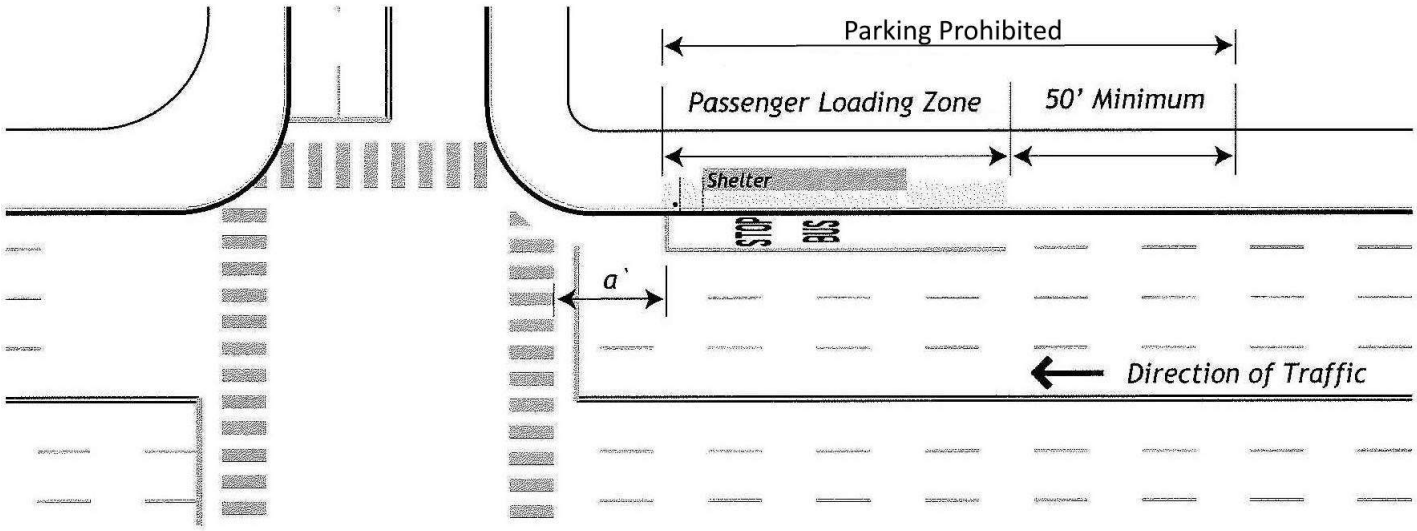
1.) Duckout taper length varies according to appoach speed.
2.) Duckout width is 10'.
3.) Assume 12' adjacent Lane, and 10' wide min bus stop.
4.) Increase exit taper (b') to 225' to achieve 20 mph merger.

Dimension b`	
< 20 mph approach	50ft min
20-30 mph approach	80ft min
30-40 mph approach	125ft min



Duckout Configuration

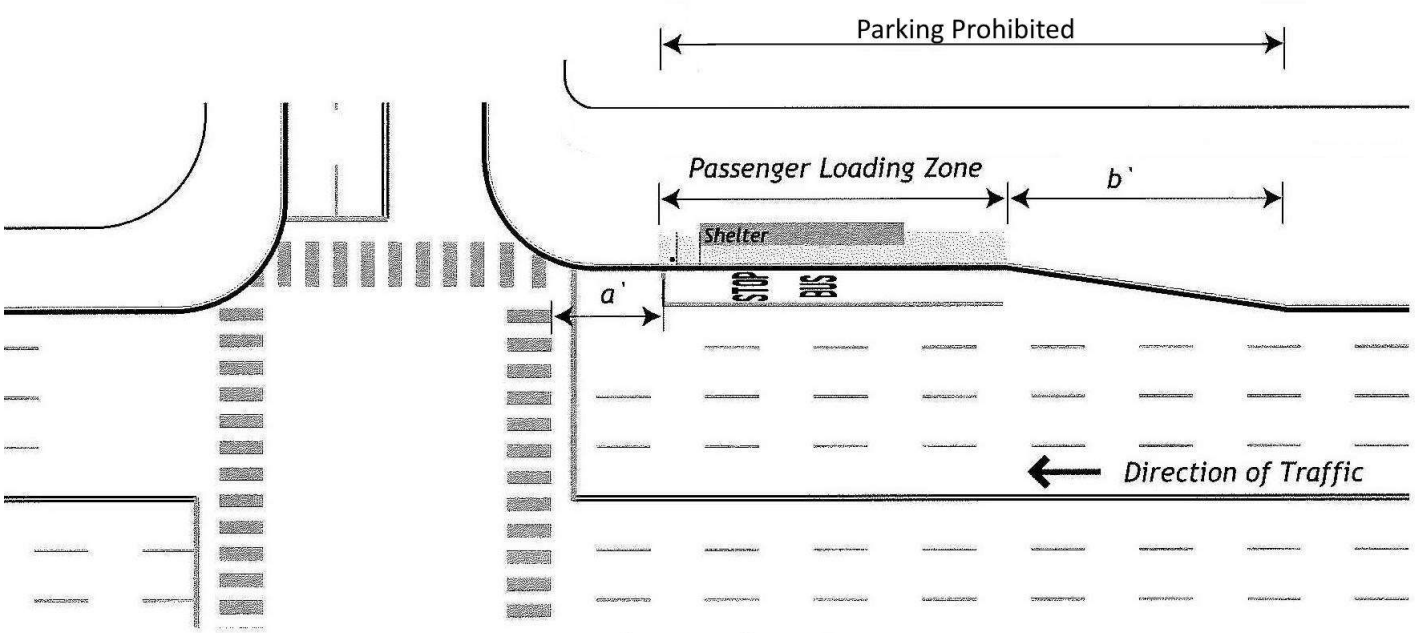
Figure 2.1b – Mid block configuration conventional & duckout



Conventional Curbside Configuration

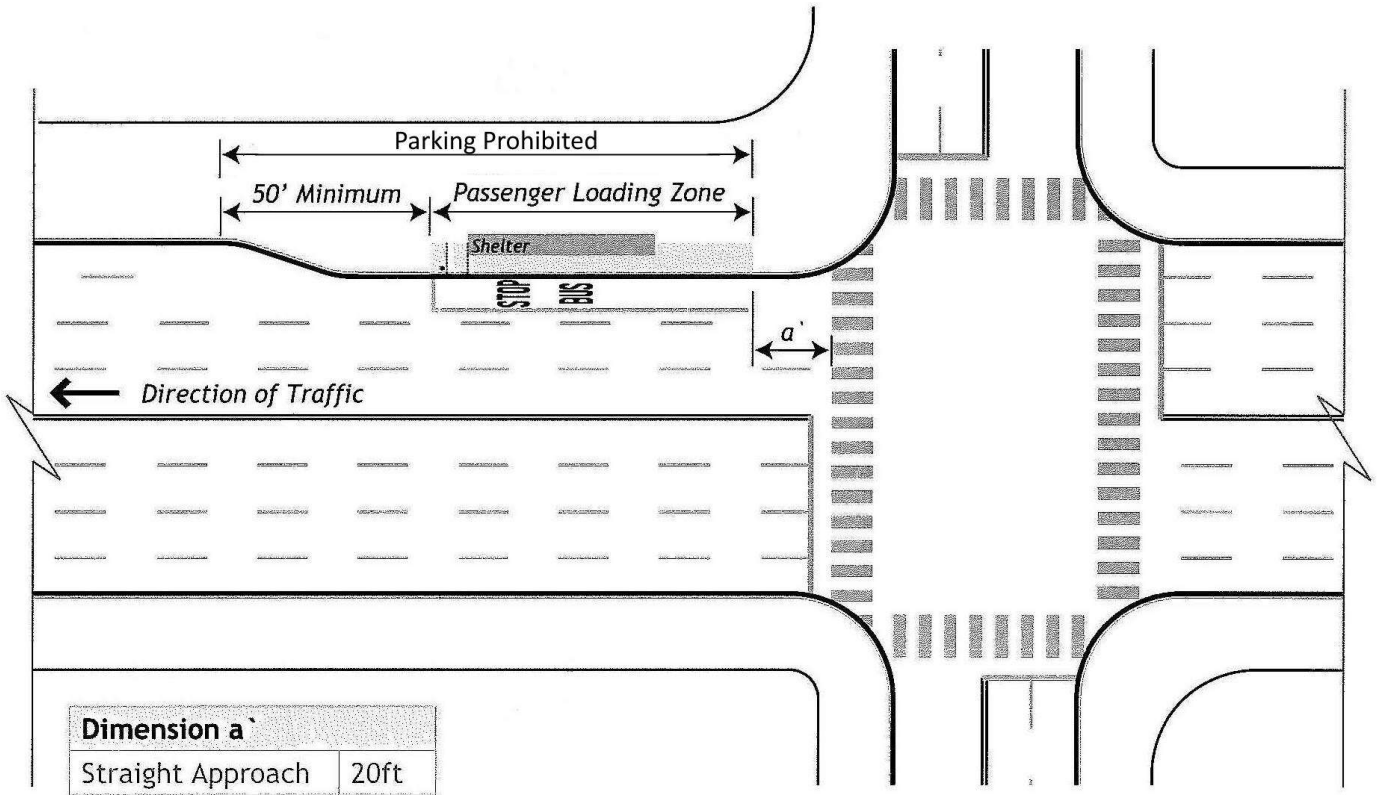
Dimension a`		Dimension b`	
Straight Departure	5ft	< 20 mph approach	50ft min
Before Right Turn	20ft	20-30 mph approach	80ft min
		30-40 mph approach	125ft min

Notes:
1.) Duckout taper length varies according to approach speed.
2.) Duckout width is 10'.



Duckout Configuration

Figure 2.1c – Near side configuration conventional and duckout



Dimension a`	
Straight Approach	20ft
After Right Turn	75ft
After Left Turn	50ft

Bulbout Configuration

Notes:

1.) Dimension a' is to be measured from the edge of crosswalk or end of curb radius, whichever is further from the intersection.

*2.) For the layout and details of the passenger loading zone, refer to Figure **2.1g** .*

3.) A 75' loading zone is sufficient for a standard (40') or an articulated (60') bus.

4.) A 55' loading zone is sufficient for a standard (40') bus.

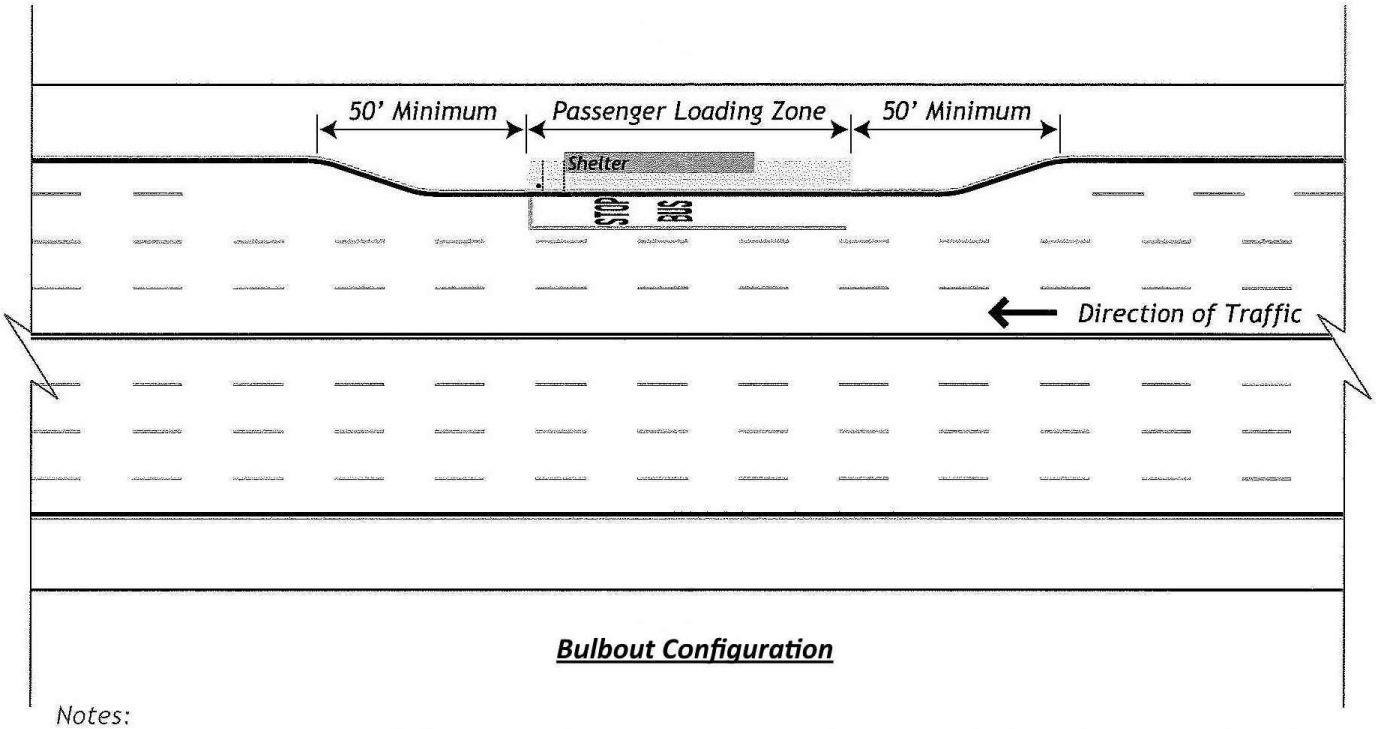
5.) A 120' loading zone is sufficient for serving two standard buses simultaneously.

6.) A 140' loading zone is sufficient for serving a standard and an articulated bus simultaneously.

7.) Unless safety or physical constraints prohibit their implementation, far-side stops are preferred.

8.) The type of stop chosen shall be decided on a case-by-case basis, however, bulbout stops are preferred to facilitate optimal operations (thus a section view is only shown for bulbouts). Conventional curbside stops may be appropriate considering traffic, geometric, and safety conditions. Dockout stops may be appropriate when requested by a local jurisdiction.

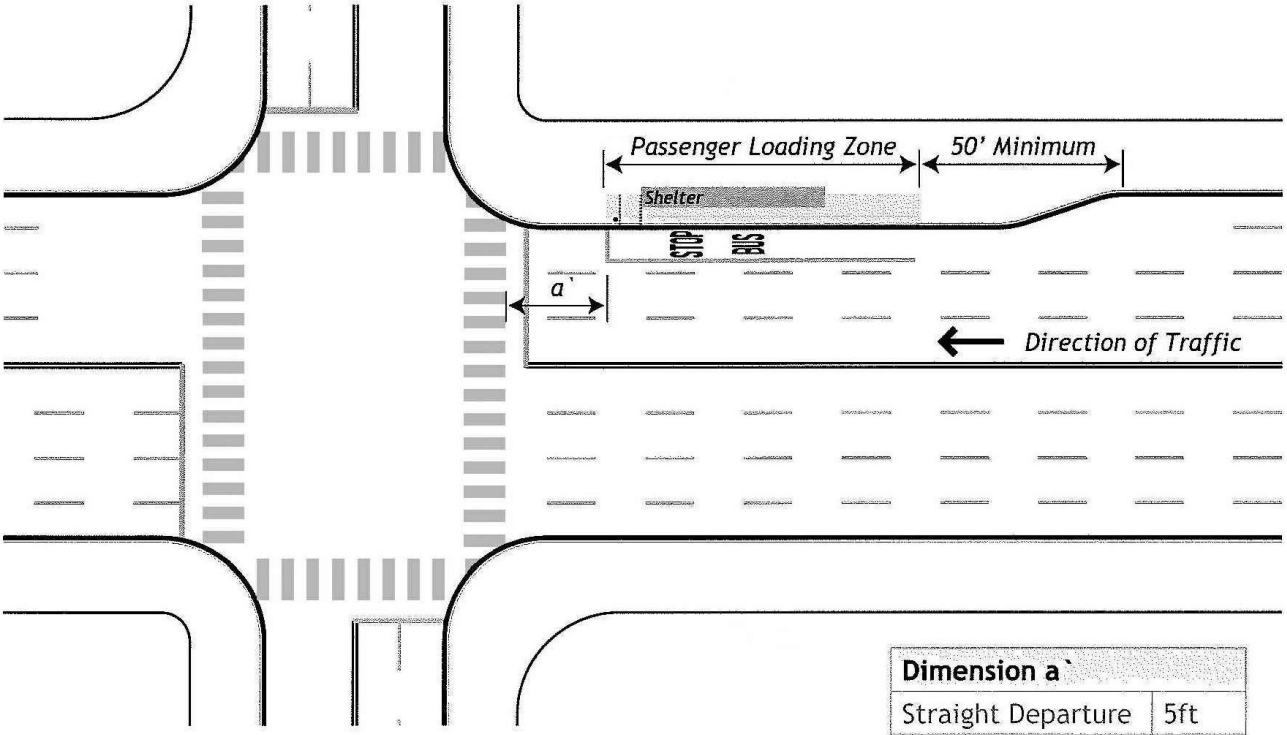
Figure 2.1d – Far side configuration bulbout



Bulbout Configuration

Notes:
1.) The type of stop chosen shall be decided on a case-by-case basis, however, bulbout stops are preferred to facilitate optimal operations (thus a section view is only shown for bulbouts). Conventional curbside stops may be appropriate considering traffic, geometric, and safety conditions. Dockout stops may be appropriate when requested by a local jurisdiction.
2.) For the layout and details of the passenger loading zone, refer to Figure 2.1g .
2.) A 75' loading zone is sufficient for a standard (40') or an articulated (60') bus.
3.) A 55' loading zone is sufficient for a standard (40') bus.
4.) A 120' loading zone is sufficient for serving two standard buses simultaneously.
5.) A 140' loading zone is sufficient for serving a standard and an articulated bus simultaneously.

Figure 2.1e – Mid block bus stop configuration bulbout



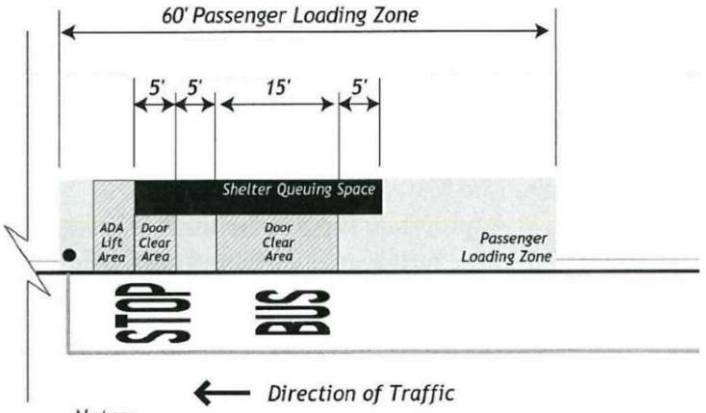
Bulbout Configuration

Dimension a`	
Straight Departure	5ft
Before Right Turn	20ft

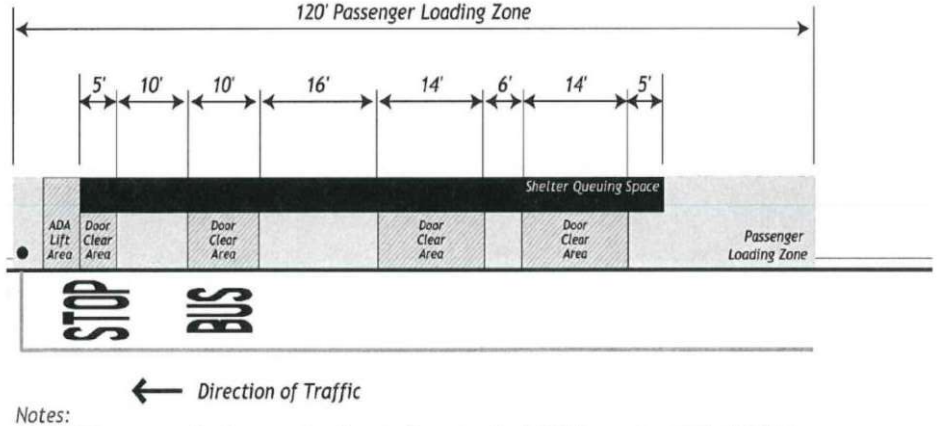
Notes:

1.) *Dimension a' is to be measured from the edge of crosswalk or end of curb radius, whichever is further from the intersection.*
2.) *For the layout and details of the passenger loading zone, refer to Figure* **2.1g** *.*
3.) *A 75' loading zone is sufficient for a standard (40') or an articulated (60') bus.*
4.) *A 55' loading zone is sufficient for a standard (40') bus.*
5.) *A 120' loading zone is sufficient for serving two standard buses simultaneously.*
6.) *A 140' loading zone is sufficient for serving a standard and an articulated bus simultaneously.*
7.) *Nearside bus stops shall only be adopted when the placement of a far-side stop is constrained by safety issues or physical limitations or improves operational efficiency.*
8.) *The type of stop chosen shall be decided on a case-by-case basis, however, bulbout stops are preferred to facilitate optimal operations (thus a section view is only shown for bulbouts). Conventional curbside stops may be appropriate considering traffic, geometric, and safety conditions. Dockout stops may be appropriate when requested by a local jurisdiction.*

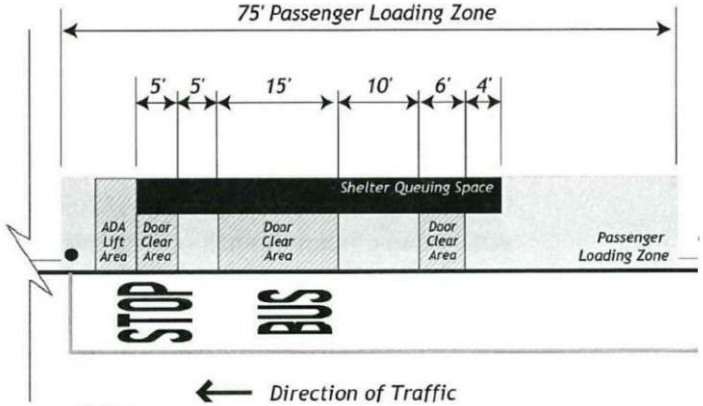
Figure 2.1f – Near side bus stop configuration bulbout



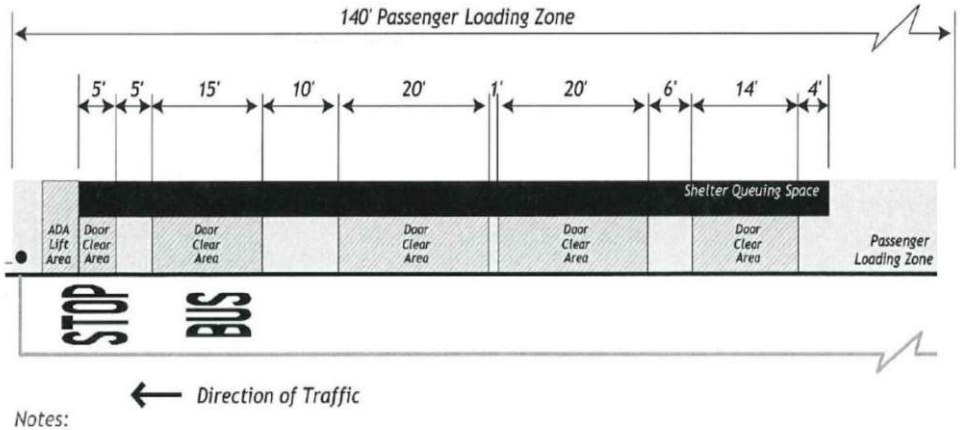
Notes:
1.) A 60' passenger loading zone is adequate for a standard (40') bus.



Notes:
1.) A 120' passenger loading zone is adequate for a standard (40') bus and a standard (40') bus.
2.) For simultaneous arrivals, this configuration assumes that the rear bus will not depart until after the front bus, with a 5' gap between the front and rear buses. If buses have bicycle racks, this is 9'.
3.) If the rear bus is permitted to leave prior to the departure of the front bus, the pull-out distance between the two buses will vary according to the width of the lane it is entering.



Notes:
1.) A 75' passenger loading zone is adequate for a standard (40') bus or an articulated (60') bus.



Notes:
1.) A 140' passenger loading zone is adequate for an articulated (60') and a standard (40') bus.
2.) For simultaneous arrivals, this configuration assumes that the rear bus will not depart until after the front bus, with a 5' gap between the front and rear buses. If buses have bicycle racks, this is 9'.
3.) If the rear bus is permitted to leave prior to the departure of the front bus, the pull-out distance between the two buses will vary according to the width of the lane it is entering.

Figure 2.1g – Passenger loading zone 60',75',120' & 140' loading zones

Minimum lane widths required for modified bus duckouts are shown in Figure 2.1h.

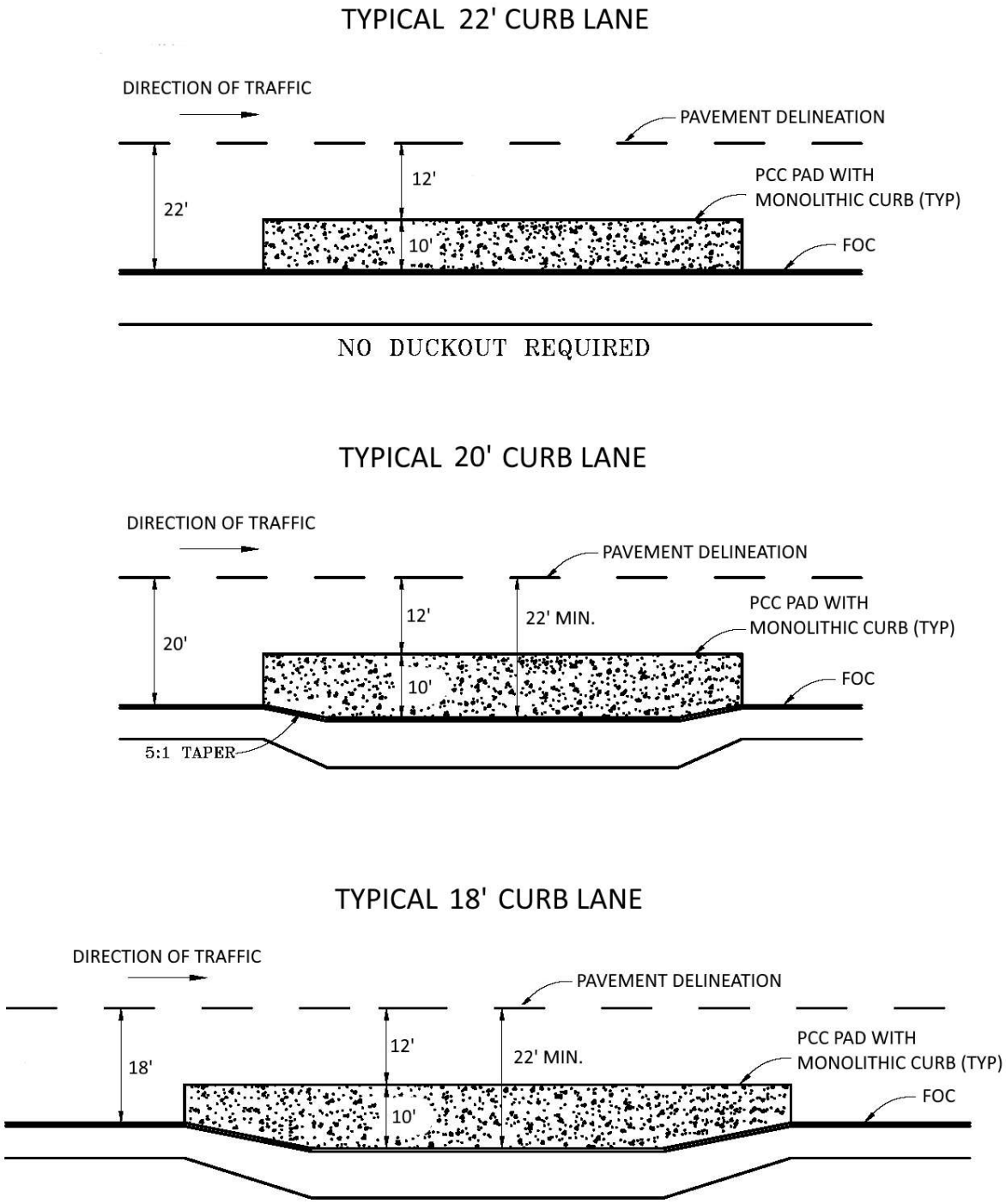


Figure 2.1h – Modified bus duckout to achieve minimum land width

See Transit Passenger Environment Plan for details on bus stop placement near the curb or away from the curb.

2.2 Pedestrian Accessway

A pedestrian accessway provides for easy pedestrian movements between bus stops and adjacent land uses. Pedestrian accessways should be provided between all developments and the adjacent streets identified as transit streets. District staffs are available to assist cities and project developers in identifying transit streets. In addition, pedestrian accessways should extend to individual bus stops to minimize barriers to transit service for residents, employees, and visitors of a development.

Pedestrian accessways should be provided between all developments and the adjacent streets identified as transit streets. Pedestrian access should also be provided past the bus stop to allow easy movement for people who are walking by but not accessing the stop itself. The special considerations relative to maximizing accessibility to available transit services are:

- Accessways should be direct and should minimize unnecessary meandering.
- Accessways should be paved, wheelchair accessible and, whenever possible, lighted.
- Accessways should extend from the development to the bus stop, to avoid bus passenger walking through landscaping or parking lots to access buses.
- At the bus stop, the hardscape extends to the curb, ensuring that bus patrons are not forced to walk through mud or landscaping to access the bus. Individual projects can develop additional designs, based on the project layout and the locations of the public sidewalk and bus stops.

2.3 Bus Stop Passenger Pad

Bus stop passenger pads are provided at bus stops to ensure safe boarding and deboarding of passengers with or without disabilities and to provide additional room for bus stop furniture. Bus stop benches and shelters are provided for the convenience and comfort of bus passengers while they wait for their scheduled bus to arrive.

The criteria and guidelines for passenger pads and related amenities are included in the VTA Transit Passenger Environment Plan (TPEP). Based on the TPEP, there are four main categories for bus stops, based on ridership and destination:

1. Basic Bus Stop has an average less than 40 boardings per weekday with only a bus stop sign and optional bench seating. Basic stops typically do not have shelters.
2. Core Bus Stop averages between 40 and 200 boardings per weekday with seating and, at stops with higher ridership, single-unit shelters. Additional seating, trash receptacles and bicycle parking may be warranted.
3. Major Bus Stop averages over 200 boardings per weekday with a full set of amenities, including seating, shelters, transit information, and, where applicable, additional seating, trash receptacles, and bicycle racks.

4. Community Designation Bus Stop is a Major Stop whose with classification status based on a special location within the community context. These stops may be associated with civic buildings or sites such as museums, libraries, and parks or schools, hospitals, or other public places.

At bus stop locations the minimum width of the sidewalk and curb together must be at least 6' before a bus stop bench can be installed. The 6' width will provide adequate room for disabled passengers in wheelchairs to maneuver around the bus stop bench. At existing bus stop locations where curb and sidewalk measure less 5'5", a bus stop bench pad (measuring at least 3' x 7') shall be installed behind the sidewalk for the placement of a bus stop bench.

At bus stop locations with curb and gutter and no sidewalk, ADA requires that the new bus stop pad installations have a minimum 96" width measured from the face of curb to the back of pad to allow for proper loading and unloading of passengers in wheelchair. Considering that VTA coaches have wheelchair lifts located either in the front or rear of the bus, the minimum pad length is 40'. Standards for bus stop passenger pads are shown in figures 3.2a through 3.2c.

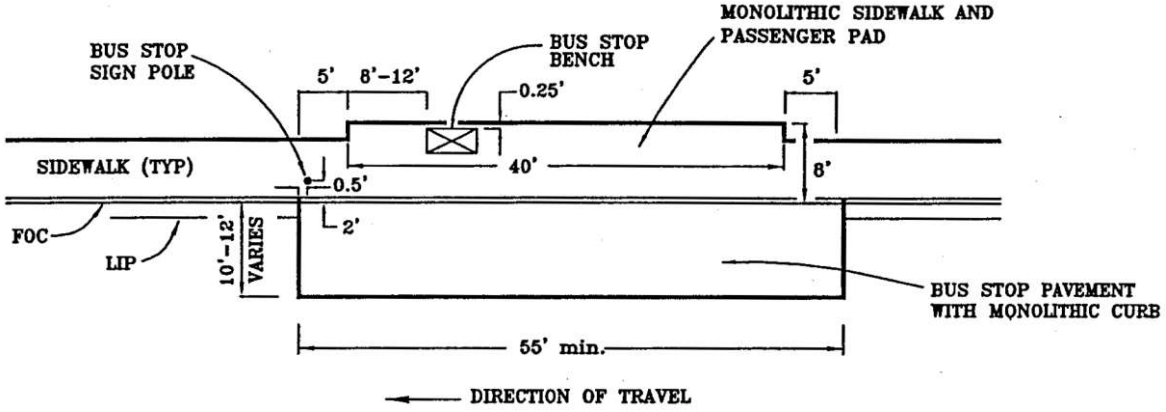


Figure 3.2a – Bus stop and passenger pad without shelter

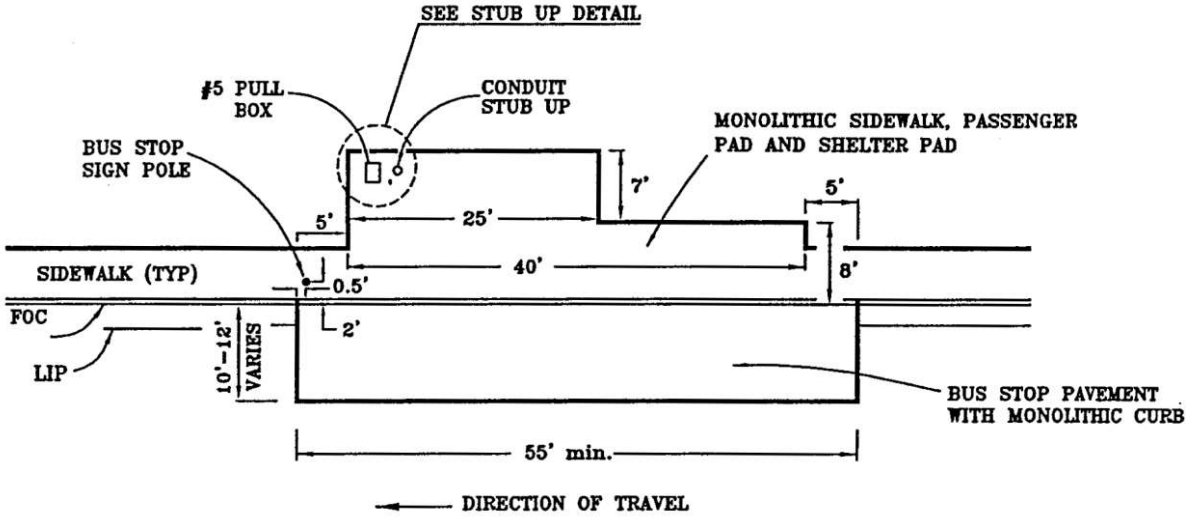


Figure 3.2b – Bus stop and passenger pad with shelter

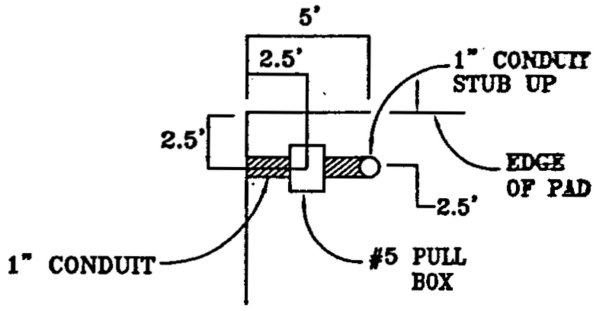


Figure 3.2c – Stub up detail

VTA provides, installs, and maintains bus benches at bus stops. Standards for bus stop benches are shown in figure 2.3d through 3.2f. An example for a litter receptacle is show in figure 3.2g.

