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APTA Infrastructure and Systems Security Working Group

Bus Stop Design and Placement Security Considerations

Abstract: This recommended practice provides guidance to transit agencies on the security concerns related to the design and placement of bus stops.

Keywords: bus stop design, bus stop placement, crime prevention through environmental design (CPTED), considerations, security, threat vulnerability assessment

Summary: Bus stops help define boundaries, channel access and egress of passengers, and provide visual barriers. Bus stops should be integrated with other security measures, including CPTED, lighting, barriers, etc., to optimize protection and complement security solutions.

Foreword

The American Public Transportation Association is a standards development organization in North America. The process of developing standards is managed by the APTA Standards Program's Standards Development Oversight Council (SDOC). These activities are carried out through several standards policy and planning committees that have been established to address specific transportation modes, safety and security requirements, interoperability, and other topics.

APTA used a consensus-based process to develop this document and its continued maintenance, which is detailed in the manual for the APTA Standards Program. This document was drafted in accordance with the approval criteria and editorial policy as described. Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

This document was prepared by the APTA Infrastructure and Systems Security Working Group (ISSWG) as directed by the APTA Security Standards Policy and Planning (SSPP) Committee.

This document represents a common viewpoint of those parties concerned with its provisions, namely transit operating/planning agencies, manufacturers, consultants, engineers and general interest groups. The application of any recommended practices or guidelines contained herein is voluntary. APTA standards are mandatory to the extent incorporated by an applicable statute or regulation. In some cases, federal and/or state regulations govern portions of a transit system's operations. In cases where there is a conflict or contradiction between an applicable law or regulation and this document, consult with a legal adviser to determine which document takes precedence.

This document supersedes APTA SS-SIS-RP-008-10, which has been revised. Below is a summary of changes from the previous document version:

- Assorted changes to modernize standard contents

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Introduction

This introduction is not part of APTA SS-SIS-RP-008-10, Rev. 1, "Bus Stop Design and Placement Security Considerations."

APTA recommends the use of this document by:

- individuals or organizations that operate bus transit systems;
- individuals or organizations that contract with others for the operation of bus transit systems; and
- individuals or organizations that influence how bus transit systems are operated (including but not limited to consultants, designers and contractors).

Scope and purpose

This document establishes recommended practices for the design, installation and maintenance of bus stops. APTA recommends the use of this recommended practice by any entity, public or private, that regulates, inspects, designs, specifies, builds, maintains and/or operates public transportation facilities.

Bus Stop Design and Placement Security Considerations

1. Stakeholder considerations

The first point of contact between the passenger and the transit system is often the bus stop/shelter. Many factors influence the design and placement of the bus stop/shelter. Transit agencies, city governments, developers, employers, neighborhood groups and passenger destinations are significant influences to safe and secure bus stop/shelter placements. More so, to satisfy passenger safety and security demands, the influences of functional requirements and operational needs of the service area should be addressed. These include transit system performance, traffic flow, safety and security. At a minimum, each of these concerns should be reviewed when addressing the security concerns for the appropriate placement of a bus stop/shelter.

2. Risk assessment considerations

2.1 Systemwide risk assessment

Each transit agency should conduct and document a security risk assessment of its system and use the output as a guide to determining bus stop design considerations. The assessment should be holistic and consider the total transit environment, both static and mobile. The security risk assessment should evaluate the following:

- transit operating environment
- personnel (both managers and front-line staff)
- facilities and infrastructure
- policy and procedures
- surrounding non-transit environment

2.2 Specific bus stop risk assessment

Each transit agency should conduct and document a security risk assessment of bus stops in its system, considering trade-offs between customer satisfaction and risk. The assessment should be holistic and consider the total transit environment, both static and mobile.

3. Crime prevention through environmental design

CPTED is a multidisciplinary approach to deterring criminal behavior. Applying CPTED principles (e.g., natural surveillance, natural access control and territorial reinforcement) to the design and placement of a bus stop/shelter location is essential to identifying space issues and concerns.

