WAKE TRANSIT PLAN UPDATE

Wake Transit BRT System Guidelines

January 2026

CAMPO
NC Capital Area Metropolitan Planning Organization

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GLOSSARY/LIST OF ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation Officials
ADA	Americans with Disabilities Act
APS	Automated Pedestrian Signals
APTA	American Public Transit Association
AV/CV	Automated and Connected Vehicles
AVL	Automatic Vehicle Location
BAT	Business Access and Transit
BRT	Bus Rapid Transit
CAD	Computer-Aided Dispatch
CIG	Capital Investment Grants
CCTV	Closed-Circuit Television
CMS	Central Management Software
CNG	Compressed Natural Gas
FTA	Federal Transit Administration
GPS	Global Positioning System
GSI	Green Stormwater Infrastructure
mph	Miles Per Hour
MUTCD	Manual on Uniform Traffic Control Devices
NACTO	National Association of City Transportation Officials
NCDOT	North Carolina Department of Transportation
NCHRP	National Cooperative Highway Research Program
NEPA	National Environmental Policy Act
PAR	Pedestrian Access Route
RFID	Radio-Frequency Identification
SEPA	North Carolina State Environmental Policy Act
TCE	Temporary Construction Easement
TOD	Transit-Oriented Development
TSP	Transit Signal Priority
TVM	Ticket Vending Machine

1 INTRODUCTION

In 2016, Wake County voters approved a plan for focused investment in public transit, putting the implementation of the Wake County Transit Plan in motion. The original plan calls for building approximately 20 miles of transit lanes along four bus rapid transit (BRT) corridors within Wake County, to be implemented and operated by the City of Raleigh. These corridors comprise the current planned Wake BRT system. This document is an update to the basis of design for the Wake BRT system and has been prepared in collaboration with project partners including the City of Raleigh, Town of Cary, Town of Clayton, Town of Morrisville, GoTriangle, Research Triangle Foundation, Regional Transportation Alliance, Capital Area Metropolitan Planning Organization (CAMPO), North Carolina Department of Transportation (NCDOT), and other regional planning partners. Additional BRT corridor extensions in the region are currently being studied, including the Western Corridor and Southern Corridor BRT extensions. Any future BRT extensions will be evaluated based on service characteristics for the inclusion into the Wake BRT system. The purpose of this document is to establish design guidelines and criteria that would be used for Wake BRT corridors, addressing factors that may affect the design of BRT and incorporating best practices for BRT implementation.

These design guidelines include:

- Station Spacing and Sitting
- Station Facilities
- Roadway
- Stormwater
- Technology
- BRT Fleet and Vehicles
- Identity and Branding
- Service Operations
- Design Considerations for Federal Funding

INTENDED AUDIENCE

This guide is intended to aid project stakeholders and design teams in planning and developing BRT facilities funded through the Wake Transit Plan. As design standards become more established within the Wake BRT system, current and future BRT project stakeholders may benefit from this guide as well, including design consultants, contractors, developers, public works administrators, and neighborhood and community organizations and leaders.

HOW TO USE THE GUIDE

This document establishes guidelines to be used for the four planned BRT corridors to be implemented and operated by the City of Raleigh (listed in Section 2: Existing Conditions) as well as planned BRT extensions that may be operated by additional project sponsors. This document includes facility descriptions, graphic renderings, design diagrams, and technical drawings to help illustrate how various BRT transit facilities should be designed. The graphics and tables included herein have been created to align with the region's transit vision and assist in accommodating the interests and needs of the various communities BRT would serve. While the establishment of System Guidelines provides consistency in operations and user experience, design flexibility is often needed to work within a given environment. As new design standards are developed, this guide should be updated accordingly.

Additional documents are available that describe various policies, procedures, and design standards applied by jurisdictions in the Wake County transit service area. These include, but are not limited to:

- Americans with Disabilities Act (ADA) Requirements
- American Association of State Highway and Transportation Officials (AASHTO) *A Policy on Geometric Design of Highways and Streets*
- American Public Transit Association (APTA) BRT Design Standards
- APTA BRT Branding, Imaging and Marketing
- Town of Cary Standard Specifications
- Town of Garner Standards
- City of Raleigh Street Design Manual
- National Association of City Transportation Officials (NACTO) Transit Street Design Guide
- National Cooperative Highway Research Program (NCHRP) Reports
- Manual on Uniform Traffic Control Devices (MUTCD)
- The National Environmental Policy Act[1] (NEPA)
- North Carolina State Environmental Policy Act[2] (SEPA)
- North Carolina Department of Transportation (NCDOT) Roadway Design Manual
- Title VI[3] of the Civil Rights Act

These resources are referenced within these guidelines where applicable. Additionally, each jurisdiction in Wake County has individual permitting procedures and requirements governing use

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[1] Federal Transit Administration NEPA overview: https://www.transit.dot.gov/regulations-and-guidance/environmental-programs/national-environmental-policy-act

[2] North Carolina Department of Environmental Quality SEPA overview: https://deq.nc.gov/permits-regulations/sepa

[3] FTA Title VI guidance: https://www.transit.dot.gov/regulations-and-guidance/civil-rights-ada/title-vi-guidance

and development of private property as well as the public right-of-way. The BRT project sponsor will work with each jurisdiction to ensure compliance with permitting requirements for each project.

BUS RAPID TRANSIT OVERVIEW

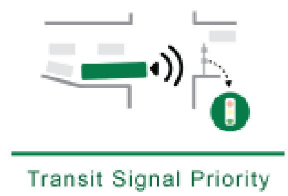
BRT is defined by the Federal Transit Administration (FTA) as high-capacity bus-based transit that delivers fast and efficient service. BRT may include dedicated lanes, busways, transit signal priority, off-board fare collection, elevated platforms, and enhanced stations. BRT has several distinguishing features, described in greater detail throughout this guide.[4]

Dedicated Bus Lanes

BRT buses operate primarily in their own lane in traffic. Dedicated lanes prevent traffic delays even during rush hour, and they reduce the risk of collisions between buses and other vehicles, increasing safety for all road users.

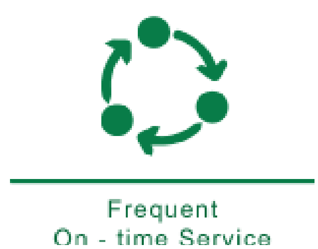
Transit Signal Priority

BRT buses can coordinate with traffic signals along the route to extend green lights and shorten red lights, reducing the amount of time buses spend idling at traffic lights. This increases service speed and reliability.



Frequent, On-Time Service

With dedicated lanes and less frequent stops, BRT buses are better able to adhere to their posted schedules. BRT buses should also have onboard real-time location information so stations can display live, accurate, updates for bus arrival time. BRT service is planned to operate with 10-minute peak frequency and matching or exceeding fixed-route frequencies at all other times.



Off-Board and All-Door Fare Collection

Passengers should purchase physical fare media at stations instead of on the bus, speeding up boarding and reducing dwell time at stations. Passengers should be able to validate physical fare media or mobile app codes at all doors of the BRT vehicle to decrease boarding times. Cash should not be accepted on board BRT buses. BRT fares should be the same as the project sponsor's fixed route fares. In the future, local transit systems

[4] BRT Icons: https://raleighnc.gov/services/transit-streets-and-sidewalks/what-bus-rapid-transit-brt

may be able to accept open payment through contactless cards or mobile wallets.

Enhanced Stations

BRT stations should include improvements to ticketing, scheduling information, and boarding to enhance the passenger experience. Stations should also have raised platforms that reduce or eliminate the gap between the station and the bus, making boarding easier, quicker, and more accessible for all passengers – including those using mobility devices.

Specialized Vehicles

Wake BRT should utilize custom 60' articulated buses with higher seat and mobility device capacity than the buses typically used on local routes. BRT vehicles should also have doors on both sides and lower floors to allow for easier boarding.

Unique Branding

Wake BRT should have its own unique branding to make buses and stations more visible and help passengers distinguish between BRT and other transit services.

BRT SERVICE TYPES

For the purposes of these guidelines, BRT service is categorized as either Urban BRT or Arterial BRT. As corridors evolve, BRT may change from Arterial BRT to Urban BRT as frequencies increase and additional projects are implemented to achieve the minimum dedicated guideway threshold.

Urban BRT

Urban BRT is characterized by at least 50% dedicated guideway, TSP at all signalized intersections, enhanced stations, unique BRT branding, specialized 60-foot buses with left and ride side doors, and peak frequencies of at least 10 minutes.

Arterial BRT

Arterial BRT is characterized by less than 50% dedicated guideway, TSP, enhanced stations, unique BRT branding, and ideal peak frequencies of at least 10 to 15 minutes, although 20 or 30 minute frequency may be initially implemented for longer or more rural corridors. Service is operated by specialized 60-foot buses or 40-foot buses. Typically, the land use and ridership contexts for Arterial BRT corridors vary from those of the Urban BRT.

IMPLEMENTING SYSTEM GUIDELINES

Every transit facility project is designed within the context of its physical space. Facilities are designed to reduce long-term maintenance demand and with passenger safety and comfort in mind. Facilities should also promote safe, efficient, and reliable transit service. To achieve that goal, this document contains guidelines that serve as a starting point for design development.

Variations from Guidelines

The Wake BRT System Guidelines are intended to apply to all BRT projects that receive capital and/or operational funding through the Wake Transit Plan for consistency in design, operation, and rider experience. However, each BRT corridor is unique, so these guidelines have been developed with flexibility, differentiating between requirements, recommendations, and optional elements. Even with this flexibility, there may be circumstances where deviations are needed from these guidelines to address site-specific conditions.

In these cases, the project sponsor is required to complete a written memorandum detailing the requested variance and present the application to the Transit Planning Advisory Committee (TPAC) for consideration and approval. The memorandum should clearly reference the Wake BRT System guideline and detail the requested variance. The reason(s) for the requested variance should be articulated with excerpts and citations to any applicable roadway standards triggering the variance. Furthermore, supporting documentation in the form of maps and plan sheets should be included with the memorandum.

The TPAC discussion and decision regarding the variance will be documented in the meeting minutes. The TPAC will attach an excerpt from the meeting minutes of the variance agenda item to the project sponsor's memorandum and transmit the package to the project sponsor for their records. Lastly, the TPAC will maintain a log of requested variances and their outcomes to be used in the regular review and update of the Wake BRT System Guidelines.

Coordination with Overlapping Projects

To effectively plan, design, and construct intersection and guideway improvements, particularly supporting pedestrian infrastructure, planned roadway projects should be identified and evaluated. It is more efficient and cost effective to incorporate elements such as TSP, queue jumps, sidewalk segments, and crosswalks into transportation projects planned for the BRT corridors. It is also critical that the other roadway projects are designed to not preclude these elements required for future BRT service. These elements not only support BRT service, but they also address the safety and connectivity of all roadway users. For example, TSP improves response times for emergency responders in addition to improving transit reliability and speed. Strong collaboration is needed between the local NCDOT divisions, NCDOT Integrated Mobility Division, NCDOT Transportation

Mobility and Safety Division, CAMPO, transit agencies, and municipalities, facilitated through regular meetings and the NCDOT Complete Streets process.

Third-Party Agreements

The term third-party agreement refers to those agreements entered into by the project sponsor with an outside party (i.e. NCDOT, municipalities, utility companies, other transit agencies, etc.) that are necessary to facilitate the financing, design, permitting, construction, or operation and maintenance of a capital project. Each BRT project will require specific third-party agreements based on the project sponsor, funding requirements, utility impacts, right-of-way ownership, jurisdiction, operating agency, etc. For example, any BRT project operating on a road owned or maintained by NCDOT will require third-party agreements between the project sponsor and NCDOT.

Failure to timely execute critical third-party agreements is highly likely to cause changes to the project's baseline scope, budget, and schedule. The lack of executed agreements may slow the progress of design, impede the start or progress of project construction, delay start-up, or interrupt operations. Verifying the execution of critical third-party agreements is an important part of successfully implementing BRT projects and should be addressed as early as possible for each corridor.