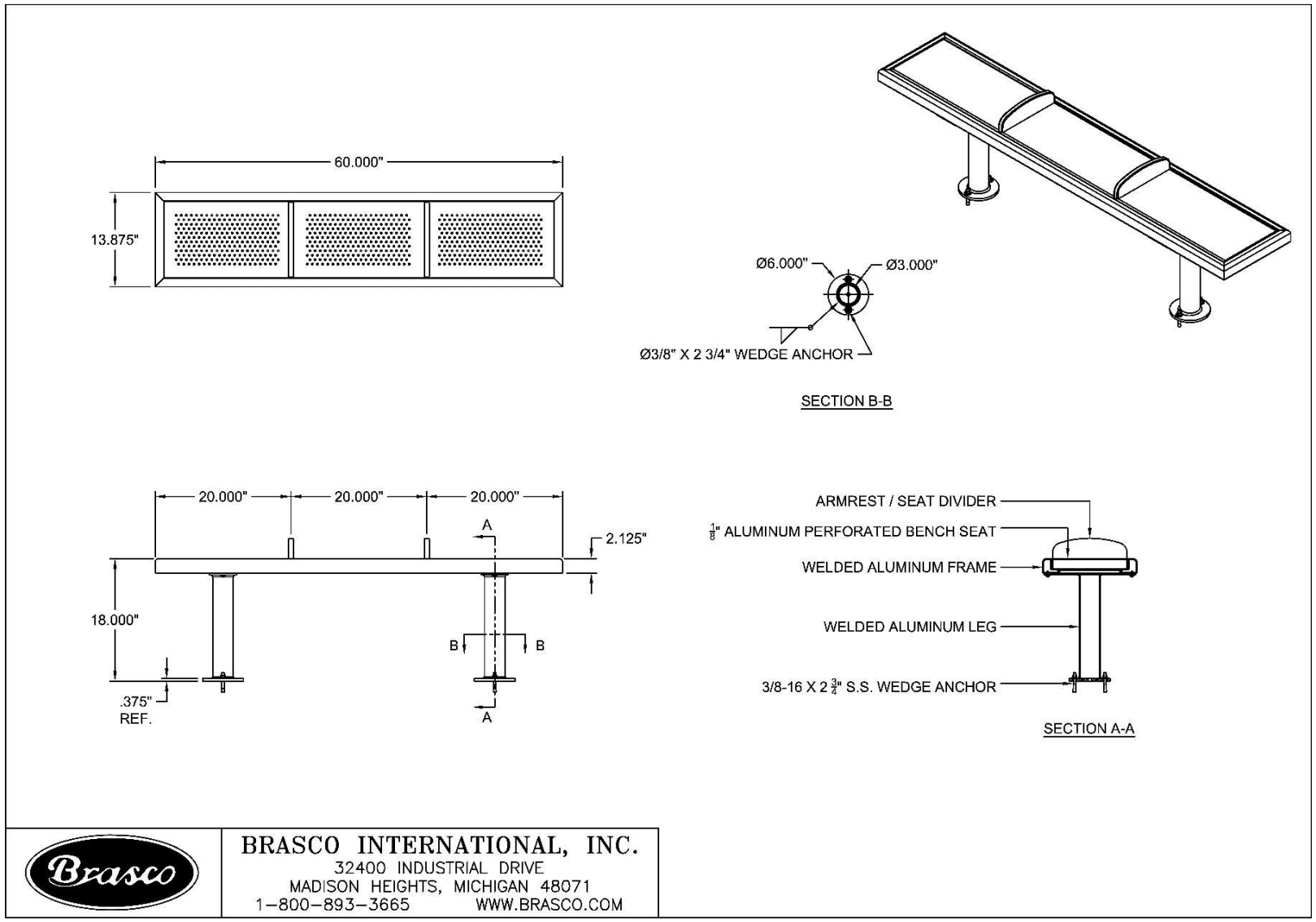


Figure 2.3d – Bus stop shelter bench details

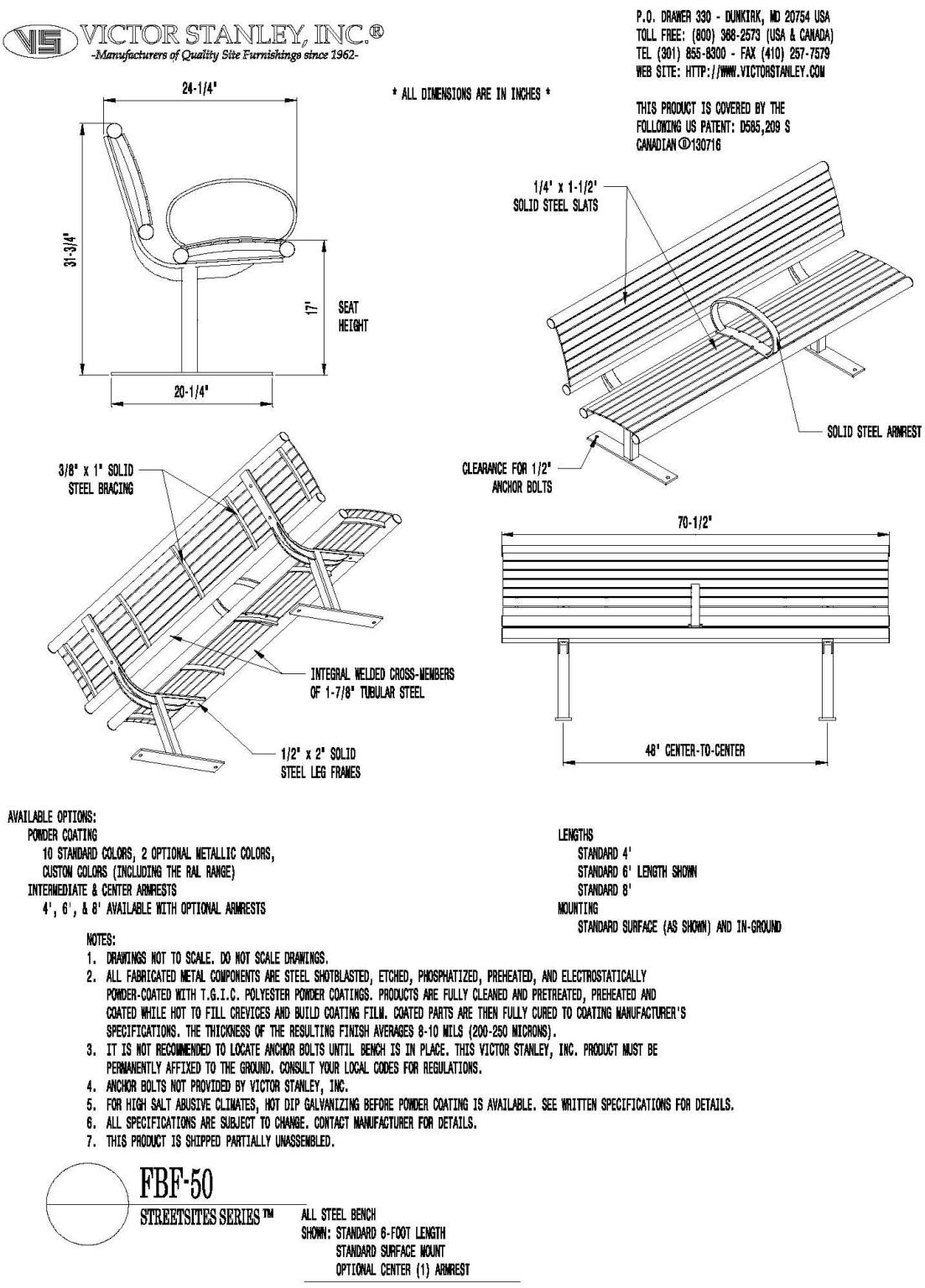


Figure 3.2e – Bus stop standalone bench – Example 1

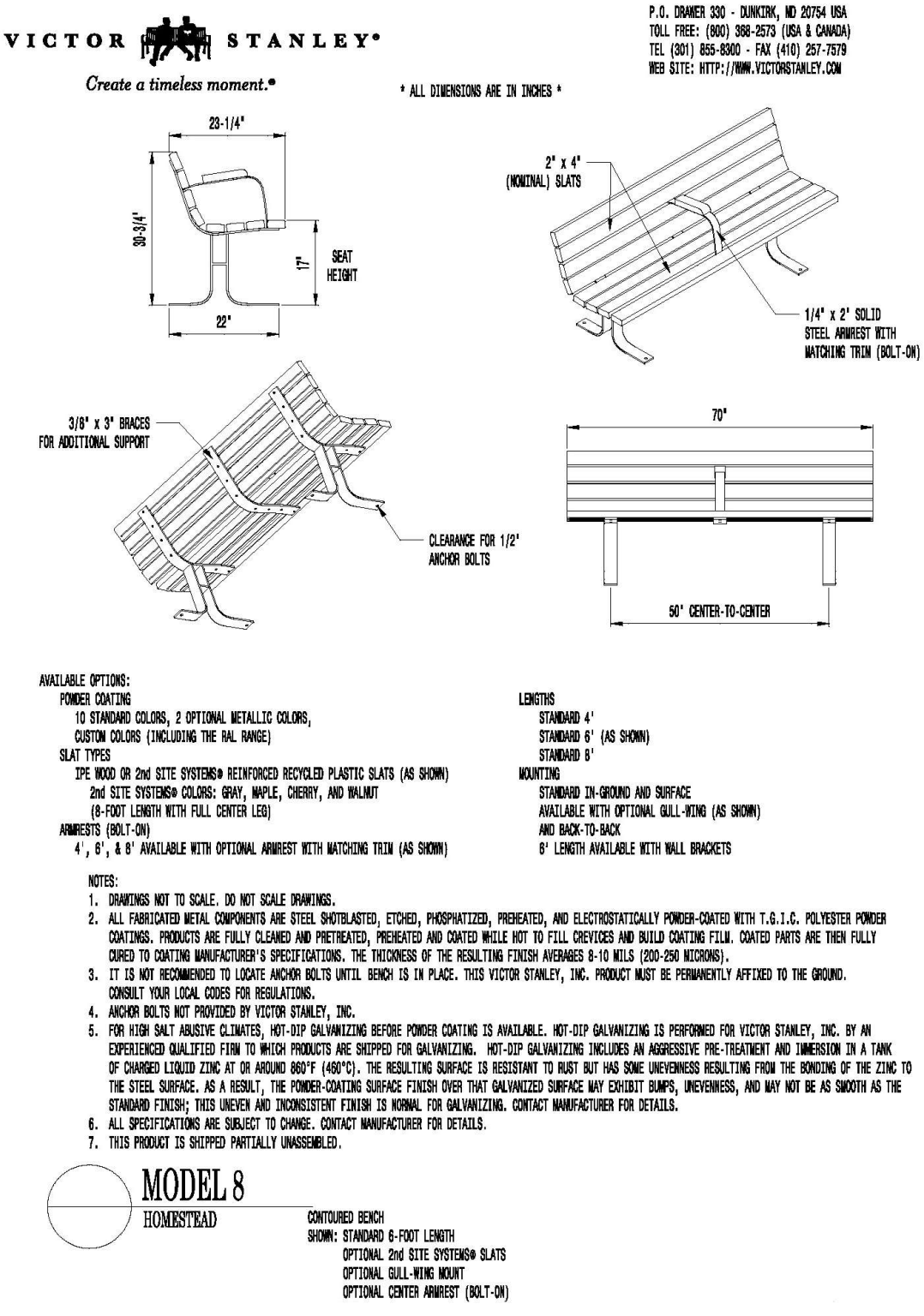


Figure 3.2f – Bus stop standalone bench – Example 2

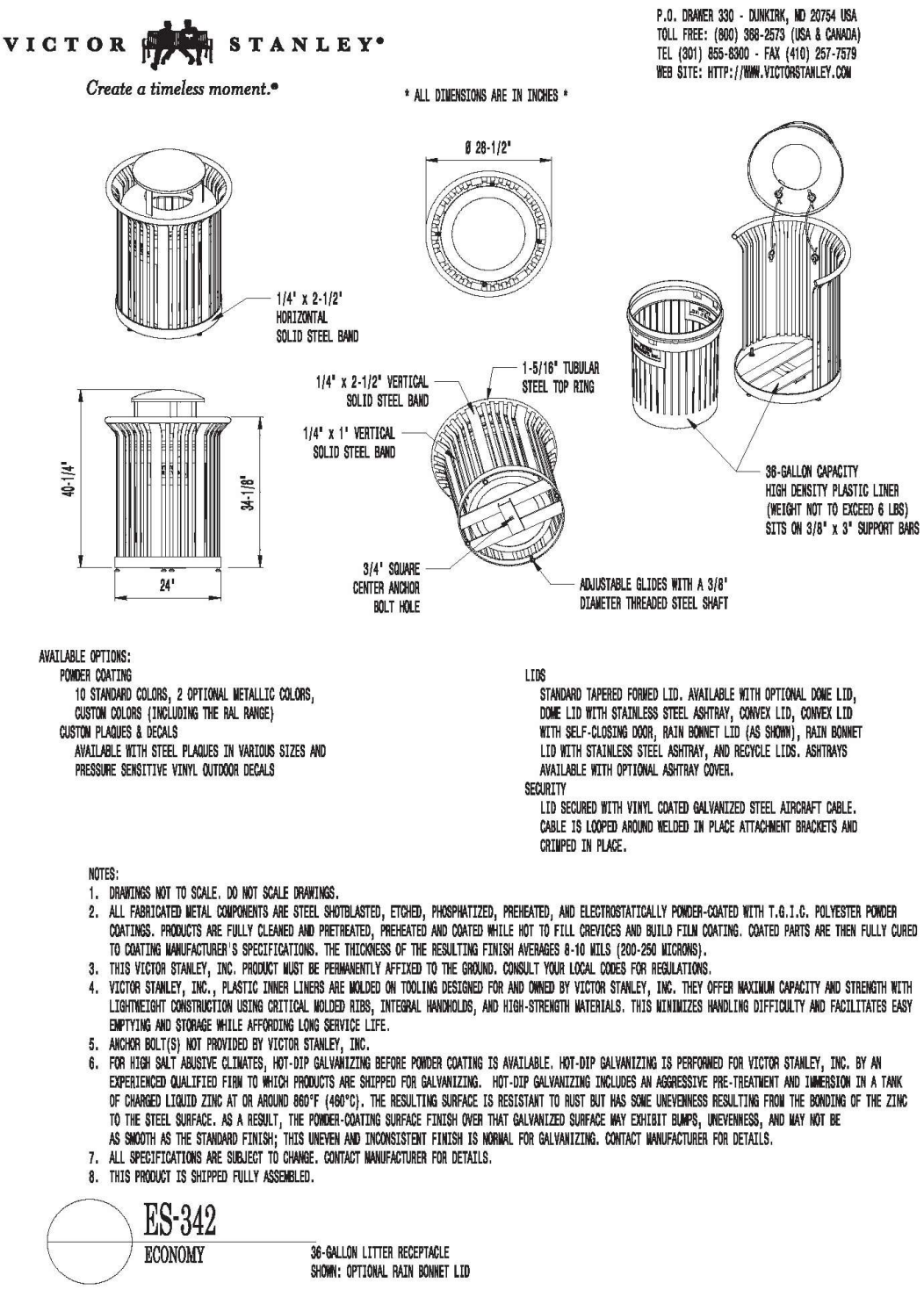


Figure 3.2g – Bus stop litter receptacle

2.4 Bus Shelter

Bus shelters are provided for the convenience and comfort of bus passengers. Shelters provide protection from the elements and provide general bus schedule information. The VTA Transit Passenger Environment Plan (TPEP) includes guidelines and criteria for shelter requirement, size, placement, material, etc. As identified above in Section 2.3, standard shelters are used at higher ridership Core bus stops and Major bus stops. At locations with over 200 weekday boardings, a large shelter nay be warranted.

2.4.1 Shelter Configuration

Figure 2.4.1a should be used as a guide for determining shelter size, advertising panel placement, back panel placement and map case placement. Figures 2.4.1b through 2.4.1k provide details for various shelter configurations. Figures 2.4.1l and 2.4.1m provide detail information for 12' bus shelters no longer used by VTA.

