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TRANSIT

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AMENITY ZONE

BUS STOPS & SHELTERS

Functional Emphasis	Frontage Context: Des. Comm.	Comm.	Mixed	Civic & Uni.	Near NBH
Pedestrian	!	!			
Transit		✓	✓	✓	
Vehicle		!	!	!	
Bicycle		!	!		!
Balanced		!	!	!	!

DESCRIPTION & INTENT

Bus stops are designated places where riders can board or alight the bus. Bus stops may be as simple as a as a signpost along a curb edge or may be a distinct sub-place that includes distinct features such as a shelter, seating and/or public art.

Bus stops typically occur in the pedestrian zone of the street. Bus stops may be located at the curb line or may be accommodated on a bus bulb, an extension of the curb that permits the bus to safely board passengers from the travel lane. The location and design of bus stops depends on passenger volume and available space, among other factors. Bus stops typically share space on the sidewalk with other uses and should be considered in the overall context of the sidewalk area.

Bus stops should be located proximate to designated crosswalks since riders often cross the street to get to or return from the transit stop. Transit stop design should also consider cyclist access to the stop including bicycle route connections and bicycle parking.

Bus stops are most successful when they are appropriately scaled to the volume of riders, provide comfortable places to wait, and deliver sufficient information to transit riders to understand the services provided. A well-designed stop calls attention to the availability of transit service, explains how it works, and makes transit an appealing travel option.

USE & APPLICATION

Location

- Bus stops are appropriate and recommended for all street types and are essential to provide access and mobility for downtown users.
- The type of bus stop (sign only or shelter) and provided amenities will depend largely on the number of passengers utilizing that location (primarily waiting to board), as well as the width and pedestrian volume of the adjacent curbside and sidewalk areas, whether the space can accommodate transit amenities.
    - » On transit emphasis streets and in locations with high ridership, stops should provide an enhanced waiting environment, such as covered waiting shelter, formal seating, informal seating, rider information, and real-time information.
- Bus stops may be located at near-side, far-side, or mid-block locations.
    - » Where buses operate in mixed traffic and stop at the curb line, far-side stops are generally considered preferable unless located at a stop-controlled intersection or if a bus bulb is utilized.
    - » The location of the bus stop will be the result of multiple factors including operations, routing and transfers, and local land use and right-of-way context.

Related Design Elements

- **Sidewalks**: Bus stops must be co-located with continuous sidewalks and adjacent crosswalks connecting them to the larger pedestrian network. Transit stops should be accessed by ample sidewalks and wide, well-marked crosswalks in appropriate locations. Bus stops are complemented by a lively public realm with active building fronts and street activity. On multi-lane streets, pedestrians traveling to and from transit stops should have median refuges at the crosswalk.
- **Bus Bulb**: In locations where sidewalk space is tight, buses have difficulty re-merging into travel lanes, and/or large volumes of pedestrians wait, bus bulbs may be used.
- **Bicycle Parking**: Where possible, bus stops should include bike racks to accommodate bicycle access. Bike share stations should be located proximate to bus stops and/or provide wayfinding to nearby transit stops.
- **Bicycle Lanes**: On bicycle priority streets, bus stops should be designed to minimize conflicts with cyclists. This may include routing bicycle lanes onto the sidewalk and behind the transit stop to reduce conflicts between cyclists and transit passengers.

Policy References

- The AAATA follows guidelines promulgated by the Transit Cooperative Research Program (TCRP) for transit stop location and design (Report 19).
- The Downtown Ann Arbor Design Guidelines require that transit "be considered in the design of streetscapes" and that transit patrons have a "comfortable environment" at transit stops. The guidelines recommend providing trash receptacles and seating or leaning walls for waiting passengers, as well as nearby bicycle racks.
- The Non-Motorized Transportation Plan Update recommends that the walking distance to transit stops not exceed 1,300 feet (1/4 mile), that transit stops be located close to the main entrance of activity generators, and not areas with high numbers of transit users, particularly the elderly and persons with disabilities.

DESIGN & OPERATIONS

Design Requirements

A Stop Location:

- Stops shall be at least 50 feet past (downstream from) a crosswalk whenever possible.
- Bus stops should not be placed immediately before (upstream of) a crosswalk as the stopped bus can prevent pedestrians and traffic from seeing each other.
- Bus stops should be located at least 100 feet from alleys or frequently used curb cuts, such as those servicing parking decks, to minimize conflicts with vehicles entering and exiting, however in dense urban contexts such as Ann Arbor, this is not always possible.