REGULAR UPDATING OF THE GUIDELINES

As additional BRT corridors in the region are designed, constructed, and operated and industry guidance evolves, it is important to regularly review and update these guidelines at least once every three years. TPAC will oversee the review, update, and adoption of the guidelines with collaboration from BRT project sponsors and operators in the region. As part of the regular update process, TPAC will review:

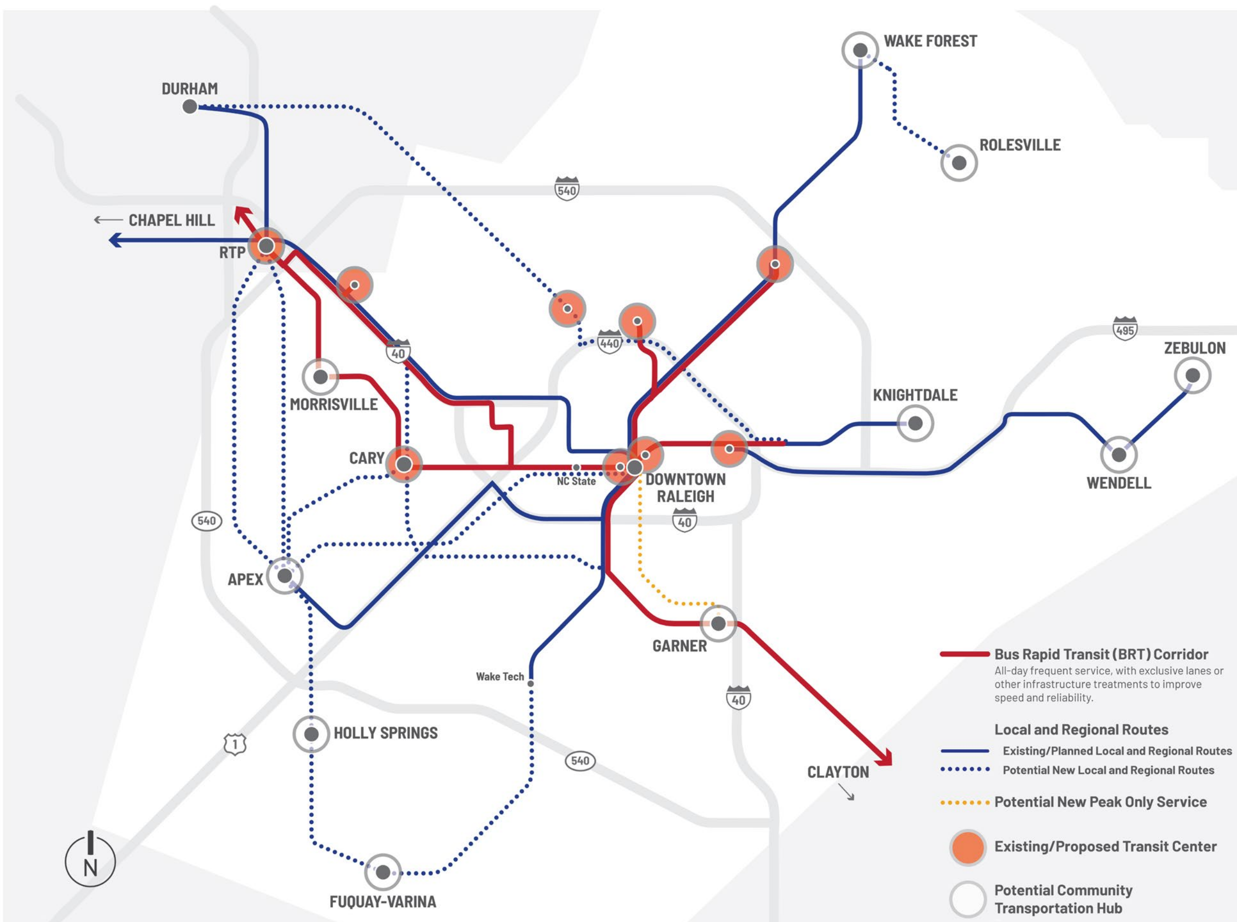
- Variances from the past three years to identify specific guidelines that may require revision
- Updates to NCDOT Roadway Design Manual
- Updates to municipal street specifications and standards
- Revised or new guidance from national organizations such as AASHTO, APTA, NACTO, and NCHRP

2 EXISTING CONDITIONS

LAND USE AND DEVELOPMENT

Figure 2.1 above shows proposed BRT corridors to be implemented and operated by the City of Raleigh in a variety of land use contexts, including residential, commercial, institutional, and mixed-use areas, as well as downtown Raleigh, industrial centers, and healthcare facilities. Vacant or undeveloped lots may also be adjacent to Wake BRT routes and/or stations. Land use patterns shape station nodes and impact pedestrian traffic and the transit environment. These patterns should be considered when selecting lighting, determining the placement and type of station elements including pedestrian/bicycle access and various safety measures. Stations and support facilities should aesthetically and functionally complement the character of their surroundings within the common design kit of parts, should be designed to take advantage of existing attractive site features and be compatible with surrounding land uses and development. Where consistent with land use policies, stations can form the nucleus for transit-oriented development.

Figure 2.1 Wake County BRT Corridor Map



ROADWAYS

Roadway classifications are determined using the appropriate municipal and state roadway design manuals. Arterial BRT corridors would most often operate on major streets, including 4 and 6-lane avenues, one and two-way, and divided or undivided. Each classification of roadway has specific requirements for design speeds, right-of-way width, curb radii, and other standards. The following corridors are currently planned for BRT service in Wake County.

WAKE BRT PROJECTS

New Bern BRT

Heading east, this route begins in downtown Raleigh, continues past the WakeMed Raleigh Campus, and terminates in a low-density commercial and industrial area past Interstate 440.

Figure 2.2 WakeMed Campus[5]

[5] WakeMed Image: https://www.wakemed.org/

Northern BRT

This route follows Capital Boulevard or West Street from downtown Raleigh to Crabtree Boulevard. Final routing is yet to be determined at the time of this writing.

Figure 2.3 William Peace University[6]

Western BRT

Heading west, this route would follow Western Boulevard to Cary Towne Boulevard (via a new roadway extension), Maynard Road and terminate at the Downtown Cary Multi-Modal Center.

Figure 2.4 North Carolina State University Campus[7]

[6] William Peace University Image: https://peace.edu/academics/academic-resources/core-curriculum/

[7] North Carolina State University Image: https://magazine.cals.ncsu.edu/the-power-of-giving-entrepreneur-and-philanthropist-and-cals-alum-carroll-joyner/

Southern BRT

The northern portion of this route would use South Wilmington Street, while the southern piece would use the S Wilmington Street extension (by new roadway construction).

Figure 2.5 Martin Marietta Center for the Performing Arts[8]

Western and Southern BRT Extensions

The original Wake Transit Plan in 2016 identified the above four corridors for BRT investments. Since then, further studies have identified two additional corridor extensions. The Western BRT Extension would extend the Western BRT from Cary to Research Triangle Park (RTP). The Southern BRT Extension would extend the Southern BRT from Garner to Clayton and Johnston County.

[8] Martin Marietta Center for the Performing Arts Image: https://www.visitraleigh.com/listing/martin-marietta-center-for-the-performing-arts/57123/

LAND USE CONTEXT

Planned BRT corridors in Wake County include a wide array of adjacent land use context. Land uses include high- to low-density residential and commercial areas as well as light industrial areas. Routes also serve institutional uses such as primary and secondary schools, colleges and universities, and hospitals.

High Density

High density land uses along BRT corridors are typically located in activity centers with high pedestrian volumes, such as downtown. Transit facilities in these areas would require high levels of access and circulation as they often can experience the highest ridership levels on the corridor. Right-of-way can be limited with vertical adjustments constrained. Stations must be designed to maximize pedestrian movements and limit adverse impacts on storefront businesses. A high-density land use is shown below in **Figure 2.6**.

Figure 2.6 High Density Land Use Example[9]

[9] High Density Land Use: https://www.bing.com/maps

Moderate Density

Moderate density land uses along BRT corridors are typically located in areas just outside activity centers and often in predominantly residential or commercial areas. More space for transit facilities is available than in high density areas, but increased traffic speeds and reduced pedestrian activity may impact the implementation of BRT stations and exclusive runningways. An example of moderate density land use is shown below in **Figure 2.7**.

Figure 2.7 Moderate Density Land Use Example on New Bern Avenue in Raleigh

Low Density

Low density land uses along BRT corridors are typically located in areas farther from activity centers with lower pedestrian volumes. Right-of-way tends to be less constrained, but low pedestrian volumes can reduce need for BRT exclusive stations and runningways. Low density locations often contain higher speed segments. Stations may require additional setbacks from roadways, constraining platform element placement. A low-density land use example is shown below in **Figure 2.8**.

Figure 2.8 Low Density Land Use Example[10]

[10] Low Density Land Use: https://www.google.com/maps/@35.7977859,-78.5772489,3a,75y,65.63h,89.18t/data=!3m6!1e1!3m4!1srH6nSU5pEWxXqZLLoCe7Dg!2e0!7i16384!8i8192

3 STATION SPACING AND SITING

STATION SPACING

BRT stop spacing seeks to balance speed and access. Speed is prioritized to ensure that BRT is an attractive service for transit users and competitive with driving. Fewer stops allow for faster travel but also reduce the number of destinations within a short walk of a stop. **Table 3.1** below indicates general guidelines for application of Urban and Arterial BRT stop spacing and proportion of dedicated transit runningway based on surrounding land use context. These are approximate distances recommended between stations. Station placement depends on the guideway location, station locations, intersection conditions, right-of-way impacts, vehicle type, etc.

A BRT stop is defined as a single platform in one direction of travel. Closer stop spacing is warranted in moderate to high-density areas with more trip generators, while in lower-density areas, speed is prioritized to ensure that BRT is an attractive alternative to driving. Moderate to high density areas are those with at least ten residents and jobs per acre, and low-density areas have less than ten people and jobs per acre.

The core distinction between Urban BRT and Arterial BRT is the number of dedicated guideways. For Urban BRT, at least 50% of the corridor should be in dedicated BRT lanes. While there is no minimum percentage established for Arterial BRT, dedicated guideway should be considered in targeted sections of the corridor where speed and reliability can be enhanced for the BRT vehicles and BRT travel time can be decreased.

Table 3.1 Station Spacing

Stop Spacing	**Moderate to High Density** (≥10 people and jobs per acre)	**Low Density** (<10 people and jobs per acre)
Minimum stop spacing	0.5 miles	1 mile
Maximum stops per mile	2	1
Dedicated Runningway		
Urban BRT **Minimum percentage of all-day dedicated runningway**	50%	N/A*
Arterial BRT **Minimum percentage of all-day dedicated runningway**	No minimum, but encouraged	No minimum, but encouraged

*Implementation of dedicated runningway for low-density segments would be context sensitive. Benefit/Cost analysis is recommended.

STATION SITING

After the general location for a BRT station is identified through the corridor planning process, several factors influence the specific location of station platforms, including right-of-way needs, public input, adjacent property/business access, population and job density, community destinations, land use and (re)development potential, connecting transit routes, and nearby pedestrian and bicycle infrastructure.

STATION ORIENTATION

Five different station orientation categories, as referenced by NACTO[11][12][13], are used for station design. Each orientation describes the location context based on the roadway itself, as well as physical limitations or contexts. These categories are not mutually exclusive, as near-side, far-side, and mid-block describe proximity to an intersection, while split island and shared island stations reference the roadway layout.

Near Side

Near-side stations are described by platforms that are placed on the close side of the intersection to the direction of travel. Near-side stations allow for the bus to pull up to the station while in traffic prior to the intersection signal. If a bus pulls into the station during a green light cycle, allowing for boarding time, it may have to wait until the next cycle to proceed through the intersection. Limited transit signal priority (TSP) advantages can be implemented in this configuration. **Figure 3.1** shows a schematic of a near-side station in relation to an intersection along the BRT corridor.

Figure 3.1 Near Side Station[14]

[11] Near-Side, Far-Side, Mid-Block: https://nacto.org/publication/transit-street-design-guide/stations-stops/stop-design-factors/stop-placement-intersection-configuration/

[12] Split Island: https://nacto.org/publication/transit-street-design-guide/stations-stops/stop-configurations/in-street-boarding-island-stop/

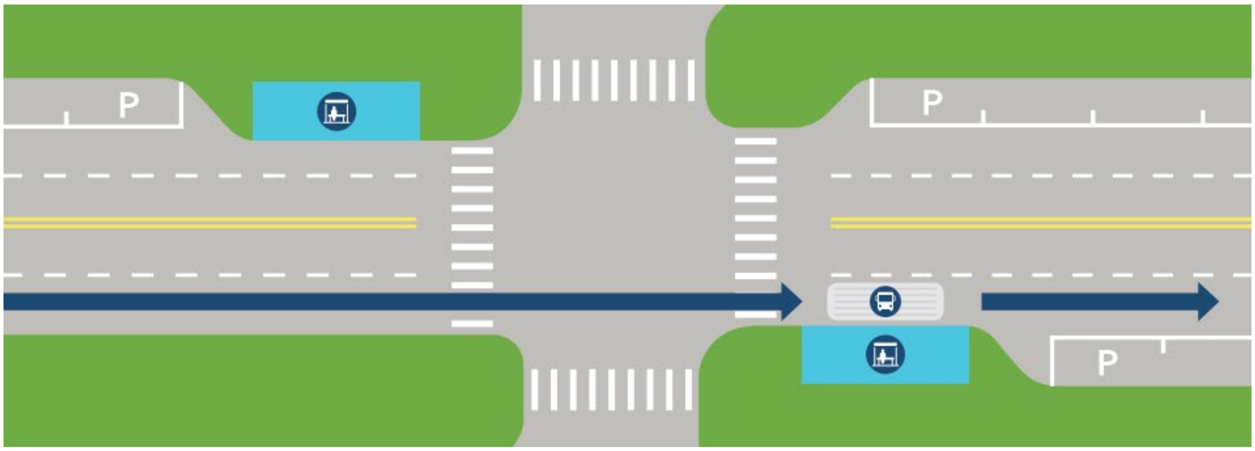
[13] Shared Island: https://nacto.org/publication/transit-street-design-guide/stations-stops/stop-configurations/median-stop-left-side-boarding/

[14] Station Siting Graphic: https://nacto.org/publication/transit-street-design-guide/stations-stops/stop-design-factors/stop-placement-intersection-configuration/

Far Side

A far-side station is placed on the distant side of the intersection from the direction of traffic. These stations allow for buses to travel through the intersection before boarding. Additionally, if TSP is implemented, far-side stops allow buses to travel through the intersection during a green light, stop at the BRT platform, and depart without additional delay. **Figure 3.2** shows a schematic of a far-side station in relation to an intersection along the BRT corridor.