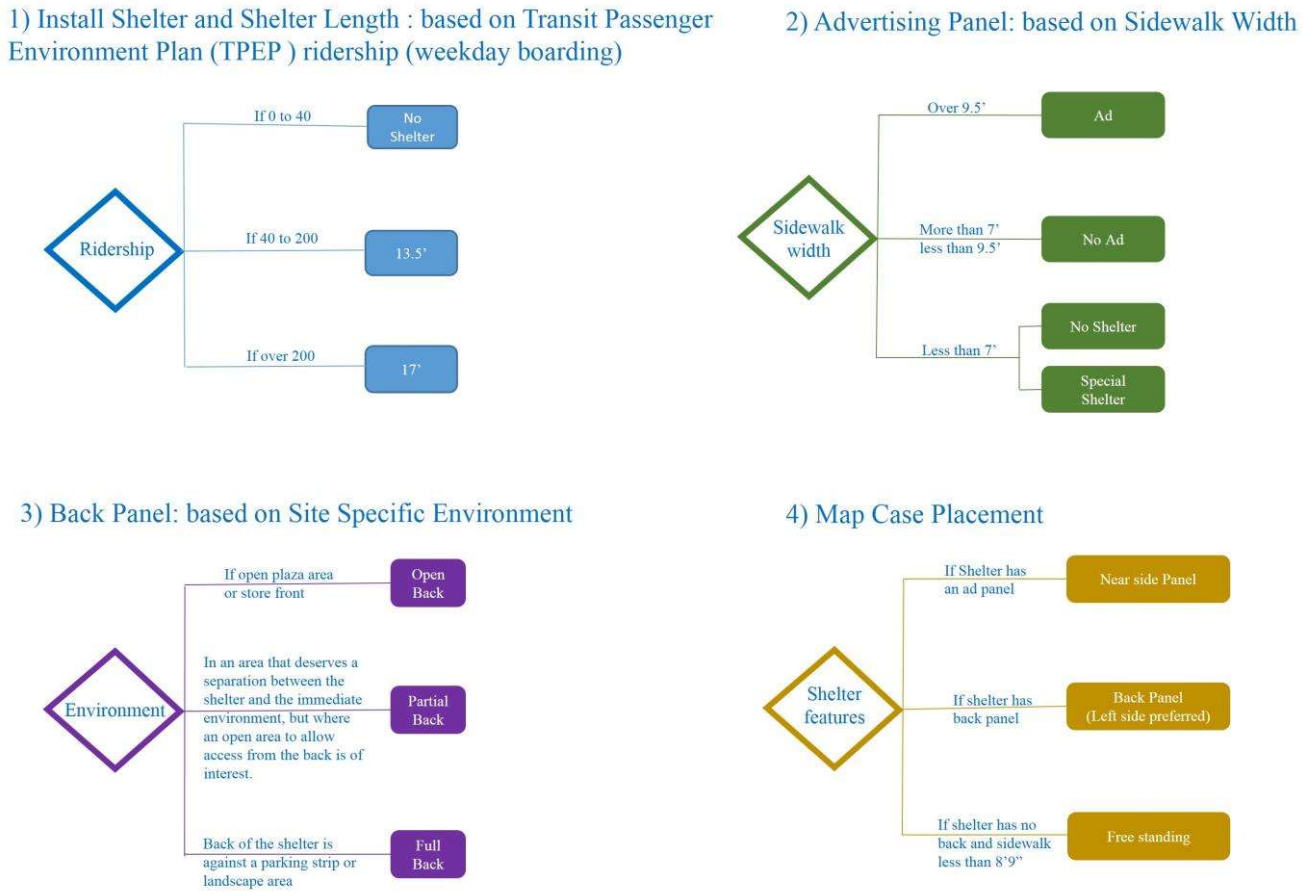


Figure 2.4.1a – Shelter configuration determination guide

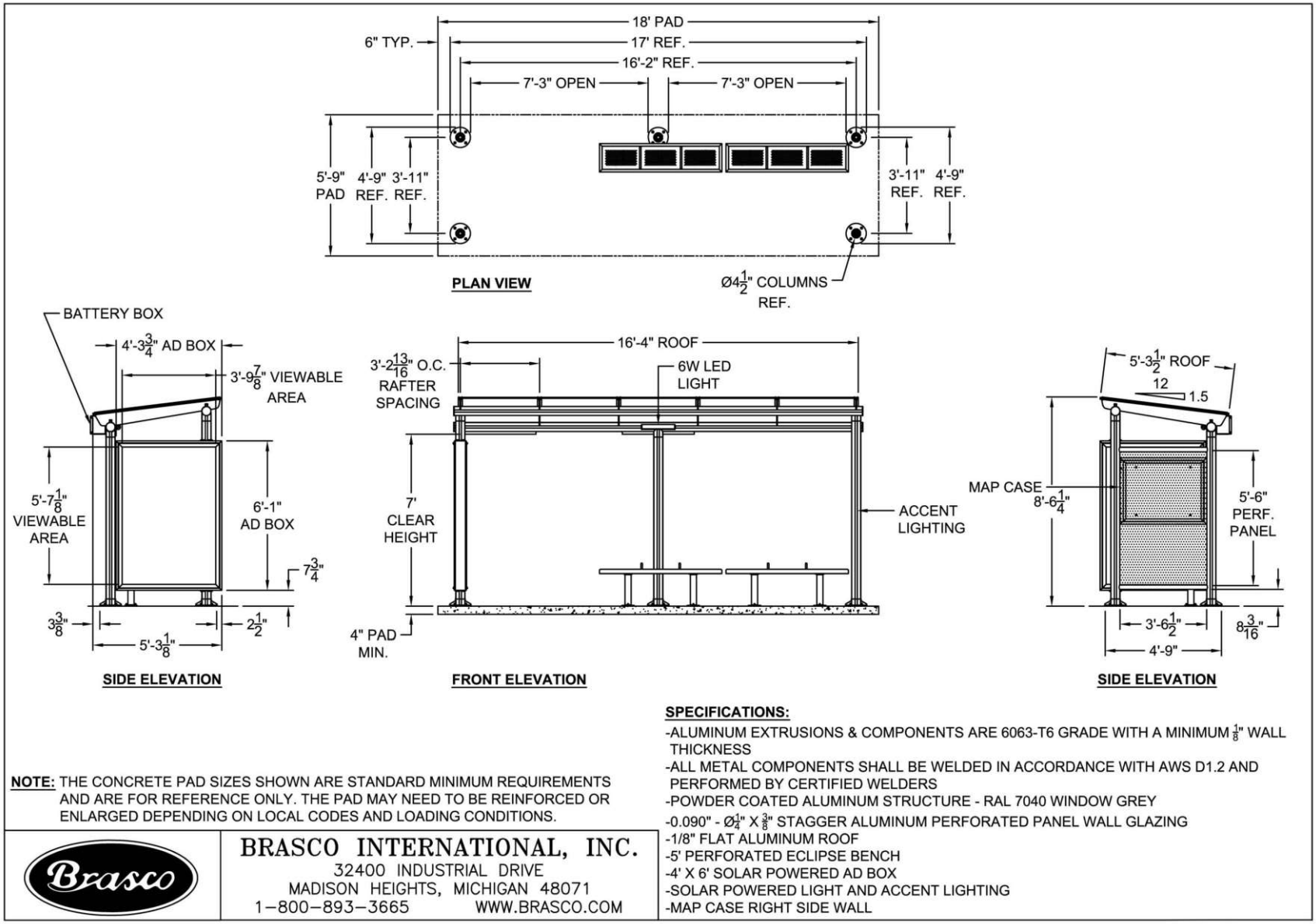


Figure 2.4.1b – 17" long bus shelter (wide) with no shelter backing

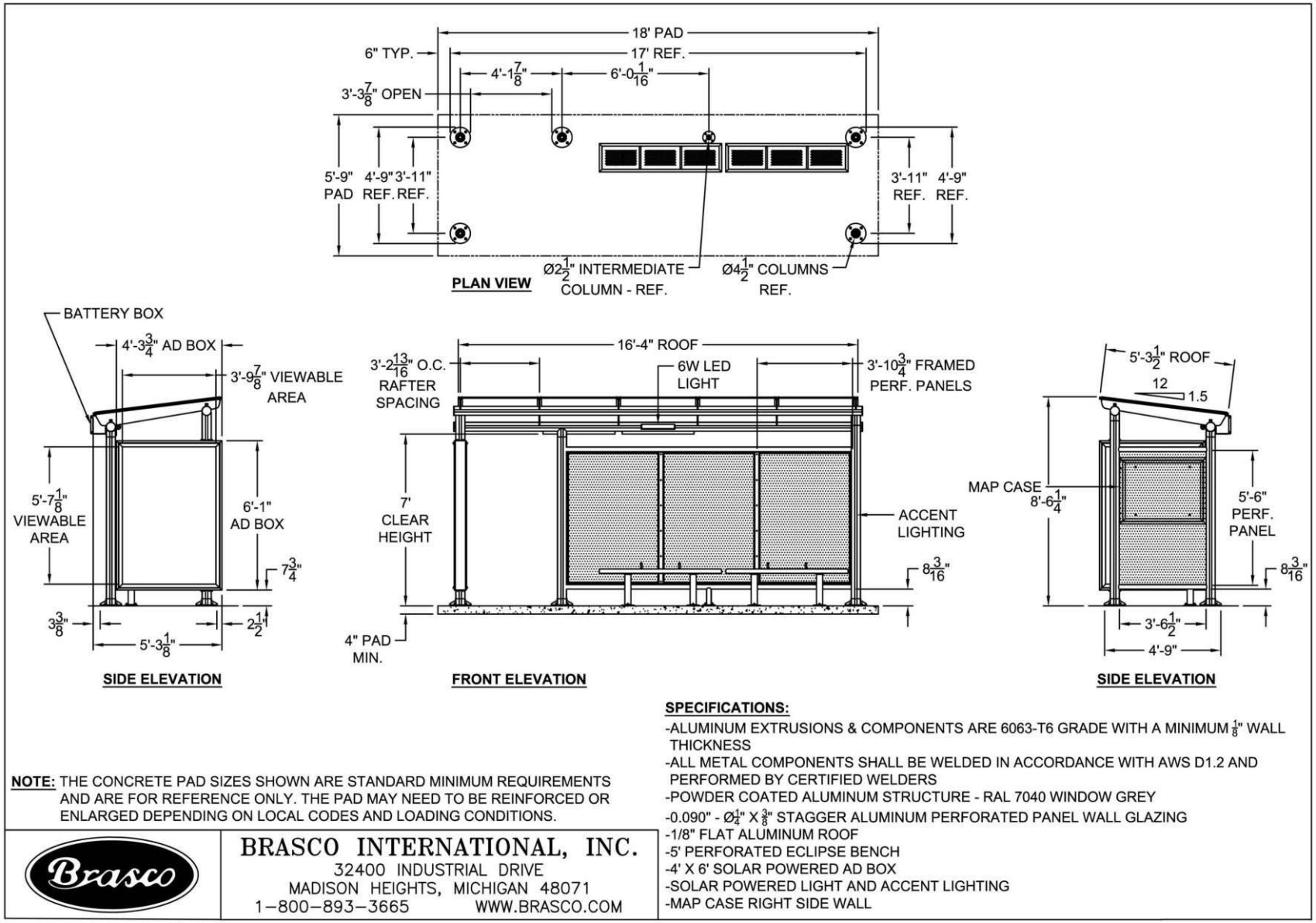


Figure 2.4.1c – 17' long bus shelter (wide) with partial shelter backing

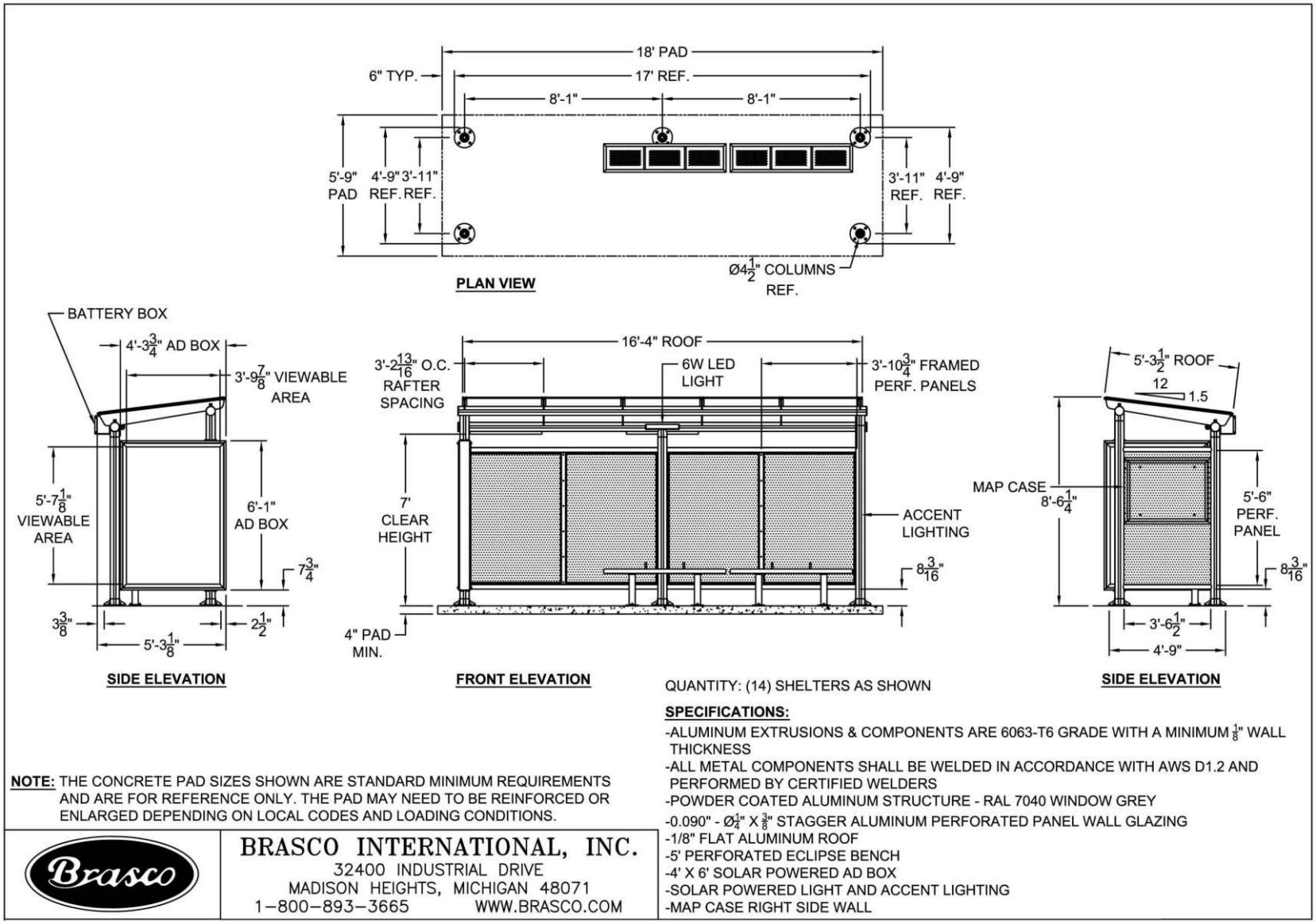


Figure 2.4.1d – 17' long bus shelter (wide) with full shelter backing

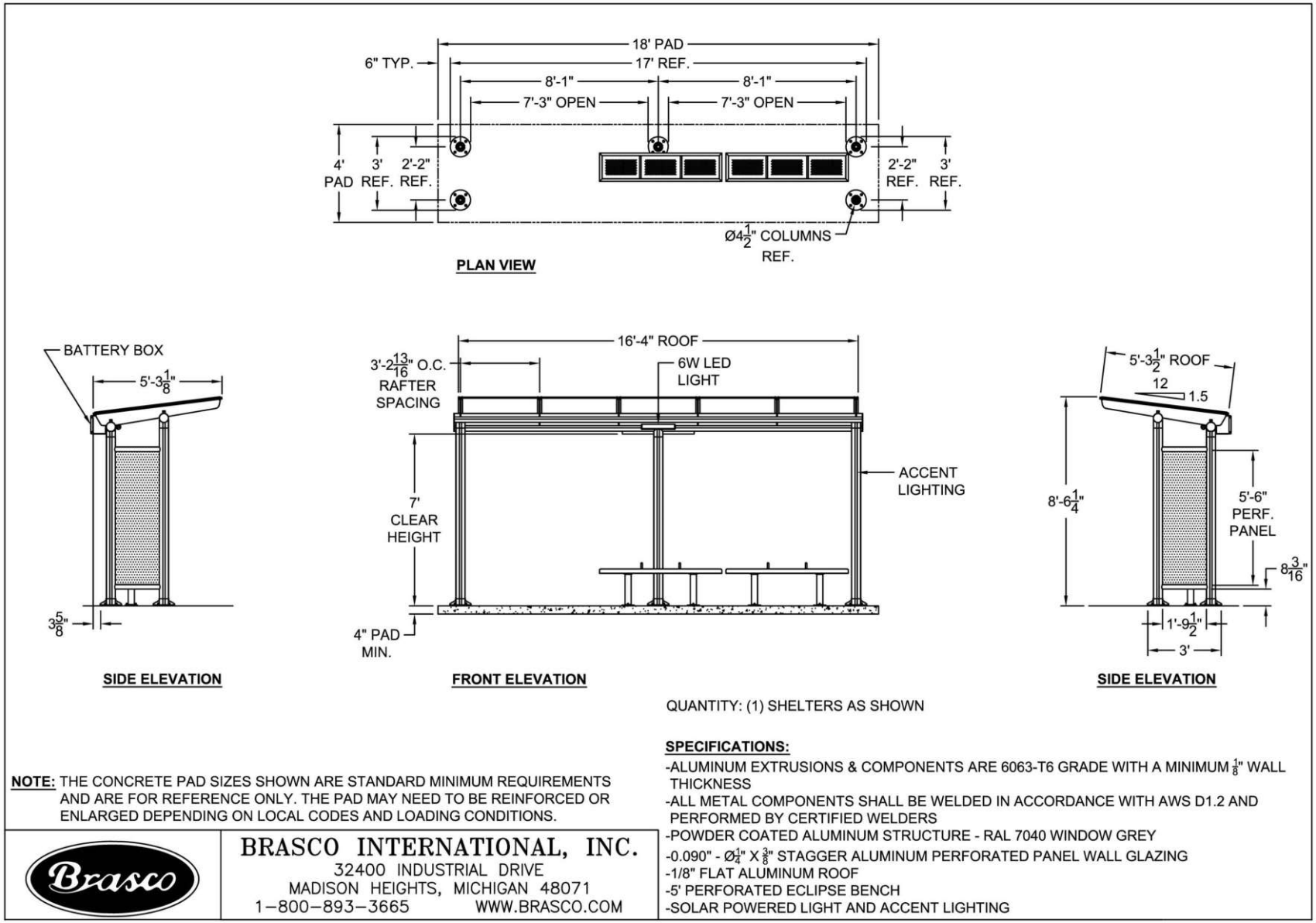


Figure 2.4.1e – 17' long bus shelter (narrow) with no shelter backing

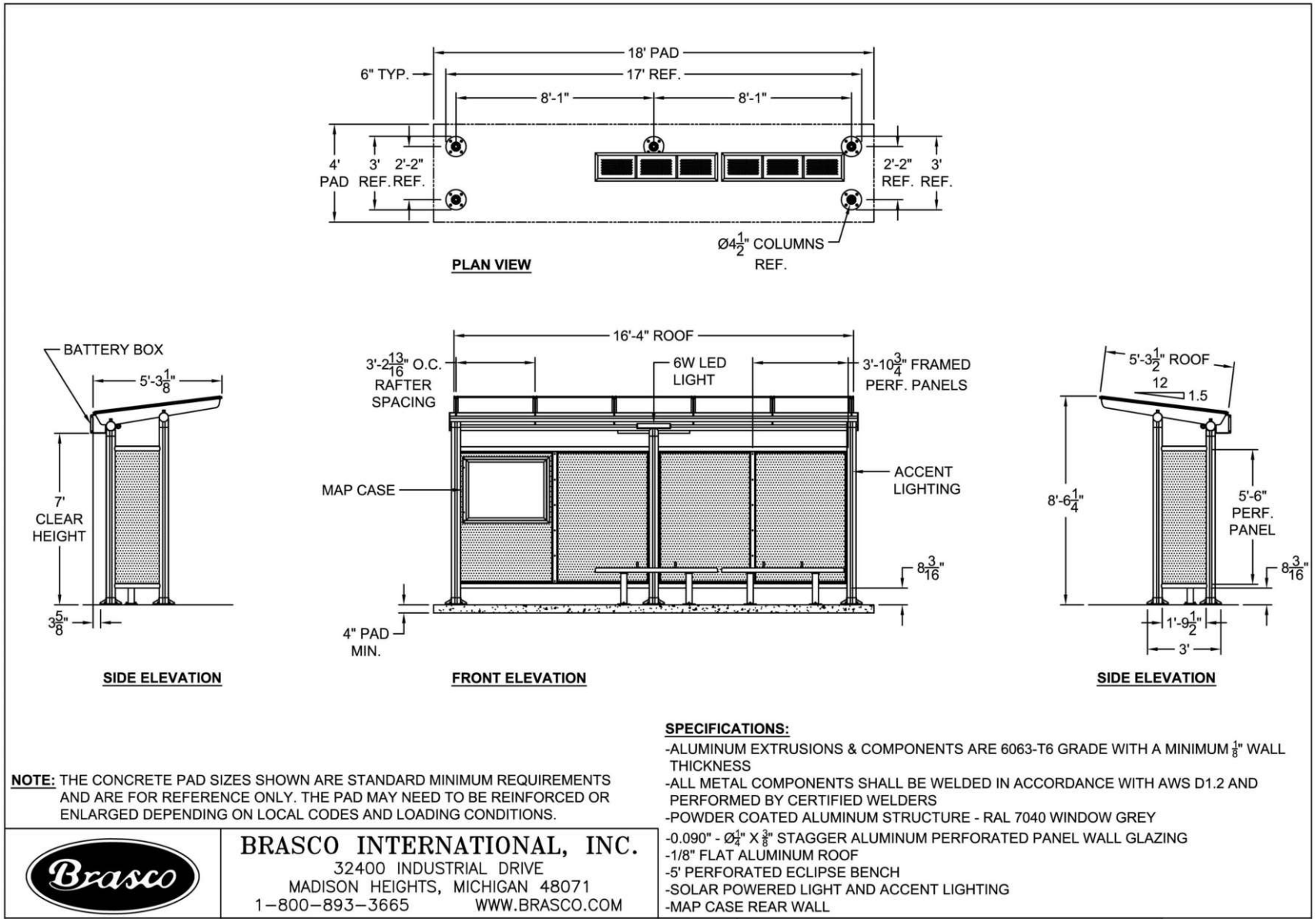


Figure 2.4.1f – 17' long bus shelter (narrow) with full shelter backing

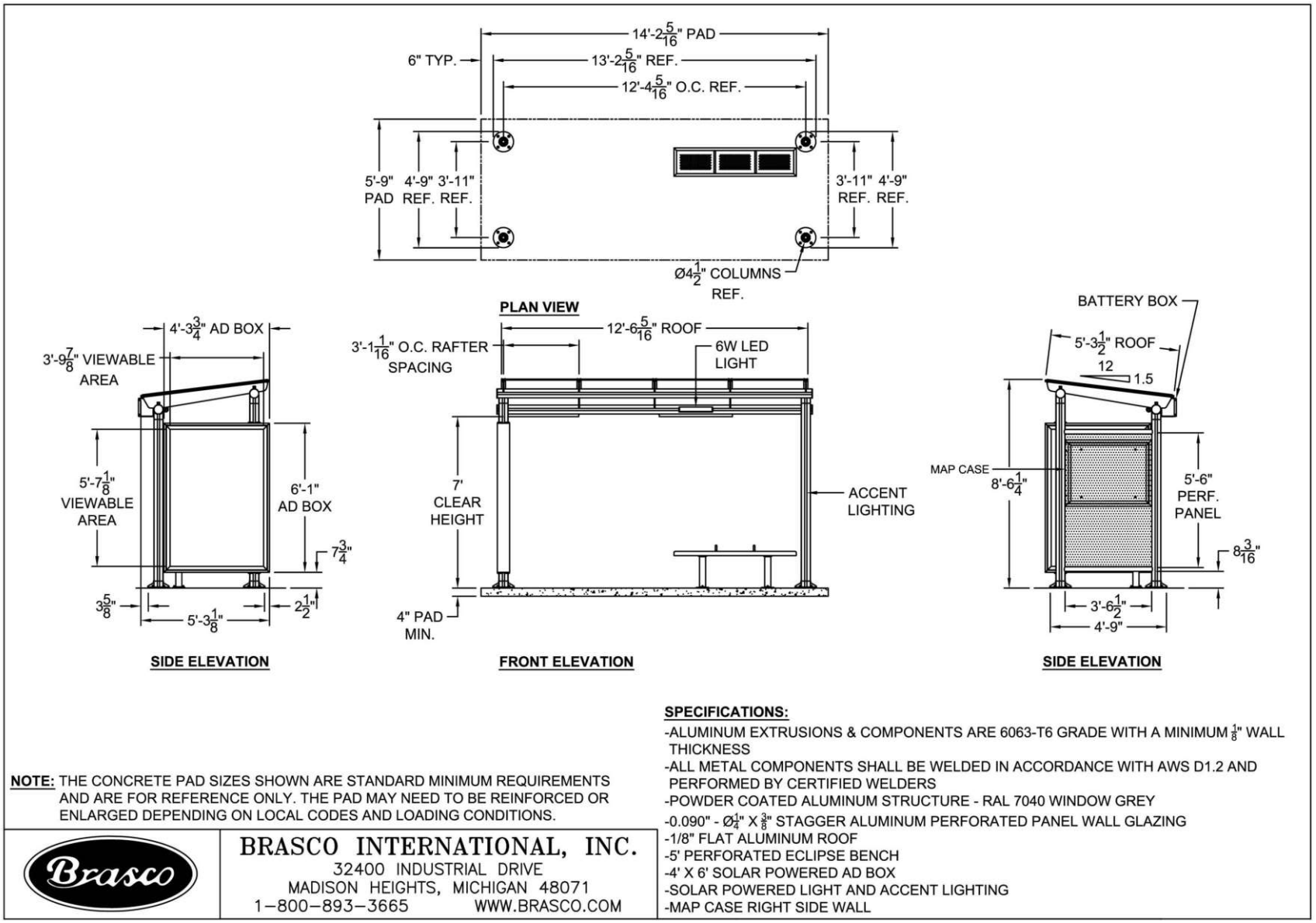


Figure 2.4.1g – 13.5' long bus shelter (wide) with no shelter backing

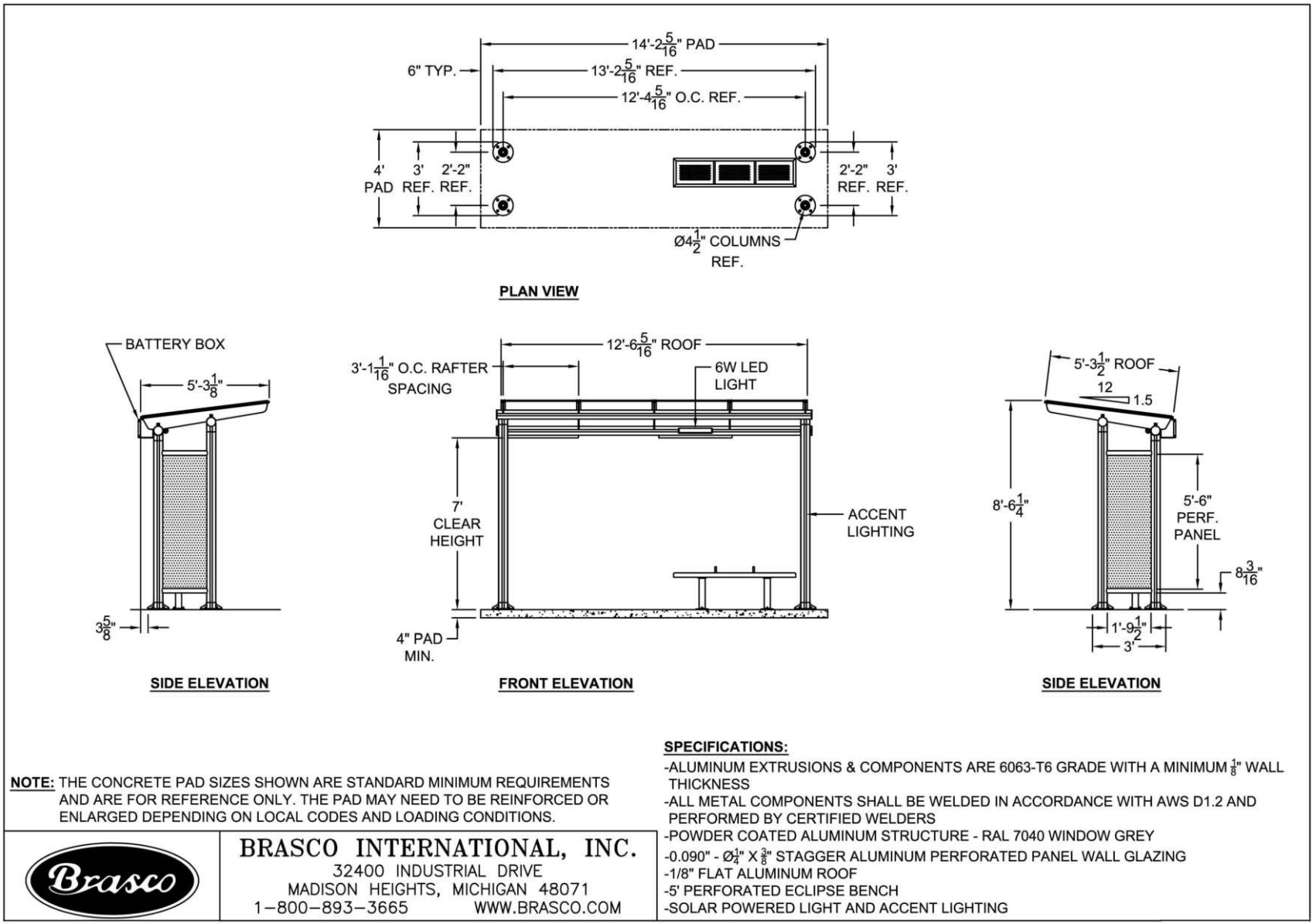


Figure 2.4.1h – 13.5' long bus shelter (narrow) with no shelter backing

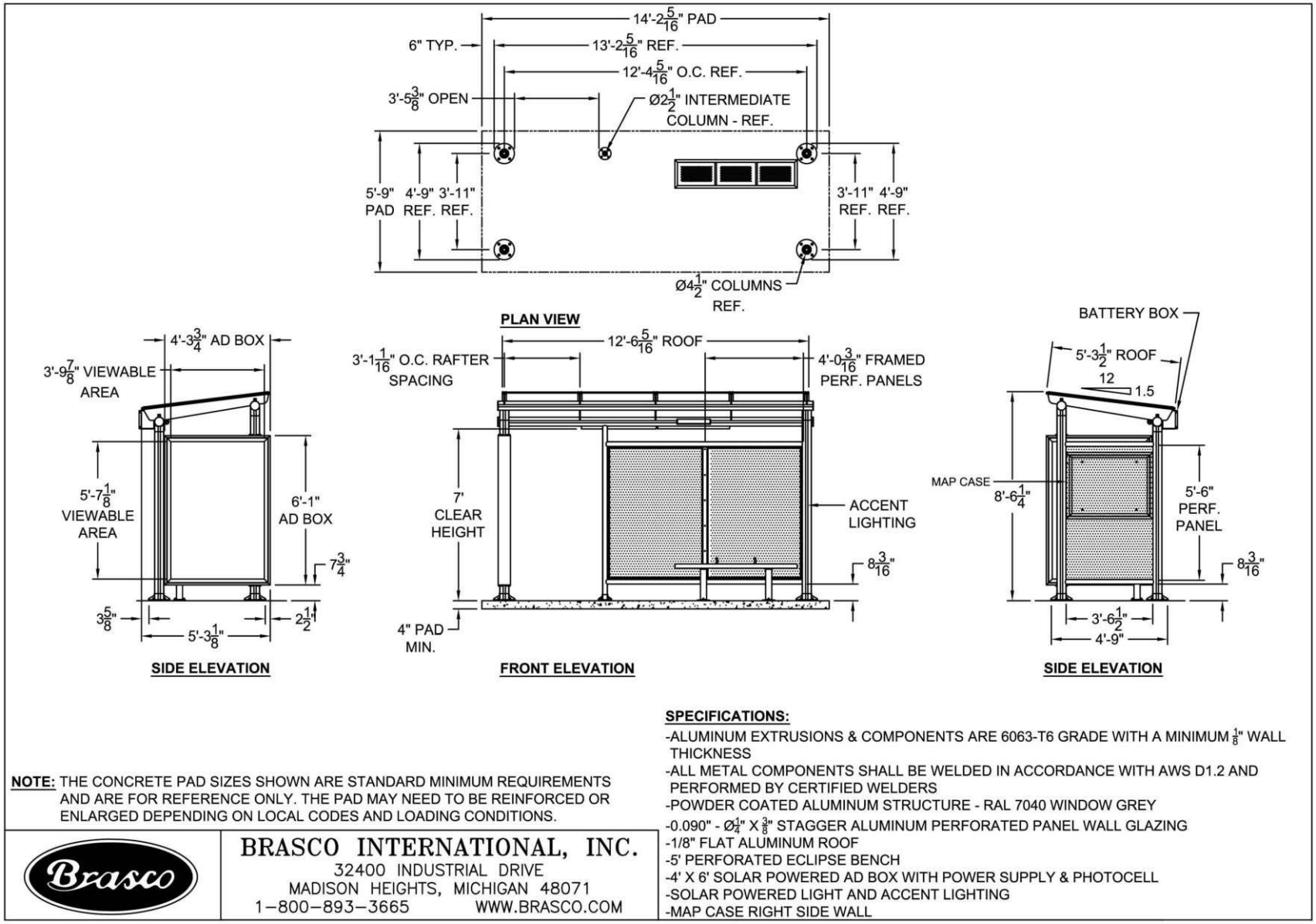


Figure 2.4.1i – 13.5' long bus shelter (wide) with partial shelter backing

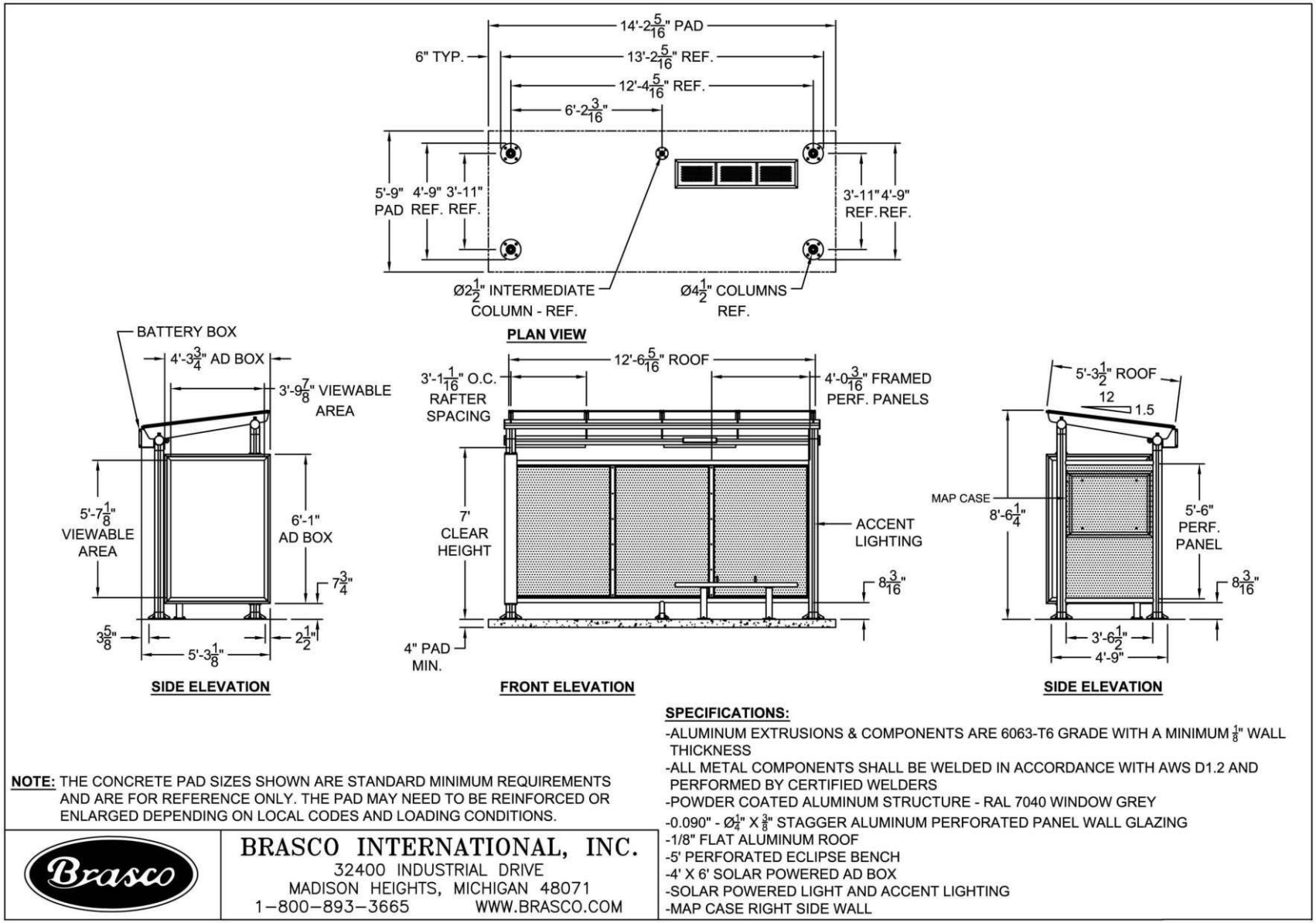


Figure 2.4.1j – 13.5' long bus shelter (wide) with full shelter backing

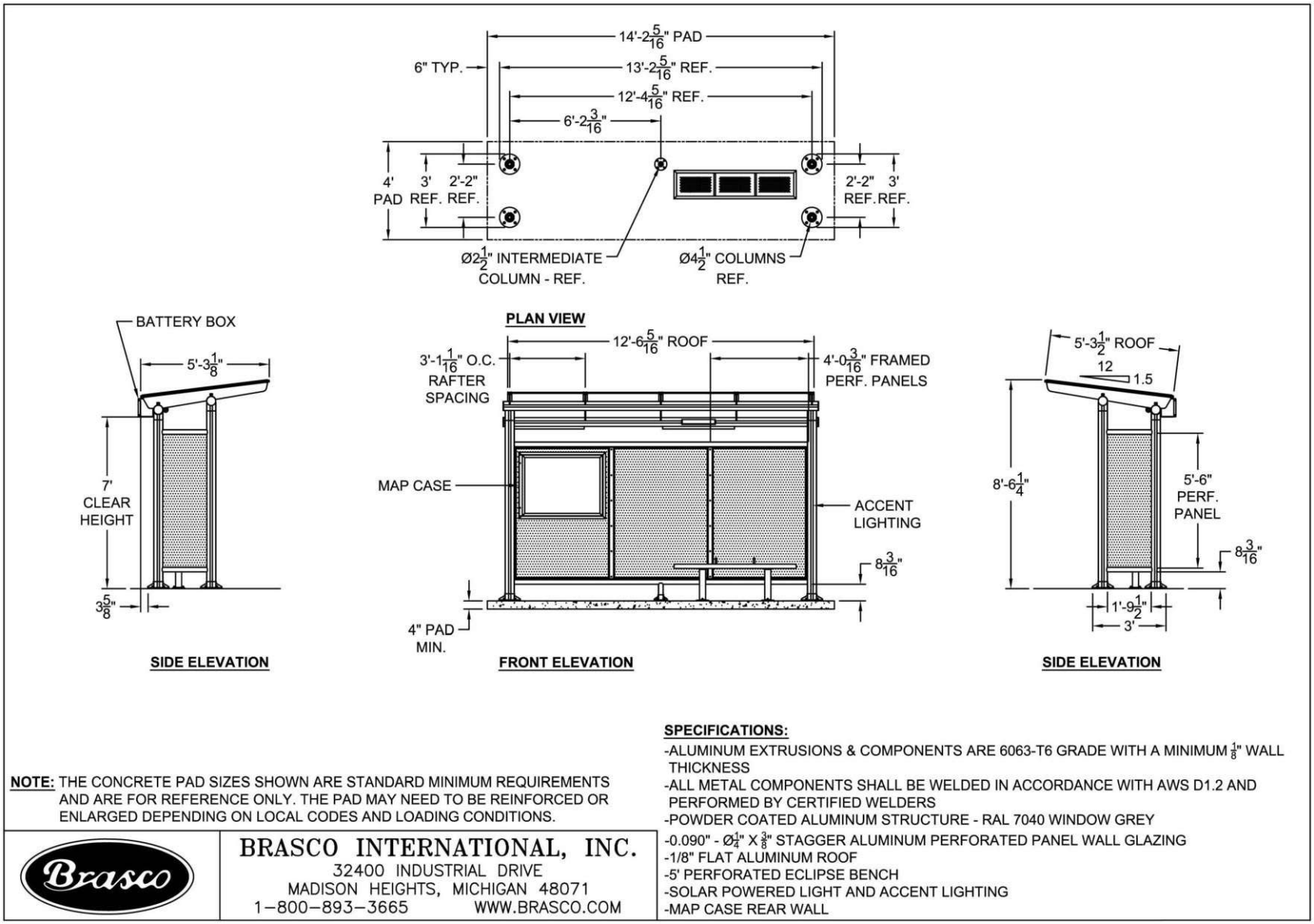


Figure 2.4.1k – 13.5' long bus shelter (narrow) with full shelter backing

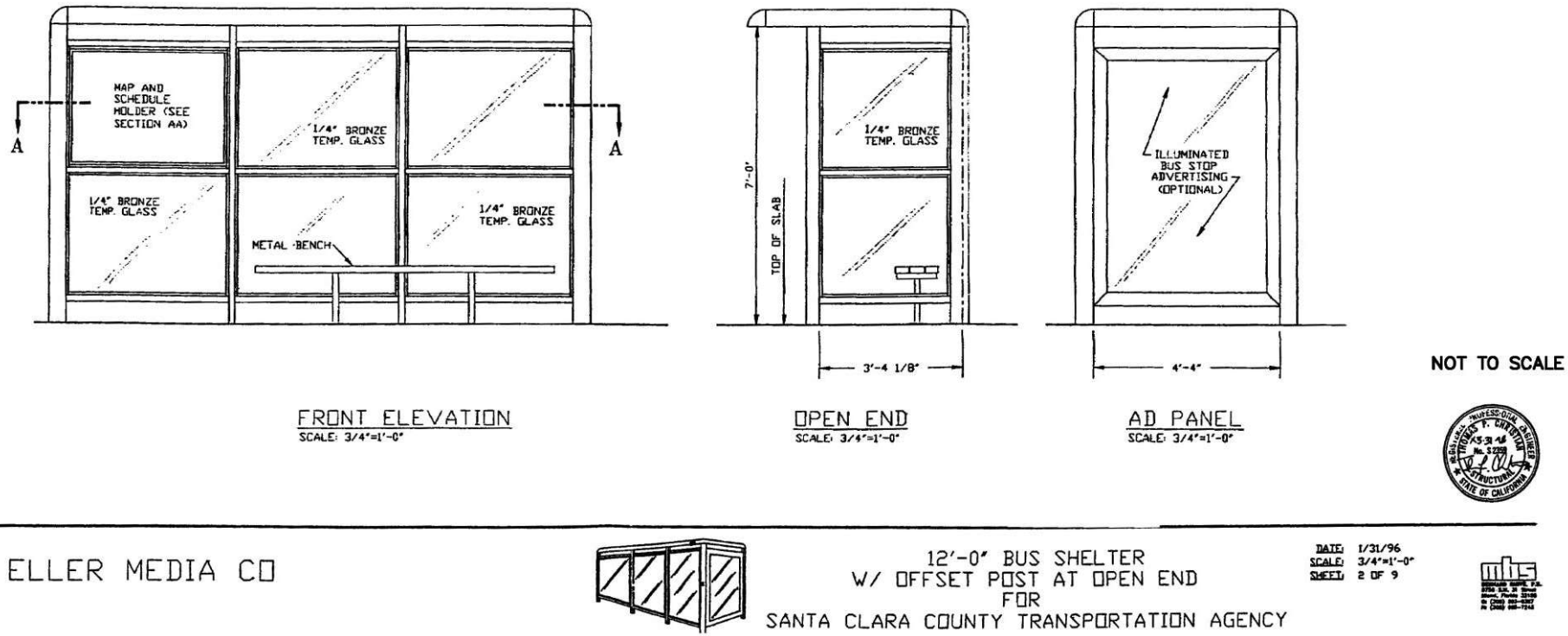
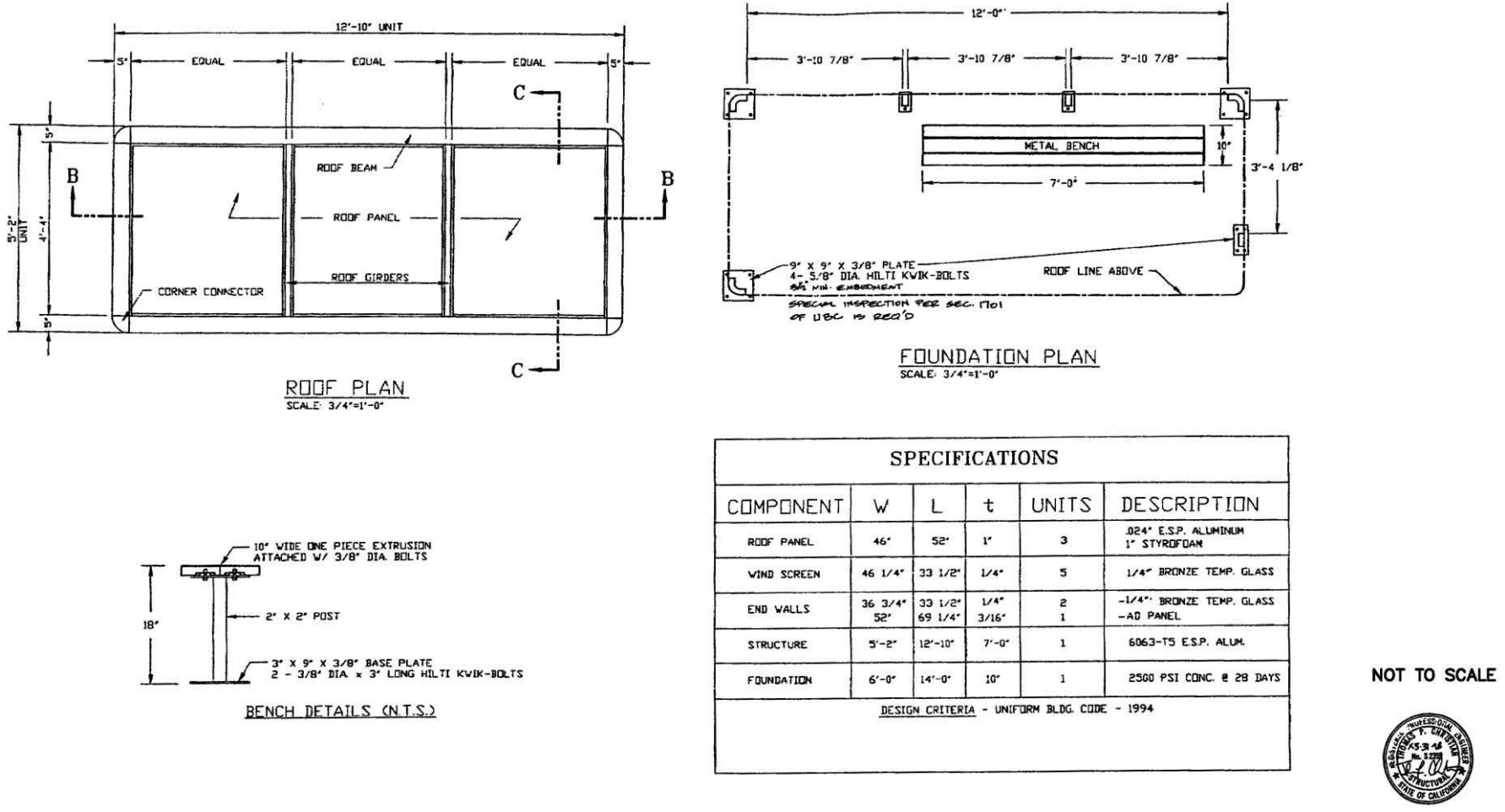


Figure 2.4.11 - 12'-0 bus shelter w/offset post at open end



SPECIFICATIONS

COMPONENT	W	L	t	UNITS	DESCRIPTION
ROOF PANEL	46"	52"	1"	3	.024" E.S.P. ALUMINUM 1" STYROFOAM
WIND SCREEN	46 1/4"	33 1/2"	1/4"	5	1/4" BRONZE TEMP. GLASS
END WALLS	36 3/4" 52"	33 1/2" 69 1/4"	1/4" 3/16"	2 1	-1/4": BRONZE TEMP. GLASS -AD PANEL
STRUCTURE	5'-2"	12'-10"	7'-0"	1	6063-T5 E.S.P. ALUM.
FOUNDATION	6'-0"	14'-0"	10"	1	2500 PSI CONC. @ 28 DAYS

DESIGN CRITERIA - UNIFORM BLDG. CODE - 1994

NOT TO SCALE

ELLER MEDIA CO

12'-0" BUS SHELTER
W/ OFFSET POST AT OPEN END
FOR
SANTA CLARA COUNTY TRANSPORTATION AGENCY

DATE: 1/31/96
SCALE: 3/4"=1'-0"
SHEET: 2 OF 9

Figure 2.4.1m - 12'-0 bus shelter w/offset post at open end

2.4.2 Freestanding Map Case

Figure 2.4.2a provides details for a freestanding map case.

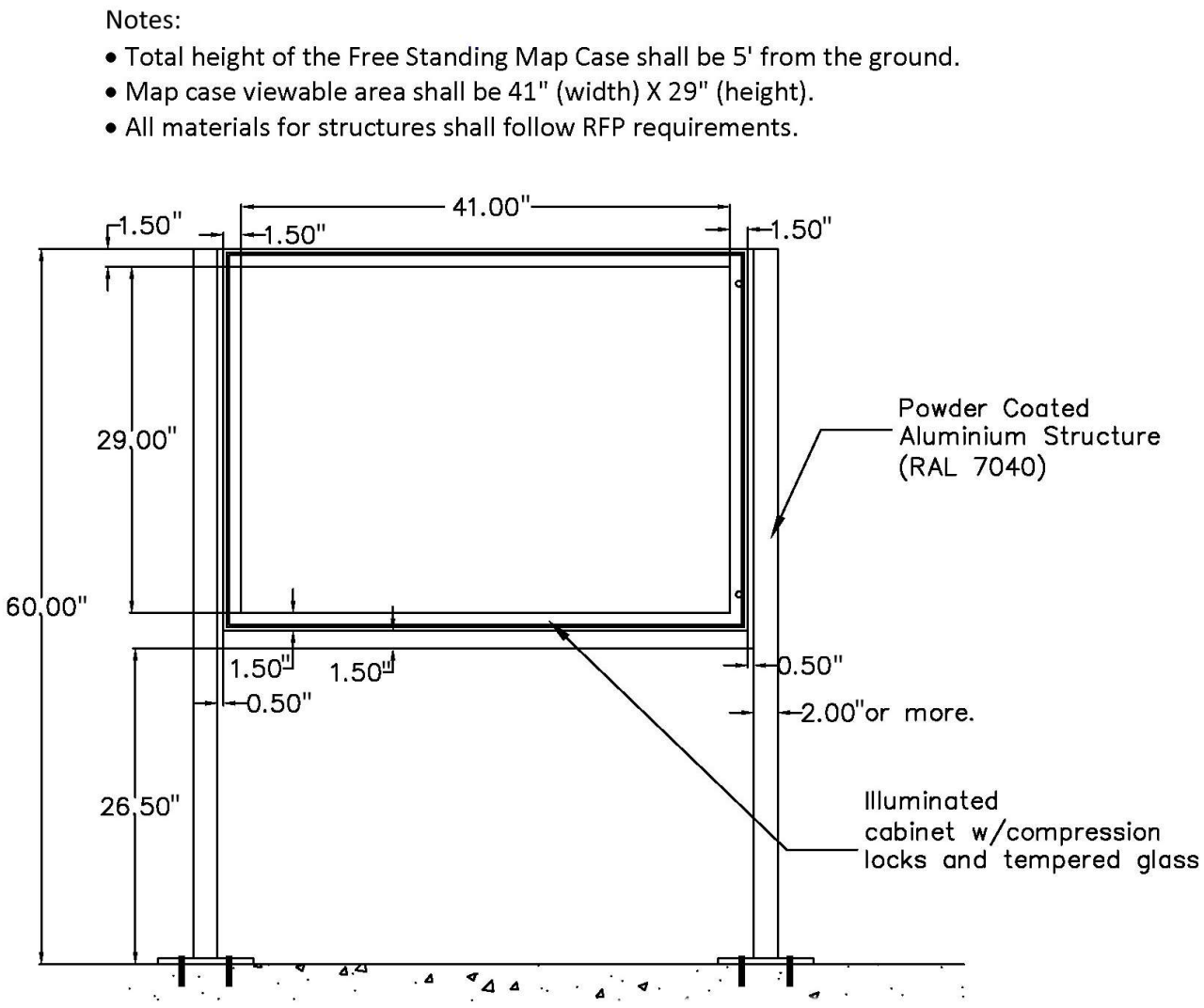


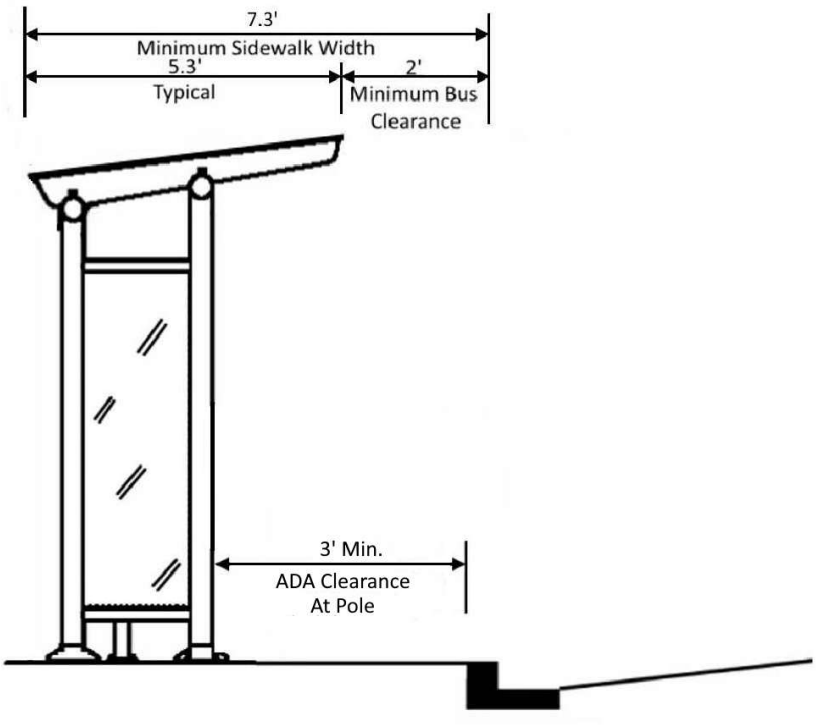
Figure 2.4.2a – Freestanding map case detail

2.4.3 Shelter Placement based on sidewalk widths

Figures 2.4.3a through 3.4.2c provide minimum clearances for shelter placement based on sidewalk widths. The shelter location must consider:

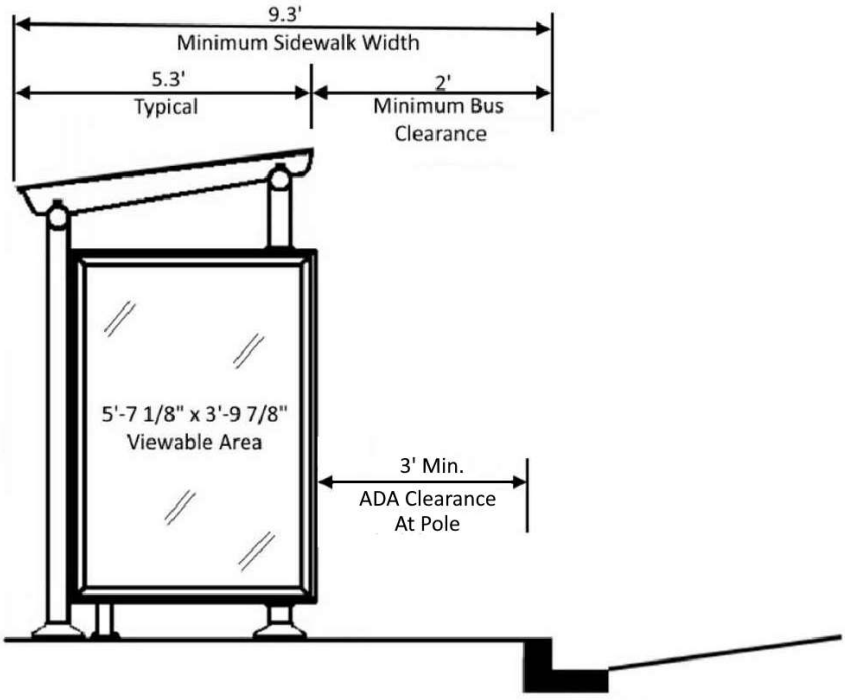
- Sidewalk condition and location
- Relation to bus entrance: and exit doors

- Obstructions of sightlines at intersections
- Drainage
- Electrical service, if needed
- Available right-of-way
- Impact on adjacent property
- Approval of VTA



Notes:
1) Distance measured from back of curb to nearest shelter edge
2) Walking distance outside of pole is 4' min.
3) Distance may be increased depending on local jurisdiction

Figure 2.4.3a – Small size shelter



Notes:
1) Distance measured from back of curb to nearest shelter edge
2) Walking distance outside of pole is 4' min.
3) Distance may be increased depending on local jurisdiction

Figure 2.4.3b – Large size shelter

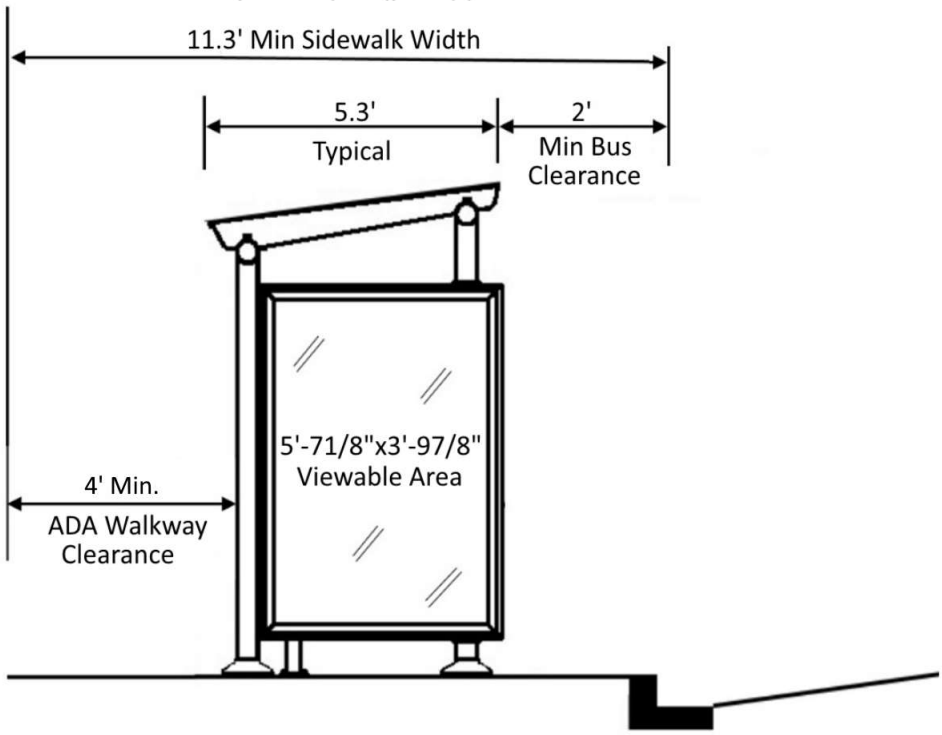


Figure 2.4.3c – Large size shelter with rear walkway

2.4.4 Urban and Suburban Bus Stop Configurations

As expressed in the TPEP, shelters should include:

- Opening or material that allow visibility for the bus driver and the customer
- Roof with overhang that provides inside protection with slope to the rear for drainage
- Lighting: If permanent power if not available then install solar powered panels as needed
- Bench
- One wall minimum (windbreak) with bottom opening 6"or more for ventilation and to avoid trash accumulation within the shelter
- Open space for wheelchair with ADA clearance
- Shelter dimension ranging from 3.0' wide x 13.0' long to 5.0' wide x 17.0' long, depending upon use, location, etc.
- Use of low maintenance materials with textured or treated surfaces to resist vandalism and minimize maintenance
- Provision for mounting an information sign, a minimum 32” x 44” in size
- Concrete pad on which the shelter is placed should be sloped toward the roadway for drainage and should have a different texture to assist the blind in identifying the location

Figures 2.4.4a through 2.4.4h provide desired, typical layouts for various bus stop configurations for locations where space allows. These layouts are not intended to address every possible scenario. Dimensions identified with an asterisk (*) are required minimums.