Each transit agency should complete a CPTED survey to identify and recommend the appropriate enhancements to implement crime prevention or homeland security measures. See APTA SS-SIS-RP-007, “Crime Prevention Through Environmental Design (CPTED) for Transit Facilities,” for additional information.

3.1 Natural surveillance

Natural surveillance is the ability to observe the whole environment without taking extraordinary measures to do so. The following sections detail strategies for providing natural surveillance.

3.1.1 Clear lines of sight

The optimum location and design of the amenities should permit 360-degree visibility in and around the bus stop at all times. Primary emphasis should be placed on a clear line of sight for the approach direction of buses servicing the stop.

Bus stop amenities should minimize hiding places for packages and people and encourage clear lines of sight. This includes under the seating, advertising and information display areas, and the shelter roof lines. Windbreaks and shelter glass should be designed with graffiti-resistant materials that provide sufficient visibility. Consideration should be given to changes in grade, retaining walls or other obstructions that may create areas of concealment.

3.1.2 Lighting

Illumination levels at night can act as a deterrent to criminal activities. A lighting level evaluation during hours of darkness should be considered. Refer to APTA SS-SIS-RP-001-10, “Security Lighting for Transit Passenger Facilities,” for additional information.

3.1.3 Landscaping

Landscaping should not interfere with clear lines of sight by passing vehicles and pedestrians. A basic CPTED premise is to plant trees with foliage no lower than 6 to 7 ft and shrubs and ground vegetation that grow no higher than 2 to 3 ft. Landscaping should not create areas where items or people could be hidden, including behind the shelter. Agencies should work with neighboring third parties that maintain adjacent properties.

If appropriate lighting design is dependent on ambient or adjacent lighting, landscaping should not block lighting sources.

3.2 Territoriality

Territoriality consists of establishing recognized authority and control over the environment, along with cultivating a sense of purpose, to reinforce territory boundaries. The following sections detail strategies for providing natural territoriality.

3.2.1 Use and ownership

Indicators, such as signage, physical barriers and environmental cues, define intended use and ownership:

- Signage can define the area of the bus stop and allowable activity, such as “For Patrons Only.” (To post any enforcement actions, some jurisdictions require the posting of the actual city ordinance or state statute in addition to “No Trespassing.”)
    - Post Neighborhood Watch or Transit Watch signs and phone numbers to report any criminal activity in jurisdictions where these programs exist and working with local law enforcement.
    - Ensure that signage is simple, legible and bilingual if appropriate.
- Physical barriers such as fencing or symbolic barriers (e.g., vegetation, planters) can define pathways and access areas.
- Environmental cues such as pavement color or markings can denote the actual bus stop area; changes in grade or elevation or footpath material could also be beneficial.

4. Selection of materials

Consideration must be given to the selection of materials used in the building of bus stops and shelters. The following sections discuss factors that should be considered.

4.1 Visibility

Visibility is a key goal in complying with the previously mentioned goals of CPTED yet shelter structures must be sturdy, maintainable and usable. The interior of the shelter should be visible from the bus approach side of the shelter, at a minimum. Consideration should be given to the consequences of vandalism such as graffiti and "scratchitti" (or etching). Use materials that are easily cleaned, fire resistant and/or resistant to vandalism, such as perforated metal sheeting or other metal semi-transparent applications, or transparent panels that are easy to repair or replace.

4.2 Durability

Consideration should also be given to the fragmentation factor of materials used. Some preexisting materials such as glass can be mitigated through application of certain treatments such as films and/or glazing. Other vandal-resistant materials, such as perforated metal sheeting or other metal semi-transparent applications, or polycarbonate transparent panels that are easy to repair or replace, may be considered.

4.3 Bollards and other barriers

At high-risk locations, identified in the agency's risk assessment, the use of bollards and other barriers such as planters will assist in providing buffer zone protection to mitigate vehicle encroachment and enhance pedestrian safety. Consider both intentional and unintentional vehicle encroachments in the assessment. Stops placed near sharp turns or T-intersections are vulnerable to vehicle strikes. See APTA SS-SIS-RP-009-12, "Anti-Vehicle Barriers for Public Transit" for more information.