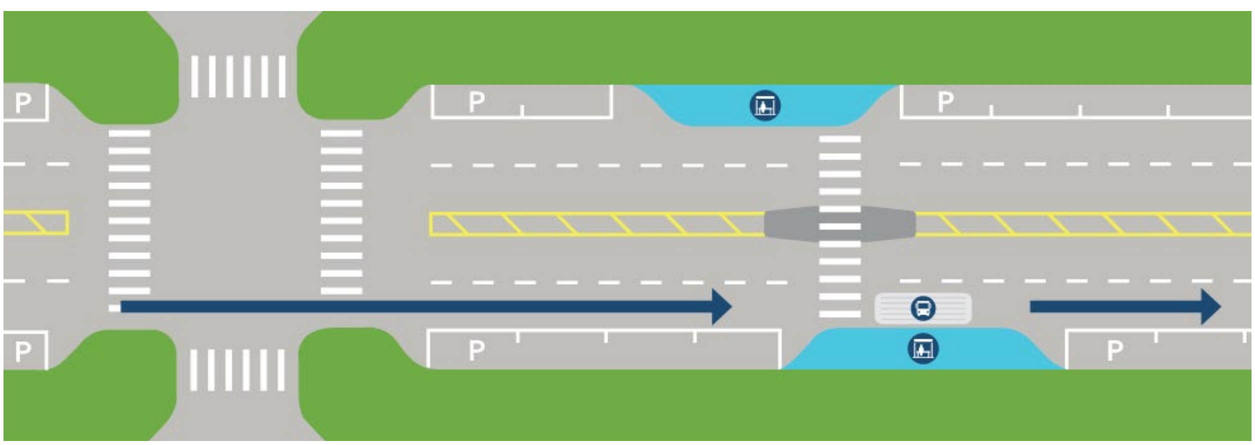
Figure 3.2 Far Side Station



Mid-Block

Mid-block stations are located at a distance between intersections when the station is unable to be placed near intersections due to driveway access, on-street parking, or other operational safety concerns near the intersection. Mid-block stations ideally still allow for nearby access to key destinations. However, due to their greater distance from pedestrian roadway crossings, mid-block stations are typically proposed only where near-intersection platforms are not feasible, or where mid-block pedestrian crossing facilities are warranted. **Figure 3.3** shows the schematic of a mid-block station in relation to an intersection along the BRT corridor.

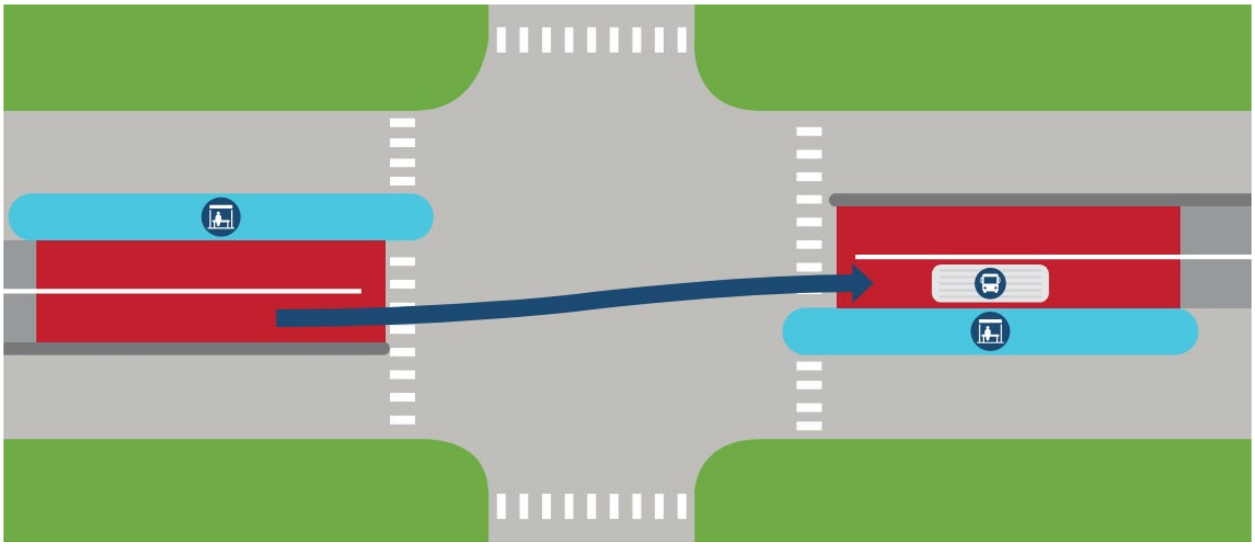
Figure 3.3 Mid-Block Station



Split Island

Split island stations are placed in the median of a dedicated transitway. With through traffic at the back edge of the platform, a protective edge behind the platform must be implemented to ensure the security of waiting passengers. Split island stations are typically associated with dedicated transitway roadway configurations. **Figure 3.4** shows the schematic of a split island station in relation to an intersection along the BRT corridor.

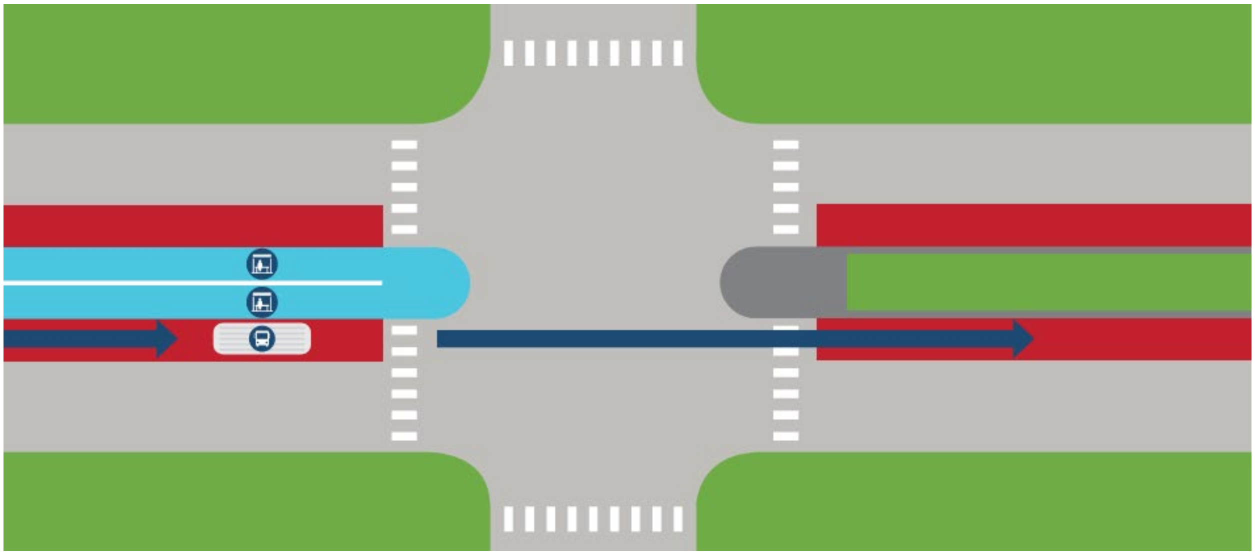
Figure 3.4 Split Island Station



Shared Island

Shared island stations are placed where transit routes require high capacity stops and have adequate right-of-way available to allow for both median-adjacent transit stops as well as passenger waiting space for a bi-directional platform. Sufficient passenger capacity and adequate rider pedestrian access are the primary considerations for this type of station. Buses are required to have left-boarding doors for this configuration. **Figure 3.5** shows the schematic of a shared island station in relation to an intersection along the BRT corridor.

Figure 3.5 Shared Island Station



Factors Influencing Station Orientation

The context of a station site influences where the station should be located. Far-side platforms are generally preferable from an operational standpoint, optimizing the potential for TSP to enable a bus to pass through an intersection without delay, and reducing dwell times after boarding. However, there are situations in which near side platforms better meet operational needs. In some cases, a mid-block platform may be appropriate when intersection-adjacent sites do not allow for adequate platform length.

Other factors that are considered in selecting a station site include the location of utilities, vertical roadway elements, access from local streets, and whether pedestrian guideway elements such as fencing or vertical separations would be needed for safety or other purposes. Space needs for the travel lane, curb and gutter, clear zone, through zone, furnishing zone, and tactile platform edge must also be accounted for during station site selection. When necessary, due to constrained right-of-way, this evaluation should also consider the possibility for a through zone combination with the clear zone. Full descriptions of each zone in the platform area can be found in the station facilities section.

4 STATION FACILITIES

BRT stations should include branding and as many consistent elements as possible to enhance the ease of the rider's experience. The ability to include elements will depend on site-specific conditions such as available right-of-way, topography, etc. At a minimum, all Urban BRT and Arterial BRT stations should include the elements identified in **Table 4.1**.

Table 4.1 Station Elements

Required Station Elements	Urban BRT	Arterial BRT
Shelter with seating	●	●
Trash and recycling receptacles	●	●
Bicycle racks	●	●
Lighting	●	●

In addition to these required station elements, the following elements are recommended at all BRT stations when possible:

- Raised Platform
- Reserved space and signage for micromobility parking

Raised platforms are desired but may not be feasible due to site-specific constraints.

PLATFORMS

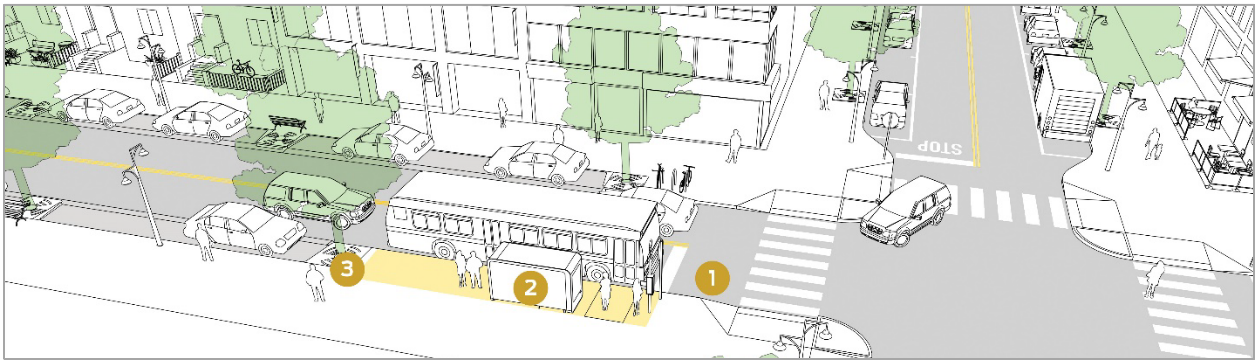
Stations must serve users efficiently, safely, conveniently, and comfortably. Station design should be compatible with the station's surrounding environment and reflective of the regional context and branding.

Stations should be standardized to the fullest extent, practical to provide a consistent experience. This is essential for ensuring accessibility for all users. Standard graphical information systems are especially important. Some design elements can be modified based on ridership and neighborhood setting.

Configuration

There are several configuration types that would be used in Wake BRT. Stations can be located curbside, on a curbside island, or on a median island. Curb configurations occur on the edges of the mainline rather than the middle, like the medians. Islands describe where the platform is separated from the sidewalk by either vehicle or bicycle traffic lanes. Bus bulbs are curb extensions that align the bus stop with the parking lane, allowing buses to stop and board passengers without leaving the travel lane (**Figure 4.1**). Bus bulbs help buses move faster and more reliably by decreasing the amount of time lost when merging in and out of traffic.

Figure 4.1 Bus Bulbs



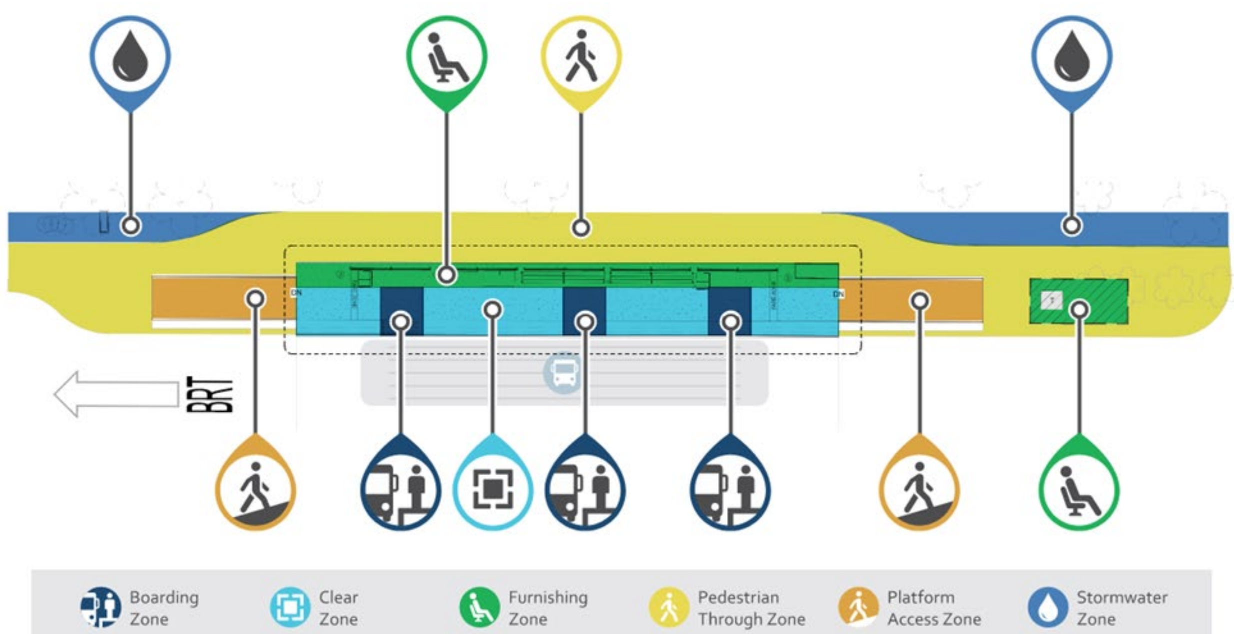
Source: NACTO Transit Street Design Guide

Level boarding (14” tall platforms for the proposed New Flyer 60-foot articulated vehicles) should be provided at all platforms to the fullest extent possible. Level boarding should be provided at all stations where possible and the platform height should be determined based on the vehicle type that will serve that station. Where level boarding is not feasible due to site constraints, individuals with disabilities may board the BRT vehicle by using a deployable bridge plate spanning the gap between the bus and the platform.