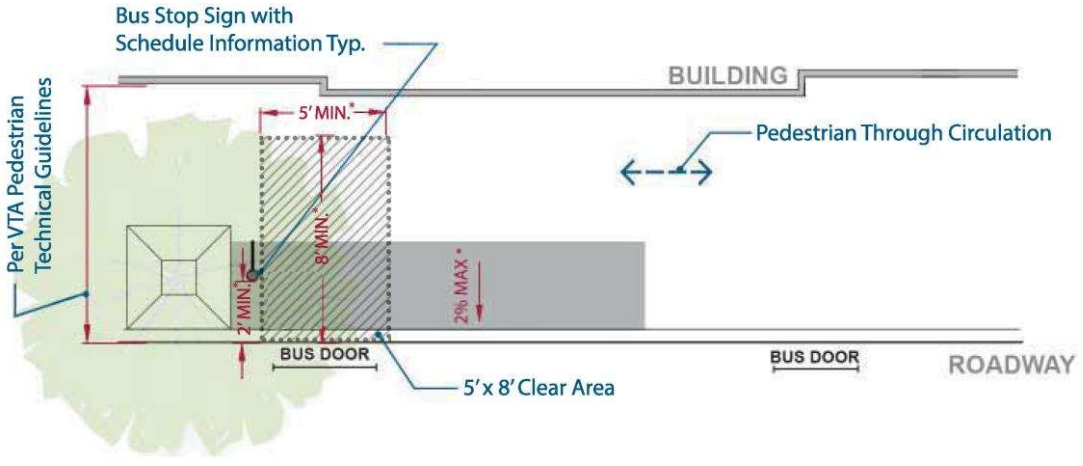


Figure 2.4.4a – Urban basic stop without bench

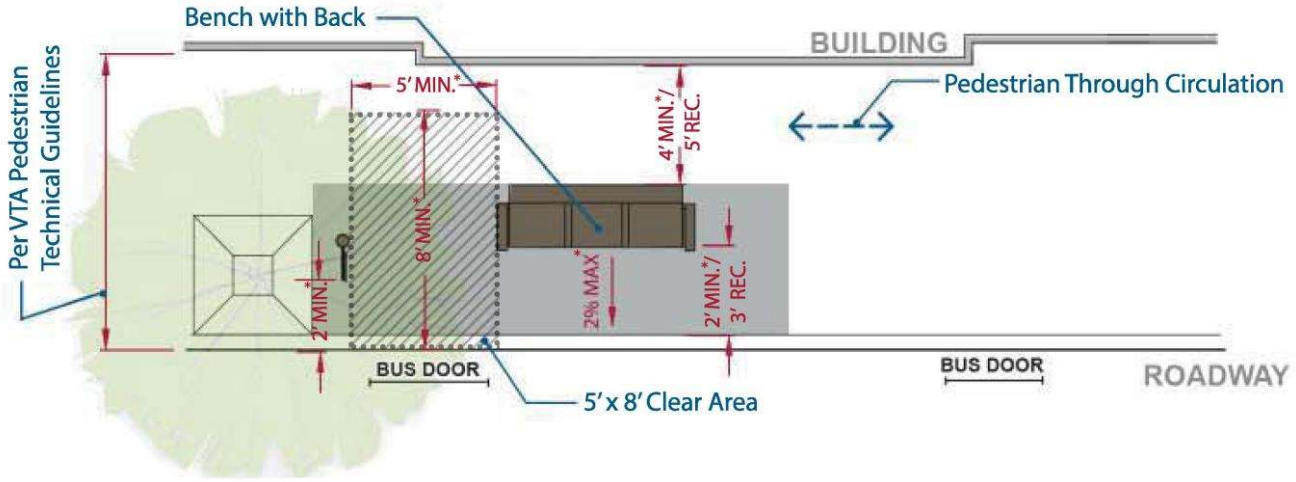


Figure 2.4.4b – Urban basic stop with backed bench

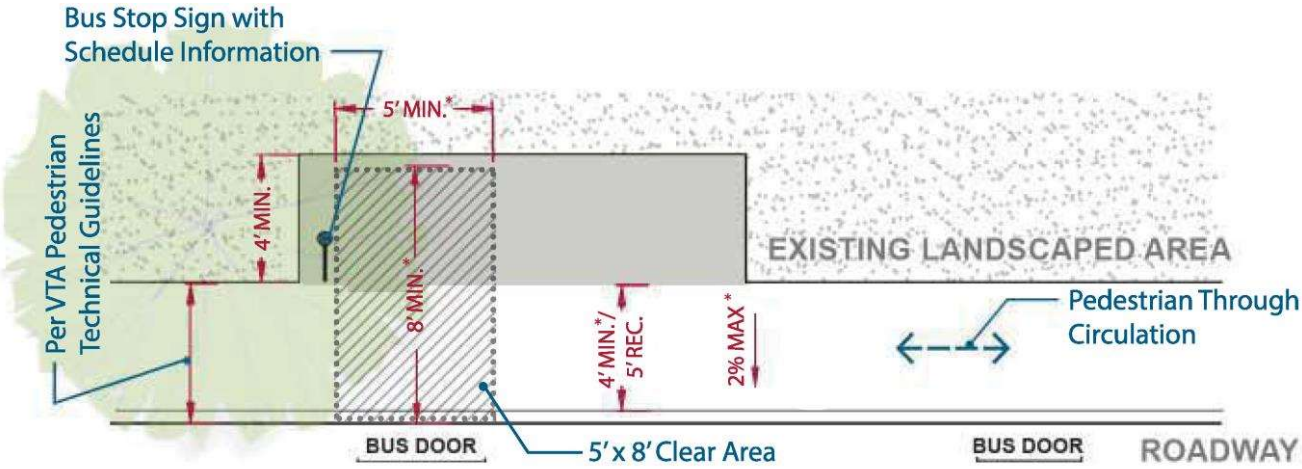


Figure 2.4.4c – Suburban basic stop without bench

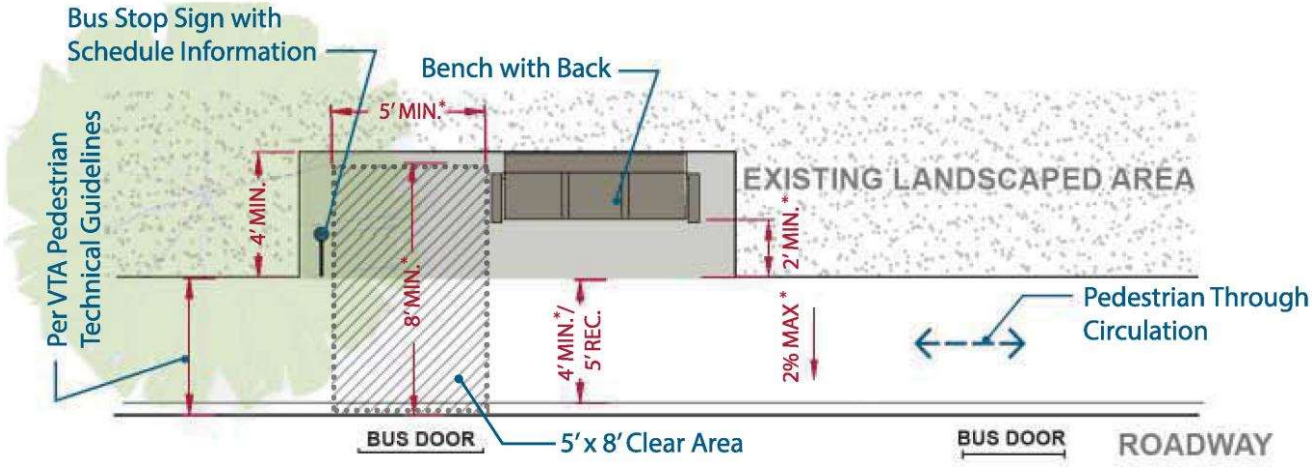


Figure 2.4.4d – Suburban basic stop with backed bench

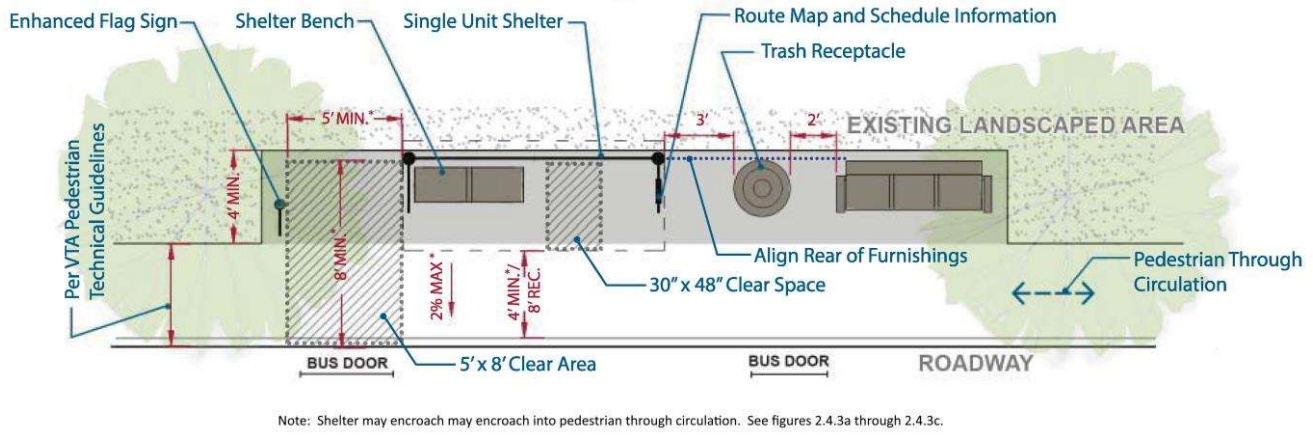


Figure 2.4.4e – Suburban core stop

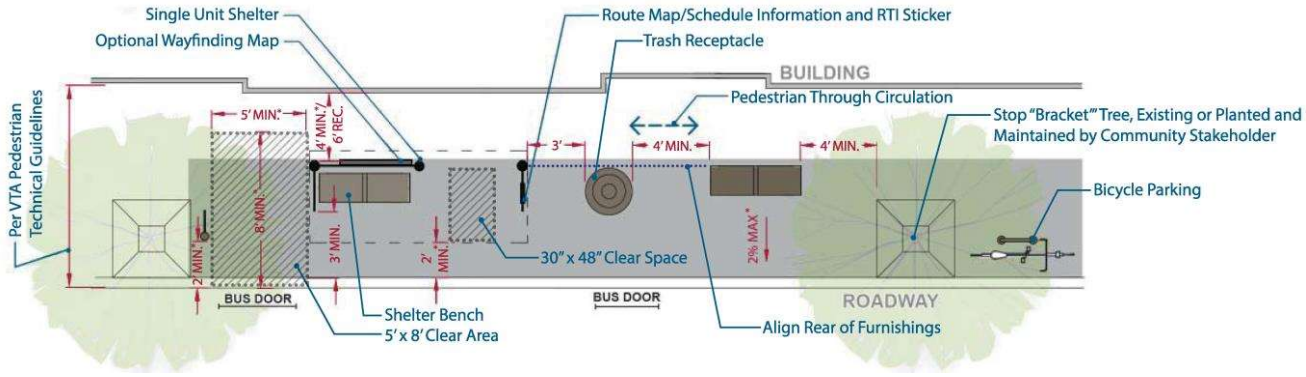


Figure 2.4.4f – Urban core stop

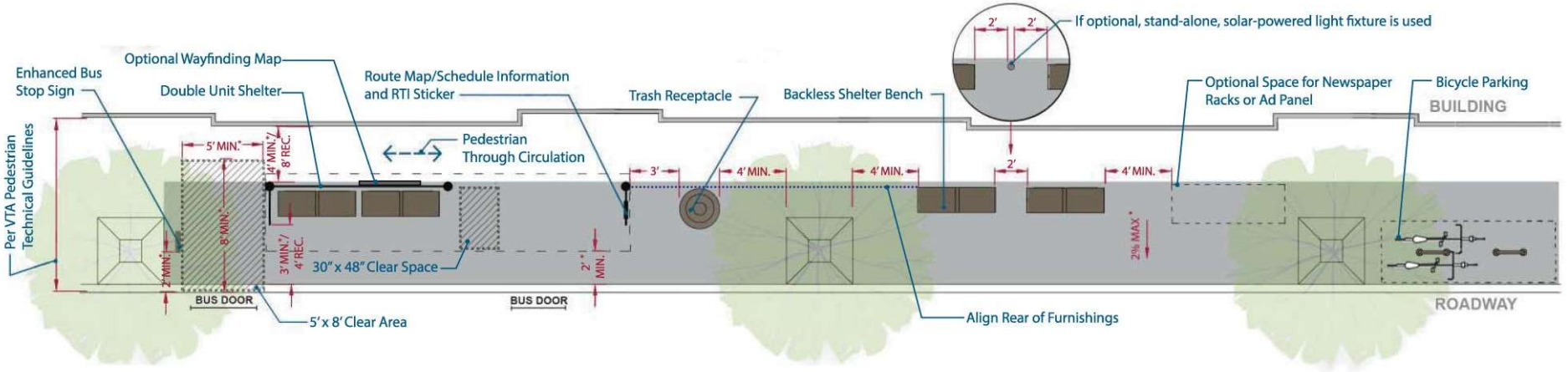


Figure 2.4.4g - Urban major stop layout

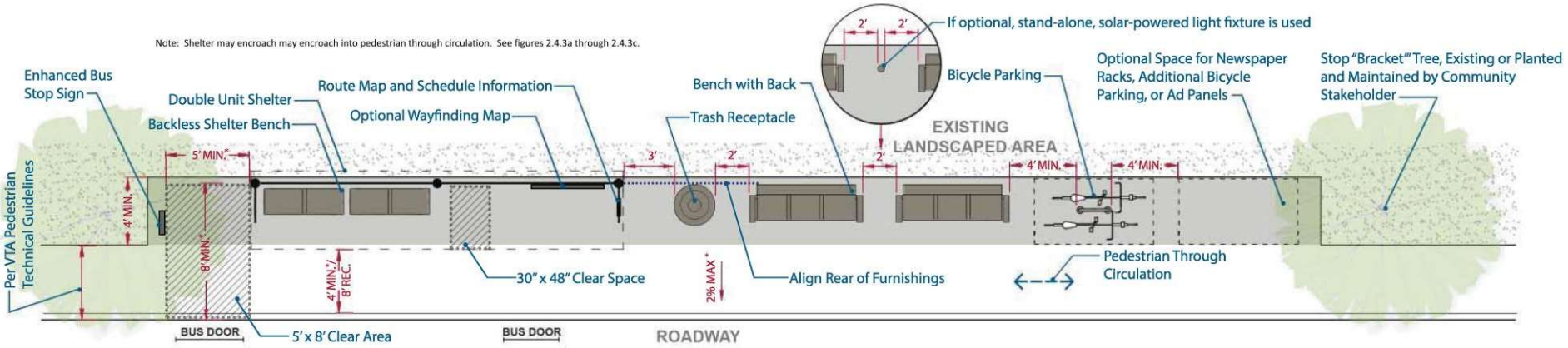
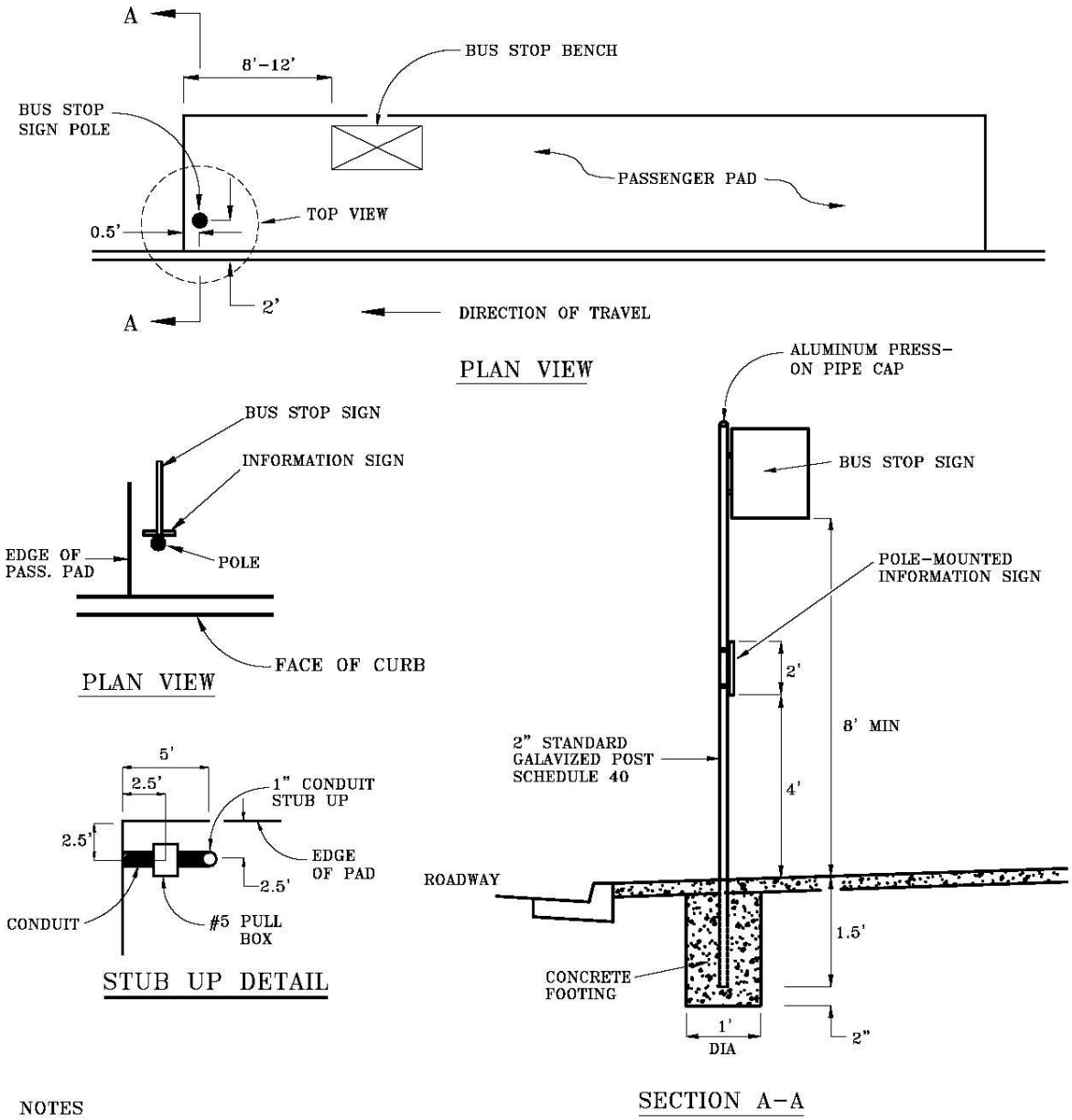


Figure 2.4.4h - Suburban major stop

2.5 Bus Stop Sign and Information Sign Installation

Bus stop signage is included at every VTA bus stop. At locations where only one bus route is provided, a standard sign with route number is provided accompanied by a raised letter braille sign with the notation "Bus." When multiple routes are served at a bus stop, all the route numbers are included on the bus stop sign and the raised letter braille sign includes the route numbers. Additional pole mounted information signs are installed at bus stops that are time points, heavily used bus stops and major transfer points. See Figure x for standard details of the signs and the sign placement.

In a typical bus stop sign installation, the bus stop sign pole is located 2' from the face of curb with the face of the sign positioned away from the street. If the sidewalk is less than 5'5" wide, the bus stop pole must be located 6" from the back of walk with the face of the bus stop sign facing the street. This allows for optimum pedestrian and wheelchair traffic flow around the bus stop pole. See Figure 2.5a for standard details. When a bus stop sign pole is located behind the sidewalk, it should be confirmed that the sign is in public right of way or private property rights should be secured.



NOTES

1. SIGN TO BE MOUNTED PERPENDICULAR TO ROADWAY.
2. FOUNDATION SHALL BE CLASS B CONCRETE PLACED AGAINST UNDISTURBED SOIL.
3. ID SIGN POLES TO BE LOCATED WITHIN AN EXISTING CONCRETED AREA, CORE 3" MIN DIA HOLE AND FILL AROUND POST WITH PCC GROUT. DEPTH OF POST AND GROUT TO BE SIMILAR TO SECTION A-A.

Figure 2.5a – Bus sign installation and light connection detail

2.6 Bus Stop Pavement Standards

The following pavement standards have been designed to provide pavement section at bus stops.

Generally, these improvements are to be made by developers, cities, and VTA at new or existing bus stops where the City or VTA has established that the existing or new roadway pavement will not sustain the bus stop loading.

The typical bus stop pavement pad constructed from Portland concrete cement and the pad size is 10' wide by 55' long pavement. If more than 2 bus routes use the same bus stop, a longer pad will be required.

An asphalt pavement section can be used in place of Portland concrete cement at the request of local city engineer.

See Figure 2.6a through 2.6c for bus pad construction details.

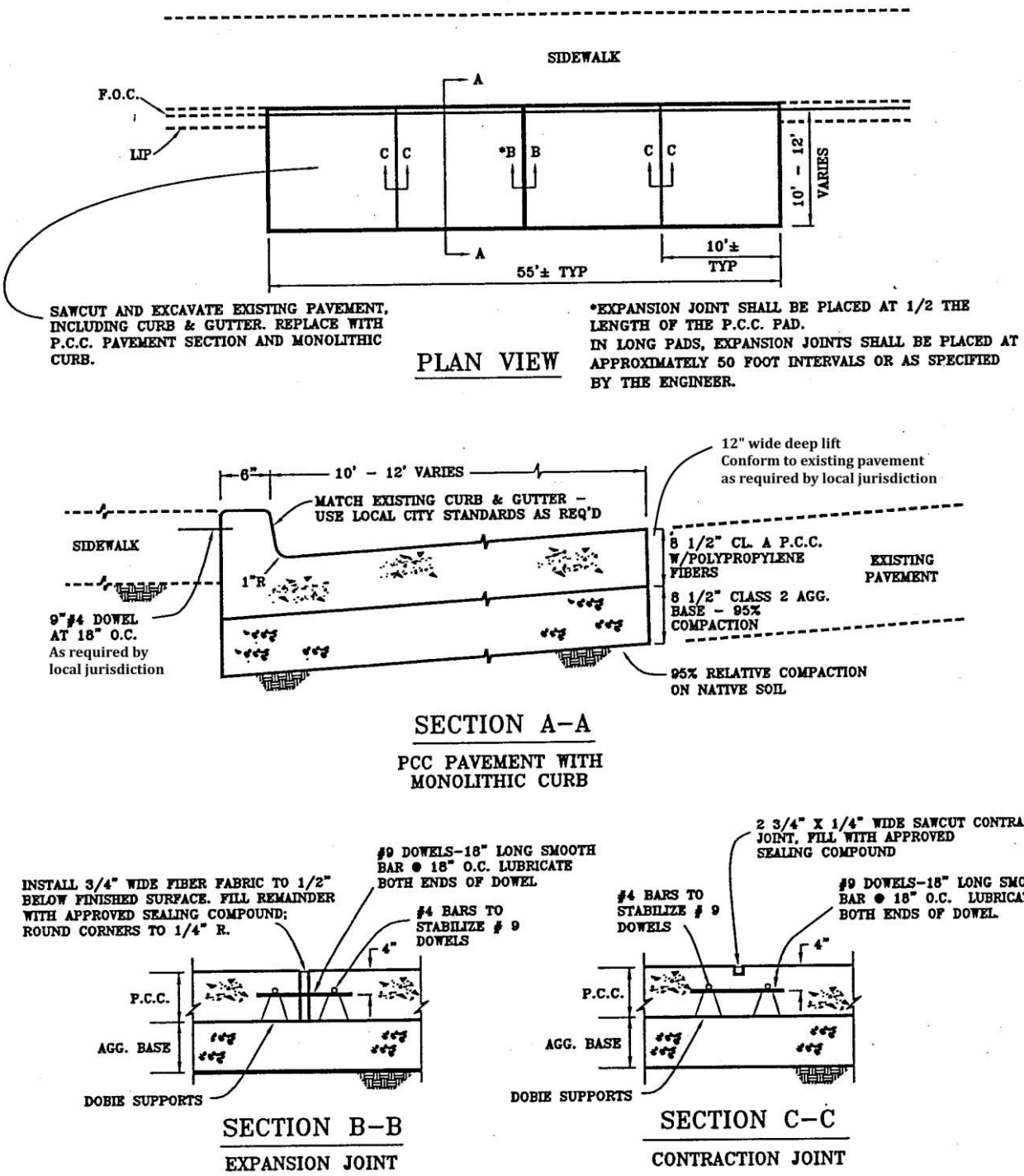
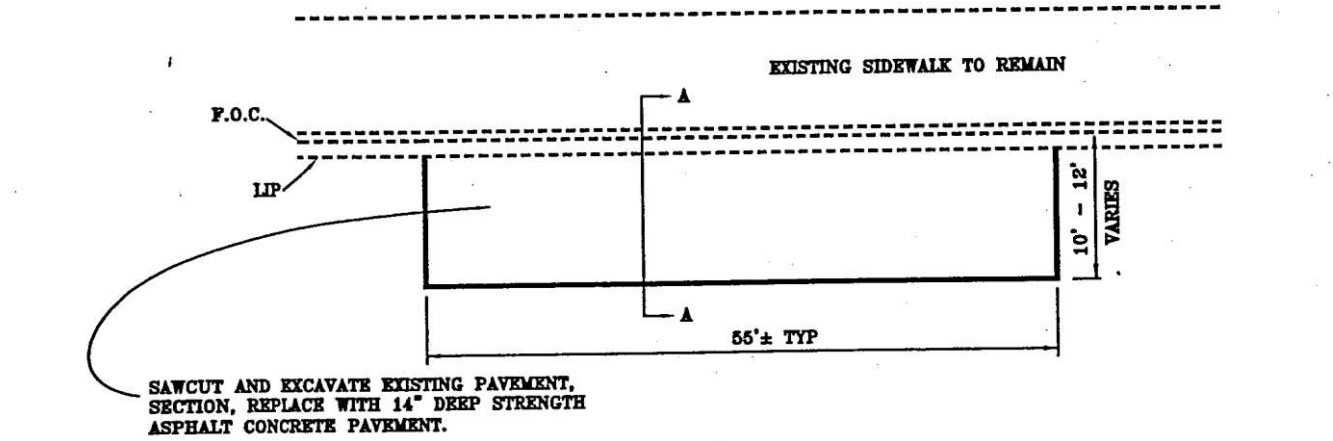
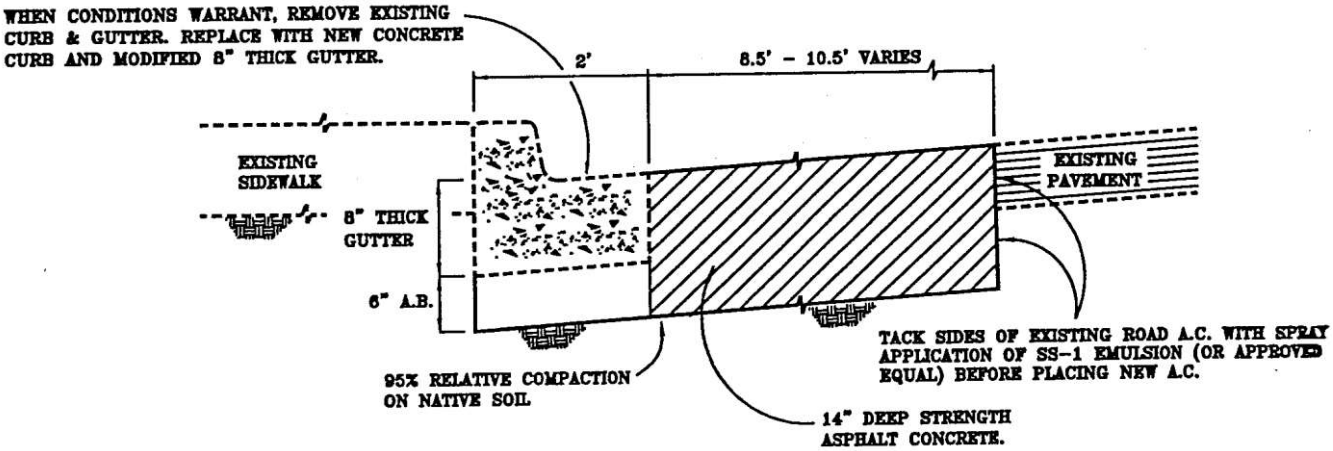


Figure 2.6a – Bus stop pavement details



PLAN VIEW

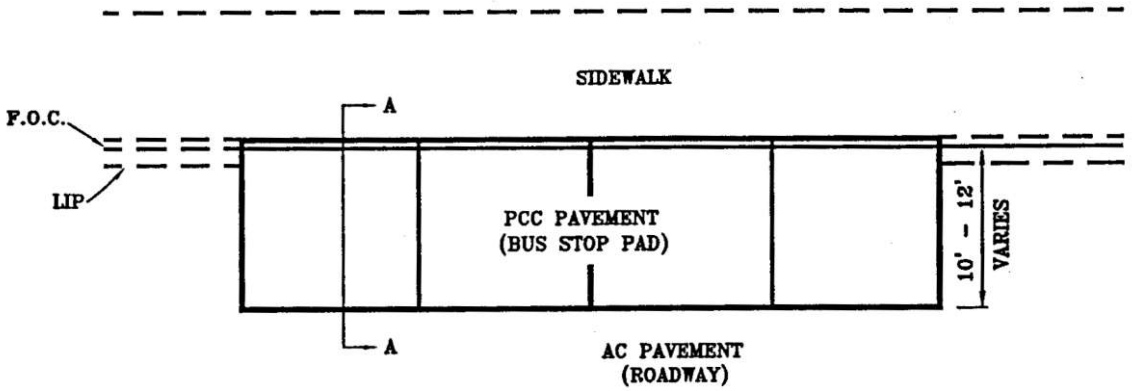


SECTION A–A

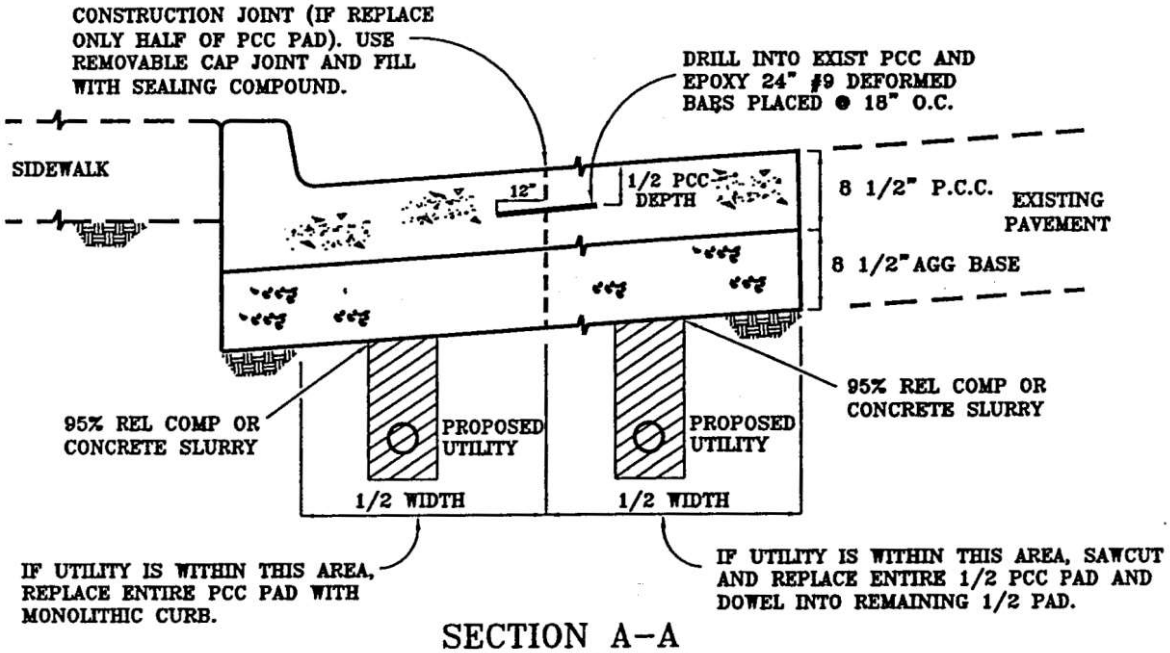
NOTES

1. ASPHALT CONCRETE (A.C.) PAD IS USED FOR BUS AVERAGE DAILY TRAFFIC (A.D.T.) OF 50 OR LESS.
2. 14" DEEP STRENGTH ASPHALT CONCRETE SHALL BE STATE STANDARD TYPE 'A' 3/4" MAX. MEDIUM GRADING, AND SHALL BE PLACED IN ACCORDANCE WITH STATE STANDARD SECTION 39.

Figure 2.6b – Bus stop pavement details



PLAN VIEW



SECTION A-A

PCC PAVEMENT BUS PAD

NOTES:

1. PCC PAVEMENT SHALL CONFORM TO THE DETAILS SHOWN ON SANTA CLARA TRANSPORTATION AGENCY BUS STOP PAVEMENT DETAILS FIGURE 26.

2. THIS DETAIL REFLECTS THE ABSOLUTE MINIMUM REQUIREMENTS. IT IS PREFERED THAT IF ANY UTILITY FALLS WITHIN THE PCC PAVEMENT, THAT IT EITHER BE BORE AND JACKED UNDER PAD OR THAT THE ENTIRE PCC PAD WITH MONOLITHIC CURB BE REPLACED.