4.4 Video surveillance

Due to advancements in technology and reductions in costs, the ability to provide video surveillance (e.g., CCTV) coverage at high-risk bus stop locations, as identified through the agency's security assessment, is now a possible alternative. A key consideration, however, is the supporting infrastructure, which would require at least a power source. Consideration also should be given to connectivity to monitoring systems (in real time and post-incident) and record retention costs. Alternatively, agencies should consider the use of video surveillance by businesses proximate to bus stops or shelters. See APTA IT-CCTV-RP-001-11, "Selection of Cameras, Digital Recording Systems, Digital High-Speed Networks and Trainlines for Use in Transit-Related CCTV Systems," for additional details.

4.5 Communication systems

The use of communication systems (e.g., blue light phones, call boxes) at bus stops is needed only in areas of isolation, places without reference and locations lacking cell phone signals. Agencies should consider implementing a security program that advises passengers on whom to call to report suspicious activity or criminal events. Emergency call boxes have been installed in high-traffic public areas, but their utilization and usefulness has been greatly depleted by the increased use and ownership of cell phones.

4.6 Passenger amenities

The design of bus stop waiting areas and provision of amenities that enhance security and comfort play a significant role in a person's decision to use transit. Passenger amenities should be considered for bus stops to

improve passenger comfort and the relative attractiveness of transit as a transportation alternative. Selection of bus stops at which to install amenities takes into account a number of factors, including the following:

- average daily boardings
- proximity to major trip generators
- passenger transfer activity
- planned neighborhood improvements
- transit corridor marketing efforts
- equity among communities in the county
- proximity of other nearby sheltered areas
- customer and community requests
- safety and security data

4.7 Shelters

Transit shelters are installed at bus stops to provide weather protection and seating for waiting passengers. Any advertising and/or art incorporated in the shelter should incorporate security principles, such as clear lines of sight. Design considerations for shelters include the following:

- strength and durability of structure and materials
- resistance of materials and paint treatment to weather conditions, graffiti, cutting, fire and other forms of vandalism
- existence or provision of external lighting in the area, and provision of internal lighting for the shelter
- appropriateness of the design to the neighborhood
- the Americans with Disabilities Act and Public Rights of Way Accessibility Guidelines
- accommodation of trash disposal within the location design
- easy maintenance of the shelter and other amenities
- landscape design meeting CPTED standards
- communications conduits for current or future use
- semi-transparent enclosure that allows a vehicle operator to see passengers
- wheelchair marking/placard that indicates the space underneath the shelter dedicated for wheelchairs

4.8 Seating

Seating is typically installed inside standard shelters. Seating may also be installed independently at bus stops that do not have shelters. Local communities may also install seating as one element of an improved streetscape; in this case, efforts should be made to locate seating near bus stops where they do not create barriers to accessible bus boarding or sidewalk usage. Transit agencies may also consider leaning posts or other seating alternatives.

The purpose of shelter seating is to provide amenities for customers waiting for a bus. In order to achieve that and discourage non-customer loitering, armrests should be designed and/or incorporated so that individuals will not be comfortable lying down. Other approaches include wave design seating, fold-down seats and individual pillar seats at various heights.

Seating should incorporate security principles, such as providing clear lines of sight behind and underneath to discourage hiding of unattended objects.

Design factors for seating should include the following:

- Seating should be placed facing the street.
- Structure and materials should be chosen for strength and durability.
- Materials and paint treatments should be resistant to weather conditions, graffiti, cutting, fire and other forms of vandalism.
- Seating should be placed to allow pedestrians to move past people sitting on the bench.
- Ensure that there are no conflicts with wheelchair accessibility and loading at the bus stop.
- Seating should be anchored to prevent unauthorized movement.
- Seating should allow for easy relocation in case of bus route changes, street improvement projects, etc.

4.9 Newspaper and vendor boxes

Newspapers can provide waiting transit customers with convenient access to reading material. However, newspaper boxes in the shelter should be discouraged and should not obstruct access to the landing area, sidewalk, shelter or posted transit information. These could be used for garbage or explosive or incendiary devices. Newspaper boxes should never be chained or otherwise affixed to the bus stop sign pole, shelter or bench. Currently, laws or ordinances restricting placement of vendor boxes are instituted by the cities where they are located. Vendor boxes for free publications should be discouraged, as they contribute to trash problems at bus stops and may serve as hiding places for explosive devices.