B Stop Length: Bus stops shall be at least 60 feet long.

- Longer stops may be necessary if articulated buses are used and/or there is a high volume of buses utilizing a stop location. The bus zone is longer than the bus to accommodate buses maneuvering to the curb and/or back into the travel lane.

C Signage Location: Bus stops should have a flag sign on a sign post embedded in the sidewalk a minimum of 2 feet from the curb edge.

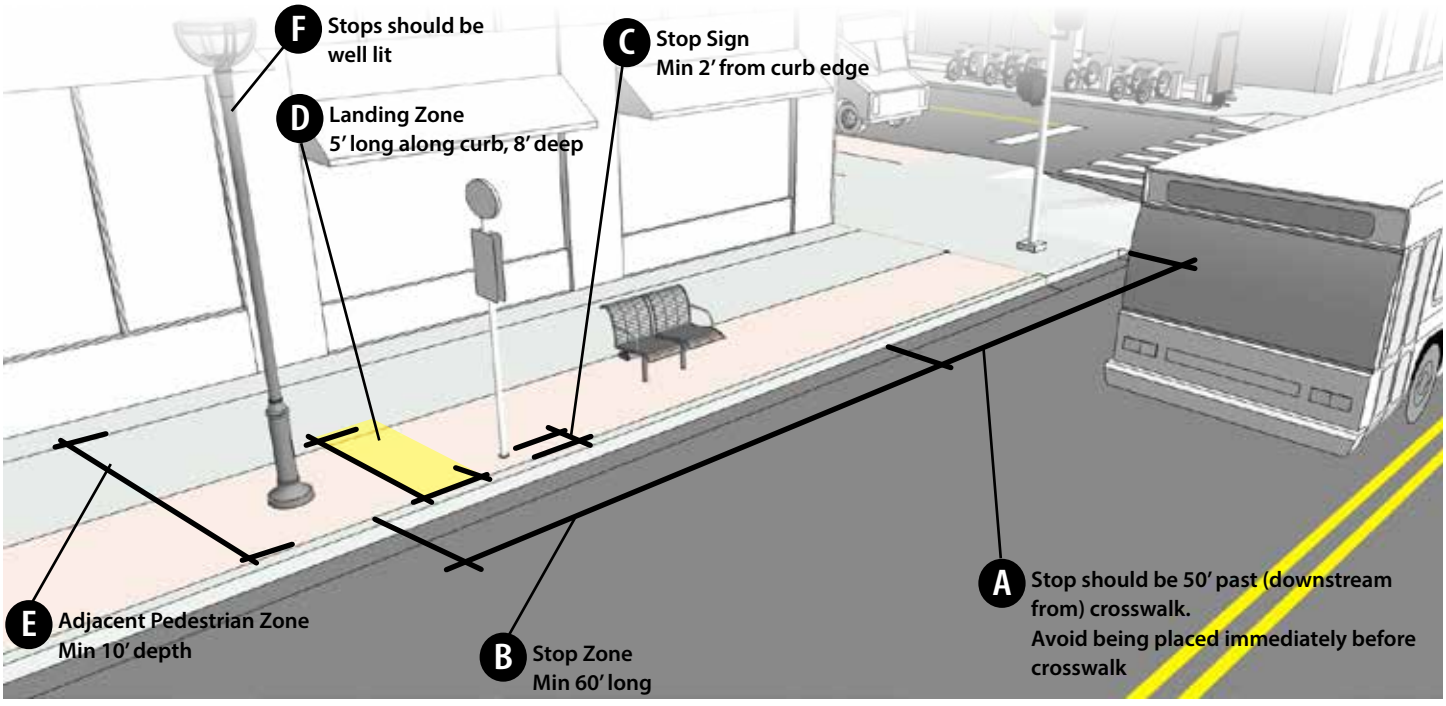
- At far-side or mid-block stops, the sign should be located 25 to 35 feet from the front edge of the bus zone to give the bus room to pull out from the stop and reenter traffic from its stopped position
- Basic route information shall be provided including service operator, route(s) servicing that stop, schedule information, and major stops serviced.

D Landing Zone: Bus stops shall have a landing zone at every door that is at least 5 feet wide parallel to the curb and 8 feet deep. This allows enough room for the bus to extend its ramp for riders with mobility impairments.