3. IF ONLY THE OUTSIDE HALF OF THE PAD IS REPLACED, THE CONSTRUCTION JOINT SHALL CONFORM TO THE PROVISIONS OF SECTION 51-1.13, 'BONDING,' OF THE STATE STANDARD SPECIFICATIONS.

Figure 2.6c – Bus stop pavement details

Section 3 Park and Ride Facility

3.1 Park and Ride Lot

This is a specially designated parking area for bus, vanpool, and carpool users to park their cars and transfer to another vehicle (bus, light rail, van or car) to complete their trip.

Park and Ride facilities are divided into two categories, permanent facilities, and shared use facilities. VTA has several operating and planned permanent park and ride facilities in Santa Clara County. In addition, VTA participates in several shared use agreements. The arrangements can be as simple as a verbal agreement to allow bus or carpool/vanpool patrons free parking privileges. On a more formal scale, VTA can develop a written agreement with a private property owner for use of certain parking spaces for park and ride passengers. Shared use agreements can be arranged to fit the service need, and there is flexibility to alter the arrangement as service needs change.

3.2 Placement Considerations

Considering the growing demand for carpool, vanpool, and bus 'park and rides', parking spaces should be provided by developers at major developments such as shopping centers or planned communities. These parking spaces are intended for use by residents of the immediate community and will help to mitigate the traffic related impacts of the development and to conserve energy resources. These parking spaces should be provided as close to freeways or major arterials as possible. These spaces can be provided separately or can be joint use spaces with nearby commercial, recreational or office development. Persons parking in these reserved spaces will frequent the adjacent commercial uses and other businesses, which is an additional benefit to the developer and tenants of a facility.

3.3 Design Criteria

Standard parking lot design criteria will be applicable to park-and-ride lots except that a bus loading area and auto drop off (kiss and ride) area may also need to be provided at the lot. Shelters, benches, telephones, and other amenities may also be included at park-and-ride lots, depending on the demand at the lot. The number of parking spaces to be reserved for park and ride use can be determined through coordination between VTA, the city or the developer.

3.4 Parking Lot Layout

The recommended Park-and-Ride layout and parking stall dimensions are shown on Figures 3.4a through 3.4c.

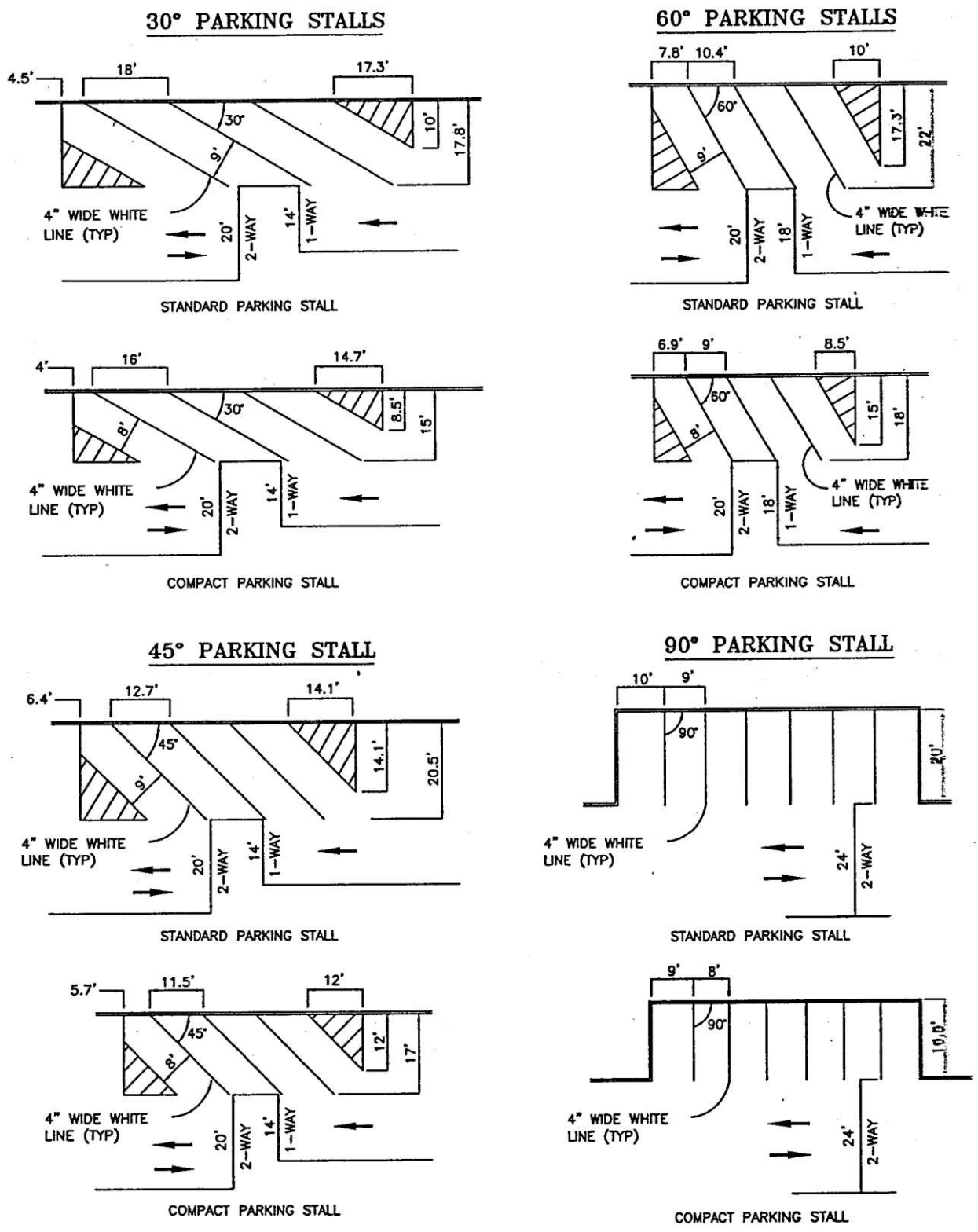


Figure 3.4a – Standard and compact parking stall dimensions

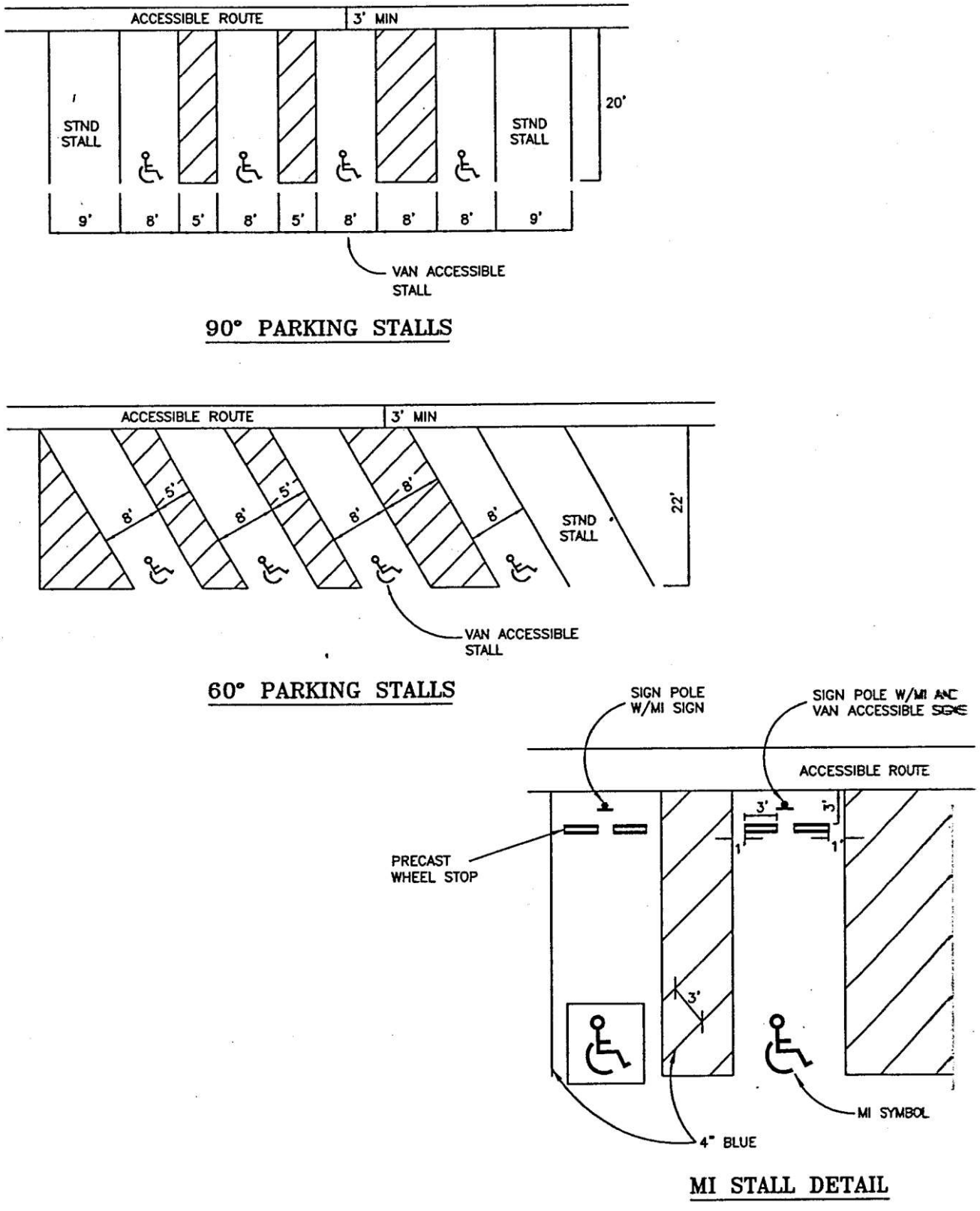


Figure 3.4b – ADA parking stall dimensions

Total Parking Stalls in Lot	Required Minimum Number of Accessible Space
1 to 25	1
26 to 50	2
51 to 75	3
76 to 100	4
101 to to 150	5
151 to 200	6
201 to 300	7
301 to 400	8
401 to 500	9
501 to 1000	2 % of total
1001 & over	20 +1 for ea 100 over 1000

Figure 3.4c – Required minimum accessible stalls to parking stall total

3.5 Lighting

The VTA has adopted a standard light fixture for use on its Park-and-Ride lots and other facilities. High pressure sodium lighting is recommended. The standard light fixture is shown in Figures 3.5a and 3.5b.

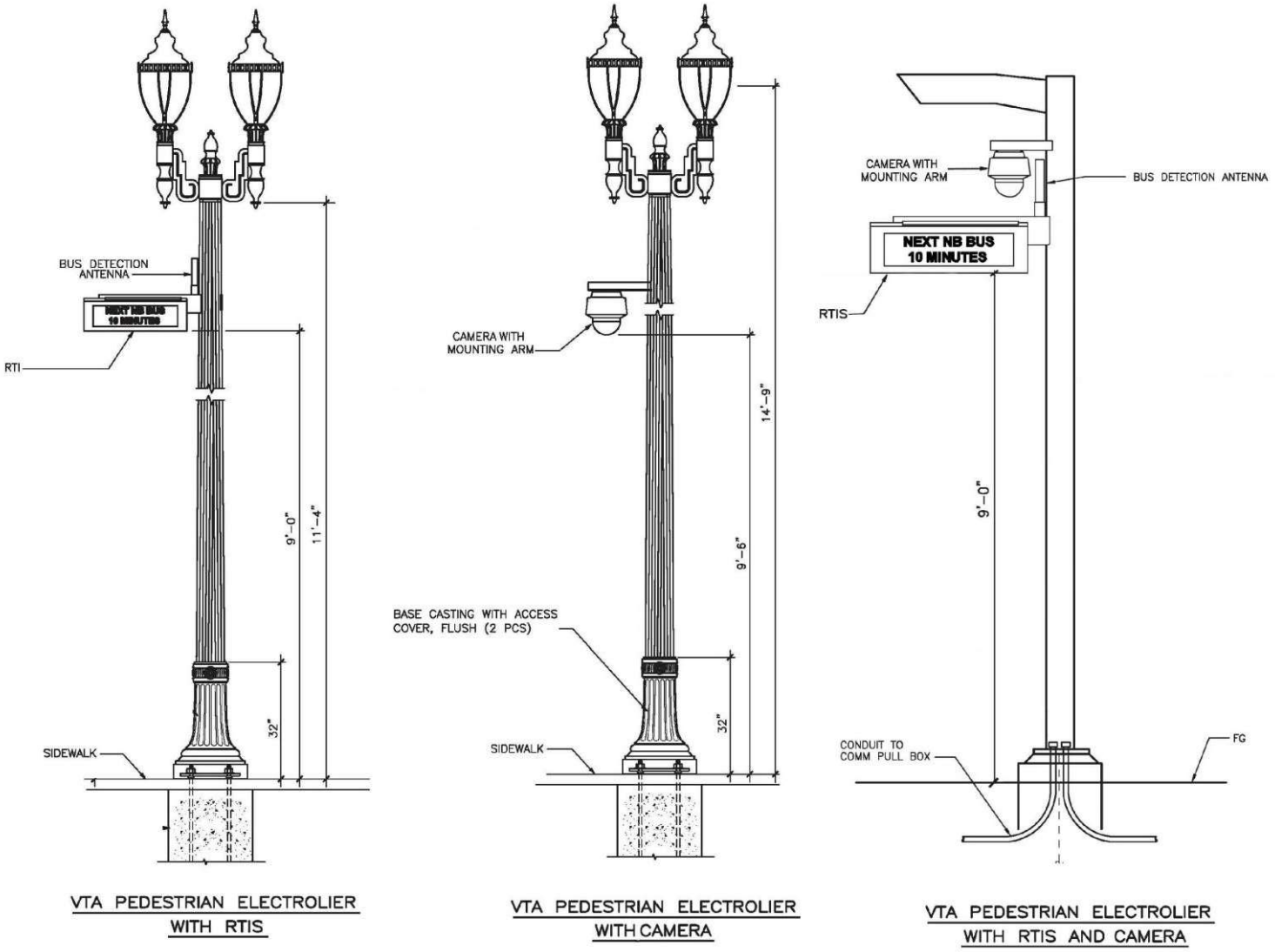


Figure 3.5a – Pedestrian electrolier with CCTV and RTIS

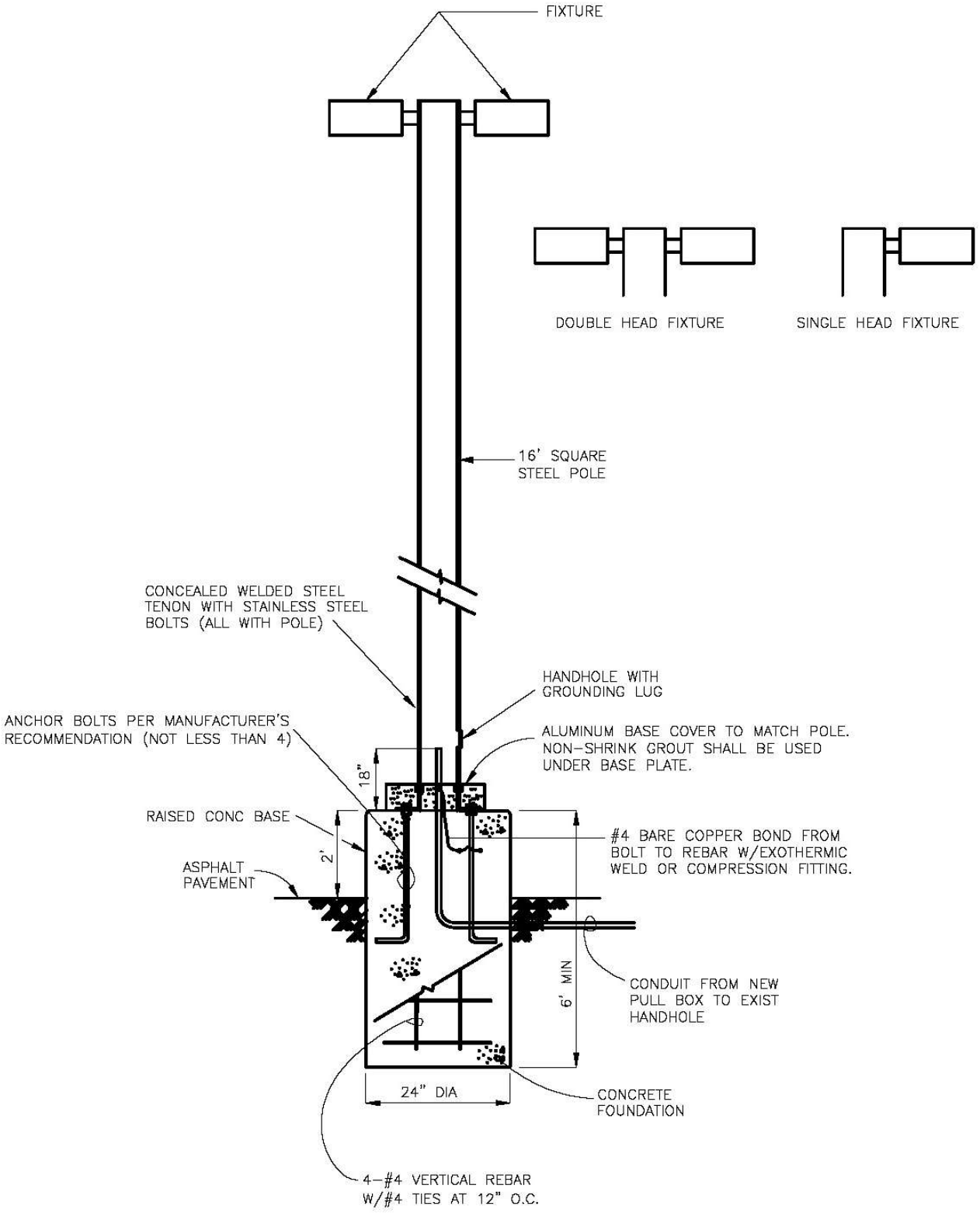


Figure 3.5b – Standard electrolier

Station Lighting:

Station illumination levels shall be measured in foot-candles (fc) for the following areas:

Area	Illumination Level
Platforms (open) area	5.0 fc average, 1.0 fc minimum
Shelter	10 fc average, 1.0 fc minimum
Concourse (open) areas	1.0 fc average
Escalators/elevators/stairways/ramps	5.0 fc average, 1.0 fc minimum
Fare-vending machines/validators	15.0 fc average (vertical surface: 36" to 54" from floor level)
Electrical/mechanical rooms	20.0 fc average
Underpasses	5.4 fc average

Park-and-Ride Lighting:

Area	Illumination Level
Open parking	2.5 fc average, 0.6 fc minimum
Pedestrian walkways	2.5 fc average, 0.6 fc minimum
Entrance and exist roadways	2.5 fc average, 0.6 fc minimum
Bus loading/unloading	10.0 fc average
Bus shelter (interior)	5.0 fc average
Kiss-and-Ride area	10.0 fc average
Substation area	2.0 fc average

Exterior lighting shall be High Pressure Sodium (HPS) incandescent. Light poles shall be no higher than 20 feet with downward directed light fixtures.

Emergency Lighting:

Emergency lighting shall be provided for aerial stations. Emergency illumination levels shall be measured in lux at floor level for the following area:

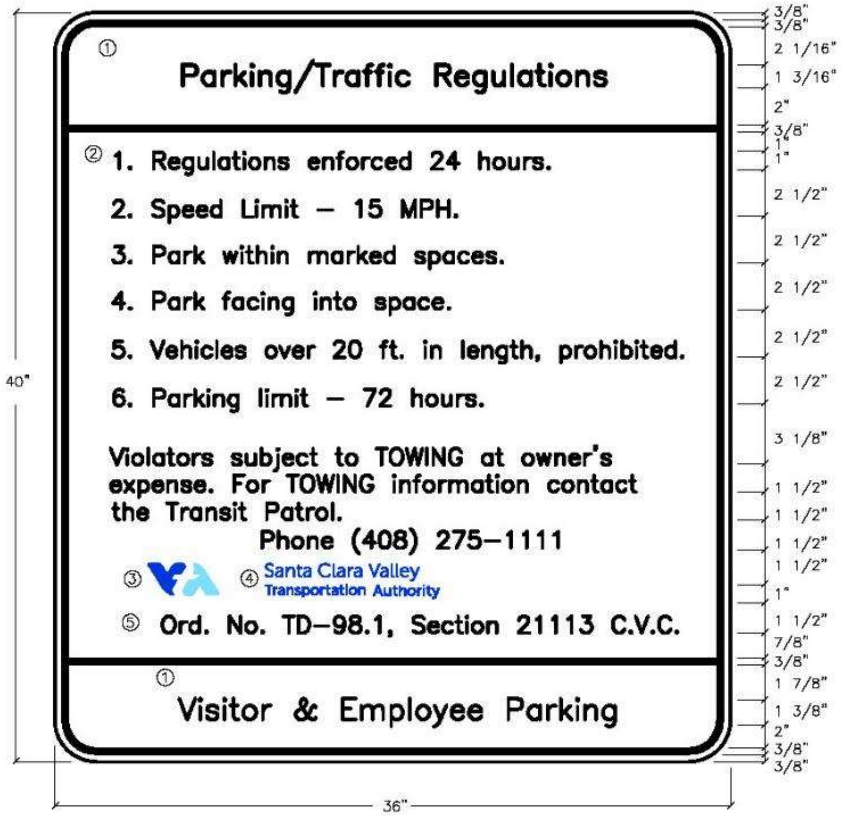
Area	Illumination Level
Emergency (egress route)	1.0 fc average, 0.1 fc minimum

3.6 Landscaping

Provisions should be made for landscaping and irrigation, including a landscape setback with sidewalk in residential areas.

3.7 Park-and-Ride Signage

- The standard Park and Ride directional sign, for placement on local streets and expressways to announce the approach to a Park-and-Ride facility, shall comply with state wayfinding signage.
- The standard Park and Ride lot facility sign placement shall be placed in a visible location from adjacent access roads.
- The standard Park-and-Ride regulation sign for on-site placement is detailed in Figures 3.7a through 3.7c.



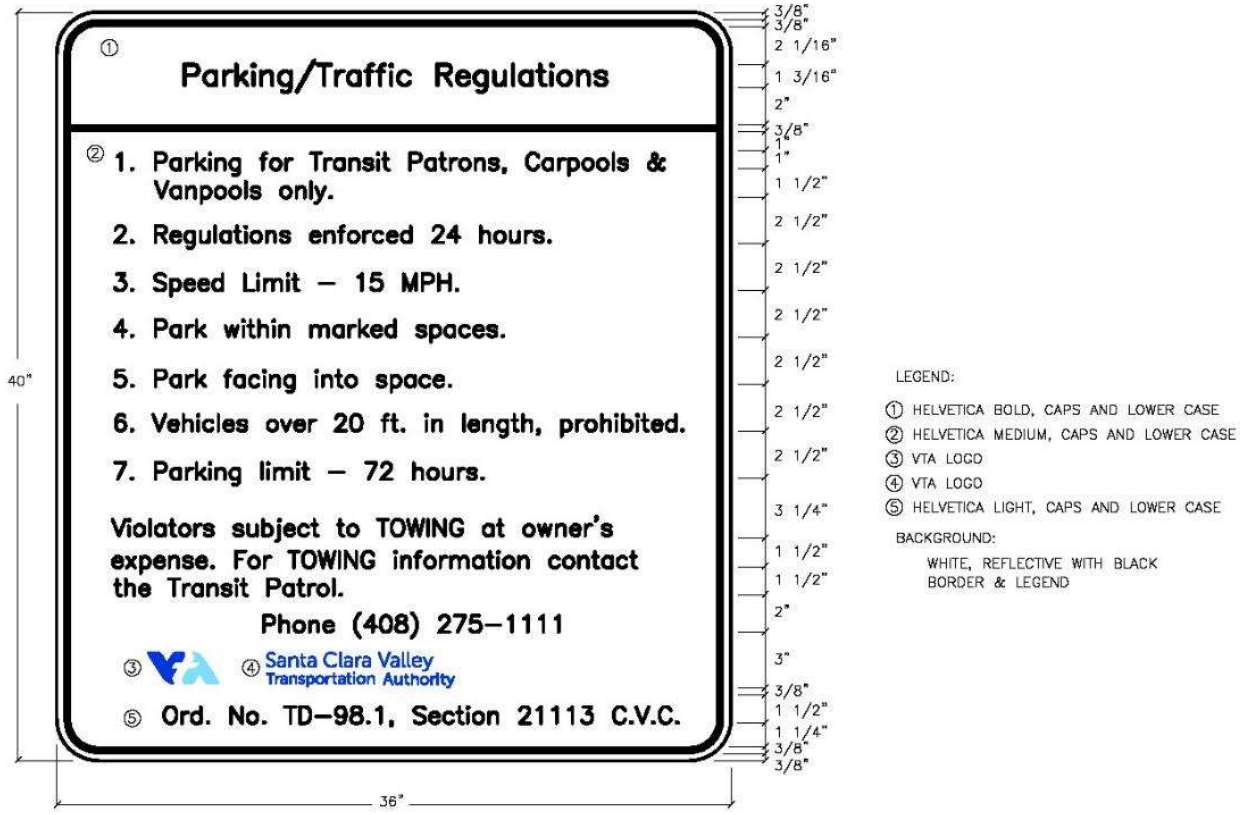
TDPR1

LEGEND:

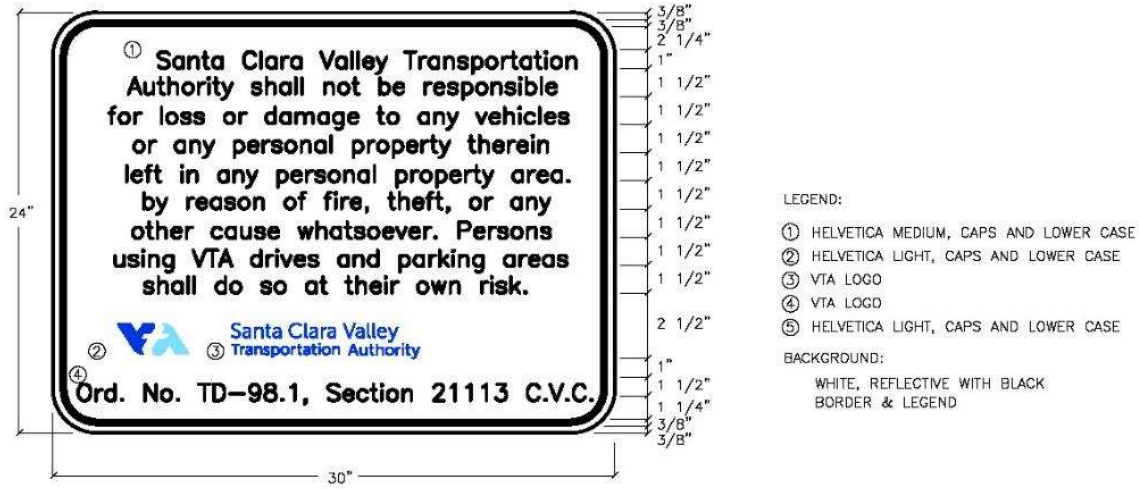
① HELVETICA BOLD, CAPS AND LOWER CASE
② HELVETICA MEDIUM, CAPS AND LOWER CASE
③ VTA LOGO
④ VTA LOGO
⑤ HELVETICA LIGHT, CAPS AND LOWER CASE

BACKGROUND:
WHITE, REFLECTIVE WITH BLACK BORDER & LEGEND

Figure 3.7a – Park and ride sign TDPR1

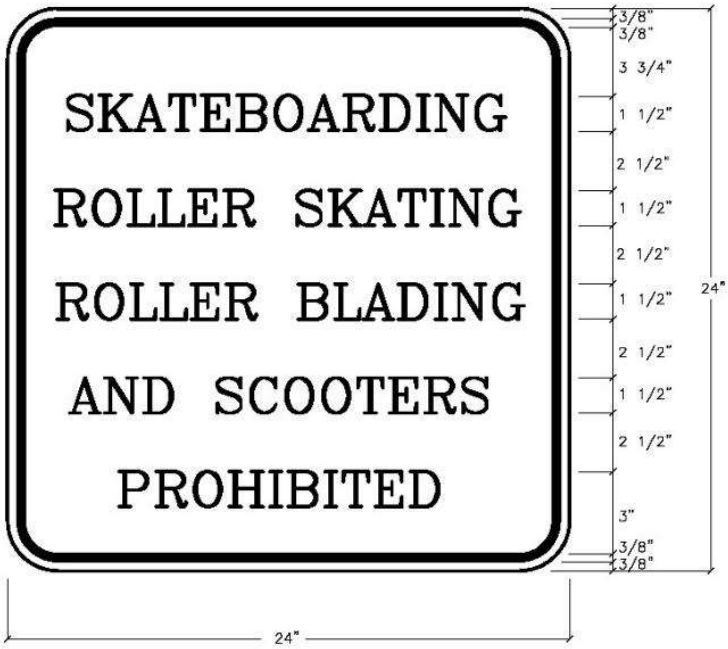


TDPR2



TDPD

Figure 3.7b– Park and ride signs TDPR2 and TPDP



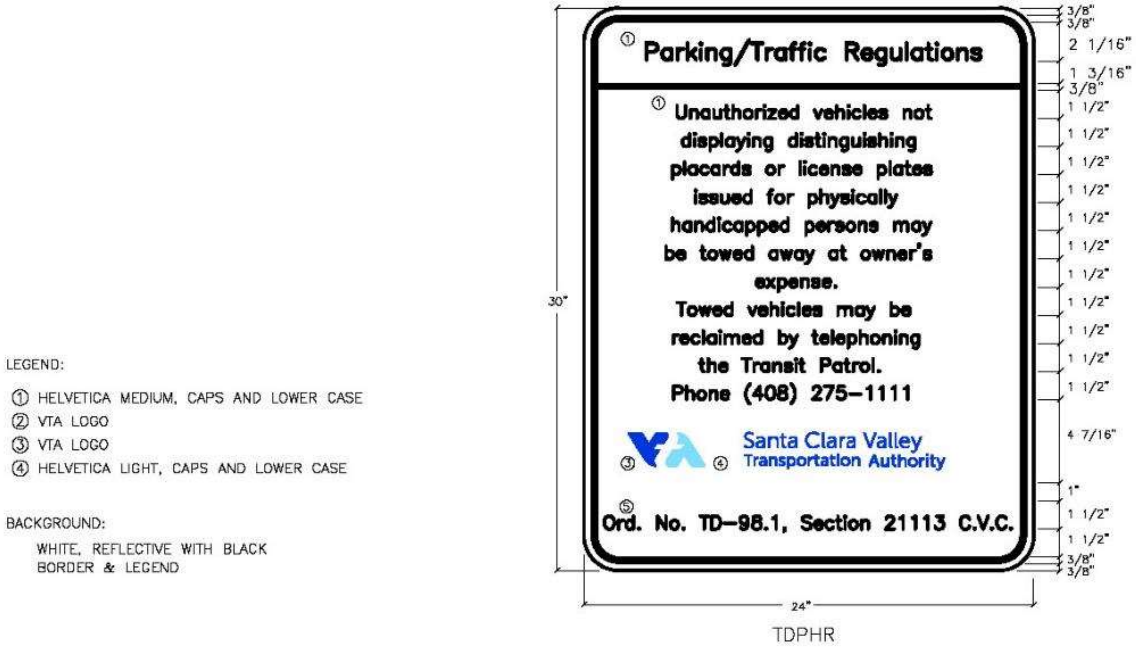


Figure 3.7c – Park and ride signs TDPROHI and TDPHR

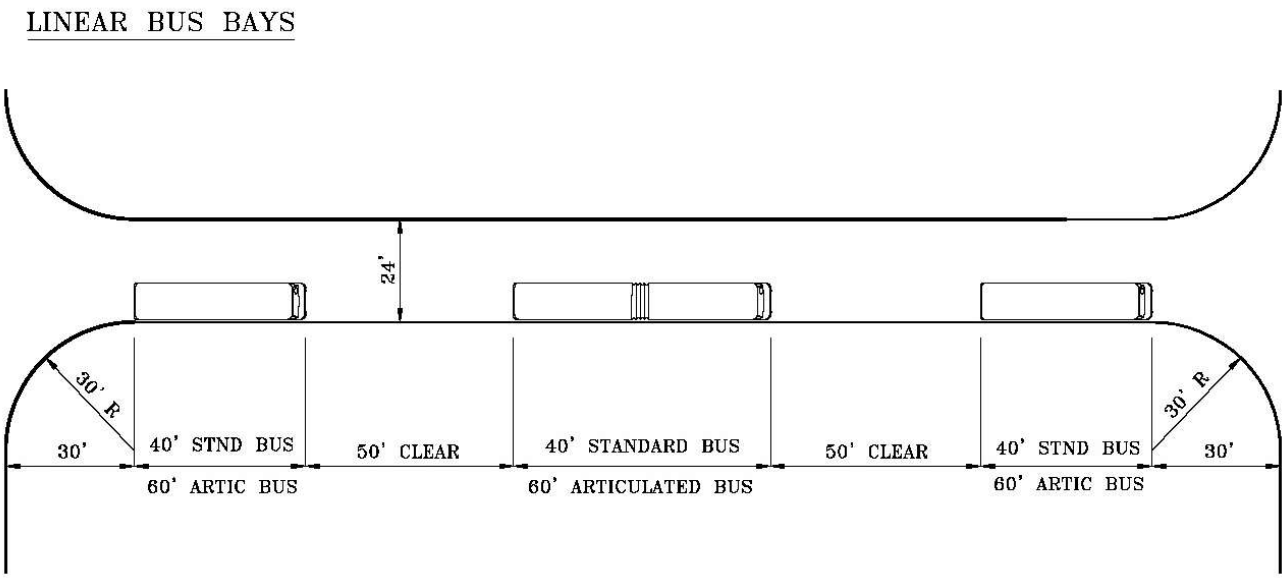
Section 4 Transit Centers

4.1 General Provision

A transit center has the advantage of bringing many bus routes together for easy transferring between buses and other modes of transit. Considerable variation in size and style are possible, but the transit center must fulfill the basic functions of serving all routes with an adequate stopping area and providing a comfortable and convenient waiting area for passengers. Shelter, seating, route information, public telephones, bicycle racks, bicycle lockers should be provided.

4.2 Design Considerations

- Transit Centers can be placed on street or off street although off street facilities generally provide a more attractive passenger environment and shorter transfer distances. On street facilities offer the advantage of using the public street for right of way.
- Exclusive bus access and signal preference should be provided at off street transit centers to minimize facility dwell time. Exclusive bus travel ways should also be provided when transit centers are located in parking areas.
- As space is often a consideration in transit center design a sawtooth bay configuration is recommended. Figure 4.2a illustrates both sawtooth and linear bus bay configurations.
- Bus and pedestrian access to and circulation through the transit center should be direct, safe and convenient.
- Out of direction travel for all buses should be minimized to avoid inefficient operation and unnecessary operating cost.
- Transit center should be designed for convenient transfers between bus to bus and bus to other modes of transportation.
- Busways should have a minimum number of turning movements for ease of operation and passenger comfort.
- Transit center must be designed in compliance with the Americans with Disabilities Act (ADA) and California Title 24 design standards.



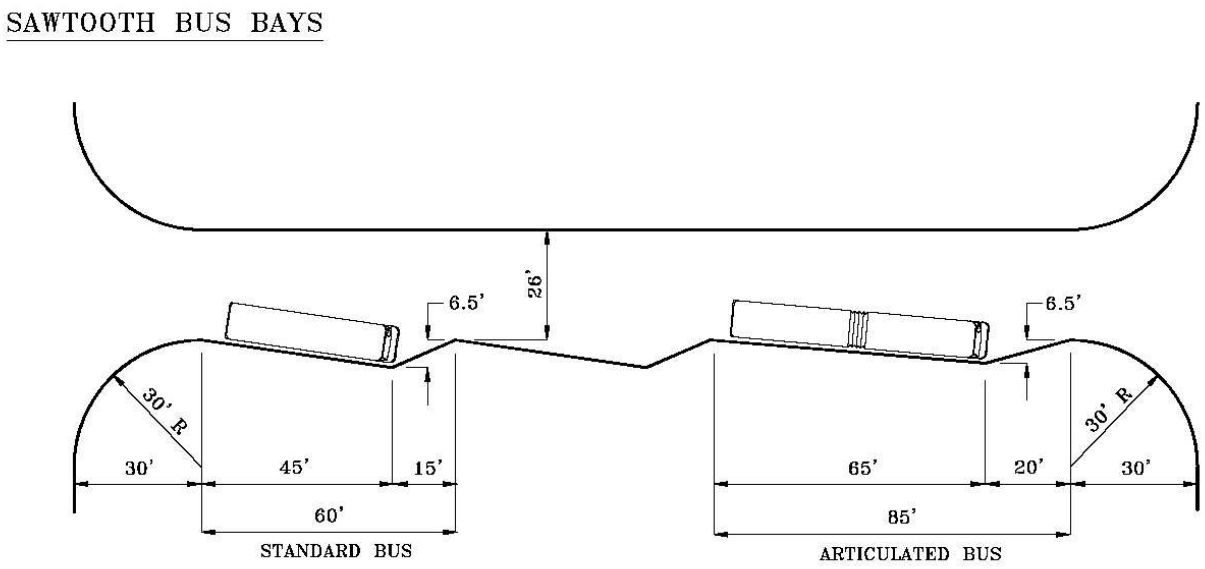


Figure 4.2a – Transit center bus bay configuration

Section 5 Accessible Facility Design Elements

VTA staff in consultation with members of the previous VTA Committee for Transit Accessibility (CTA) has created a list of accessibility considerations to be applied to all VTA transit facilities (transit centers, light rail stations, bus stops and park and ride lots). These considerations are in addition to the requirements included in the Americans with Disabilities Act (ADA).