PLATFORM ZONES

Platform zones are specific areas at a station dedicated for different uses, such as boarding, drainage, walking, etc. These areas are distinguished for both design and practical applications. All platforms should include the following zones, as shown in **Figure 4.2**.

Figure 4.2 Station Zones



Furnishing Zone

The furnishing zone at the back of the platform includes permanent furniture items at the station such as seating, ticket vending, and waste disposal. Spanning the length of the platform, riders would use this zone for waiting, ticket vending, and disposing of waste. This zone is generally about 3 feet in depth and does not interfere with other pedestrian zones described below. Additionally, a furnishing zone will be included adjacent to the platform to accommodate bike parking.

Clear Zone

This area describes the defined area where passengers wait to board and alight the bus. This zone should have adequate access from pedestrian sidewalks and trails adjacent to the platform. Detectable warning strips are located within the clear zone along the curbside edge of the platform. Waiting passengers should not enter the detectable warning area unless boarding or alighting the bus. Furniture, landscaping, and other vertical elements should not be placed here. This zone is not to be confused with the "traversable clear zones" required by the North Carolina Department of Transportation (NCDOT) adjacent to highway travel lanes where there are no fixed hazards (such as trees or non-breakaway structures).

Boarding Zone

To improve consistency in ridership experience, a boarding zone should be explicitly established within the clear zone at each station to indicate to riders where they should enter the bus. The purpose of specifically and visually defining the areas in which riders would board helps to improve rider organization and understanding of the boarding process at each station. Though there would be multiple doors to board the bus, certain doors should be specified for different ridership experiences. The front door (mid-way along the vehicle for left-door boarding stations) should be the established point for wheelchair boarding and the back door should be the established point for bicyclist boarding. The boarding zone cross slope should not exceed 2% to meet ADA requirements. All doors should be indicated by station markings for operational consistency.

Pedestrian Through Zone

The pedestrian through zone provides continuous access through the station area. Located behind the station platform, this zone should feature a clearly designated pedestrian access route (PAR) and allow pedestrian traffic to travel uninhibited by the BRT platform and BRT riders. Depending on the station type, there should be several locations in which pedestrians would be able to exit the pedestrian through zone to enter the platform itself.

Platform Access Zone

The platform access zone describes the ramps on either side of the platform on which pedestrians would enter the station area. The zone contains ADA accessible ramps and railings, allowing all riders to access the station without obstacles.

Stormwater Zone

The stormwater zone indicates the area in which landscaping features are placed to collect runoff from the shelter, platform, and adjacent walkways and assist in drainage infiltration purposes. This area is not meant to be used by riders.

Ramps

All station ramps must adhere to ADA standards. However, each station has more specific dimensions depending on the configuration. Across all types, ramp lengths are typically 10 feet with a 6-foot minimum landing per ADA standards when required, but many stations require longer ramp dimensions for slope criteria. Ramp widths are typically 8 feet including railing foundations with larger widths occurring at stations with available space.

Surface and Edge Treatments

Surface and edge treatments should be placed along the full length of the platform with varied coloration at boarding zones. All platform surfaces should be non-skid and use durable, weather-resistant materials. The tactile warning plates at the platform edge must be fabricated with high-strength concrete, urethane, or other approved materials. The plate must accept the deployable ramp of a BRT vehicle if it is used and be sufficiently textured to be detected by users with visual impairments without impeding passage for wheelchairs. Tactile warning plates must be compliant with ADA requirements, which currently stipulate a width of 24 inches from the clear zone on tangent or curved platforms. A potential example of a tactile surface used on a station is shown below in **Figure 4.3**.

Figure 4.3 Tactile Warning Plate Example[15]

STATION TYPOLOGIES

Typologies have been developed with references to both land use contexts and station orientations. Land use context, discussed in Section 2. Existing Conditions impact the typology choice by providing the setting for the station. High density uses tend to have station typologies that are designed for more compact spaces or higher pedestrian counts. Low density uses typically are prescribed station types that allow for pull-outs or do not have as much pedestrian space. Each typology has different configurations, dimensional specifications, amenities, and uses, among other criteria. **Table 4.2** shows a detailed description of the typologies. **Figure 4.4** depicts a typical station amenities layout and **Figure 4.5** shows typical station dimensions. Variations from the dimensions in **Table 4.2** would require a variance as discussed in Section 1.

[15] Tactile Warning Image: http://www.whsupply.com/products/ada-tactile-systems

Table 4.2 Station Typologies

	Urban Core	Sub-Urban/Intermodal	Peripheral	Split Island	Shared Island
Configuration	Curbside (in-lane or pull-out)	Curbside (in-lane or pull-out)	Curbside (pull-out)	Median island (in-lane)	Median island (in-lane)
Platform length	75' typical, *65' minimum*, 140' at terminal or connecting station (accommodates two 60-foot buses with 20 feet of maneuvering space)				
Platform width	12' standard, *10' constrained*				
Platform height	14" standard, 6" *constrained*	14" standard, 6" *constrained*	6" *minimum*	14" standard, 6" *constrained*	14" standard, 6" *constrained*
Level Boarding (14")	Yes	Yes	No	Yes	Yes
Boarding type	Right side typical	Right side typical	Right side typical	Right side typical	Left side typical; right side optional
Accessed via	Sidewalk (2 end ramps), rear mid-platform access	Sidewalk (2 end ramps), Intermodal: + rear mid-platform access	Sidewalk (through platform)	Crosswalk (1 ramp)	Crosswalk (1 ramp)
Ramp length	10' typical + 6' landing	10' typical + 6' landing	N/A	14' typical + 6' landing	14' typical + 8' landing
Ramp width	6' standard, *5' minimum*	6' standard, *5' minimum*	N/A	*6' minimum*	8' standard, *6' minimum*

Figure 4.4 Station Amenities Layout

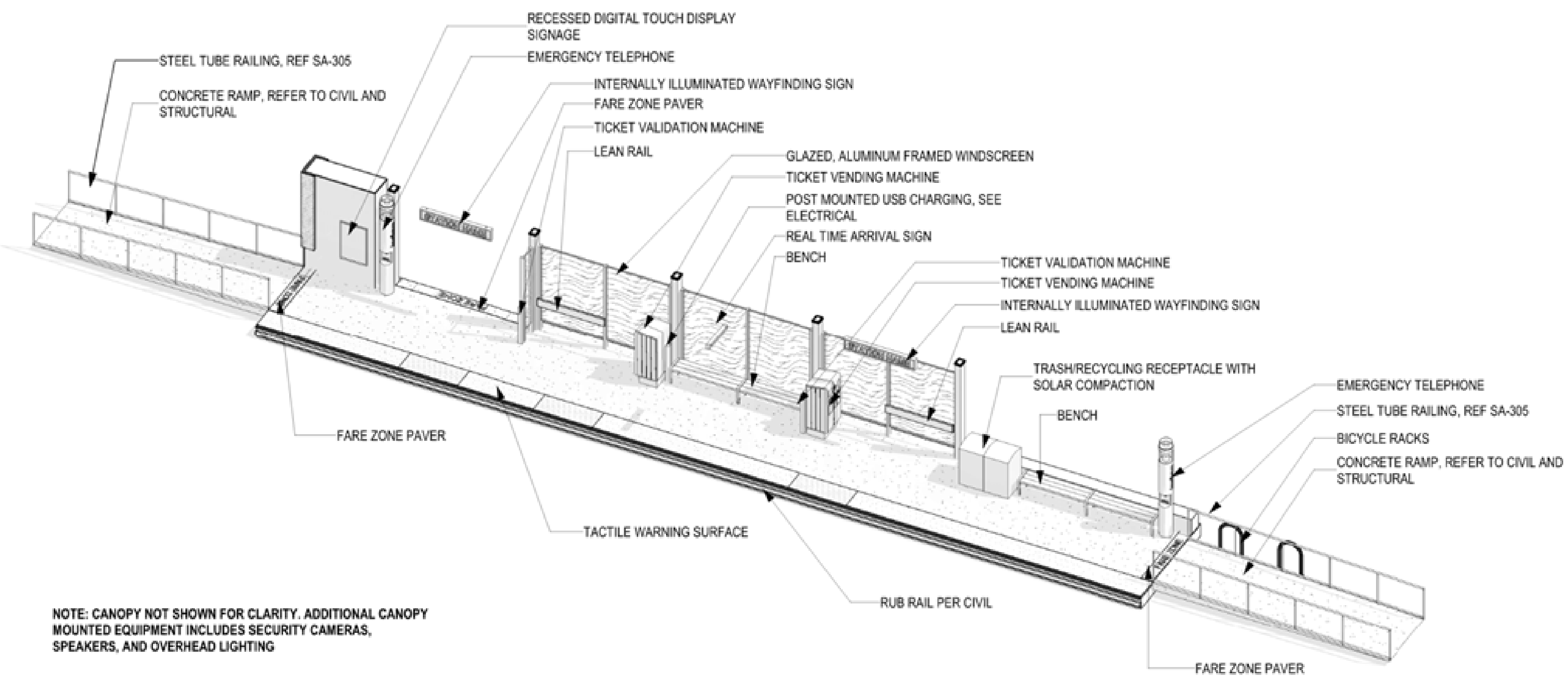
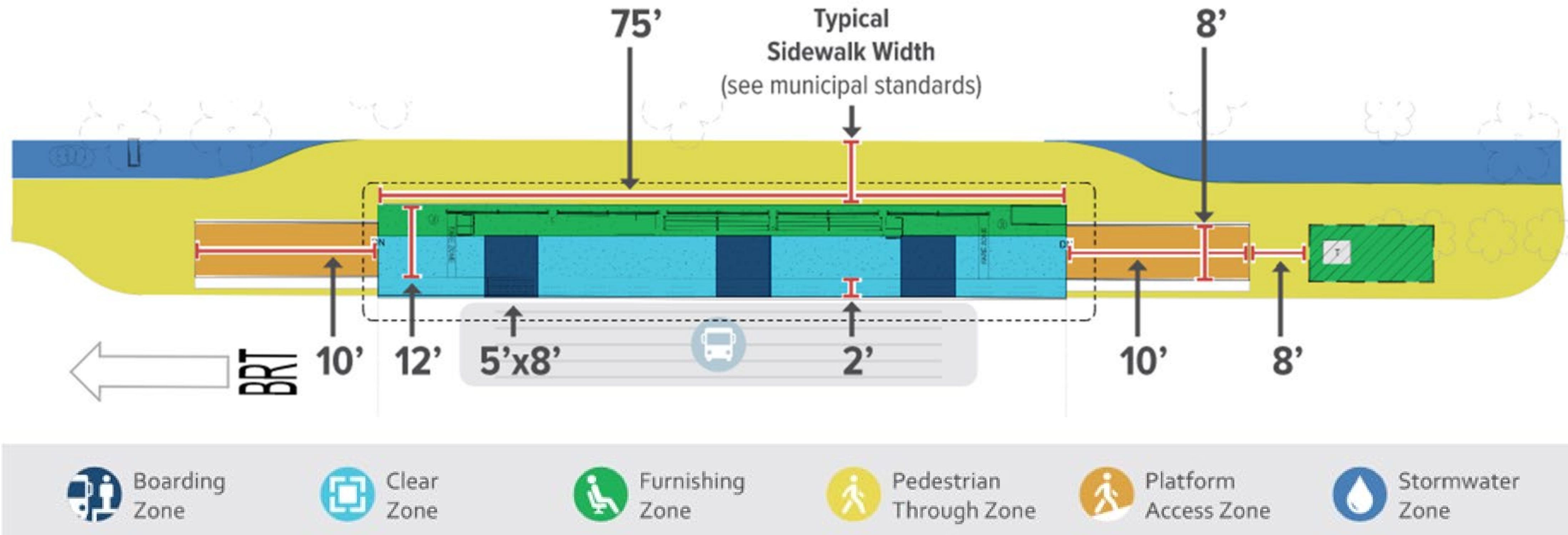


Figure 4.5 Station Dimensioning



DESIGN KIT OF PARTS

Each transit station should contain a design kit of parts of repeatable elements, components, and materials. These elements are placed at every station for both utility and consistency. Using consistent components allows for more efficient and easier maintenance of stations compared to unique components. Providing amenities and other useful features helps improve the rider experience of BRT. Additionally, whenever possible, it is crucial for a transit agency to provide a consistent rider experience across all stations with the focus of equity. Below is a list of station elements included in the design kit of parts:

- Fare Kiosk
- Fare Validator (Optional)
- Bench Seating
- Lean Rail
- Trash/Recycling Receptacle
- Emergency Phone
- Interactive Route Map
- Local Information/Wayfinding
- Community Messaging
- Real-Time Arrival Information
- Closed-Circuit Television Cameras
- Annunciators
- Bike Racks
- Step Up Platform Access
- Branding Elements

Station elements in the design kit of parts are shown separately in **Figure 4.6**, and in a generic station context in **Figure 4.4** previously

Figure 4.6 Design Kit of Parts

Customizable Elements

Providing consistent BRT elements at all stations is important for rider experience and maintenance. However, some elements do not need to be identical, and they can be customized to accommodate locations of greatest use, need, or space. Opportunities for incorporating public art in station design should be identified for each corridor, considering the station context, local municipality, and available resources.