- Landing zones shall be clear of any curbside obstacles, such as street trees, planters, planting beds, light poles, or sign posts.
- In Near Neighborhood areas where the Amenity Zone may be a planting strip, using a hard paving surface for the landing zone is encouraged.

E Pedestrian Area: Adjacent pedestrian areas (Amenity Zone and Walking Zone) shall be at least 10 feet in total depth. 10 feet provides adequate space for passenger waiting while still providing comfortable room for pedestrians to travel through the bus stop zone.

- Along sidewalks with greater pedestrian density, the width may need to be larger.



F **Lighting**: Bus stops shall be well lit by the surrounding street light system. See Section 4.6- Street Lighting Design Element for recommended light levels.

  - » The City of Ann Arbor Bike Parking Manual for Businesses recommends Illuminating areas around bike parking to a minimum of 0.4 foot candles and max uniformity ratio of 10 to 1. This light level would benefit transit stop locations as well.

- **Sidewalk Connectivity**: Bus stops shall be contiguous with a continuous sidewalk network.
- **ADA Accessibility**: Bus stops shall meet accessibility requirements including providing a smooth, level, and clear zone for boarding, alighting, waiting, and access and egress from the bus stop.

Additional Design Considerations

- **Safety**: Bus stops should be located and oriented to promote real and perceived personal safety for passengers waiting for transit service.
- **Shade**: Ideally bus stops will have some degree of shade, whether provided by adjacent buildings, street trees, or bus shelters.

- **Bus Shelters-Design**: Bus shelters may be provided at higher volume stops where sidewalk space permits.
  - » Shelters are typically 10 to 12 feet wide and between 5 feet deep.
  - » Shelters can be fully or partially enclosed on one or more sides to provide protection from wind and rain.
  - » Transit shelters should use transparent materials like glass, to improve security and reduce sight obstructions.
  - » Bus shelters provide the opportunity for additional information such as real time bus arrival displays, advertising panels, and larger maps of the stop area and/or transit system.
- **Bus Shelter - Position & Clearances**
  - » Shelters should be located in the Amenity Zone, with at least 4 feet of clear space between the shelter and the curb.
  - » Alternatively, shelters may be placed in the Frontage Zone at least 1 foot from a blank building face and/or be integrated features of the building wall, such as an alcove or awning.
  - » Shelters can be oriented facing out to the street or out to the sidewalk. When located close to the curb, sidewalk facing shelters can provide pedestrian protection against vehicle splashes.
  - » Shelters should be located 10 feet, parallel to the curb, from any vertical obstructions such as street trees, street lights, and utility poles.
  - » Transit shelters should not be utilized where they would result in less than 6 feet of pedestrian through zone for the adjacent sidewalk.
  - » Use of a bus bulb may be an appropriate treatment to provide for shelter siting and sufficient sidewalk clear space.
- **Amenities**: Bus stops may include additional passenger amenities such as waste or recycling receptacles, benches or leaning rails, wayfinding signs, street trees, and/or special lighting.
  - » Fixtures should be at least 18 inches from landing zones and 3 feet from benches to accommodate circulation.
  - » Trees should be planted no closer than 10 feet from landing zones.

- **Information Displays**: Increasingly, major bus stops are designed to be "mobility hubs" provide information on the range of area transportation services, including nearby bike share and car share services, information for taxis and ride sharing providers, and wayfinding to local civic destinations or businesses.
- **Special Materials**: Stops may use special paving patterns, plantings, public art, or street furniture to further highlight and distinguish the bus stop. This would be most common on transit priority corridors or at the most significant bus stops.

Utility Considerations

- Coordinate bus shelters, tree pits, and any amenities anchored in the pavement of the sidewalk with underground utilities.
- Locate bus shelters at least 1 foot from manholes and other utility access and 10 feet from fire hydrants.
- Do not locate utility vaults in bus stop areas.

Sustainability Considerations

- Consider green roofs, white roofs, or include solar or wind generators to power advertising displays or real time information.