5.1 Directional Bar and Decision Tile Design Criteria

The use of detectible directional surface tiles and decision tiles are preferred as they improve the ability of persons with visual impairments to navigate at transit facilities, making it easier to locate bus stops and light rail station platforms.

The design characteristics and use of these tiles can be summarized:

1. The goal of directional bar tile is to help passengers connect between different modes of transit. Directional bar tile is generally used as a wayfinding device to guide visually impaired passengers to bus stops, shuttle stops, rail station platforms and crosswalks. It is also used to guide passengers out of a transit center to a crosswalk which will lead them to a major activity center, such as a shopping mall or a college campus. Directional bar tiles should be used in conjunction with decision tiles (see below).

2. Both the directional bar tiles and the decision tiles are made of high-strength material. One example is Vitrified Polymer Composite (VPC), which is an epoxy polymer composition employing aluminum oxide particles in the raised surface. The directional bar tile is 6" wide and is bright yellow with two raised bars along the length of the tile. In addition, there are very small, raised dots on the bars and in the spaces between the bars. The base is designed to be installed flush with the surrounding surface, while the bars are raised 0.2 inches for detectability. The decision tile is similar to directional bar tile but is 12" wide (typically a square) and includes four raised bars.

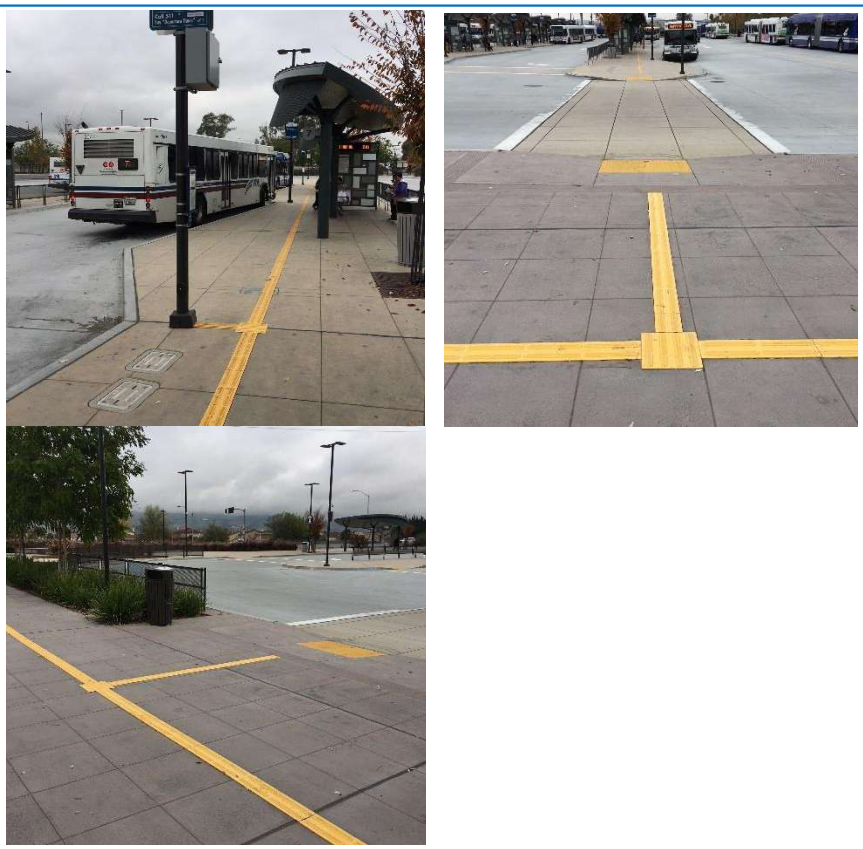
3. The location of directional bar tiles is very important. They should be installed approximately four feet from the face of any curb with a minimum of two feet clearance on either side of the tile. This is to ensure that passengers walking with white canes will have sufficient clearance to sweep with the cane and have a buffer from vehicular traffic. At the curb ramp, the directional bar tiles terminate at the side or top of a curb ramp that leads passengers to the crosswalk. In proximity to the curb ramp, the yellow tiles may be less than four feet from the face of the curb as necessary.

4. The directional bar tiles should not cover any portion of the curb ramp.

5. Decision tile is used to alert visually impaired passengers using white canes that there is a choice in which direction they can travel along the path. The raised bars in the decision tile are oriented at an angle to the raised bars in the directional bar tile to improve white cane detection.

6. Decision tile may be used to alert visually impaired passengers that they are approaching a bus stop. It should be centered along the directional bar tile path and installed such that the four raised bars are at 90 degrees to the raised bars in the directional tile. A smaller section of directional bar tile is installed to the left or right of the decision tile to take the passenger to the bus stop pole. This constitutes a "T" intersection. (Bus stop poles serving two or more routes and connecting with directional tile should have a route number sign in Braille/raised letters mounted on the pole as per established guidelines. See "Tactile Signage".) This same configuration can be used to indicate an alternate path option at the decision tile.

7. Another important use of decision tile is at junctions where passengers are leaving a crosswalk/ramp area and have the options of going straight ahead, or to the left or to the right. The decision tile would connect the two or three paths of the directional bar tile and would be installed such that the four raised bars are at an angle to the raised bars in the directional tile to the extent possible. This junction is called a "Y" intersection.



Examples of Directional and Decision Tiles at Eastridge Transit Center

5.2 Tactile Bus Sign Signage Design Criteria

The use of tactile signage is required by the ADA for some applications and is a preference for other applications in transit centers, light rail stations and at bus stops.

The purpose of tactile signage is to enable visually impaired passengers to independently locate their public transit connections (e.g., find bus stops and light rail platforms), to be able to access VTA Customer Service via Speed Dialing at public telephones at transit centers and light rail stations, as well as to successfully use Ticket Vending Machines (TVM) and access other information.

Tactile signage includes both Braille and raised letters. The design characteristics and use of various tactile signs are described as follows:

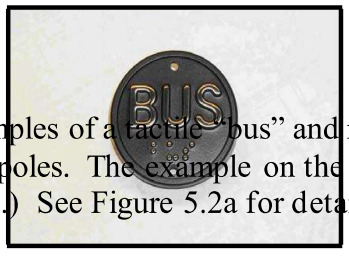
1. Tactile "bus" signs should be mounted on all standard 2 3/8" OD bus stop poles (and non-standard poles where practical.) This allows visually impaired customers to differentiate bus stop poles from other similar poles. (These small Braille and raised letter signs simply say "bus" on the front.).
2. Tactile route-specific signs (instead of generic tactile "bus" signs) should be mounted to bus stop poles which are in proximity to other bus stops, such as at transit centers. This allows visually impaired customers to identify the correct stop at locations where multiple stops are served. (This does not apply to single, stand-alone stops serving multiple routes.)
3. Stand-alone paratransit stops should include standard paratransit signs at the top plus tactile paratransit signs attached to the same pole, including paratransit broker customer service telephone number.
4. Tactile speed dialing signs should be installed above public telephones at transit centers and light rail stations.
5. Tactile transit center and light rail station facility name signage should be included on information cabinets.

Specifications and installation information for tactile "bus" signs:

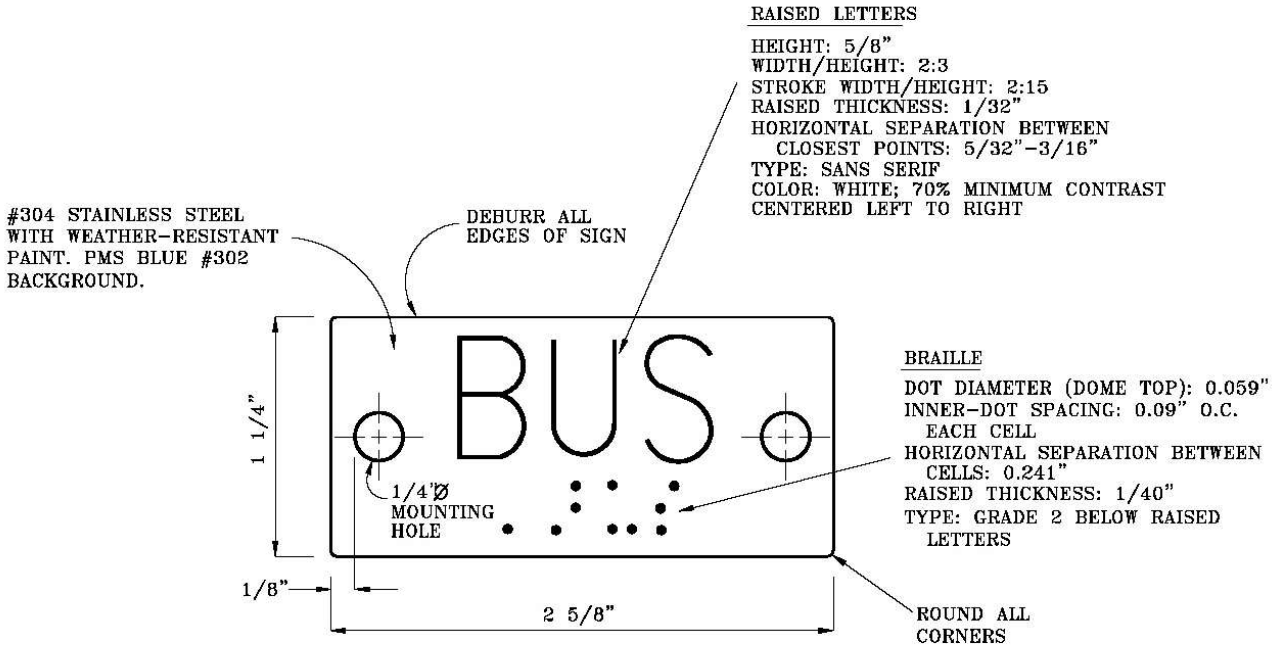
- Sign measures 1 ¼" high.
- Material is steel with weather resistant paint.
- Includes raised letters/Braille.
- Color-white letters on Blue PMS 302 (VTA blue).
- Mount flush with curvature of the standard 2 3/8" OD bus stop pole (alternate arrangements required for non-standard poles).
- Sign comes with two ½" holes on left and right side of sign.
- Height of installation should be 60" measured from the pavement to the center of the tactile (raised letter and Braille) portion of the sign.

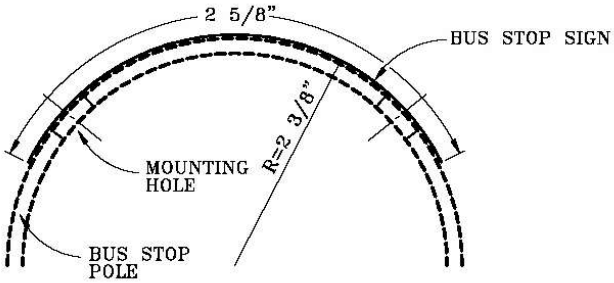
Specifications and installation information for tactile route-specific signs:

- Sign measures 3.5” wide and 4” long for one route, 5” long for two routes. Signs may be made as large as necessary to accommodate all routes.
- Material is a minimum 3/32” thick aluminum plate.
- Color is PMS 302, front and back.
- Raised letters and numbers are 1” high.
- Width-to-height ratio for raised letters and numbers is between 3:5 and 1:1.
- Stroke width to height ratio is between 1:5 and 1:10 vii. Raised thickness is 1/32”.
- Horizontal separation between closest points is between 0.15” and 0.20”
- Vertical separation between closest points is 0.50” including between Braille and raised characters.
- Type: Sans Serif. Futura Regular and Futura Bold Condensed are both ADA compliant. Futura Bold Condensed is preferred and is also easier for sighted passengers to read.
- Color: etched Braille (Natural) on PMS 302 background.
- Mounting holes are ¼” dia. placed at .6” for raised characters and Braille and .3” from edge of sign (measured from edge of hole).
- Braille specifications for tactile “bus” and route route-specific signs:
- Dot diameter: .059”
- Interior dot spacing: .09” on centers in each cell.
- Horizontal separation between cells: .241”
- Vertical separation between cells: .395”
- Raised thickness: 1/40”
- Grade 2 Braille should be placed immediately below raised letters.
- Installation: signs come with ¾” wide foam strips. Sign has 2 punched holes and is attached to the pole with screws/rivets.



Examples of a tactile “bus” and route-specific signs. The left and center examples are for standard bus stop poles. The example on the right is for tactile route-specific signs used for non-standard bus stop poles.) See Figure 5.2a for details.





SIGN TO BE CURVED TO FIT 2 3/8" OUTSIDE DIAMETER BUS STOP POLE.

TOP VIEW

NOTES:

1. SIGNAGE SHOULD BE DURABLE AND TAMPER-RESISTANT.
2. SIGNAGE MUST COMPLY WITH ALL APPLICABLE REGULATIONS SET FORTH BY THE AMERICANS WITH DISIBILITIES ACT AND THE CALIFORNIA CODE OF REGULATIONS, TITLE 24.

SCALE: 1"=1"

Figure 5.2a – Raised letters and Braille sign detail

5.3 Tactile Speed Dialing Sign Design Criteria

Specifications and installation information for tactile speed dialing signs:

- Sign measures 5.5” x 8” x 1/32” thick.
- Sign made of aluminum with rounded corners-1/2” R Typical.
- Color is PMS 302
- 50 pt. Sans Serif-Upper case.
- Raised letters and Braille on exposed aluminum finish-1/32” raised thickness.
- Backing: Sign comes with (4) ¾” wide foam tape strips.
- Grade 2 Braille.
- Installation: use a tamper proof screw in each corner (4 locations).
- Text for Speed dialing:

  “SPEED DIALING: PRESS # 1 FOR VTA CUSTOMER SERVICE”

  Note that the raised letter text uses the # key symbol. However, the pound sign is not easily translated into Braille. Therefore, the Braille portion of the sign uses the word “pound” for the symbol #.

Example of speed dialing sign and placement.

5.4 Paratransit Stop Sign

Specifications and installation information for Paratransit Stop Signs:

- These signs are located wherever Paratransit stops exist. All transit centers and light rail stations should include at least one designated stop, as well as colleges and other destinations with a high frequency of Paratransit connections. A standard “Paratransit stop” sign is located at the top of the pole, and a special sign with large print and tactile signage is mounted at the middle of the pole.
- Sign at top of pole is 8.5” wide x 17” long.
- Raised letters are 50 pt. Sans Serif in upper case.
- Color is PMS 302 on reflective white.
- Grade 2 Braille.

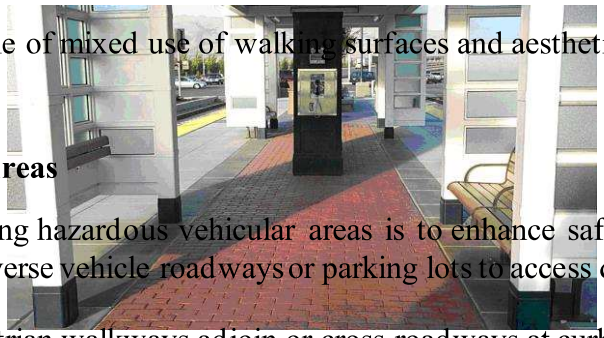
Example of large print/tactile Paratransit stop sign.

5.5 Walking Surfaces

The purpose of defining standards for walking surfaces is to enable persons traveling in wheelchairs to experience minimal vibrations. It is also intended to reduce tripping hazards for other mobility-impaired persons or visually impaired persons who walk with canes.

The preference for walking surface is a non-stamped or no-texture walking surface. However, architectural paving has become an important aesthetic design element in new transit centers and light rail stations. To reduce vibrations, while recognizing the importance of an aesthetic surface treatment, it is recommended that any stamped concrete or pavers be limited to a pattern with no less than 24" x 24" dimensions. Any accent paving with dimensions less than 24" x 24" should be limited to non-primary walkway areas. Patterns with dimensions smaller than 24" x 24" should never be used in the designated accessible path.

In regard to control/expansion joints and the static coefficient of friction for walking surfaces, VTA complies with both ADA requirements and California Title 24 requirements. Walkways should also be clear and unobstructed per ADA regulations.

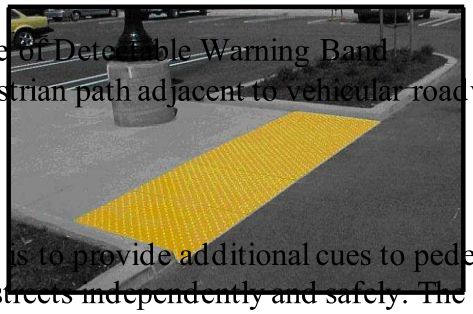


Example of mixed use of walking surfaces and aesthetic paving

5.6 Hazardous Vehicular Areas

The purpose of identifying hazardous vehicular areas is to enhance safety for visually impaired passengers who must traverse vehicle roadways or parking lots to access different modes of transit.

In locations where pedestrian walkways adjoin or cross roadways at curb ramps, the boundaries between the pedestrian area and the vehicular area should incorporate a detectable warning band according to ADA requirement.



Example of Detectable Warning Band
at edge of pedestrian path adjacent to vehicular roadway

5.7 Audible Signals

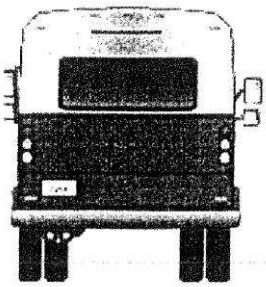
The purpose of audible signals is to provide additional cues to pedestrians with visual impairments in order to cross streets independently and safely. The major signalized crosswalks to a light rail station or transit center should include audible signals at each intersection. In crossing east to west, one type of audible sound is used. This sound can best be described as a

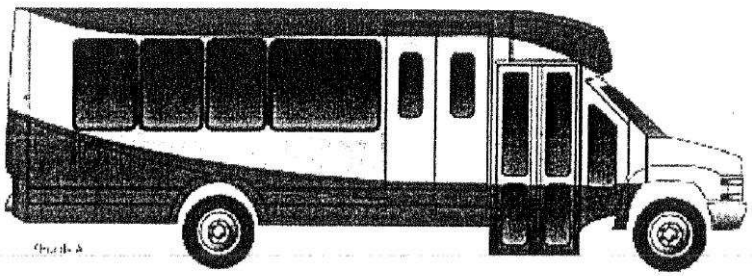
high-pitched “cuckoo, cuckoo”. For crossing north to south, a different sound is used. This sound can best be described as a “chirp, chirp”.

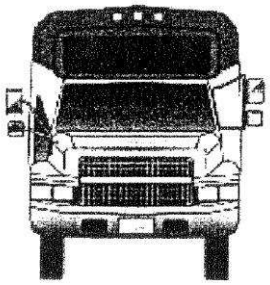
Section 6 Transit Vehicle Specifications

6.1 Basic coach data.

See Figures 6.1a through 6.1f





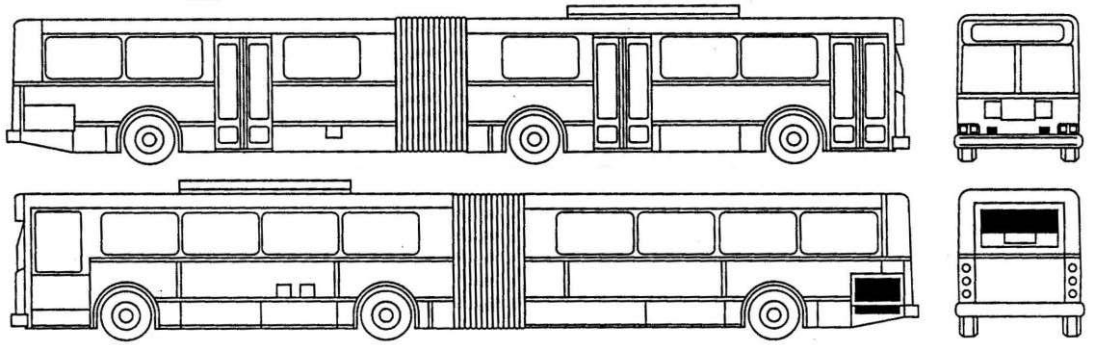


ITEM		DIMENSION
A.	OVERALL HEIGHT	10'- 1"
B.	OVERALL LENGTH	29'- 3"
C.	OVERALL WIDTH	8'- 0"
D.	WHEEL BASE	17'- 9"
E.	FRONT AXLE TO BUMPER	2'- 11"
F.	REAR AXLE TO BUMPER	8'- 7"
G.	STEP TO GROUND, ENTRANCE	10"
H.	STEP TO GROUND, EXIT	3'- 1"*
I.	CLEAR DOOR OPENING. ENTRANCE	2'- 9.5"
J.	CLEAR DOOR OPENING, EXIT	3'- 8.5"*
K.	CENTERLINE DOOR TO FRONT	8'- 1"
L.	CENTERLINE DOOR TO REAR	17'- 3"
M.	CENTERLINE DOOR TO DOOR	3'- 11"
N.	WIDTH, MIRROR TO MIRROR	8'- 8"
	SEATING CAPACITY	25

Figure 6.1a - 30' Community Bus

NEW FLYER D60 ARTICULATED BUS

The New Flyer D60 is a 'Pusher Type' articulated coach. This coach has all the features of the New Flyer 35' & 40' models. Most components are interchangeable which simplifies maintenance and reduces parts stock.



- Reinforced fiberglass exterior roof, front & rear and aluminum side panels for maximum corrosion resistance and reduced maintenance.
- Options such as air conditioning, wheelchair lifts, double stream doors, seating and more.
- In-line T-drive configuration for maximum rear axle capacity.

SPECIFICATIONS

POWER TRAIN

Engine	• DDC Series 50
Transmission	• Allison

FUEL TANK

- Capacity 150 US gallons
- Option of 200 US gallons

SUSPENSION

- Full air suspension with 2 hydraulic shock absorbers at each axle

Front Axle	• Rockwell Reverse Elliott 14,600 lbs
Center & Rear Axles	• Rockwell Full Floating 26,000 lbs

JOINT

- ATG "Artic-O-Mat" with anti jack knife feature

BRAKES

- Internal expanded S-CAM type
- Front Drum 14 1/2" x 6"
- Center & Rear Drum 14 1/2" x 10"
- Manual or Automatic slack adjusters

AIR SYSTEM

- Bendix Compressor, Governor, & Air Dryer

DOORS

Front	• Slide Glide
Center	• Optional
Rear	• Various styles

DIMENSIONS

Length	60'
Width	102"
Height	120"
Wheelbase	Front - 208"
	Rear - 309"
Passenger Capacity	145
Seating Capacity	64
Pivot Angle	40°
Turning Radius	41'

HEATING & VENTILATION

- Underfloor forced air heating, roof vents
- Driver's fresh air vent
- Optional A/C

ELECTRICAL

- Allen-Bradley PLC Multiplex Wiring System

WINDOWS

- Aluminum sash, clamp type - Stormtite laminated or tempered safety glass.
- Two piece laced in windshield

BODY

- Integral 'chassisless' design, sides are hollow structural tubing
- Panels are aluminum and fiberglass
- Wheel housings & stepwells are stainless steel

NEW FLYER OF AMERICA

Administration:
600 Pandora Ave. West,
Winnipeg, Manitoba, Canada R2C 3T4
Tel: (204) 224-1251 Fax: (204) 224-4214
Parts Sales: 1-800-665-2637

New Flyer of America Inc.
Assembly Plant:
214-5th Avenue South West
Crookston, Minnesota, U.S.A. 56716
Tel: (218) 281-5752
Fax: (218) 281-5672

Figure 6.1b – New Flyer D60 articulated bus

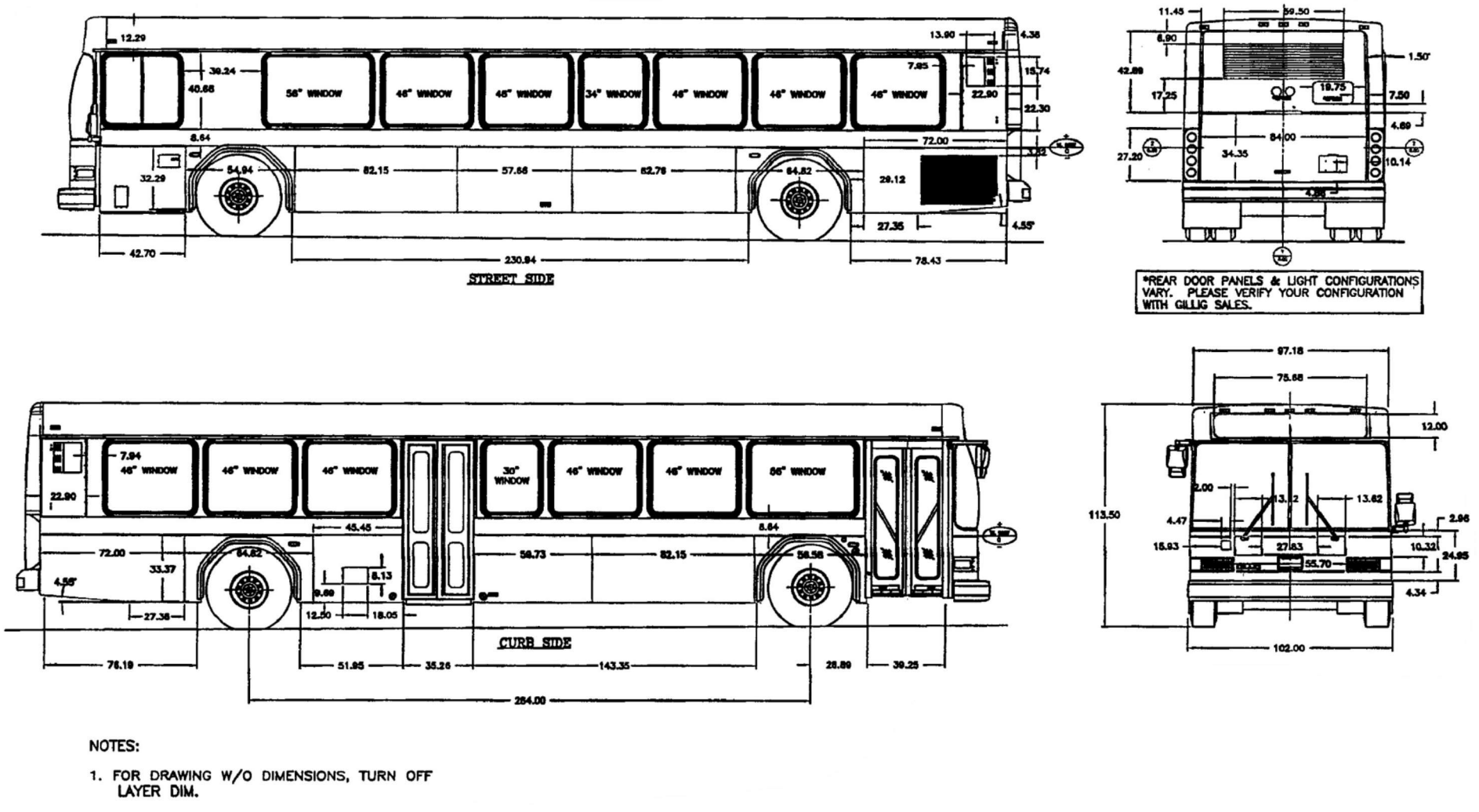


Figure 6.1c – Gillig standard 40' bus

Manufacturer			
Manufacturer	Gillig	Coach #s	0130-0199
Model	Low Floor	Serial #s	
Length	40 ft	Year of Mfr	2010
Width	102 in	GVWR	39600
Height	132 in	Curb Weight	29500
Max Speed	65 MPH		

Body Dimensions	
Rear Overhang = 112 in	Approach Angle = 9 degrees
Front Overhang = 84.5 in	Breakover Angle = 10 degrees
Wheelbase = 284 in	Departure Angle = 9 degrees
Ground Clearance at Axle = 8.5 in	Turning Radius = 43'11"
Ground Clearance away from Axle = 11.3 in	

Manufacturer			
Manufacturer	Gillig	Coach #s	1002-1052
Model	Low Floor 1000 (LF1000)	Serial #s	72799-72849
Length	40 ft	Year of Mfr	2001
Width	102 in	GVWR	39600
Height	120 in	Curb Weight	27840
Max Speed	65 MPH		

Body Dimensions	
Rear Overhang = 112 in	Approach Angle = 9 degrees
Front Overhang = 84.5 in	Breakover Angle = 10 degrees
Wheelbase = 284 in	Departure Angle = 9 degrees
Ground Clearance at Axle = 8.5 in	Turning Radius = 43'11"
Ground Clearance away from Axle = 11.3 in	

Figure 6.1d – VTA fleet characteristics 1 of 3

Manufacturer			
Manufacturer	Gillig	Coach #s	0130-0199
Model	Low Floor	Serial #s	
Length	40 ft	Year of Mfr	2010
Width	102 in	GVWR	39600
Height	132 in	Curb Weight	29500
Max Speed	65 MPH		

Body Dimensions	
Rear Overhang = 112 in	Approach Angle = 9 degrees
Front Overhang = 84.5 in	Breakover Angle = 10 degrees
Wheelbase = 284 in	Departure Angle = 9 degrees
Ground Clearance at Axle = 8.5 in	Turning Radius = 43'11"
Ground Clearance away from Axle = 11.3 in	

Manufacturer			
Manufacturer	Gillig	Coach #s	1002-1052
Model	Low Floor 1000 (LF1000)	Serial #s	72799-72849
Length	40 ft	Year of Mfr	2001
Width	102 in	GVWR	39600
Height	120 in	Curb Weight	27840
Max Speed	65 MPH		

Body Dimensions	
Rear Overhang = 112 in	Approach Angle = 9 degrees
Front Overhang = 84.5 in	Breakover Angle = 10 degrees
Wheelbase = 284 in	Departure Angle = 9 degrees
Ground Clearance at Axle = 8.5 in	Turning Radius = 43'11"
Ground Clearance away from Axle = 11.3 in	

Figure 6.1e – VTA fleet characteristics 2 of 3

Manufacturer			
Manufacturer	**Gillig**	Coach #s	**2201-2256**
Model	Low Floor 2200 (LF2200)	Serial #s	72643-72698
Length	40 ft	Year of Mfr	2002
Width	102 in	GVWR	39600
Height	120 in	Curb Weight	27300
Max Speed	65 MPH		

Body Dimensions	
Rear Overhang = 112 in	Approach Angle = 9 degrees
Front Overhang = 84.5 in	Breakover Angle = 10 degrees
Wheelbase = 284 in	Departure Angle = 9 degrees
Ground Clearance at Axle = 8.5 in	Turning Radius = 43'11"
Ground Clearance away from Axle = 11.3 in	

Manufacturer			
Manufacturer	**New Flyer**	Coach #s	**2301-2340**
Model	D60LF, Artic 2300	Serial #s	23959-23998
Length	60 ft	Year of Mfr	2002
Width	102 in	GVWR	66600
Height	121.75 in	Curb Weight	41300
Max Speed			

Body Dimensions	
Rear Overhang = 113 in	Approach Angle = 9 degrees
Front Overhang = 84 in	Breakover Angle = 8 degrees (rear section)
Wheelbase =	Departure Angle = 9 degrees
Ground Clearance at Axle = 5 in	Turning Radius = 42'6"
Ground Clearance away from Axle = 10.5 in	

Figure 6.1f – VTA fleet characteristics 3 of 3

6.2 Bus Turning Radii

Bus turning radii standards should be used whenever possible, on all streets identified as transit streets. While radii not equal to these standards can be used, they will result in a degradation of smooth vehicle movement through an area.

Using a turning template will ensure that large transit coaches can safely conduct turning movements based on a variety of coach sizes, as shown in Figures 6.2a through 6.2f In areas that have service provided by tourist, airport, or hotel over-the-road coaches, a 55-foot radius ensures that all these coaches can maneuver smoothly.