Specific examples include the use of step-up platform access at urban and intermodal stations as well as bike parking at intermodal stations adjacent to multi-use paths. Other examples include community artwork, landscaping, and additional station seating. Placemaking goals and initiatives would rely heavily on these customizable elements to make the area unique and prominent.

Customizable elements that exceed standard expenses are not eligible for federal funding and may require additional local funds or resources for installation and maintenance. If a customizable element is requested by an area stakeholder, the installation and maintenance must be agreed upon by the transit design team, the project sponsor/operator, and area stakeholders.

5 ROADWAY

BRT corridors would primarily be constructed on existing roadways in Wake County and should conform to NCDOT and local street and transit standards as applicable; roadway design should follow the required standards of the governing roadway authority. Special attention should be given to providing convenient and safe at-grade accommodations for transit customers crossing roadways on foot, in mobility devices, or on bicycles.

RUNNINGWAY TYPES

BRT vehicles would operate in the roadway via three major runningway types: business access and transit (BAT) lanes, transitway, and mixed traffic lanes. The runningway types determine the need for roadway improvements, pavement markings, platform configuration, and other criteria. Careful consideration should be made for how buses would enter and exit bus-only roadways to allow clear delineation for bus traffic and general traffic.

Whenever possible and reasonable, separation should be added between BRT and general-purpose lanes. Median islands are a preferred method for separation, but pavement markings are also a reasonable alternative. At median stations, protection should be considered for both adjacent travel lanes and pedestrians.

Business Access and Transit Lane

BAT lane operation would primarily consist of a bus and right-turning vehicle exclusive lane located on the outermost lane in both directions without physical separation. The BAT lane should be indicated by pavement lettering and signage. **Figure 5.1** and **Figure 5.2** show a one-way and two-way BAT lane runningway typical section, respectively.

Figure 5.1 BAT One-Way Lane Typical Section

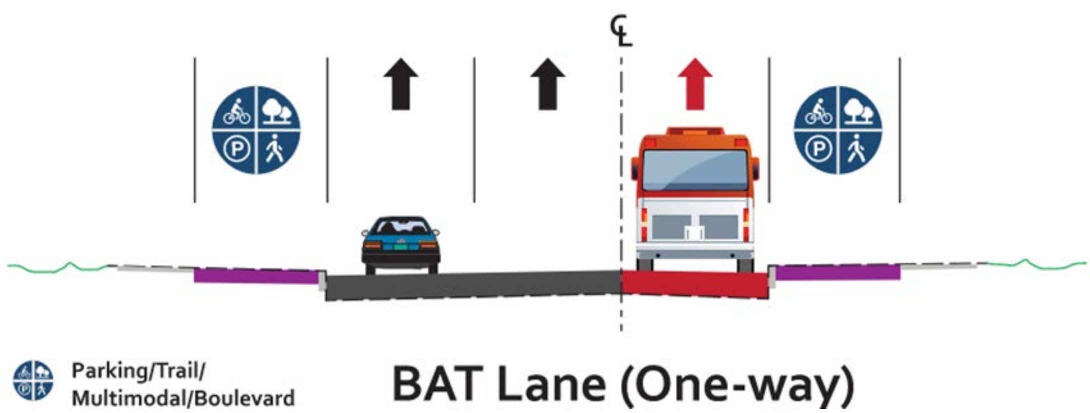
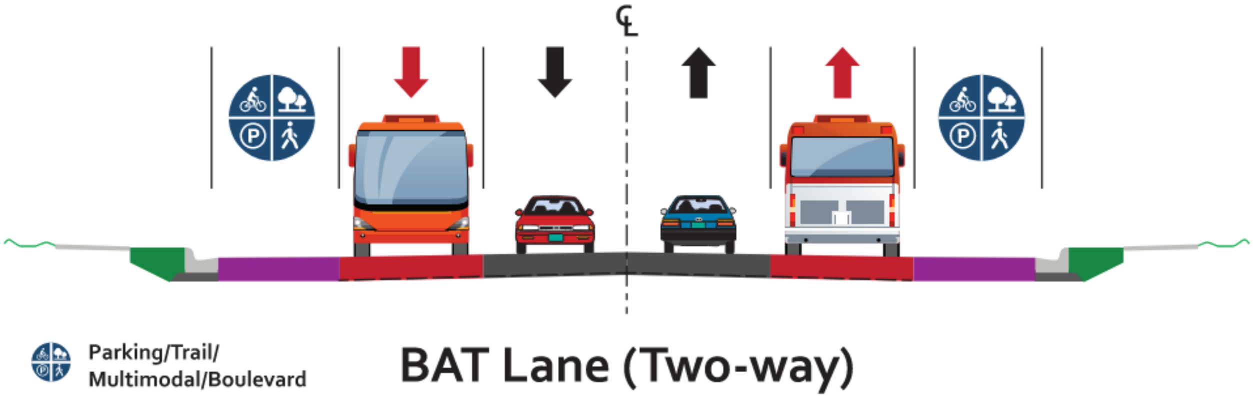


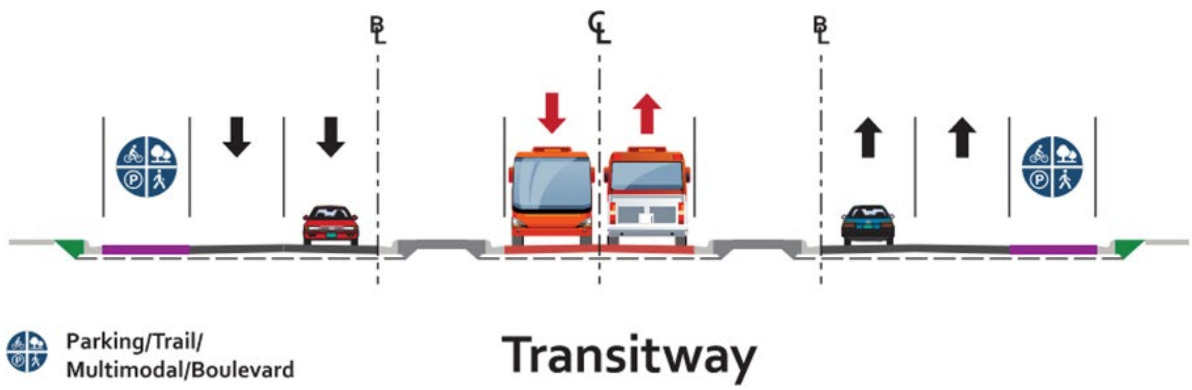
Figure 5.2 BAT Lane Two-Way Typical Section



Transitway

In a transitway, lanes should be physically separated from the general-purpose traffic lanes by medians or platforms. Bus traffic in opposing directions would run in adjacent lanes. All other vehicle travel except for emergency vehicles should be prohibited in these lanes. The BRT lane should be indicated by overhead signage, pavement lettering, and red pavement marking spanning the entire transitway lane for a determined length adjacent to transitway intersections. **Figure 5.3** shows a typical general transitway section.

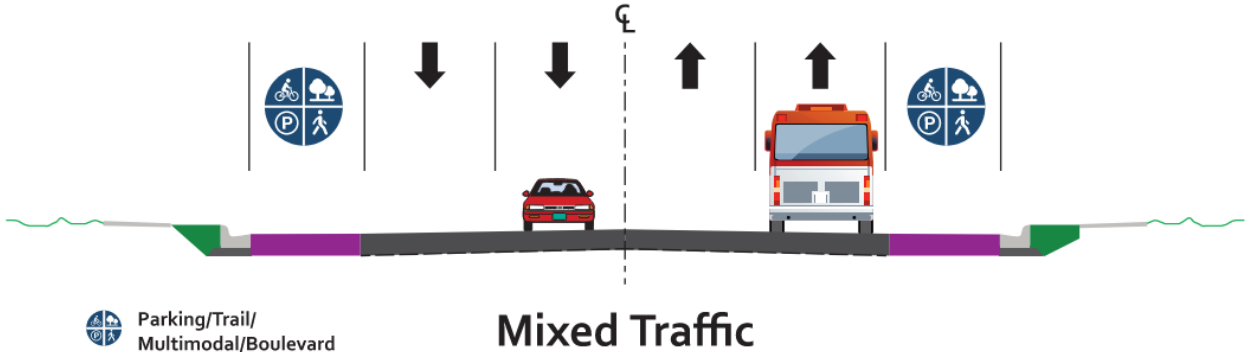
Figure 5.3 Transitway Typical Section



Mixed Traffic

In some corridors, BRT vehicles would operate in mixed traffic segments. No reconstruction would occur on the roadway itself, and buses should use existing travel lanes mixed with normal traffic. **Figure 5.4** shows a mixed traffic typical section.

Figure 5.4 Mixed Traffic Typical Section



POSTED SPEED LIMITS

Roadway posted speed limits are a significant factor related to BRT platform design. Most roadways where BRT would operate have posted speeds of 35 to 45 miles per hour (mph). The posted speed limit impacts and informs platform design development with particular attention to NCDOT "traversable clear zone" standards. If clear zone standards cannot be met, coordination is needed with NCDOT to achieve a safe and accessible platform design. **Table 5.1** shows BRT platform clear zone requirements.

Table 5.1 Clear Zone Requirements

Posted Speed Limits	Platform Clear Zone Width	Total Clear Zone Width
35 mph or less	8′	14′ (BAT lane designated as clear zone)
45 mph or greater	12′	20′ (NCDOT memo allows approved structures 12′ from face of curb)

Figure 5.5 Typical Urban/Sub-Urban/Intermodal/Split Island/Shared Island Platform

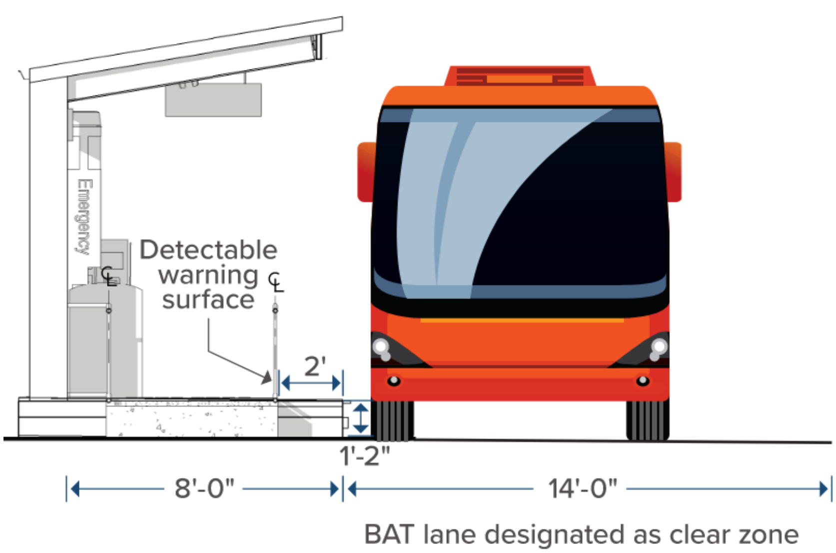
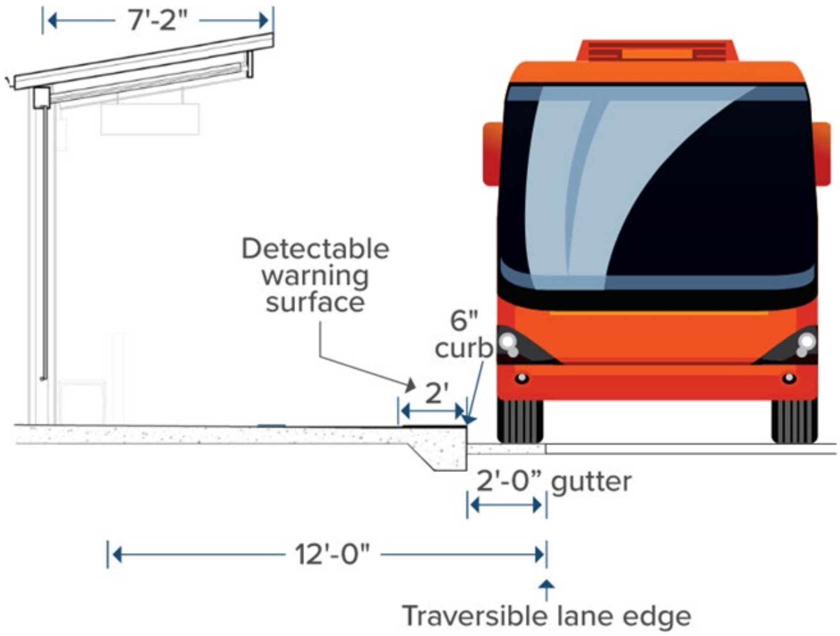


Figure 5.6 Typical Peripheral Platform



DESIGN CRITERIA

As stated previously, design criteria should adhere to the standards of the governing roadway entity. For NCDOT owned and maintained roadways, the NCDOT Roadway Design Manual should be followed. For roadways owned and maintained by municipalities, their local requirements should be met. A design criteria document should be developed specifically for each BRT corridor outlining the design requirements for that corridor and AASHTO standards, Transportation Research Board (TRB) publications, NACTO, and other resources listed in Appendix A can be incorporated. Coordination with the project sponsor, NCDOT, and other municipalities is necessary to develop the design criteria. Design criteria will include but are not limited to lane width, horizontal and vertical clearance, cross slope, clear zone, and other factors.