4.10 Trash containers

Refer to APTA SS-SIS-RP-014-13, “Trash/Recycling Container Placement at Public Transportation Passenger Facilities,” for guidance as it applies to the deployment of trash containers.

4.11 Additional considerations

There are additional amenities that are frequently found at or near bus stops and shelters, such as bicycle racks, lockers or electric scooters. Inappropriately located mobility devices and other amenities can create safety and security issues, and consideration should be made to their placement to enhance transit connections without increasing stop hazards or vulnerabilities. Agencies should consider bicycle storage that allows visibility, balancing theft concerns with security vulnerabilities. Bicycle storage should provide visibility in and around the shelter.

5. Customer information systems

Customer information systems assist customers with knowledge of the transit system’s routes, schedules, bus stop locations, safety and security information, just to name a few items.

5.1 Signage

Each bus stop can be marked with a sign indicating the transit operators that serve the stop. Bus stop signs indicate to passengers and drivers where buses stop, as well as publicize the availability of the service (see **Figure 1**).

FIGURE 1
Bus Stop Signage

The sign should be securely mounted on its own post or a light standard, at an angle perpendicular to the street. The sign must be easily visible to the approaching bus driver, ideally within 4 ft 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 from the curb for clearance and yet not impede pedestrian travel.

The bus stop sign is the generally placed point at which the front of the bus should be aligned when the bus is servicing passengers and thus should be placed approximately 1 ft beyond the far side of the landing area for stops served by front-lift buses. The bottom edge of the sign should be positioned at a height of at least 80 in. from the ground. Each bus stop sign should contain the names of routes that service the stop, as well as the telephone number to call for more information. ADA minimum specification standards make signage accessible to people with low vision. These requirements do not apply to route and schedule information posted at bus stops.

5.2 Route and schedule information

Posting route and schedule information, as well as information about fares and holiday schedules, provides additional information for passengers and minimizes wait times at the stop. The schedules should be mounted for easy viewing from the sidewalk or other safe area.

5.3 Electronic message boards

Electronic message boards at key bus stops that provide real-time schedule and route information have been implemented by some transit systems. Actual arrival information provides customers with an increased sense of security. They can also be utilized to enhance security by displaying real-time messages for emergencies,

detours or missing-person alerts. Consideration should also be given to mitigate vandalism and theft of the boards. Collocation with surveillance systems is highly desirable.

5.4 Usage and location analysis

The placement of stops and/or shelters must be determined by criteria that are consistently applied and documented. Criteria should include the following:

- pedestrian traffic and demographic information
- passenger volume
- traffic volume and circulation
- crime rate in area of the bus stop

5.5 Bus access to the stop

Location of bus stops should take into consideration aspects like visibility, parking and adjacent businesses and residences.

5.5.1 Limited visibility over hills and around curves

Bus stops should not be located over the crest of a hill, immediately after a curve to the right, or at other locations that limit the visibility of the stopped bus to oncoming traffic. Stop placement should consider both safe stopping and the ability to safely pull back into traffic. If a bus stop must be located near the crest of a hill or around a tight curve, approaching cars should be warned of the need to be prepared to stop.

5.5.2 On-street parking

Locating a bus stop in an area with existing curbside parking requires either enough space to permit the bus to pull off, service the stop and reenter the travel lane, or installation of a sidewalk extension or curb bulb to provide passenger access to the bus.

5.6 Adjacency

Before a bus stop is placed, it is important to consider the area around it. The following sections address concerns related to adjacency.

5.6.1 Abutting property owners/tenants

To promote good public relations, it is desirable that bus stops be placed at locations where they fit into the community. Some commercial establishments are interested in having a bus stop in front, while residents may object to the presence of a bus stop in front of their homes, especially if the stop is used for layovers. All efforts should be taken to minimize the impact to each property owner, but vehicle and pedestrian safety should be the overriding factor in determining the final bus stop location.