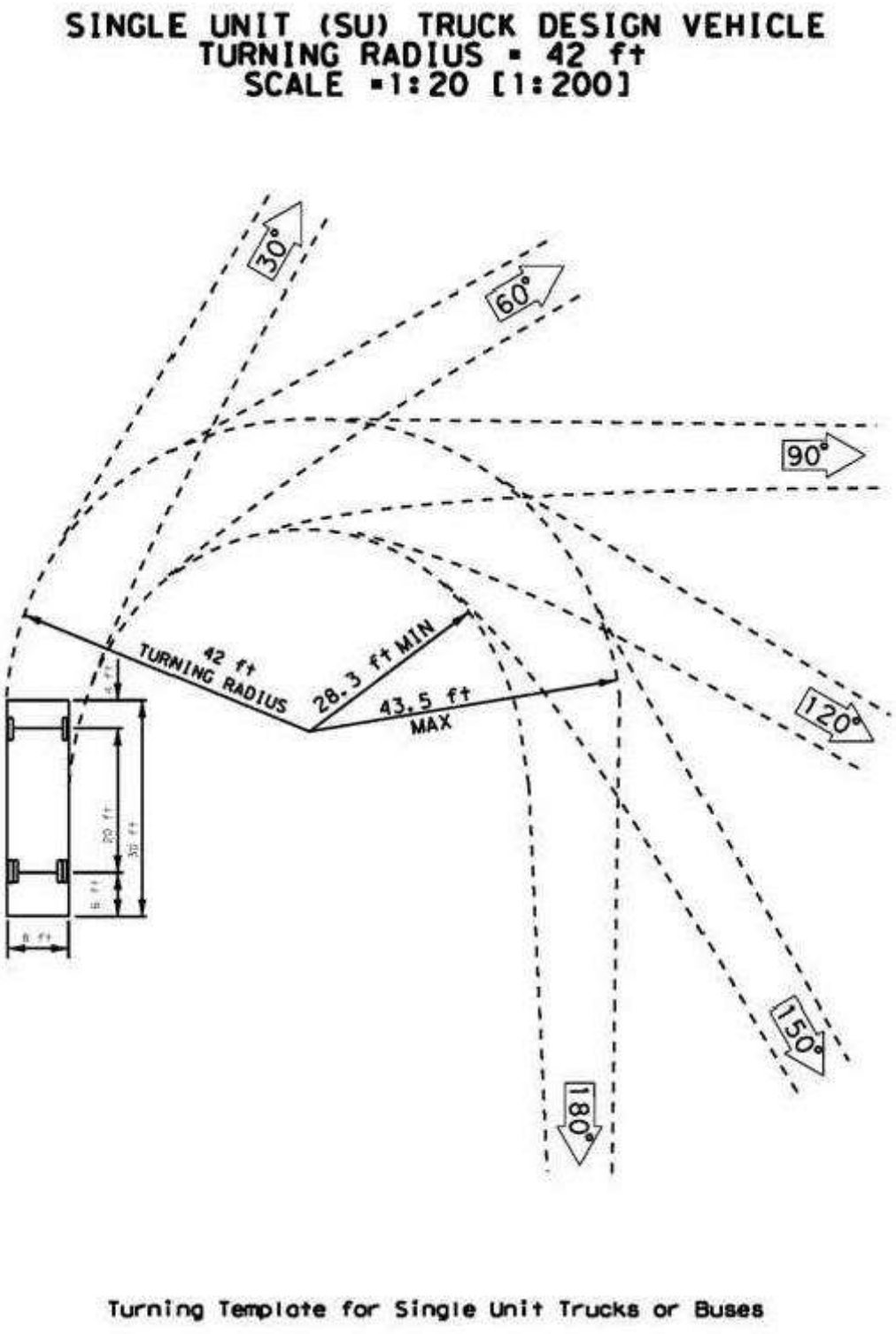


Figure 6.2a – Bus turning radius for 30' long buses

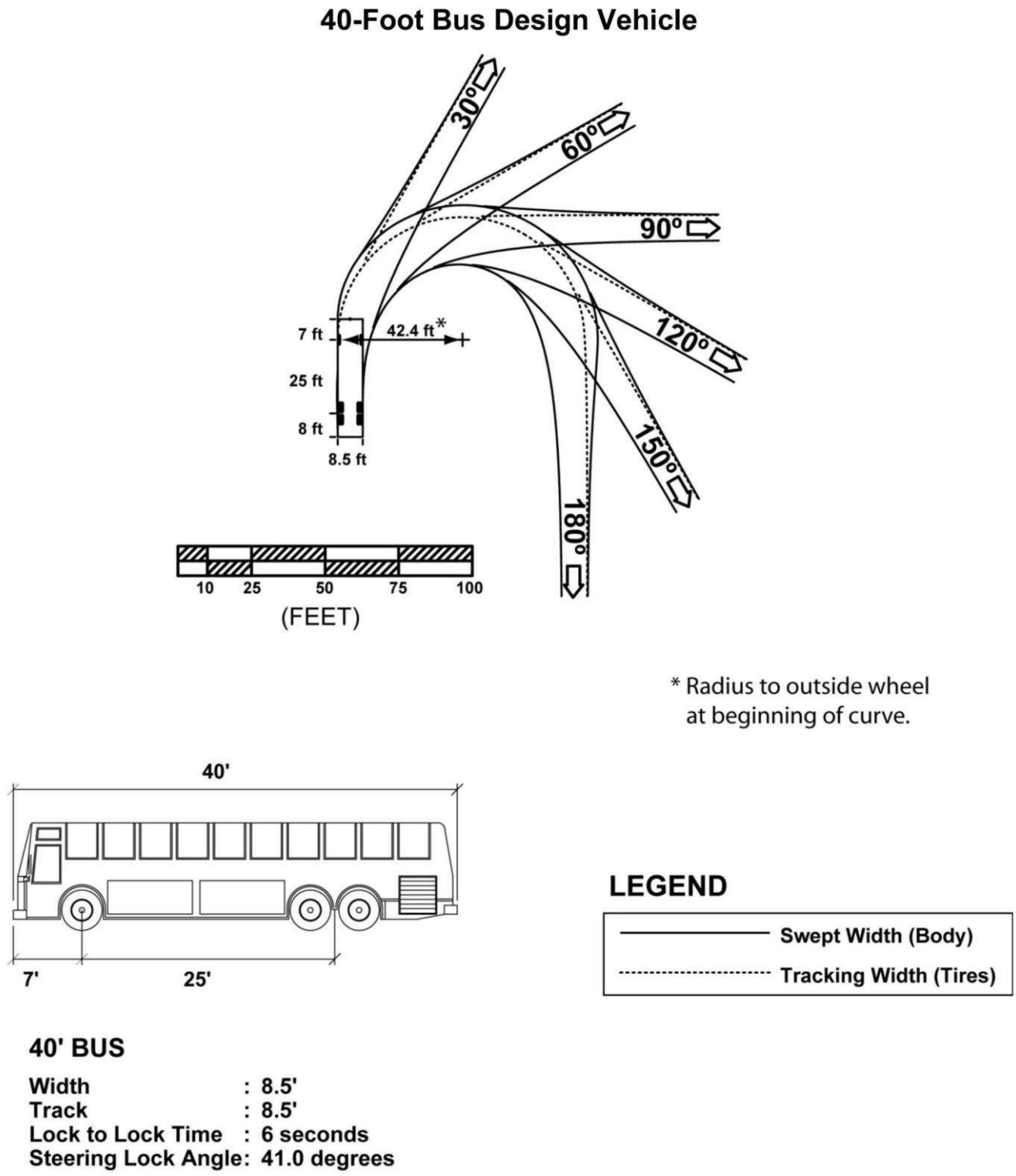


Figure 6.2b – Bus turning radius for 40' long buses

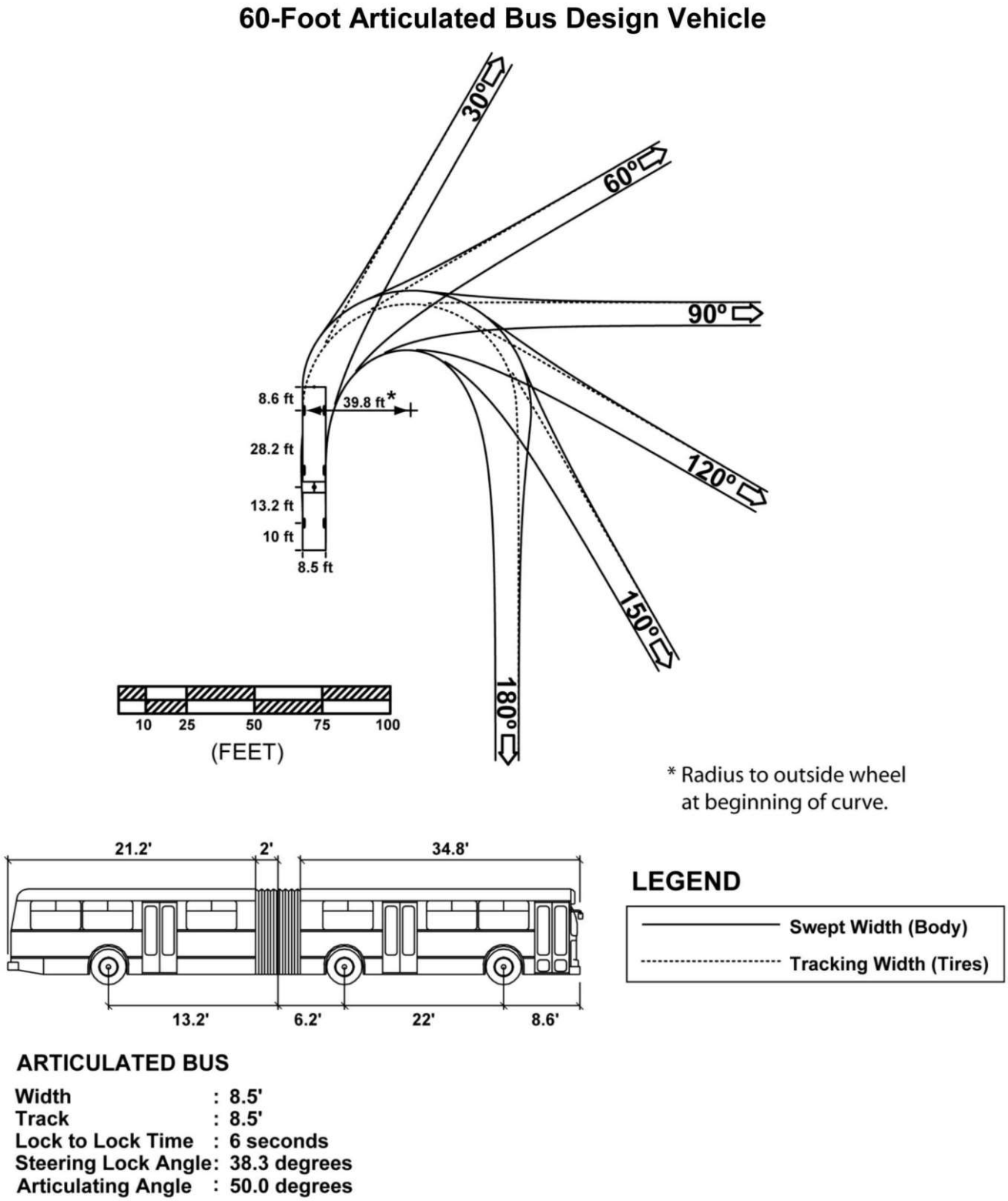
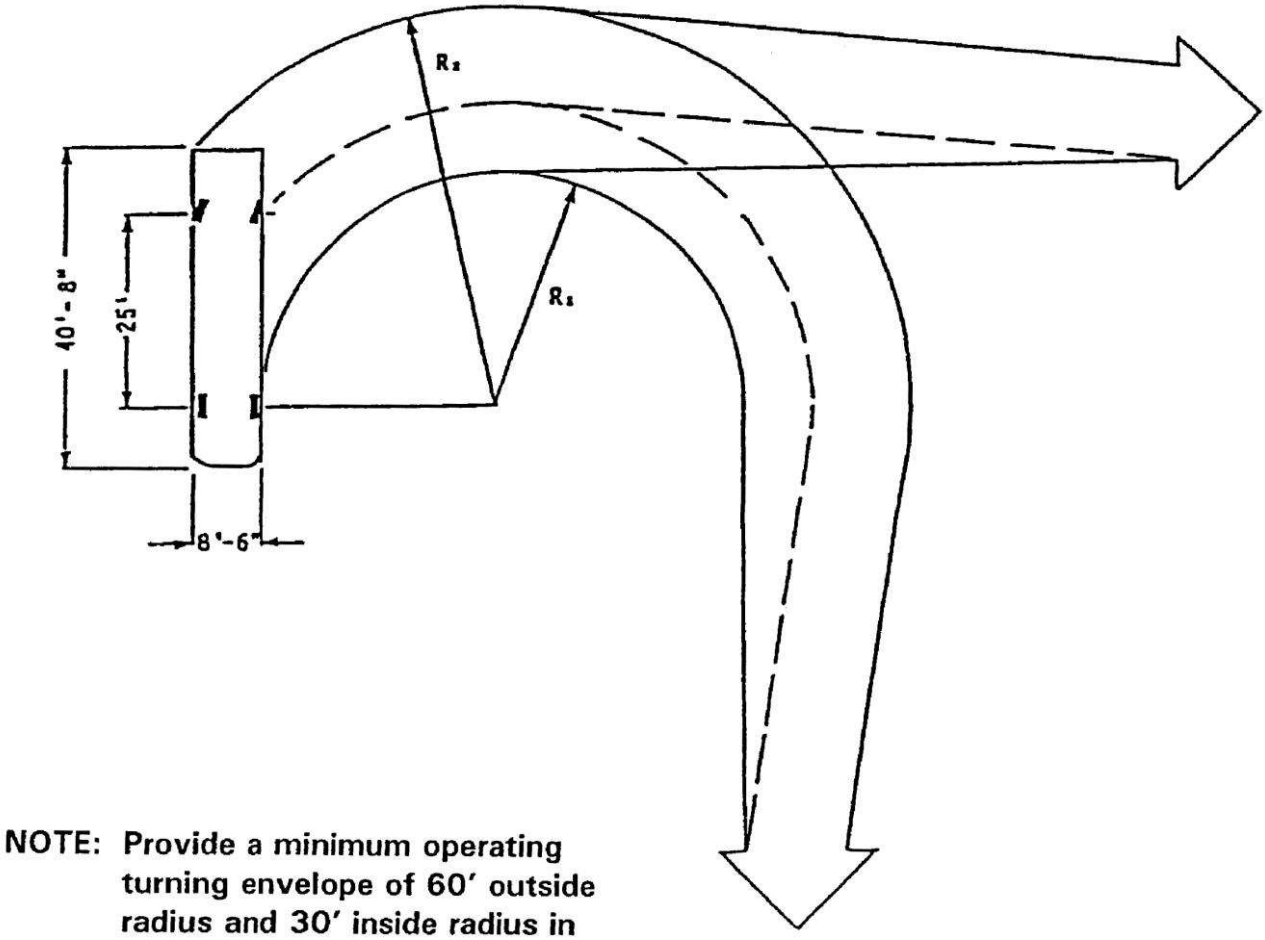


Figure 6.2c – Bus turning radius for 60' long articulated buses

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

For 40' vehicles and articulated vehicles



NOTE: Provide a minimum operating turning envelope of 60′ outside radius and 30′ inside radius in designing the transit centers.

Figure 6.2d – Bus turning radii for large buses

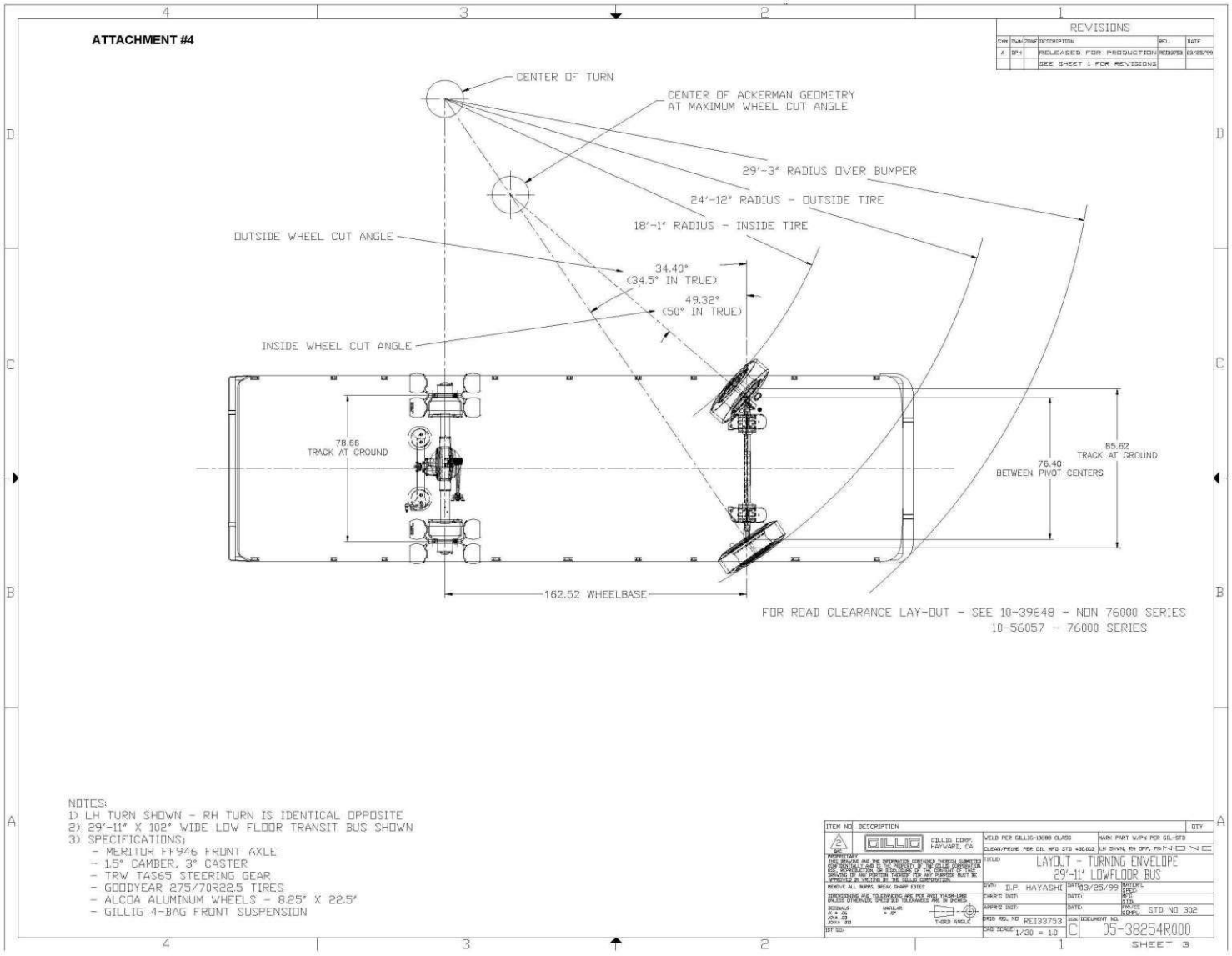


Figure 6.2e – 30' Turning radius

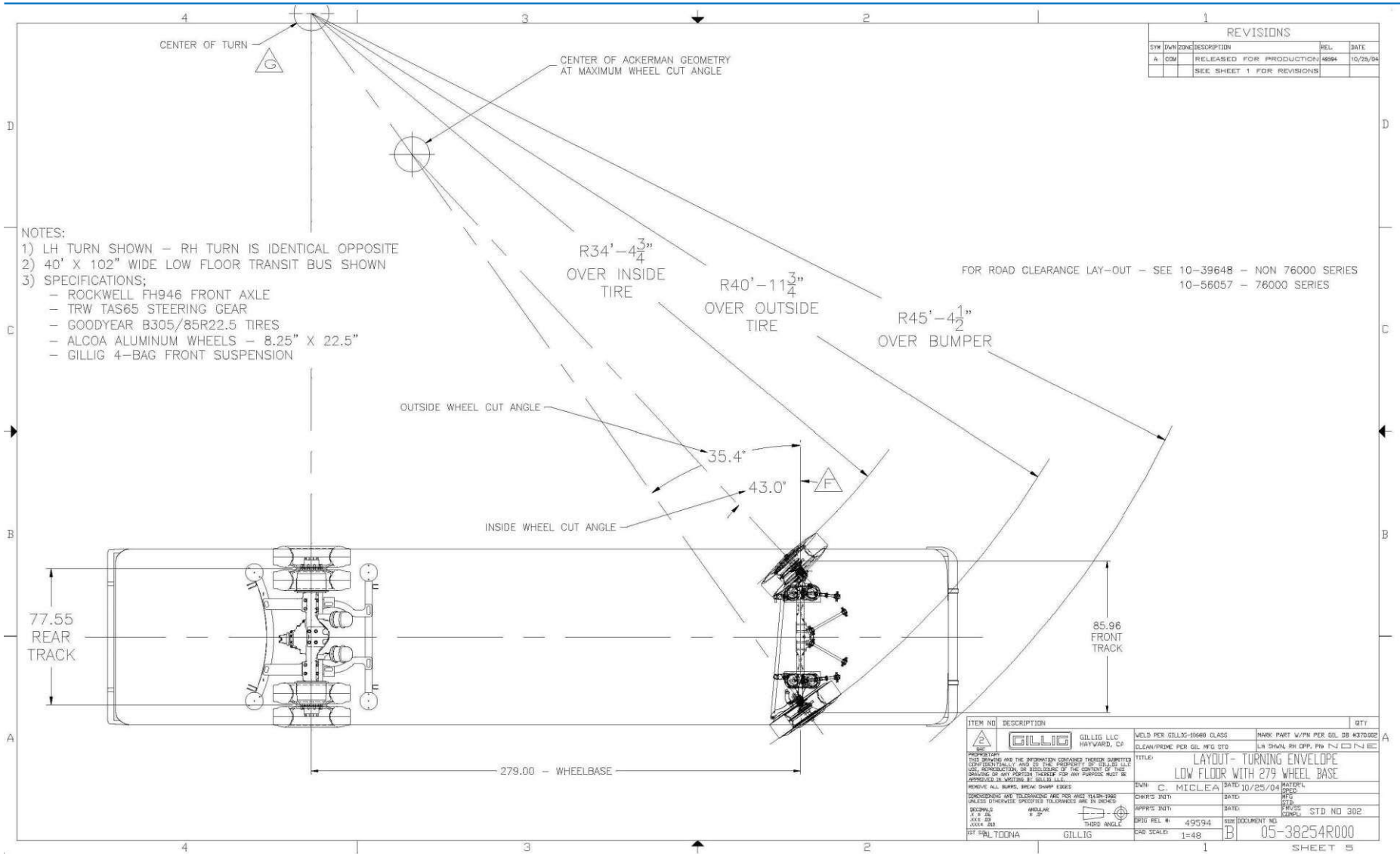
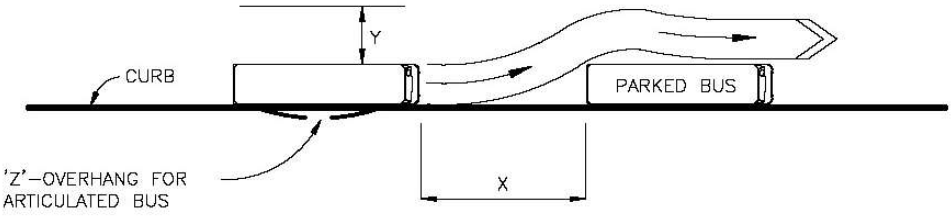


Figure 6.2f – 40' Turning radius

6.3 Bus Maneuvering

Figure 6.3a shows minimum distances required for buses to maneuver pass a traffic island, parked bus or parked car to pull-in parallel to the curb/bus stop.

PULL–OUT



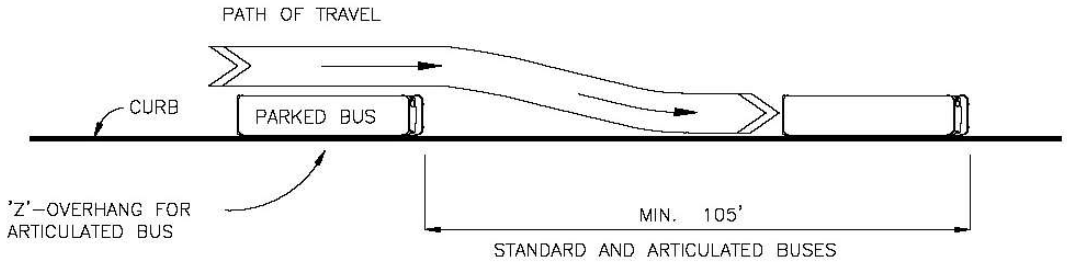
STANDARD BUS

WHEN 'X' IS	8'	10'	15'	20'	25'
MIN. 'Y' IS	18'	17'	16'	15.5'	15'

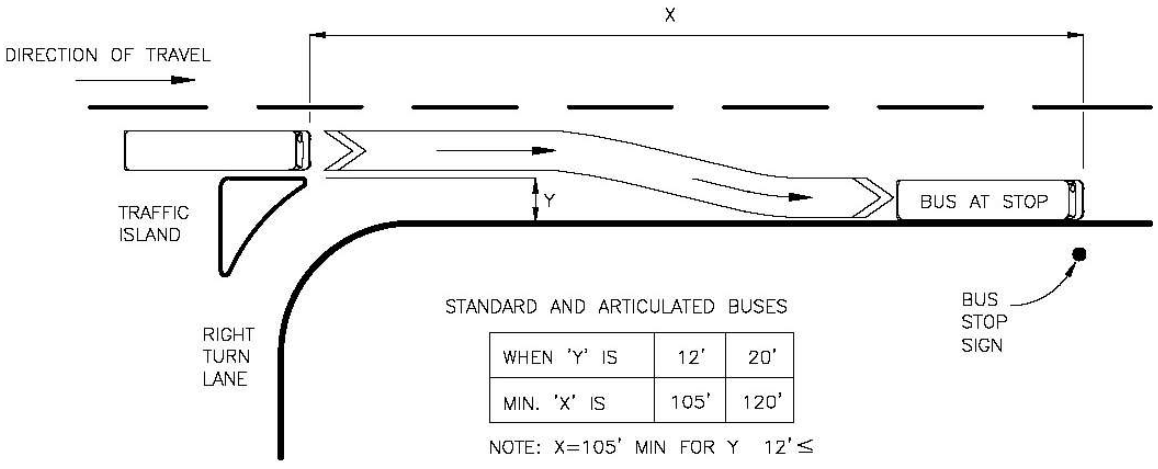
ARTICULATED BUS

WHEN 'X' IS	20'	25'	30'	35'
MIN. 'Y' IS	16'	15'	13.5'	13'
'Z IS	2'	1'	0'	0'

PULL–IN



PULL–IN AROUND TRAFFIC ISLAND



STANDARD AND ARTICULATED BUSES

WHEN 'Y' IS	12'	20'
MIN. 'X' IS	105'	120'

NOTE: X=105' MIN FOR Y 12'≤

Figure 6.3a – Bus parallel pull-in and pull-out

6.4 Bus Parking Standards

Figure 6.4a shows typical bus stall configuration and aisle width for bus parking.

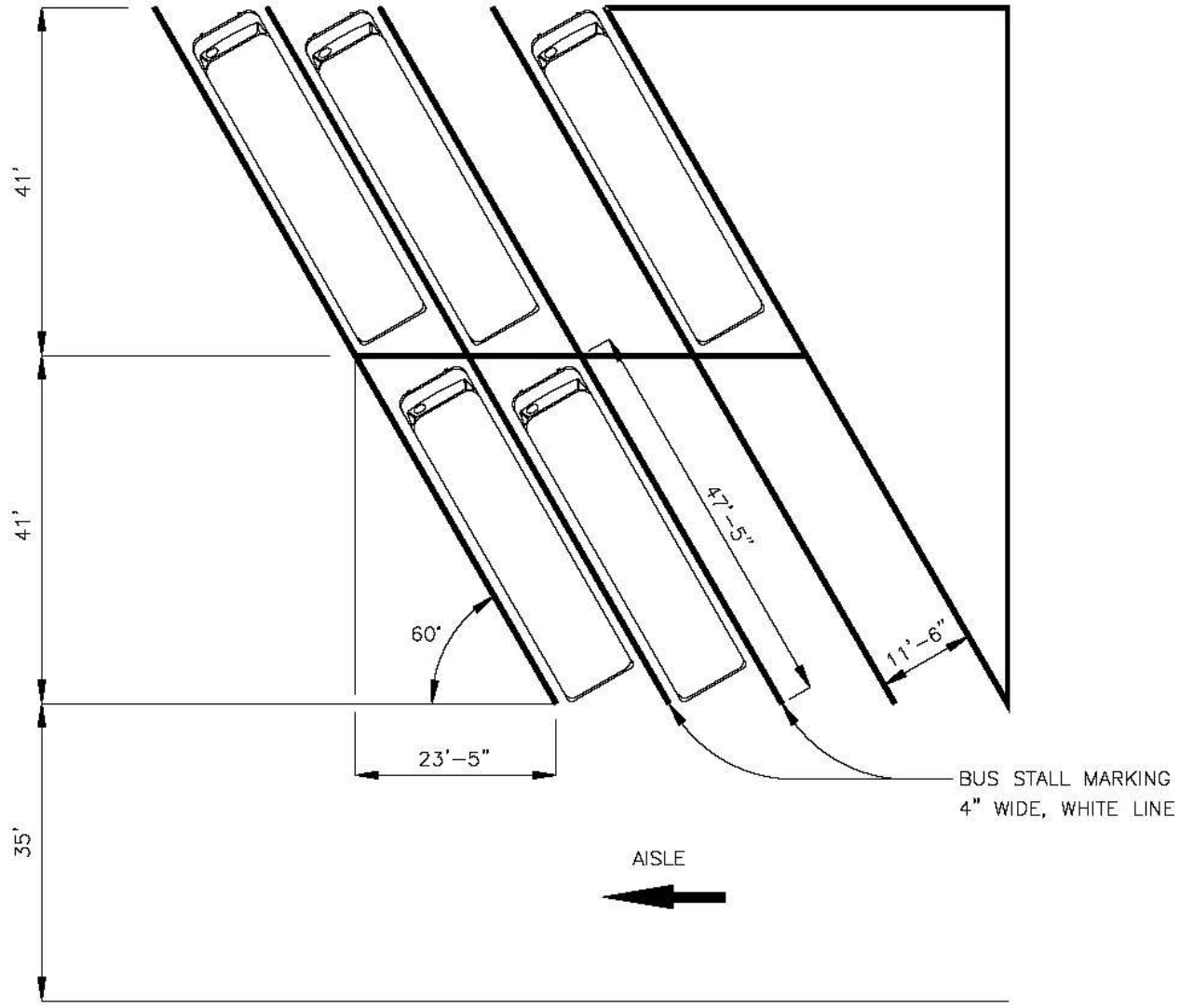


Figure 6.4a – Bus parking layout

6.5 Road Grades

Road grades refer to the maximum slope' or grade that a standard 40-foot transit bus can negotiate safely and economically. All public roads, private roads and driveways proposed for bus service must be designed with grades less than the maximum wherever possible.

In an uphill direction, the maximum sustained grade for roadways designated for bus service should not exceed 6 percent. For the downhill direction, the roadway should be designed with a maximum 12 percent grade. In some cases where the roadway is steep, a climbing lane for buses and trucks will be needed. These maximum grades are illustrated in Figure 6.5a. In addition, abrupt changes in grades should be avoided, due to bus overhangs and ground clearance requirements. Vertical curves should be specified where necessary.

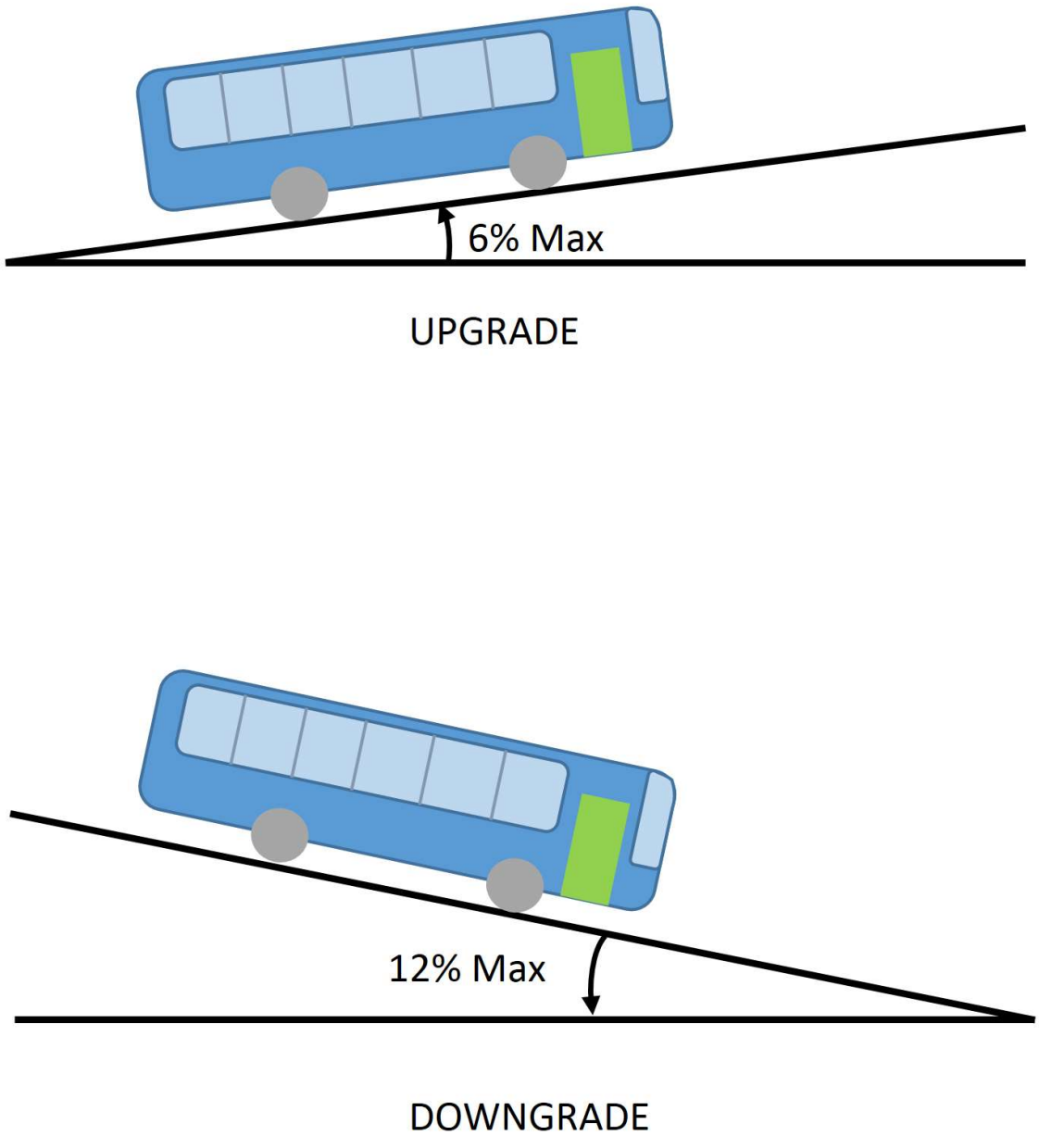


Figure 6.5a – Maximum allowable bus grades

Section 7 Bikeways at Bus Stops

7.1 Introduction

These standards were developed using California Manual of Uniform Traffic Control Devices (CA MUTCD 2014, Revision 5), Caltrans Design Information Bulletin 89, Public Right-Of-Way Access Guidelines (PROWAG), FHWA Separated Bike Lane Planning and Design Guide, and NACTO's Urban Bikeway Design and Transit Street Design Guides as well as informed by lessons learned from on-the- ground, early implementation of quick-build projects in Santa Clara County.

Early in the implementation process, Member Agency staff are encouraged to notify VTA of any possible conflicts between bikeway facility installation and bus stops by emailing bus.stop@vta.org. VTA staff will work with you to determine the best design for your facility to reduce conflicts between roadway users.

7.2 General Guidance

California Vehicle Code permits bus operators to cross over a bike lane, including buffered bike lanes, to service a coach stop. Operators must pull over to the curb when it is safe to do so. Bicyclists must yield to buses once they are at the curb.

It is important that people using the bike lane have the expectation that there may be a conflict at a bus stop. This is particularly true for enhanced bike lane treatments like green bike lanes and buffered bike lanes, as people riding on these bikeways feel more separated from motor vehicle traffic.

Dashing a bike lane adjacent to a bus stop provides that expectation and is supported by state and national design guidance.

7.3 Bike Lane Striping

VTA recommends the following practices for bicycle lanes through bus stop areas

- Dash bike lanes at bus stops. Dashed area should include the bus stop area and 50-foot merging area.
- If room is available to provide a six-foot bike lane, stripe a dashed bike lane outside of the 10' bus pad.
- If no room is available, stripe dashed bike lane through the bus pad.
- If green colored pavement is used in the bike lane, dash it at bus stops.
- If the bike lane includes a painted buffer, two options are recommended

- Dash the buffer boundary at the bus stop or
- Eliminate the painted buffer in advance of the bus stop and treat as for a standard bike lane.

- When making bike lanes through a bus pad, select materials that will adhere to and hold up well on Portland cement.

The figures 7.3a through 7.3d illustrate examples of bicycle lane marking at bus stops.