Vehicle turning movement software should be used to verify adequate space when analyzing turning movements and platform locations with the proper design vehicle. In addition, ADA requirements should be considered when determining longitudinal grade of the roadway at platform locations.

QUEUE JUMPS

Queue jump lanes combine short**,** dedicated transit facilities with a leading bus interval or TSP. This allows buses to easily enter traffic flow in a priority position. Applied thoughtfully, queue jump treatments can reduce delay considerably for transit vehicles, resulting in travel time savings and increased reliability for transit users while minimizing impacts on general travel. A bus head-start can significantly improve bus performance by routing vehicles through congested intersections ahead of traffic. An example of a queue jump is shown below in **Figure 5.7.**

Figure 5.7 Example of a Queue Jump with a Signal from Alexandria, VA.

Specialized transit-only signals are triggered by approaching BRT vehicles equipped with TSP in queue jump lanes that allow buses to pass through the intersection without additional signal delay.

Queue jumps can be applied at near-side, far-side, or non-stop configurations. At near-side stops, the bus completes loading before rolling forward onto a loop detector that gives signal priority. At far-side or non-stop locations, the bus receives priority signal treatment and proceeds either into a far-side stop or ahead of the traffic flow using a queue jump.

Queue jumps should be applied on signalized streets with low or moderately frequent bus routes, especially where transit operates in a right lane with high peak hour volumes but relatively few right turns. In some locations, implementing turning restrictions may be necessary. Queue jumps are recommended at intersections in Urban and Arterial BRT corridors, where appropriate to increase speed and reliability.

Before implementation, coordination with appropriate roadway authorities should take place to ensure consistency with existing roadway and traffic standards.

RIGHT-OF-WAY REQUIREMENTS

In many cases, to accommodate stations and other station area elements, additional right-of-way may be needed along the corridor. There are several types of right-of-way acquisition, but in the most basic sense, the process results in either permanent or temporary usage of the land.

Permanent Acquisition

Right-of-way, that would be continuously used in both the construction and operation of the BRT should be permanently acquired. This land is purchased at fair market value price by a governing public entity. Due to the permanency of the acquisition, the land can later be used by the agency for other purposes, such as station rehabilitation or additions, or transit-oriented development (TOD). Reducing the amount of land needed for BRT operation is beneficial for lowering project costs and delays. Common strategies to reduce right-of-way impacts include repurposing existing traffic lanes or on-street parking for BRT-only use, incorporating center stations in the existing right-of-way, utilizing retaining walls, and operating in mixed traffic. Due to the high public profile of typical BRT projects, property acquisition through eminent domain should only be used judiciously.

Temporary Construction Easements (TCE)

Temporary construction easements (TCE) are used when additional area is temporarily needed for accessing a site or the staging and storing of equipment during construction. Unlike permanent acquisition, this land cannot be permanently altered and must return to its original state once construction has finished. However, because it is a temporary transaction, it is cheaper than permanent acquisition.

Figure 5.8 BRT Station Construction[16]

[16] BRT Station Construction Image: https://www.sfexaminer.com/news/van-ness-brt-construction-impact-set-to-increase/

MULTIMODAL CONNECTIVITY

Figure 5.9 Raleigh Union Station with Intermodal Connections between Rail, Regional Bus, Local Bus, and Future BRT

High-visibility crosswalks should be installed at all intersections, signalized and unsignalized, in Urban BRT and Arterial BRT corridors for pedestrian safety. Leading Pedestrian Interval (LPI), which gives pedestrians a head start to cross the roadway, should be implemented at all signalized intersections along BRT corridors and on roadways approaching BRT corridors that meet the conditions specified by the NCDOT Guidelines for LPI Implementation: "LPI shall be implemented at signalized intersections where all of the following conditions and a vehicle-pedestrian interaction is existing, in design, or under construction at one or more approaches:

- Countdown pedestrian signal heads
- Pedestrian pushbuttons, where pedestrian phase is not automatic
- Marked crosswalks
- Accessible ramps at marked crosswalks
- Sidewalk on marked crosswalk approaches
- Supporting controller"

In addition, Accessible Pedestrian Signals (APS) should be installed at all signalized intersections that are modified as part of a BRT project as required by the Public Right-of-Way Accessibility Guidelines

(PROWAG). APS have audible and vibrotactile features indicating the walk interval so that a pedestrian who is blind or has low vision will know when to cross the street.

Connecting BRT stations with the existing sidewalk network is critical for promoting station access and safety. In areas where a network does not exist, sidewalks should be provided from the BRT station to the nearest intersection or destination land use. If BRT stations are located mid-block and intersections are greater than 800 to 1,000 feet apart, a signalized mid-block crossing should be provided.

Access to adjacent multi-use paths should be incorporated in BRT system designs. To increase usage and access by pedestrians and bikers, these paths would connect stations to important routes and features, as well as provide greater access for different modes throughout the corridor. Paths would include combined space for bikes and pedestrians on a wide trail separated from the roadway.

While dedicated bike lanes are preferred, in certain conditions, bicycles and buses may share lanes. These dedicated lanes, called shared bus and bike lanes, are primarily used in locations where separate bike and bus traffic is not feasible or reasonable but have high bicycle traffic. Shared bus and bike lanes offer a compromise between having the refuge of a separated bicycle space and on-street biking. General traffic cannot use shared bus and bike lanes, so bus and bicycle traffic volumes must be considered when analyzing their potential usage. An example of a shared bus and bike lane is shown in **Figure 5.10**.

Figure 5.10 Shared Bus and Bike Lane[17]

[17] Shared Bus and Bike Lane Image: https://nacto.org/publication/transit-street-design-guide/transit-lanes-transitways/transit-lanes/shared-bus-bike-lane

6 STORMWATER

Stormwater is an important consideration for BRT stations and guideways, particularly when projects increase impervious surface in a corridor. The stormwater requirements and guidance from the local municipalities along the BRT corridors need to be reviewed and incorporated into the BRT design. If proposing GSI on NCDOT maintained roadways, NCDOT Hydraulic Guidelines and Stormwater Best Management Practices Toolbox (referenced in the Appendix) should be referenced in the narrative and must be followed; the location, design and O&M Manual must be NCDOT approved; and a facility-specific encroachment is recommended.

Maintenance responsibilities for stormwater infrastructure should be clearly identified in the third-party agreements as mentioned previously.

BRT projects provide opportunities to implement Green Stormwater Infrastructure (GSI), which includes bioretention areas, permeable pavements, and green roofs. GSI manages stormwater at its source, lowering the demand on existing stormwater infrastructure, reducing flooding, and improving local water quality. GSI also enhances the station realm for riders and community. The unique characteristics of each BRT corridor such as available right-of-way, soil types, topography, and the presence of sensitive environmental features should be assessed to determine which GSI practices are most suitable.

7 TECHNOLOGY

BRT operations rely on a wide variety of technologies. Some of the technology is essential to the functionality of the system, while other applications are amenities intended to improve rider experience. All elements of technology are part of a wider network, which requires standardization to ensure compatibility with other aspects of the system. Standardization also ensures equity between different stations and routes. Device uniformity also increases ease of use and wayfinding by using systems riders already have familiarity with.

COMMUNICATIONS INFRASTRUCTURE

Technology implemented as part of a BRT system requires a robust communications infrastructure capable of transmitting large amounts of information over high speeds and distances. Fiber optic cable would meet these needs and provide opportunities for future expansion. Fiber optic trunkline should be installed along BRT routes. Branch fiber should then connect the trunkline to signal cabinets or communications cabinets, where the fiber would be terminated.

Communications cabinets should be installed at each station next to an electric cabinet. Due to the large size of the cabinet and limited space on the platform, cabinets should be installed off the platform. Cabinets should be placed with enough clearance so that the doors can open fully and do not disrupt activity in the surrounding area. Visual screening and/or artistic/branding treatments of the cabinets should be used to minimize aesthetic impacts.

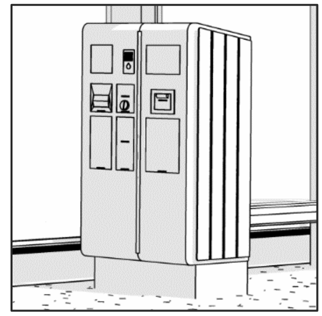
Devices on the network should also be monitored for malfunctions and outages. A centralized hub where all technology is monitored combined with clearly defined responsibilities and procedures reduces confusion and down time. Additionally, a compatible monitoring system should issue real-time reports whenever a device malfunctions so repairs and maintenance can be conducted as needed.

STATION TECHNOLOGY COMPONENTS

BRT stations should have the following amenities:

- Ticket Vending and Fare Validation Machines
- Emergency Telephones
- Closed-Circuit Television Cameras
- Real-Time Information
- Touch Screen Kiosks with optional Wi-Fi
- Public Address

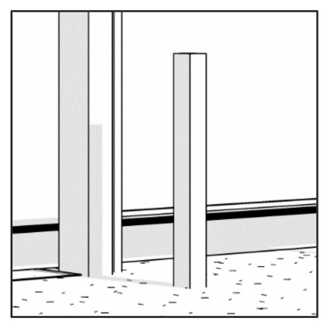
Ticket Vending Machines



To speed up boarding times, fare vending should occur at the station platform rather than on board vehicles. Two ticket vending machines (TVMs) should be present at each BRT station except where ridership projections or space constraints may limit TVMs to one. TVMs should be placed in visible areas of the platform and oriented to minimize impacts to station circulation. TVMs should be equipped with closed-circuit television cameras facing the transaction area that are managed and conform to the same guidelines as the CCTV cameras discussed below.

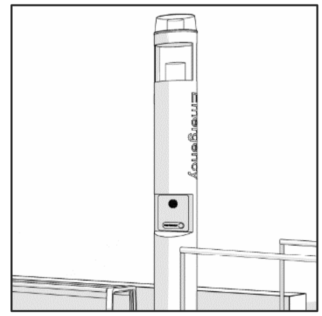
Purchasing fares at TVMs should match processes used in existing fare vending. Fares purchased at BRT stations should be accepted at other transit locations and vice versa. TVMs should meet regional and BRT branding and design guidelines and ADA requirements. TVMs should sell paper tickets with magnetic strips as well as radio-frequency identification (RFID) smart cards compatible with fare validators at stations and on vehicles. Riders with existing RFID smart cards would be able to check the balance and add funds to their cards at TVMs. In addition to single ride fares, duration-based passes such as a 7-day pass should be sold at TVMs. Discounts requiring validation such as youth or senior passes would not be available through TVMs, but rather at the project sponsor's existing locations for such pass sales. TVMs would accept payment in the form of cash, debit, or credit cards.

Fare Validation



Fare validation should be provided on board BRT vehicles at all doors to speed up boarding and reduce dwell time at stations. Fare validation may also be provided on the station platform and should take place at a separate location than the fare vending to minimize wait times and crowding. Fare validation machines should be compatible with existing regional transit technology, such as those on-board vehicles. Fare validators would be capable of reading magnetic strip cards and RFID smart cards used as fare for BRT or local buses. After reading the fare, the validator would indicate if the transaction was successful or not with audio and visual cues. These cues should match indicators on existing local fare validation systems. Design and branding of fare validators should conform to regional, BRT, and ADA requirements and standards.

Emergency Telephones

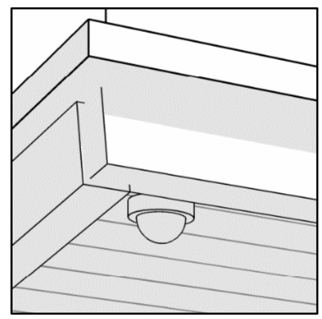


To increase safety at platforms and the surrounding areas, emergency telephones should be installed at each BRT station. Areas around the emergency telephone should be clear of obstacles and other devices so they can be accessed quickly.

The emergency telephones should be labeled clearly and distinctly to avoid accidental use. Using the telephones should be simple, such as a single button press. Emergency telephones should meet ADA requirements.

Calls from emergency telephones would be sent to a designated operator facility that can route calls to appropriate safety personnel. All calls should be recorded and kept for an established retention period.

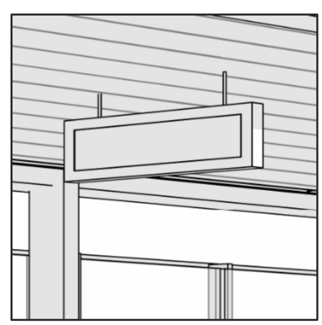
Closed-Circuit Television (CCTV) Cameras



For safety and security, two CCTV cameras should be installed into the shelter ceiling at each station. The location of the CCTV cameras should provide full 24/7 coverage of the platform. Specifically, areas to be covered include the TVMs and any areas prone to falls, such as rear stair access to the platforms and along the front of the platform curb. Station lighting and CCTV placement should be coordinated for night coverage. CCTVs should be compatible with existing local CCTV infrastructure.

CCTV footage should be available for live monitoring and as recorded footage. Recorded footage should be stored at a centralized control center for 30 days before deletion. All footage should be tagged with date, time, and location information. Live footage would also be immediately available for the operators of the emergency telephones.