5.6.2 Transfer locations

Stops should be located to minimize street crossings of passengers transferring to other routes where transfer activity between routes is heavy.

5.6.3 Compatibility with adjacent properties

Care should be taken to avoid locating a bus stop immediately adjacent to land uses that are highly sensitive to the effects of bus fumes and noise.

5.6.4 Proximity to major trip generators

When feasible, a bus stop should be located to minimize walking distances to activity centers that are expected to generate the most ridership.

5.7 Pedestrian access to the stop

5.7.1 Crosswalks

Bus stops should ideally be located close to existing crosswalks to encourage safe pedestrian crossings, but they also should be located so that a stopped bus will neither block a crosswalk nor obstruct pedestrian visibility of oncoming traffic and vice versa. In general, it is safer to locate the bus stop on the far side of a crosswalk so that passengers will cross behind, rather than in front of, the bus.

5.7.2 Universal access

Pedestrian routes to bus stops should be designed to meet the need of all users (including people with disabilities, the elderly and children). Paved pedestrian pathways can help ensure that they are accessible to everyone. Provide accessible circulation routes that include curb cuts, ramps, visual guides, signage (visual and Braille) and railing where needed. Refer to the Public Rights of Way Accessibility Guidelines for additional details.

5.7.3 Sidewalk conditions

Stops should be located and constructed to make use of existing sidewalk facilities, or new sidewalk facilities should be constructed to provide pedestrian access to the bus stop. At stops with heavy ridership, additional passenger waiting/standing areas should be constructed off the main sidewalk so waiting passengers do not block passage of other pedestrians. Where a bus stop serves as a transfer point, there should be a paved connection to the connecting route stops. Agencies should use established state, local or industry guidance for sidewalk construction.

5.7.4 Special pedestrian access considerations for rural stops

- In rural areas without sidewalks, a minimum 4 ft wide paved shoulder of stable, compacted materials, such as decomposed granite, should be provided if possible.
- At rural bus stops, a stable, solid waiting area should be provided if possible, and a tactile warning device should be placed between the roadway and the bus waiting area to allow visually impaired pedestrians to identify the bus stop position.

5.8 Other physical site characteristics

5.8.1 Landscaping issues

The presence of trees and bushes at a bus stop may necessitate periodic trimming at the stop to prevent buses from hitting tree branches and bushes from encroaching on sidewalks. Refer to APTA SS-SIS-RP-007-10, “Crime Prevention Through Environmental Design (CPTED) for Transit Facilities,” for additional details.

5.8.2 Lighting

Adequate lighting is important for passenger comfort and security, as well as for passenger and traffic visibility. Bus stops that are served after dark should be located where they will be illuminated at night, preferably from an overhead streetlight. If this is not possible, lighting should be installed at the stop. Refer to APTA SS-SIS-RP-001-10, “Security Lighting for Transit Passenger Facilities,” for additional details.

5.8.3 Right-of-way considerations

If a bus stop may be a candidate for a transit shelter, bench installation or other improvements, transit agencies should ensure adequate right-of-way for constructing those improvements. Additionally, transit agencies should confirm application of CPTED principles when planning improvements.

5.8.4 Bicycle facilities

To the extent feasible, bus stops should be located so they do not block bicycle travel lanes. Bus stops should also be located so bicycle racks do not block pedestrians' access to the bus boarding and alighting area.

5.8.5 Planning guidelines

Land uses should be designed to facilitate the movement, and minimize the distance, between housing developments and transit services. CPTED principles should be used to provide a seamless, secure pedestrian pathway. For long-term compatibility with bus transit systems, new construction should consider the following:

- Minimize the distance between buildings and the bus stop through proximity and orientation. This can be encouraged by including transit accessibility concerns in zoning policies, setback guidelines, building orientation guidelines and parking requirements to encourage transit-oriented development.
- Eliminate barriers to pedestrian activity. This includes sound walls, landscaping, berms or fences that impede pedestrian access or visibility. If access is restricted, gates should be installed at access points.
- New residential development should provide breaks in walls between properties to allow pedestrian access to bus stops.
- Provide a dedicated sidewalk and/or bike path through new development that is safe and direct to the nearest bus stop or transit center.