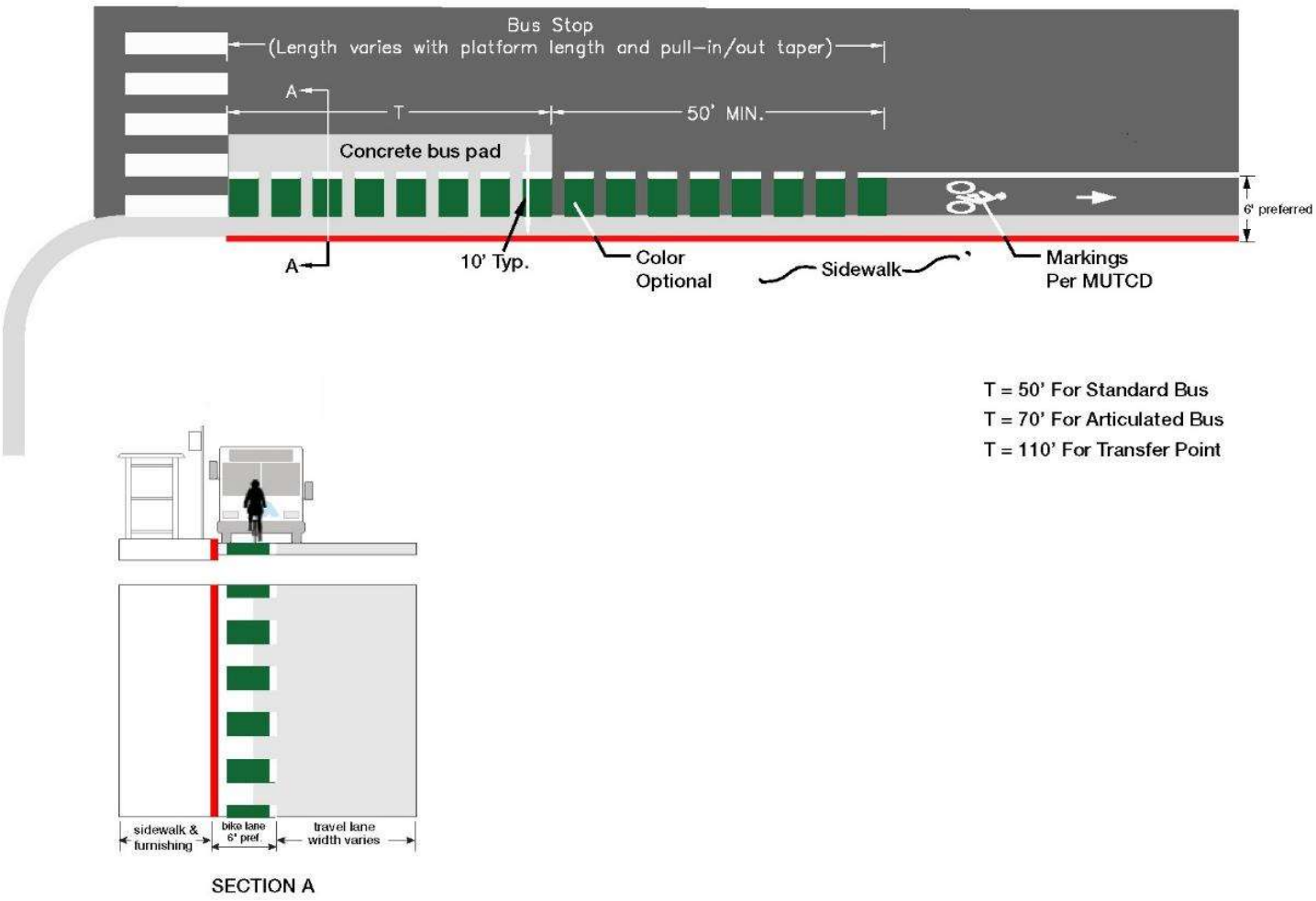


Figure 7.3a - Bus stop in standard bike lane, no parking

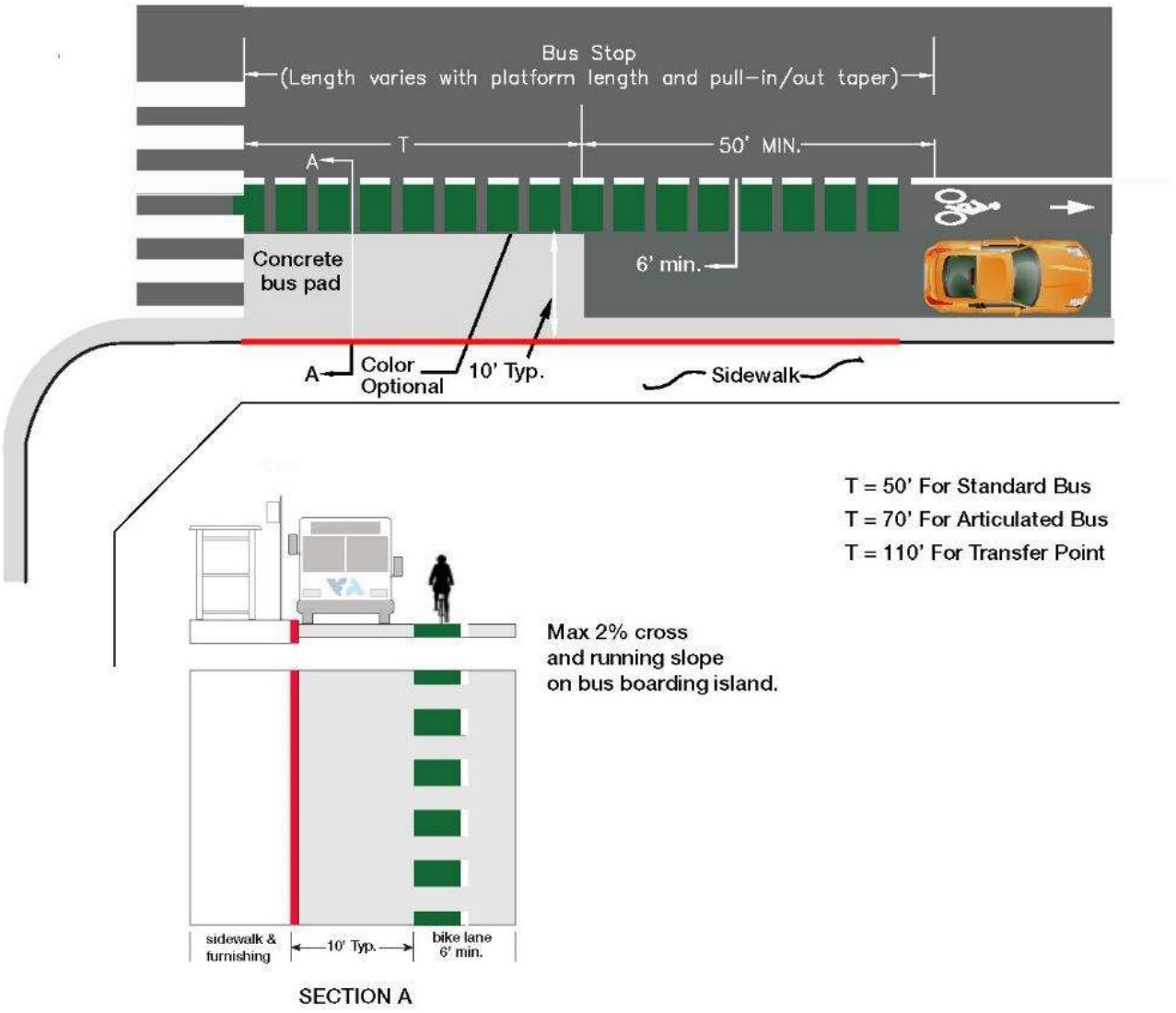


Figure 7.3b - Bus stop in parking lane with standard bike lane

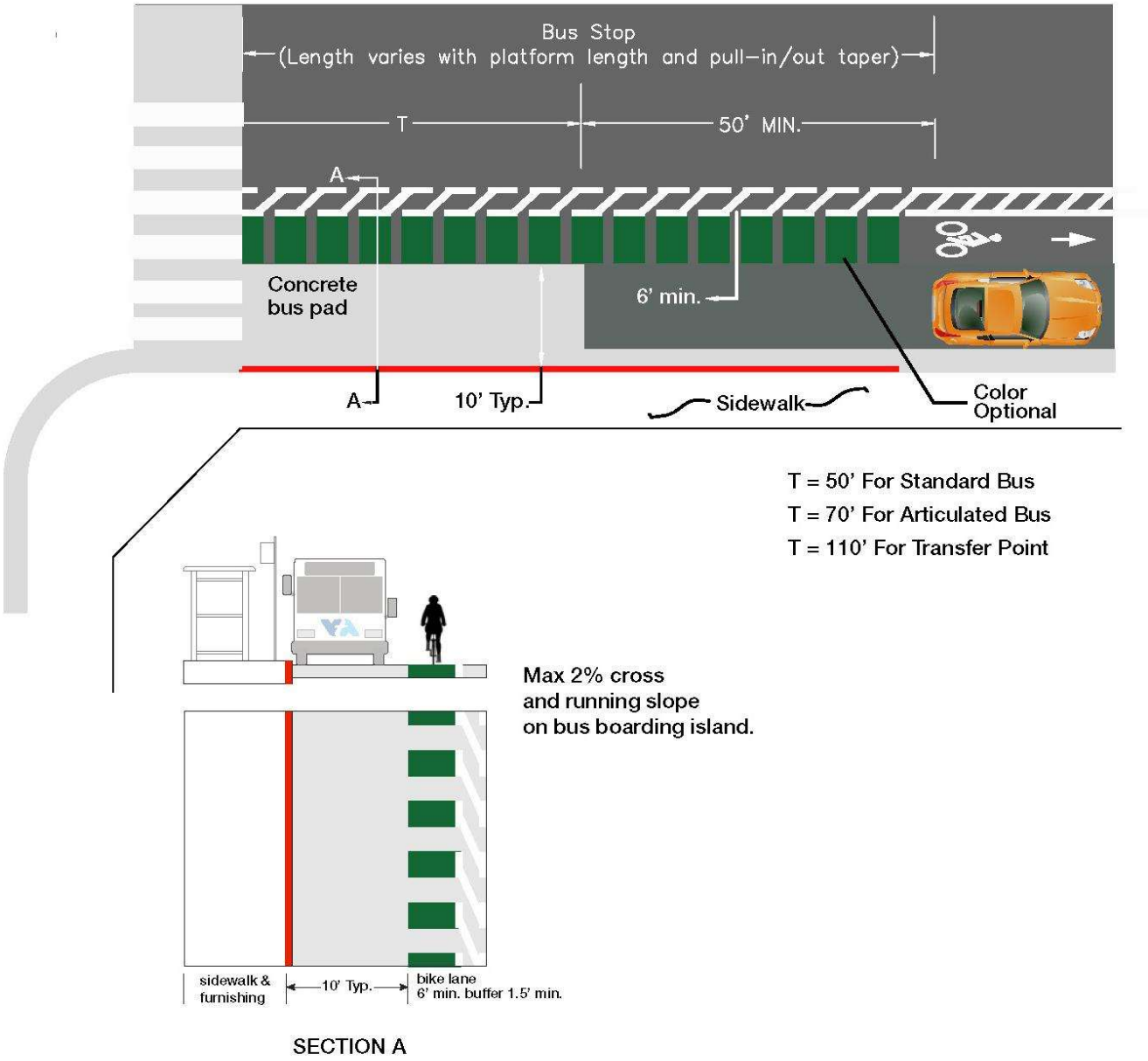


Figure 7.3c - Bus stop in parking lane with buffered bike lane

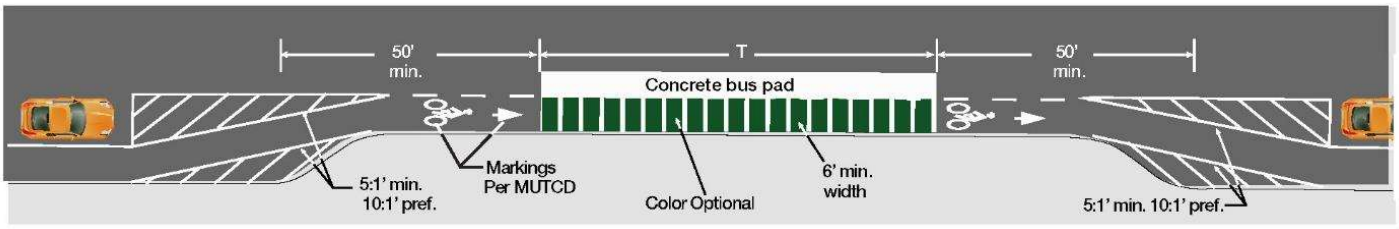


Figure 7.3d - Bus stop where bikeway is shifted into bus stop

7.4 Bikeway Widths

VTA recommends the following bikeway widths through bus stop areas:

Traditional Bike Lane, per VTA Bicycle Technical Guidelines (2012)

- 6 ft wide minimum
- 8 ft wide on streets with posted speeds 45 mph or greater

Buffered bike lane

- 6 ft wide bike lane minimum, with minimum 1.5-foot buffer

Cycle track

- One way: 7 foot preferred
- Two-way: 10 feet minimum, 12 feet preferred

7.5 Bus Boarding Islands General Requirements

Bus boarding islands must meet all ADA requirements for bus stops.

VTA requires:

- Bus boarding island must provide a clear, dedicated boarding area 8 feet deep by 5 feet wide. The boarding area may not be shared by bicyclists.

- Boarding island depth 8 foot (min) to 10 ft (preferred). Length is determined by number of lines and length of buses using the stop. Minimum depth to accommodate a railing on the bus boarding island is 9 ft. Minimum depth to accommodate a shelter on the bus boarding island is 10 ft.
- Cross slope and running slope no greater than 2% for entire platform.
- 4 foot wide (minimum) continuous, clear pedestrian access route between the bus boarding island and the sidewalk.
- Railing or other vertical separation element at back edge of platform if the cycle-track is at street level or if it is a two-way cycle-track.
- Provide directional indicators from sidewalk to bus boarding island to indicate to visually impaired pedestrians the path of travel.
- Install bus stop sign at back of bus boarding island.
- Vertical elements (signs, railings, etc..) must be at least 24" away from the street edge of the bus boarding island.

7.6 Pedestrian Crossing at Bus Boarding Island

Bicyclists must yield to pedestrians at the bus boarding island. The bikeway and pedestrian crossing should be designed to indicate this responsibility to bicyclists. Treatments to slow bicyclists and improve yielding should be installed as appropriate or needed. For new installations, consider temporary signage clarifying right-of-way.

People with visual, mobility, auditory and other impairments travel by bus. The bus boarding island and access routes to the island from the sidewalk must meet ADA requirements.

VTA recommends:

- If not integrated into an existing street crossing, the pedestrian crossing should be at the same level as the sidewalk and bus boarding island.
- Provide designated crossing(s) for pedestrians across the bikeway. Preferably, one crossing at the front door and one crossing at the rear door.
- Crossings should be striped with high visibility markings.
- Minimum 10' wide crossing width (perpendicular to pedestrian movement).
- Provide detectable warning surfaces (truncated domes) at either end of the crosswalk.

- Provide directional indicators from sidewalk to bus boarding island to indicate to visually impaired pedestrians the path of travel.
- Maintain unobstructed sight lines between pedestrians and bicyclists. Pay particular attention to vertical separation elements, or bus shelters on the bus boarding island.

7.7 Signage at Bus Boarding Islands

Signs indicate to transit customers, including visually impaired customers, and indicate to bus operators where to stop the bus

- Two signs required. One at the sidewalk adjacent to the pedestrian crossing. A second one on the bus boarding island.
- Directional indicators should lead from the sidewalk sign to the boarding area on the bus boarding island.

7.8 One-Way Cycletrack at Bus Boarding Islands

Bicyclists must yield to pedestrians at the bus boarding island. Treatments to slow bicyclists and improve yielding should be installed as appropriate or needed.

Where the bikeway is at the level of the roadbed (Figure 7.8a and 7.8d)

- Raise the pedestrian crossing to be at the same grade as the sidewalk and bus boarding platform. If this is not feasible, provide ADA-accessible curb ramps at either end of the pedestrian crossing and ensure that there is at least a four-foot-wide accessible path on the platform adjacent to the curb ramp.

- Install a guardrail or similar vertical separation on the bus boarding island. Provide a minimum 6-inch shy distance between the edge of the vertical separation and the bikeway. Maintain a minimum 8-foot depth clear space on the bus boarding island between the vertical element and the road edge of the boarding island. Vertical elements must not block sightlines between pedestrians and bicyclists.

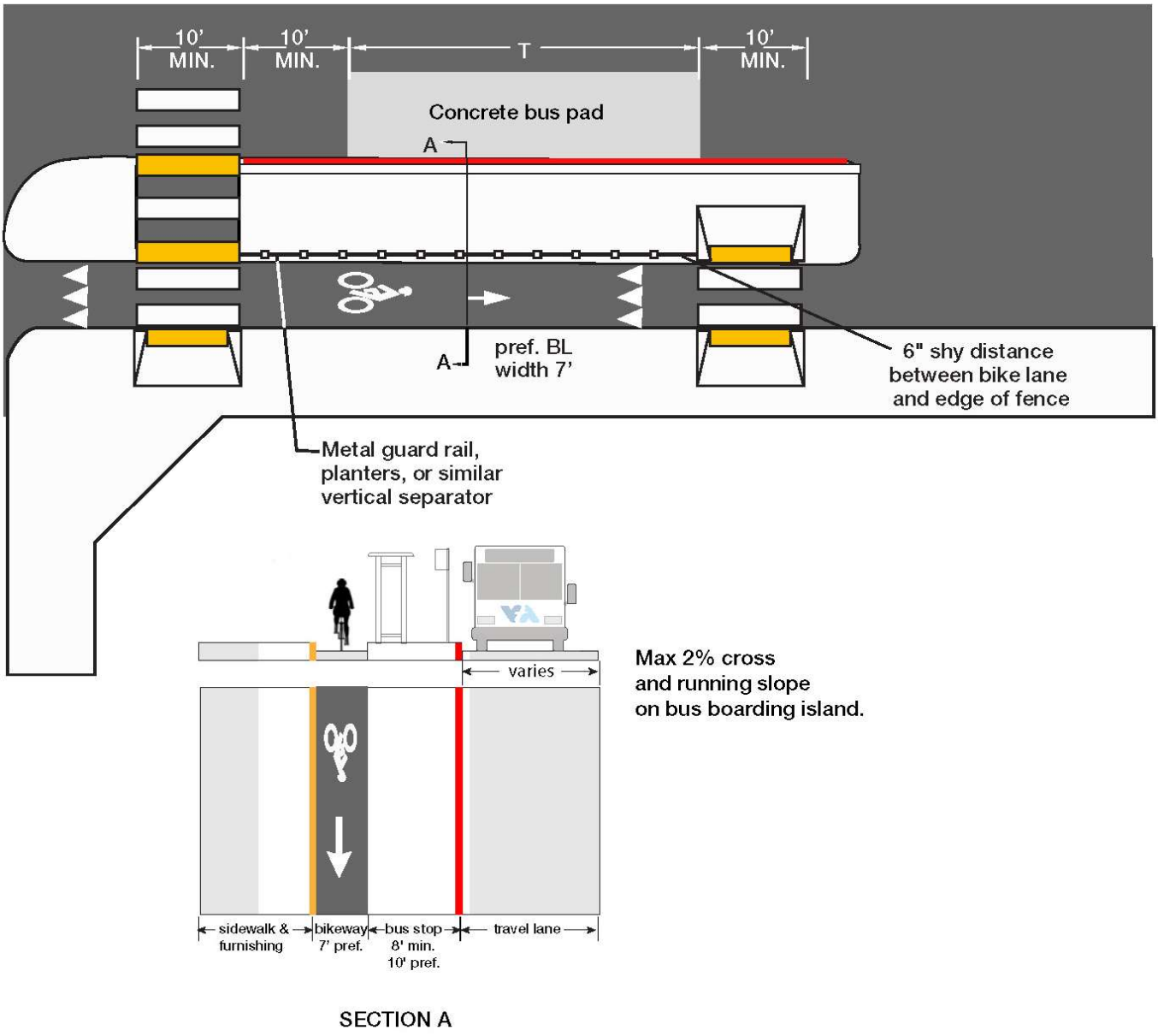


Figure 7.8a - Bus stop where bikeway is at the same level as the roadway

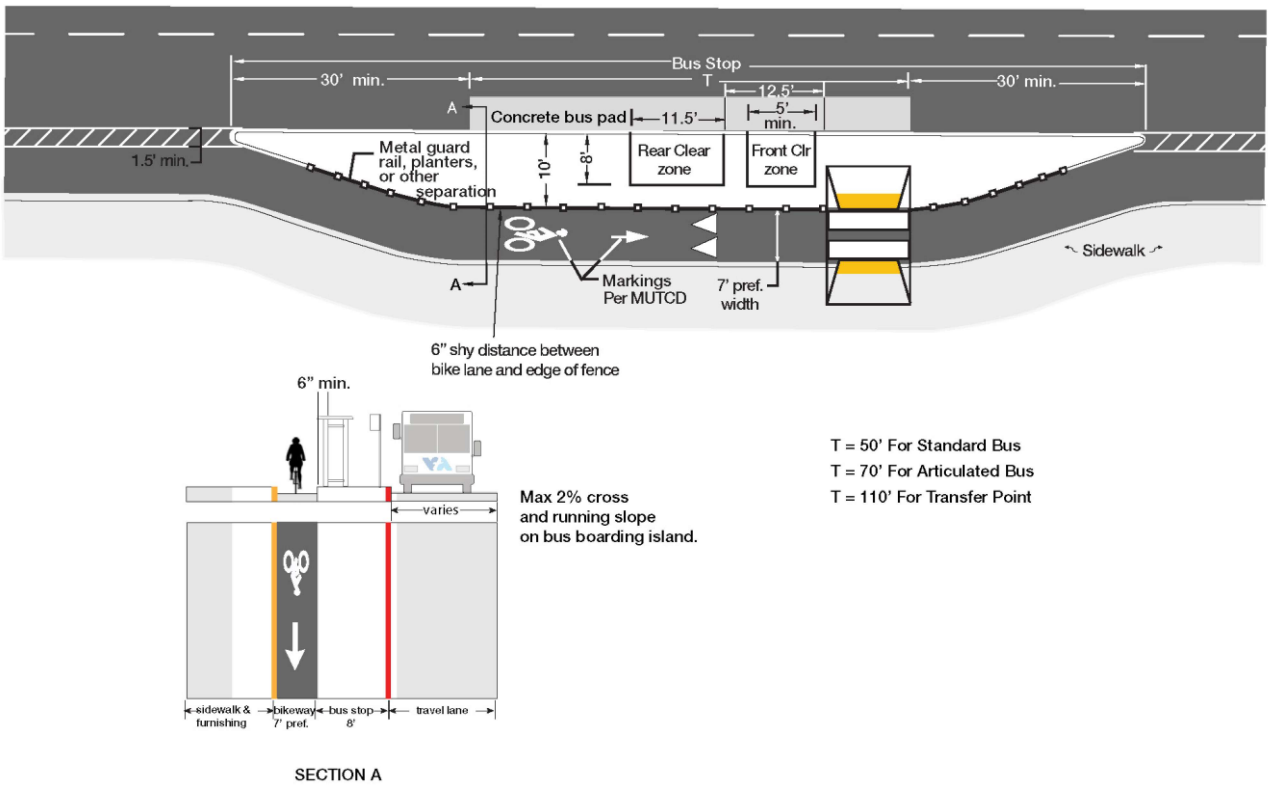


Figure 7.8b - Bus stop where bikeway is at the same level as the roadway

Where the bikeway is raised to the level of the sidewalk and bus boarding island (Figure 7.8c & 7.8d)

- Provide a detectable edge or detectable warning surface on either side of the bikeway so that pedestrians with visual impairments can detect the bikeway. Adjoining surfaces must differ from one another in visual contrast (light beside dark), as well as texture. See Caltrans Design Information Bulletin 89-01, FHWA's Accessible Shared Streets (FHWA-HEP-17-096, October 2017), and U.S. Access Board's Proposed Guidelines for Pedestrian Facilities in the Public Right-of-Way (2011) for design recommendations.
- Provide designated crossings for pedestrians across the bikeway.
- Optimally, the bikeway is in a contrasting color to the sidewalk. (e.g. asphalt bikeway, concrete sidewalk)

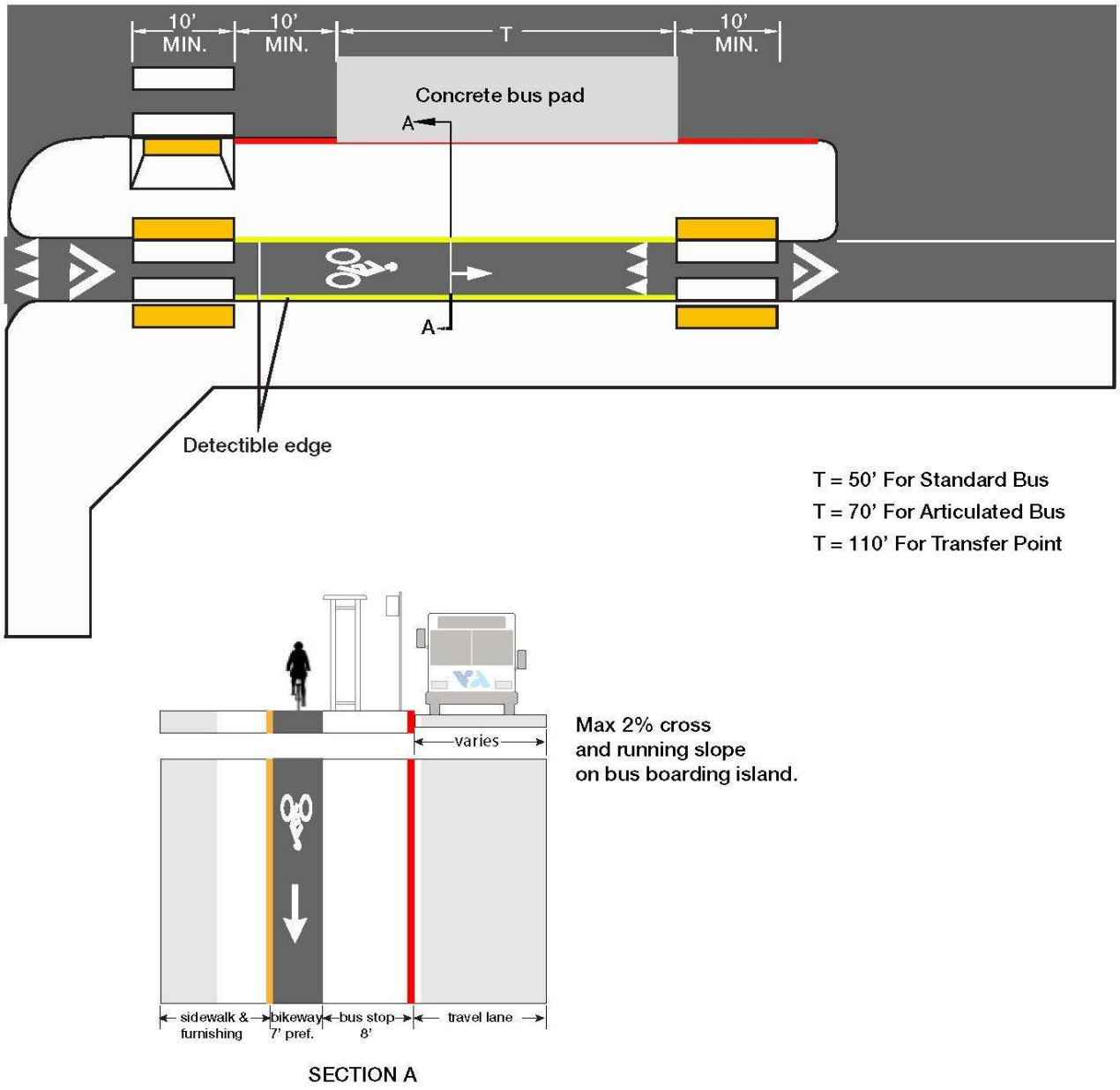


Figure 7.8c - Bus stop where bikeway is raised to the same level as the bus boarding island and the sidewalk

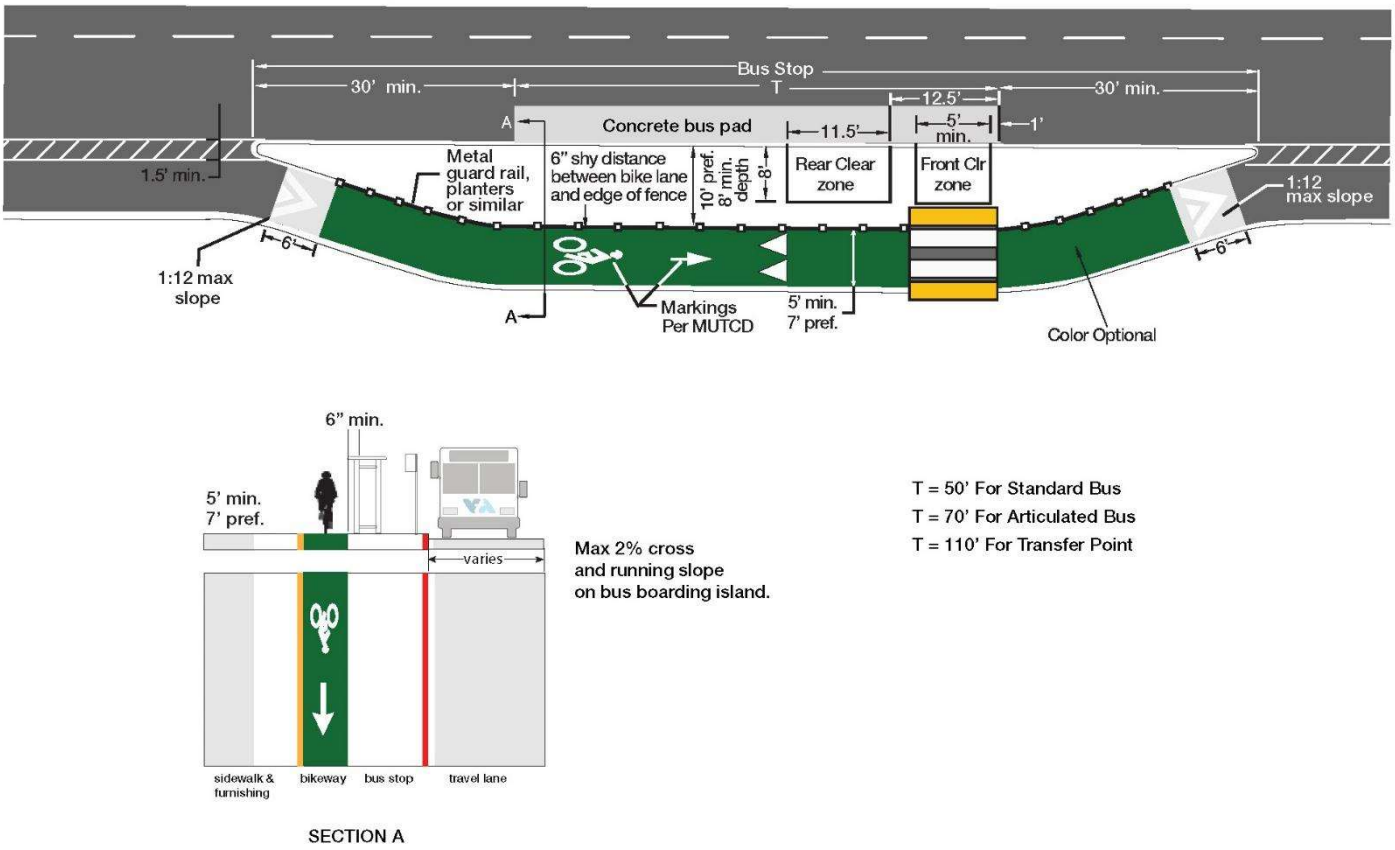


Figure 7.8d - Bus stop where bikeway is raised to the same level as the bus boarding island and sidewalk

7.9 Two-Way Cycletrack at Bus Boarding Island

Bicyclists must yield to pedestrians at the bus boarding island. Treatments to slow bicyclists and improve yielding should be installed as appropriate or needed. This is especially important at two-way cycle-tracks where pedestrians may not realize bicyclists could be approaching from both directions.

Where the bikeway is at the level of the roadbed (Figure 7.9a):

- Treat as for a one-way cycletrack.

Where the bikeway is raised to the level of the sidewalk and the bus boarding island (Figure 7.9b):

- Treat as for a one-way cycletrack but provide a guardrail or other vertical separation on the bus boarding island.

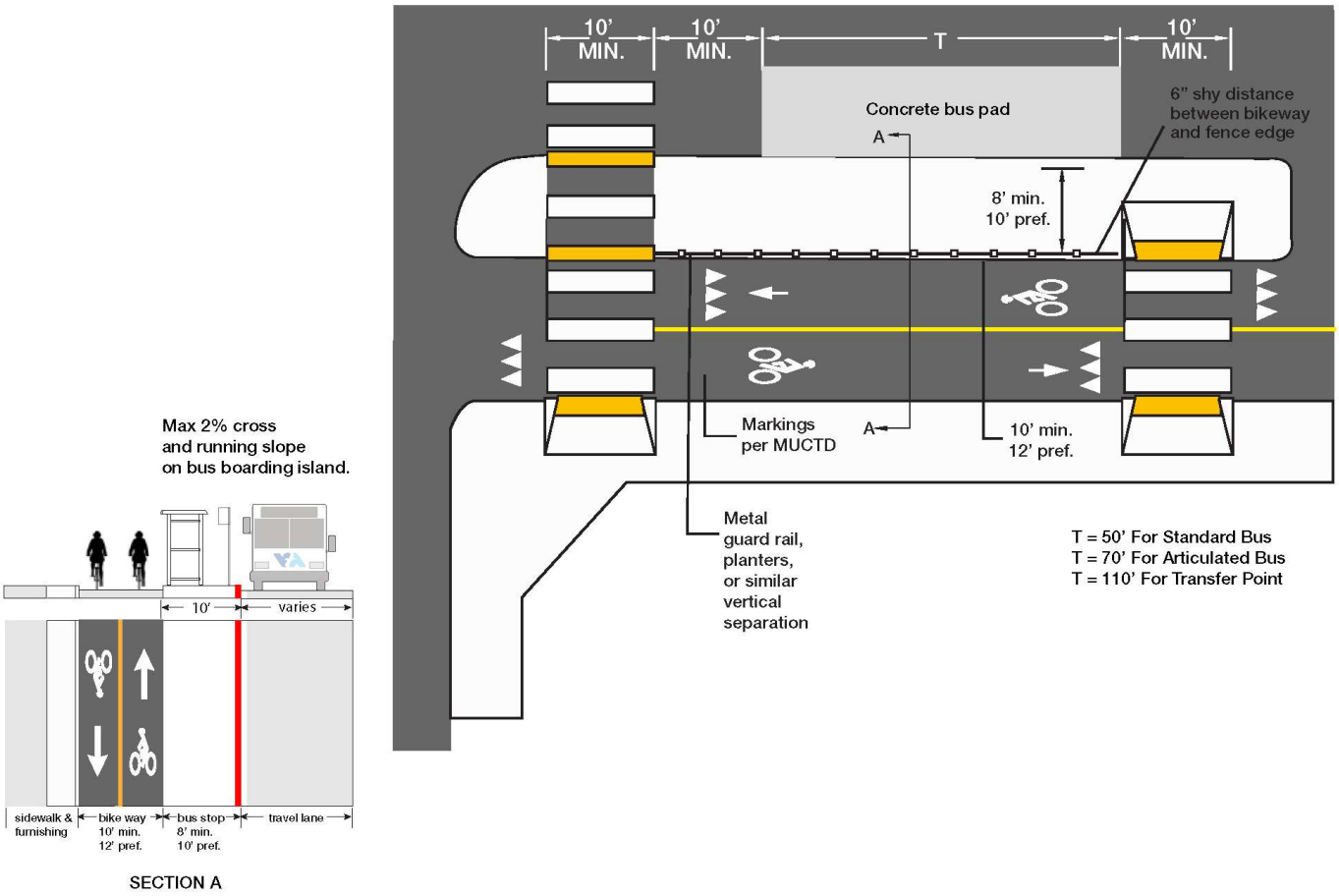


Figure 7.9a - Bus stop where two-way bikeway is the same level as roadway

Where the bikeway is raised to the level of the sidewalk and the bus boarding island, treat as for a one-way cycletrack but provide a guardrail or other vertical separation on the bus boarding island (Figure 7.9b).

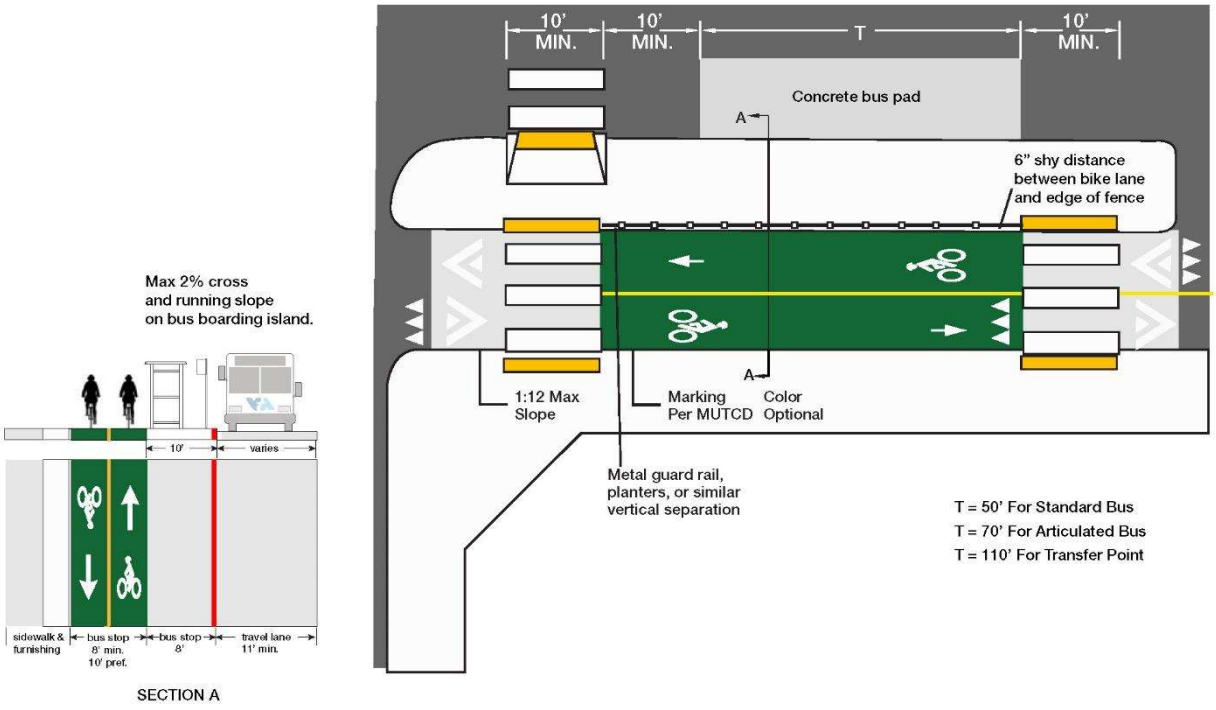


Figure 7.9b - Bus stop where two-way bikeway is at the same level as the bus boarding island and the sidewalk

7.10 Bus Boarding Island Treatments Not Accepted by VTA

VTA requires a dedicated boarding area five feet wide by eight feet deep. This area must not be shared by bicyclists. Other jurisdictions in California have experimented with shared bikeway/boarding areas in constrained conditions. VTA does not permit this treatment. Customers getting off the bus may not expect or see approaching bicyclists, and bicyclists approaching a stopped bus may not expect the wheelchair ramp to deploy in their path.

This manual has been prepared by VTA staff with support and review from the following:

- Ken Ronsse, VTA Engineering & Program Development
- Ziad Dweiri, Mott MacDonald Consultants
- Michael Catangay, VTA Operations Passenger Facilities
- Ed Evangelista, VTA Engineering & Program Development
- Lauren Ledbetter, VTA Planning