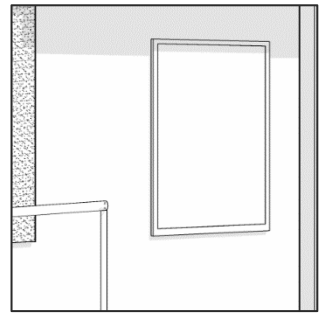
Real-Time Information



Real-time information signs provide estimated arrival time of buses based on dynamic vehicle location. Other Real-time information signs should display upcoming bus routes along with the estimated arrival time via a Variable Message Sign. Typical sign placement within the platform is shown in Section 4: Station Facilities.

Accessible push buttons located near the real-time display should prompt an announcement via speaker of the information displayed on the real-time signs. The push buttons and signage should conform to ADA standards.

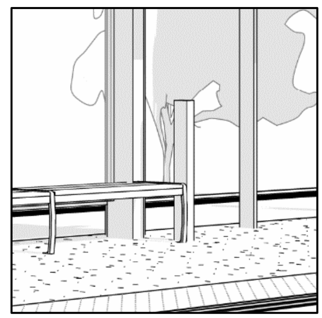
Touch Screen Kiosk with Optional WI-FI



Interactive touch screens provide tools and information such as wayfinding and local events to users. These screens are separate from real-time signs, which only provide arrival times of buses; however, if desired, these screens can also be formatted to provide the same real-time data in addition to other information. These signs should be located away from fare vending, fare validation, and boarding zones so as not to interfere with normal operations. Signs should match regional and BRT branding as well as ADA requirements.

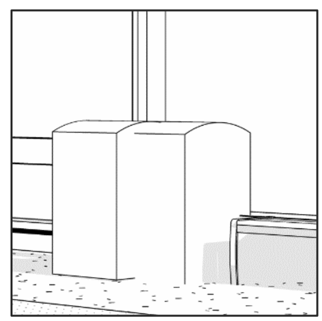
Wi-Fi may be provided by the project sponsor to riders waiting at the station. However, providing Wi-Fi may encourage loitering at stations and should be considered by the project sponsor. If Wi-Fi is provided, it can be done through modems in the touch screens. The Wi-Fi should be coordinated with the service provided aboard the buses to avoid the need for users to re-authenticate their connection when boarding.

Optional USB Charging Station



Similar to free Wi-Fi, power outlets with USB charging ports may encourage loitering and providing them should be at the project sponsor's discretion. Furthermore, the high frequency of BRT services mean that riders would have relatively short time to charge devices.

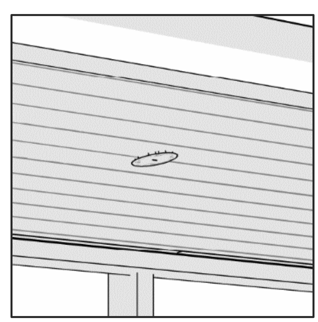
Trash And Recycling Receptacles



Each transit station should be equipped with trash and recycling receptacles to keep the surrounding areas clean and pest-free.

All waste receptacles should be clearly labelled as either trash or recycling. Any design features should match regional branding and design guidelines.

Public Address



Public address speakers should be installed in the canopy of each station shelter. Pre-recorded voice messages should convey real-time bus arrival information at regular intervals. Speakers may also be used for other information, such as changes to routes, safety reminders, or service alerts.

TRANSIT SIGNAL PRIORITY (TSP)

TSP reduces wait time for transit vehicles by changing signal behavior. TSP can be used to extend, truncate, or reallocate the green signal phase. TSP can be given conditional or unconditional priority throughout a corridor. Conditional priority applies to TSP only if the transit vehicle is delayed by a certain, defined amount of time. Unconditional priority occurs when the transit vehicle signal is given priority 100 percent of the time, reducing transit vehicle delays, but may adversely impact cross traffic by increasing the amount of time those signals receive a red light. Signal behavior may be managed at a centralized hub, or independently at each intersection.

The priority control system shall consist of vehicle equipment, intersection equipment, and a Central Management Software (CMS). The software should allow authorized local and remote users to set and read all user-programmable features and retrieve data collected by the system.

The in-vehicle equipment shall operate without requiring any action from the vehicle operator or occupants once power is applied. The system shall be intersection-centric, where configuration of system operation parameters shall be completed on the intersection equipment and not require interaction with the vehicle equipment.

Signal controllers equipped with TSP technology should be implemented at each signalized intersection along the Urban or Arterial BRT corridor, including at existing signals. The controllers should be equipped with both priority and preemption capabilities, even if those TSP methods are not planned for use at the intersection at that time. Signal timing, including conditional TSP requests, is controlled and operated by the governing roadway jurisdiction. Specific TSP equipment ownership and maintenance responsibilities are agreed upon with each individual road authority.

Figure 7.1 Traffic Signal[18]

[18] Traffic Signal Image: https://www.bizjournals.com/triangle/news/2020/12/23/bus-rapid-transit-raleigh-wake-county-usdot-funds.html

8 BRT FLEET/VEHICLES

VEHICLES

Specialized transit vehicles should be used in the operation of Urban BRT and Arterial BRT services. The Urban BRT fleet should be comprised of 60-foot articulated buses with five total doors: three on the right and two on the left. Doors on both sides are provided to increase loading and unloading flexibility, increasing potential for a variety of bus stop configurations, including center, left-door boarding stations. In addition to the standard 60-foot articulated bus, 40-foot buses may be added to the fleet when vehicle load calculations based on ridership forecasts demonstrate that loads would not exceed the loading guidelines established in **Table 10.4** for any segment of the BRT corridor, including interlined BRT services.

Arterial BRT fleets may include either 40-foot or 60-foot vehicles and may or may not have left-side boarding doors depending on the stations they will be serving. Median BRT stations require vehicles with left-side boarding doors. On 40-foot buses bicycles would be transported on exterior front racks rather than inside the vehicle. BRT vehicles should not include fare collection equipment on-board but should include fare validation equipment at all doors. BRT vehicles will include deployable ADA ramps at the frontmost door of either side of the vehicle (**Figure 8.1**) and kneeling capabilities to achieve ADA-accessible boarding even in locations without a level boarding platform.

Figure 8.1 Deployable Ramp[19]

[19] Bus Without On-Board Validators Example: https://www.goldcoasttransit.org/how-to-ride/specialized-guides/accessibility

Current GoRaleigh bus fleet utilizes compressed natural gas (CNG) for propulsion. Additional CNG buses are planned for procurement on the New Bern Corridor. However, consideration for additional propulsion types, including electric, hydrogen, and diesel, should allow for increased flexibility in fleet operations. In addition to bus specifications, necessary maintenance, storage, and operations modifications would need to be made at garage facilities and along the corridor to support the chosen fuel type. **Table 8.1** summarizes the recommended vehicle characteristics for Urban BRT and Arterial BRT, which are discussed in further detail in this section.

Table 8.1 Vehicle Characteristics

Vehicle Characteristics	Urban BRT	Arterial BRT
40-foot vehicle		●
60-foot vehicle	●	●
Left boarding door(s)	●	Required if making stops at median stations
All door boarding	●	●
Automatic wheelchair securement	●	●
Kneeling	●	●
Fare Validation at all boarding doors	●	●
Interior Bicycle Storage	●	Yes, if 60-foot bus
Exterior Bicycle Racks		Yes, if 40-foot bus
AVL/CAD Technology on Buses	●	●
Wi-Fi	●	●
USB Charging	●	●

AVL/CAD TECHNOLOGY

Automated Vehicle Location / Computer-Aided Dispatch (AVL/CAD) technology should be used on buses. AVL/CAD software is a widely implemented vehicle feature that connects riders and transit providers to GPS locations and data of vehicles in a transit system. This helps passengers with planning when there are delays, gives operators more information on where unexpected slowdowns occur most frequently, and helps operators coordinate changes in real time.

STORAGE AND AMENITIES

Riders who use bicycles to access the BRT should have interior storage of their bikes available. To avoid users stepping off station platforms in non-designated locations, bike racks at the front of the bus would not be available.

Figure 8.2 On-Board Bike Storage on a GoRaleigh 60-foot Articulated BRT Bus

To improve experience for riders, several amenities should be included on BRT vehicles. Wi-Fi, USB charging ports, and wheelchair securement should be available on all buses.

Passengers using wheelchairs should use self-securing technology on buses which uses a rear-facing device that allows riders to secure themselves with a button. This feature increases passenger independence while alleviating the need for transit operators to assist, which speeds up efficiency and decreases loading time. This improvement from typical wheelchair securing procedures would improve accessibility, equity, and operating efficiency.

Figure 8.3 Wheelchair Securement Technology[20]

EMERGING TECHNOLOGIES

As vehicle technologies continue to evolve, project sponsors should consider incorporating advanced technologies in future bus procurements. Such technologies include:

- Lane detection systems
- Smooth acceleration and braking systems
- Collision avoidance systems

Additionally, it is widely expected that precision-docking technology will continue to develop and would at some point be widely used. In several cities across the country, automated and connected vehicles (AV/CV) are being demonstrated in revenue service. AV/CV technology will continue to evolve and find new markets. Battery electric bus use is increasing and as battery technology evolves and the range between charges increases, it is anticipated that battery electric bus technology will become a more frequently used propulsion system. Battery electric buses need to be carefully considered for BRT operations given that reliability is even more critical for delivering frequent service and range is important given longer spans of service. Operating electric buses as part of the BRT system should be coordinated with the project sponsor's fleet transition plan. In addition, some transit agencies are deploying hydrogen fuel cell buses particularly on longer routes and in areas with extreme climates. Many technologies are not yet widely used in the transit industry, and as such they will not be discussed in detail. However, guidelines documents are living documents and are frequently updated as circumstances warrant. Future versions of this document would discuss these technologies as they become more prevalent in the transit industry.

[20] Wheelchair Securement Image: https://www.qstraint.com/quantum

9 IDENTITY AND BRANDING

This chapter reviews the GO+ brand and provides guidance for further developing and refining the identity and branding for Arterial BRT.

GO+ BRAND

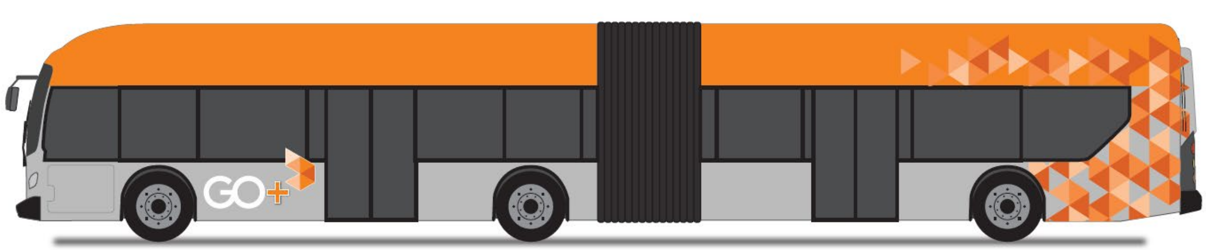
Figure 9.1 GO+ Logo

The GO+ Wake Bus Rapid Transit system (hereafter referred to as GO+) features uniquely branded buses with enhanced stations and passenger amenities, with operating characteristics that include direct routes, dedicated transit-only lanes and tract signal priority to reduce travel times and increase reliability. GO+ station features include shelters with real-time arrival information, level-boarding, off-board fare payment, digital wayfinding, and pedestrian and bicycle connections to improve safety. Three parts comprise the logo, which includes the GO lettering, the + sign, and the orange variegated chevron made of individual triangle units.

The Wake BRT system is pronounced "Go Plus," and is represented in print and graphics using the capitalized GO lettering and the orange + sign. When written with letters only, a plus sign should be included after "GO". The GO+ system name should not appear written out as two words: GO Plus. The GO+ color palette includes orange, shades of orange, dark gray, and light gray. The primary color for the GO+ brand is orange, with dark gray as an accent color. Orange adds to the current bright and vibrant color palette and helps riders distinguish the GO+ vehicles from other transit lines. Orange is prominent in vehicle wraps, GO+ station design, and marketing collateral materials.

Branding on vehicles should include three main elements: the logo, an orange roofline, and the triangle design found in the logo. The logo should appear near the middle of the vehicle or toward the front. The word "GO" should appear in white on medium to dark backgrounds but should appear in PMS Cool Gray 9 on lighter backgrounds. The orange roofline height will vary depending on the vehicle but should be about 25% of the vehicle height or less in order to draw the eye upward. The triangular design elements also will vary by vehicle but generally should be visually weighted toward the rear of the vehicle.

Figure 9.2 Articulated BRT Bus with GO+ Branding



Usage

The GO+ brand is trademarked by the City of Raleigh. The brand is to be utilized for the initial core BRT corridors identified within the Wake Transit Plan (New Bern BRT, Southern, BRT, Western BRT and Northern BRT).

Any future BRT projects can collaborate with GoRaleigh and GO+ to determine brand applicability based on project characteristics including service frequencies, amenities provided, and operating agency. These guidelines defer branding decisions for Arterial BRT corridors that are not anticipated to *initially* meet frequency standards for federal CIG funding, i.e., at least 15-minute frequency all day or 10-minute peak/20-minute off-peak. Project sponsors of Arterial BRT corridors may refer to the following considerations when designing brands for Arterial BRT.

BRANDING CONSIDERATIONS

Considerations for branding BRT service are provided as guidance once a project sponsor is selected. Determining the appropriate branding for BRT service depends on meeting CIG requirements, the service plan, and maintaining flexibility for operators. Branding should be intentionally designed for riders to distinguish BRT service from regular fixed-route service and identify the operator to effectively plan their trip.

Compatibility

Arterial BRT branding should be compatible with the operator's existing branding and with the region's GO family of brands. Providing this consistency will allow riders and community to understand how the various transit services in the region are connected and how to use them.