Related APTA standards

APTA IT-CCTV-RP-001-11, "Selection of Cameras, Digital Recording Systems, Digital High-Speed Networks and Trainlines for Use in Transit-Related CCTV Systems"
APTA SS-SIS-RP-001-10, "Security Lighting for Transit Passenger Facilities"
APTA SS-SIS-RP-007-10, "Crime Prevention Through Environmental Design (CPTED) for Transit Facilities"
APTA SS-SIS-RP-009-12, "Anti-Vehicle Barriers for Public Transit"
APTA SS-SIS-RP-014-13, "Trash/Recycling Container Placement at Public Transportation Passenger Facilities"

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Definitions

Americans With Disabilities Act (1990): The act provides reasonable access to and use of buildings, facilities and transportation by people with disabilities.

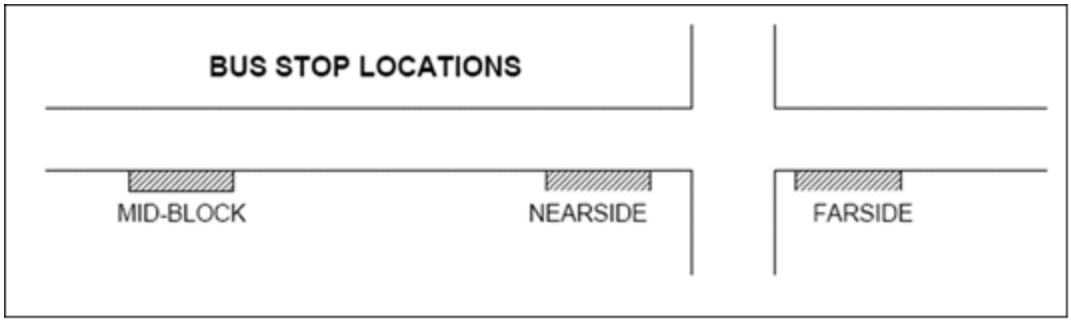
bus stop/shelter: A place on a bus route where buses stop to embark or alight passengers.

crime prevention through environmental design: The application of designing safety and security into the natural environment of a specific area. Specifically, CPTED concepts and strategy use the three interrelated principles of natural surveillance, natural access and territoriality, plus activity support and maintenance. By using the behavior of people, identifying crime generators, the working with physical environment and the space of an area, CPTED can provide benefits of safety and security if applied in the conceptual, design and planning stages of a project.

crime analysis: The study of information about criminal incidents to detect patterns or trends of criminal activity that may be used to predict the need for specific police techniques, such as aggressive patrol of a given geographic area or analysis that seeks to determine what crimes are likely to impact particular targets, the criminals likely to commit the crimes, how the crimes are likely to occur, and when they are likely to occur.

far-side bus stop: A bus stop located immediately after an intersection (see **Figure 2**).

FIGURE 2
Bus Stop Locations Relative to an Intersection



natural access control: The physical guidance of people coming and going from a space by the judicious placement of entrances, exits, fencing systems, landscaping and lighting. See also natural surveillance and territorial reinforcement.

natural surveillance: The placement of physical features, activities and people in a way that maximizes visibility.

near-side bus stop: A bus stop located immediately before an intersection (see **Figure 2**).

risk assessment: A formal, methodical process used to evaluate risks to a transit system. The security portion of the risk assessment identifies security threats (both terrorism and crime) to the transit system; evaluates system vulnerabilities to those threats; and determines the consequences to people, equipment and property.

shelter: A curbside amenity designed to provide protection and relief from the elements and a place for patrons to sit while waiting for a bus.

territorial reinforcement (territoriality): The use of physical attributes that express ownership, such as fences, signage, landscaping, lighting, pavement designs, etc. See also natural access control and natural surveillance.

Abbreviations and acronyms

ADA Americans with Disabilities Act
CCTV closed-circuit television
CPTED crime prevention through environmental design
FTA Federal Transit Administration
TCRP Transit Cooperative Research Program
TSA Transportation Security Administration

Document history

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