MAINTENANCE & MANAGEMENT

General Maintenance

- Simple bus stops introduce few significant maintenance needs.
- Bus stops are used year-round. Bus stops may be temporarily relocated to accommodate seasonal events such as festivals or other street closures; however, significant advance notice should be provided to riders and signage placed at the stop indicating the location of the temporary stop.
- Bus shelters require rapid repair if glass panels are broken or damaged. The shelter must also be regularly washed and any litter accumulating in and around the shelter should be removed.
- If waste or recycling receptacles are provided, clear responsibilities for waste removal must be established.

Seasonal Use & Maintenance

- **Snow Removal**: Bus stops must be cleared of snow and ice both in their landing zones as well as clear pathways provided to cleared sidewalk paths. Adjacent property owners are responsible for snow and ice clearing at bus stop.
  - » A pathway from the landing zone to the cleared roadway space must be maintained at a width sufficient to enable deployment of wheelchair lifts. This can be particularly challenging as roadway plowing tends to pile snow up at the curb line. This berm of snow must be cut through to enable a clear path for passenger boarding and alighting.

Reviews & Approvals

- Bus stops are approved and located on a case-by-case basis by the AAATA and the City Engineering Unit.
- City Code requires the city traffic engineer to approve bus stop locations. Siting a bus stop depends on several, sometimes competing, factors including available space, sidewalk width, traffic and pedestrian volumes, street width, turning movements, sight distances, and the presence of parking, bicycle facilities, crosswalks, impacts on adjacent property owners, nearby transit trip generators, and public input.

CURBSIDE ZONE

BUS BULBS

Functional Emphasis	Frontage Context: Des. Comm.	Comm.	Mixed	Civic & Uni.	Near NBH
Pedestrian	■	■			
Transit		!	!	!	
Vehicle		■	■	■	
Bicycle		■	■		■
Balanced		■	■	■	■

DESCRIPTION & INTENT

Bus bulbs extend the bus stop space into the roadway space for the length of the bus stop. Bus bulbs provide additional space for passenger waiting and queuing and transit amenities. They are generally used to address one or more conditions:

- Where sidewalk space is constrained and insufficient space is available to adequately accommodate both transit passenger and through pedestrian needs.
- On corridors where buses have difficulty re-merging into travel lanes after stopping for passengers.

USE & APPLICATION

Location

- Bus bulbs may be warranted on any street type where sidewalk space is constrained given the volume of pedestrians (transit riders and walkers) and where bus operations are reduced due to difficulty re-merging into travel lanes.
- On transit emphasis streets, bus bulbs are recommended to increase the visibility and efficiency of transit service.
- Bus bulbs should only be used in association with on street parking and/or dedicated on street bicycle facilities.
- Bus bulbs, like bus stops, may be located at near-side, far-side or mid-block locations. Bus bulbs located at near- or far-side locations are typically integrated with and appear as elongated bumpouts.

Related Design Elements

- **Bicycle Lanes**: Bicycle facilities should be routed behind the bus bulb and transit stop area. If bus bulbs are used at near-side locations, careful design is necessary to ensure safe bicycle progression through the intersection.
- **Travel Lanes:**: Bus bulbs should not be utilized on two-lane roadways that have only one travel lane in each direction.
- **Traffic Impact**: Because buses stop in the travel lane of a roadway while boarding and alighting passengers, bus bulbs can reduce the vehicle flow of that lane. Therefore study of traffic operations is advised before the installation of bus bulbs.
- **Street Lighting**: As with all transit stops, bus bulbs should be well lit and proximate to safe pedestrian crossings and bicycle parking.
- **Bike Share**: Bus bulbs are typically only applied on higher volume routes and thus benefit from co-location with bike share stations.