CIG Branding Requirements

The FTA CIG Program requires that for BRT systems "the provider must apply a separate and consistent brand identity to stations and vehicles".[21] Most BRT systems in the United States are implemented with CIG funding, including GoRaleigh's Urban BRT corridors in the planning, design, and construction phases. Therefore, it is critical that the GO+ brand continue to be distinct from regular bus services in the region. The GO+ brand should only be used for BRT that meets the requirements for CIG funding as listed in **Table 11.1** unless the same vehicle operating the CIG-funded corridor is also operating the non-CIG funded corridor as interlined service.

Service Plan

The service plans for operating BRT extensions are important considerations for branding. If the Core BRT vehicles operate the BRT extensions as a one-seat ride, then they will already be branded as

[21] FTA Capital Investment Grants Final Policy Guidance, November 2025.

GO+. If the BRT extensions are operated independently of Core BRT, then there is an opportunity to apply a separate identity and brand to BRT extension vehicles as well.

Flexibility

Branding and the service operator are interrelated. If a bus is branded specifically for a service, it must be used for that service exclusively and cannot be used interchangeably on other routes. This impacts how the operator interlines routes, positions vehicles, deploys spares, and schedules bus pullouts. Maintaining a proper balance between unique branding for rider recognition, funding requirements, and operator flexibility is important. Recognizing that corridors will evolve over time in response to changing land use and demographics, possibly transitioning from Arterial BRT corridors to Urban BRT corridors in the future, branding should be designed to be flexible. As with traditional fixed routes, operators should be able to increase BRT service frequencies without needing to rebrand the route.

To achieve this balance, the branding for buses operating the BRT extensions or Arterial BRT may use the same color palette as the operator's existing fixed-route service. They could be differentiated from the operator's regular fixed-route service by adding the plus sign before the name of the agency such as *Go+ Cary* or *Go+ Triangle*.

Recognition and Wayfinding

Arterial BRT branding should include the operator's name on the vehicle so that riders can effectively plan their trip and understand which agency to consult for schedule, fare, and contact information.

Recognizing that each system in the region uses their own nomenclature for route names, there is not a prescribed convention for Arterial BRT; rather an expectation that the route name should differentiate Arterial BRT from regular fixed-route service in some manner. For example, some agencies across the country use letters to name BRT routes while others use "BRT" in the route name. In some systems, colors are used to identify BRT routes. However, using a unique color for each BRT line in this region would be challenging given that color is already used to distinguish between operators.

The BRT route name could remain the same even if the Arterial BRT corridor is upgraded to an Urban BRT corridor in the future. This would avoid the need to rebrand the route and communicate that significant change to the community which could cause confusion.

10 SERVICE OPERATIONS

Service guidelines for either Urban BRT or Arterial BRT should exceed those of the operator for regular fixed-route service as BRT is intended to provide faster and more reliable service. Furthermore, these guidelines should not be considered maximums; rather, spans and frequencies for Urban BRT and Arterial BRT can exceed these levels.

DEFINITIONS

The following definitions are drawn from the Wake County Transit Plan Major Investment Study - BRT Design Standards and Performance Measures document[22] and are used to inform and guide the development of Wake BRT: System Guidelines related to bus service and operations.

- BRT service is bus service that operates within the BRT infrastructure and is branded as BRT service. While branded vehicles may operate outside of the BRT infrastructure, the guidelines and targets set in this document do not apply outside of the infrastructure.
- A standard sets the minimum investment required to achieve the desired characteristics of BRT.
- A measure is a reference point against which performance is evaluated. Measures are evaluated against a target.
- A target is the defined value set for individual measures. For example, the target for productivity is 25 passengers per revenue hour.

This section focuses primarily on operations guidelines for BRT service and is intended to communicate the customer-facing characteristics of BRT routes. Measures and targets would be primarily internally focused and should be the subject of a separate System Policies memorandum.

[22] Wake County Transit Plan Major Investment Study - BRT Design Standards and Performance Measures document. Accessed February 2020 from http://goforwardnc.org/wp-content/uploads/2018/11/Wake-MIS-BRT-Design-Standards-Performance-Measures-FINAL.pdf.

SPAN OF SERVICE

Span of service denotes the minimum hours of operation for a BRT during a typical weekday, Saturday, or Sunday. The BRT span of service should meet the baseline span of service established by other routes within the project sponsor's system. The span of service includes a definition of the portions of the day defined as the morning and afternoon peaks when frequency on BRT services may be higher to accommodate demand. Span of service for a particular BRT route may be extended beyond the minimum standard based on the transit agency's ridership and productivity guidelines. Proposed minimum standards for spans of service on Urban and Arterial BRT routes are shown in **Table 10.1** and peaks are shown in

Table 10.2.[23]

Table 10.1 Span of Service

Span of Service	Urban BRT	Arterial BRT
Weekday	4 am - 12 am (20 hrs.)	5 am - 12 am (19 hrs.)
Saturday	5 am - 12 am (19 hrs.)	6 am - 12 am (18 hrs.)
Sunday	5 am - 12 am (19 hrs.)	7 am - 10 pm (15 hrs.)

Table 10.2 Peak Service Spans

<table>
<tr><th>Span of Service</th><th>Urban BRT</th><th>Arterial BRT</th></tr>
<tr><td>Weekday</td><td rowspan="3">6 am – 7:30 pm (13.5 hrs.)</td><td rowspan="3">6 am – 7:30 pm (13.5 hrs.)</td></tr>
<tr><td>Saturday</td></tr>
<tr><td>Sunday</td></tr>
</table>

SERVICE FREQUENCY

Frequencies for Urban BRT and Arterial BRT should be more frequent than those for the operator's regular fixed-route service as these systems benefit from increased speed and reliability and distinguish the BRT service. **Table 10.3** identifies the recommended range of frequencies for Urban BRT and Arterial BRT based on the span of service. The FTA Capital Investment Grants (CIG) Program, which is discussed further in Section 11, requires a 15-minute maximum headway throughout the weekday or 10-minute maximum headway during peak and 20-minute maximum headway off-peak. On weekends, New Starts projects must have frequencies no less than every 30 minutes. There is no weekend service requirement for Small Starts projects. Note that the higher end of the weekday frequency range for Arterial BRT at 30 minutes would not qualify for CIG funding.

[23] Note: FTA guidelines for a BRT project to qualify for New Starts funding state that the project "must provide short headway, bidirectional service for at least a fourteen-hour span of service on weekdays and a ten-hour span of service on weekends." FTA will consider projects that provide weekday-only service for Small Starts, including the same requirement for a minimum span of service of 14 hours for the weekdays.

Source: APTA Recommended Practice: Bus Rapid Transit Service Design. Accessed February 2020 from https://www.apta.com/wp-content/uploads/Standards_Documents/APTA-BTS-BRT-RP-004-10.pdf.

Table 10.3 Frequency

Frequency (minutes)	Urban BRT	Arterial BRT
Weekday Early AM	15-20	20-30
Weekday AM/PM Peak	10-15	15-30
Weekday Midday	10-15	15-30
Weekday Night	15-20	20-30
Weekend Early AM/Night	15-30	20-30
Weekend Day	15-20	20-30

CAPACITY AND LOADING

Capacity refers to the total number of passengers that can be accommodated on a single BRT vehicle. Seated capacity indicates the number of passenger seats available on a single BRT vehicle; total capacity indicates the maximum number passengers that can be accommodated (including seated passengers and standees).

Vehicle load refers to the percentage of a vehicle's seated capacity that is used on any given trip. Loading standards are based on the maximum acceptable average load across a given time period. The maximum acceptable average load may differ between peak and off-peak periods, as shown in **Table 10.4**.

Table 10.4 Vehicle Loading Standards

Vehicle Loading Standard	Peak	Off-Peak
Maximum acceptable average load (BRT service) [24]	120% of seated capacity	100% of seated capacity

LOCAL SERVICE

An important factor in designing BRT projects is determining whether the BRT service would operate as a stand-alone route, or whether BRT stations and guideway features would be shared by underlying or connecting local bus routes. Wider station spacing offers the opportunity to deliver faster trips for BRT buses, with the trade-off of necessitating the provision of local bus service for customers who may not be able to walk to BRT stations. Underlying local service will be analyzed once BRT route and service begin along each corridor.

[24] BRT loading standards are as defined in the Wake County Transit Plan Major Investment Study - BRT Design Standards and Performance Measures document. Accessed February 2020 from http://goforwardnc.org/wp-content/uploads/2018/11/Wake-MIS-BRT-Design-Standards-Performance-Measures-FINAL.pdf.

Figure 10.1 GoRaleigh Bus[25]

CONNECTIONS AND TRANSFERS

When BRT service is implemented, the service plan should assess opportunities for improved connections with other local routes outside the corridor. Where possible, nearby routes could be extended to connect at major BRT stations, offering customers a convenient transfer to the BRT network. At the same time, routes that substantially duplicate BRT service or that operate in nearby parallel corridors could receive reduced service levels, as the BRT service would be expected to attract many of those route's riders. These service planning decisions should be made based on a detailed understanding of the ridership and operating context of each BRT corridor.

[25] GoRaleigh Bus Image: https://goraleigh.org/goraleigh-fares-passes

11 FEDERAL FUNDING CONSIDERATIONS

The design and operating plan of a BRT project determine eligibility for several federal funding sources. Dedicated lanes and operating plans affect whether a project qualifies for programs such as FTA Section 5307, FTA Section 5309 CIG, and FTA Section 5337 State of Good Repair funds. This chapter explains the connection between project design, operating plan, and funding opportunities.

FTA SECTION 5307 URBANIZED AREA FORMULA FUNDING

As an urbanized area with more than 200,000 in population, the Raleigh urbanized area is eligible to receive annual FTA Section 5307 allocations based on population, population density, bus vehicle revenue miles, passenger miles traveled, operating cost, and fixed guideway characteristics. Fixed guideway is defined as a public transportation facility using and occupying a separate right-of-way for the exclusive use of public transportation and can be rail, catenary system, ferry system, or BRT. Dedicated lanes for the use of BRT are considered fixed guideways.

Additional dedicated BRT lanes would allow the Raleigh urbanized area to qualify for additional funding under the 5307 fixed guideway tier. The formula for this tier depends on whether the urbanized area has commuter rail and a population greater than 750,000. Since the Raleigh urbanized area does not currently fall into this category, funding in the fixed guideway tier would be based on the following variables pertaining to fixed guideway service: directional route miles, vehicle revenue miles, passenger miles traveled, and operating cost.

FTA SECTION 5309 CAPITAL INVESTMENTS GRANT PROGRAM

The CIG Program funds heavy rail, light rail, commuter rail, streetcar, BRT, trolleybus, gondola, and ferry projects that meet eligibility and program requirements under three categories: New Starts, Small Starts, and Core Capacity. New Starts and Small Starts categories include new high-capacity projects or extensions to existing systems whereas Core Capacity projects address current or anticipated capacity issues within ten years in an existing fixed-guideway system.

The key eligibility differences between New Starts and Small Starts are cost, CIG program funding request, minimum dedicated guideway, and weekend service as outlined in **Table 11.1**. In addition to meeting these eligibility requirements, projects must complete the required steps in the New Starts and Small Starts processes and receive an overall project rating of at least Medium as defined by law to receive CIG funding.

Table 11.1 FTA CIG Eligibility Requirements for BRT Projects

Requirement	New Starts	Small Starts
Capital Cost Total capital cost of the project	$400 million or more	Less than $400 million
CIG Program Funds Funding request from the CIG Program	$150 million or more	Less than $150 million
Minimum dedicated guideway General traffic permitted to make turns	More than 50%	No minimum
Defined stations accessible For persons with disabilities, offer shelter from the weather, and provide information on schedules and routes	●	●
Faster travel times Using active signal priority in separated guideway, and either queue jump lanes or active signal priority in non-separated guideway	●	●
Short headway, bidirectional service on weekdays At least a 14-hour span of service with 15-minute maximum headway throughout the day or 10-minute maximum headway during peak and 20-minute maximum headway off-peak	●	●
Short headway service on weekends At least 10-hour span of service with 30-minute maximum service	●	
Separate and consistent brand identity applies to stations and vehicles	●	●

FTA Capital Investment Grants Final Policy Guidance, November 2025.

FTA SECTION 5337 STATE OF GOOD REPAIR

FTA Section 5337 funding, known as the State of Good Repair (SGR) Program, is specifically designed to support the maintenance, rehabilitation, and replacement of fixed guideway systems. Fixed guideway refers to any public transportation system that operates on exclusive or controlled rights-of-way or rails, including rail transit, BRT in dedicated lanes, and streetcar lines. The primary objective of Section 5337 is to ensure that these transit assets remain in a state of good repair, thereby enhancing safety, reliability, and performance for riders.

The Section 5337 funding formula is based on several key factors and funding categories, including the total mileage of fixed guideway systems, vehicle revenue miles, and the age of the infrastructure. There are also distinct categories under the program, such as High Intensity Fixed Guideway and High Intensity Motorbus, which help determine how funds are allocated to different types of transit services. To be eligible, a system generally must have been in operation for at least seven years, ensuring that resources are dedicated to the upkeep of established transit assets. Recipients use these resources for capital projects that maintain, replace, or rehabilitate existing infrastructure including rolling stock. Unlike Section 5307, which supports a broader range of transit needs, Section 5337 is narrowly focused on the preservation and improvement of fixed guideway assets, reinforcing the importance of long-term system sustainability.

APPENDIX A

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