DESIGN & OPERATIONS

Design Requirements

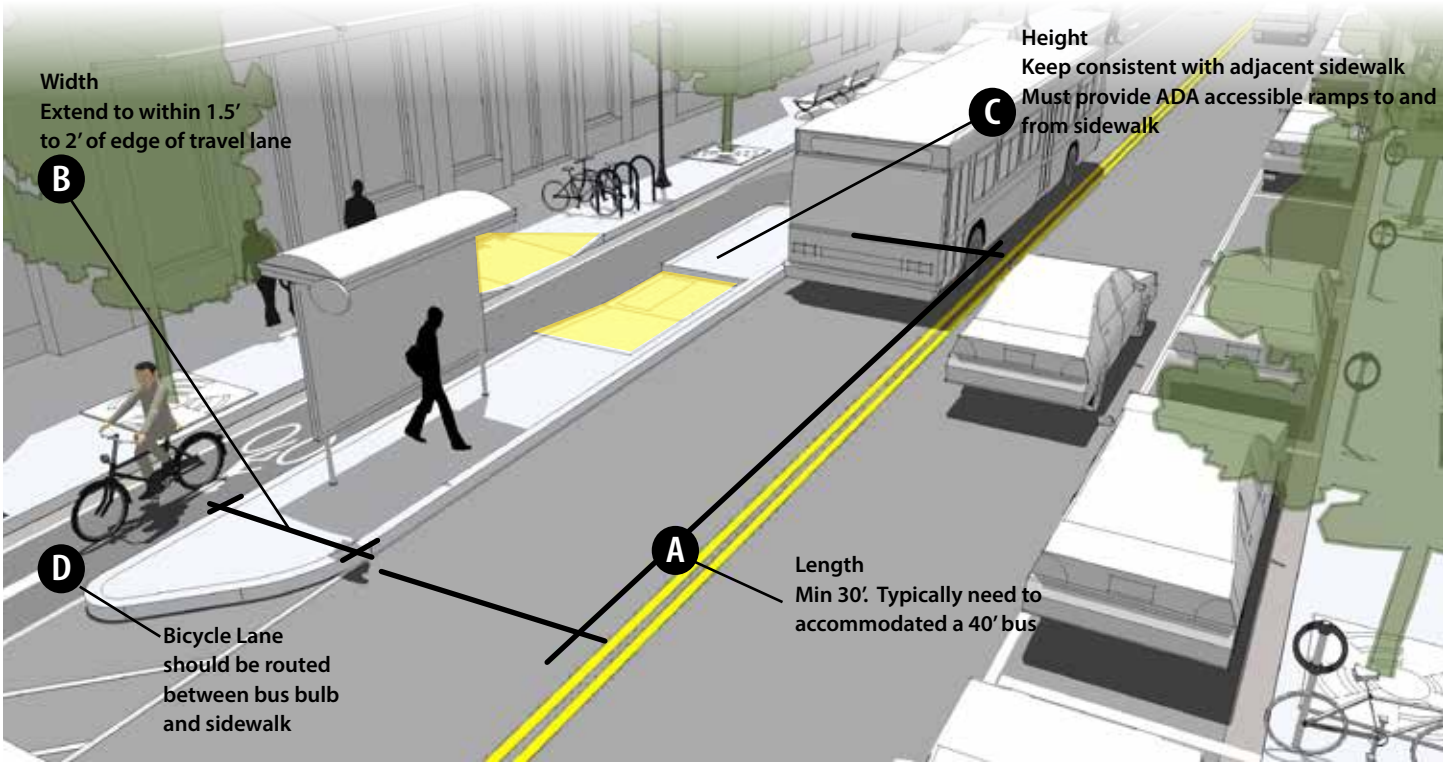
A **Length**: The length of bus bulbs depends on the type and volume of buses using the stop. For Ann Arbor bus bulbs will typically only need to accommodate a single, standard 40 foot bus. Bus bulbs shall extend from the front of the vehicle to beyond the back door, at least 30 feet in length.

B **Width**: The width of a bus bulb will depend on the typical curbside use of the street and outside travel lane. A bus bulb shall extend from the curb edge out to within 1.5 feet to 2 feet of the outside of the travel lane.

C **Height and Elevations**: Bus bulbs shall be designed at a curb height consistent with the rest of the street and level with the adjacent sidewalk.

  » Bus bulbs may also be designed at a greater height to facilitate level bus boarding. In this case, railings may be required at the back of the bus bulb and ADA accessible ramps must be provided for access to and from the adjacent sidewalk.

- **Bus Stop Design Requirements**: Bus bulbs are typically utilized with near-side or mid-block bus stops. Bus bulbs shall follow other design guidance required of typical bus stops.



D **Bicycle Lanes Routing:** Bicycle lanes shall be routed behind the bus bulb , between the bulb and Amenity/ Walking Zone, if there is sufficient space. ADA accessible curb ramps shall be provided to allow pedestrians to move from the sidewalk to the bus bulbs by crossing the bicycle lane safely. Alternatively, the bicycle lane may be raised as it pases through the bus bulb, in which case special materials should be used to indicate the presence of a bicycle lane to pedestrians.

- **Returns:** Design bus bulbs with a 45 degree return angle to facilitate street sweeping and snow plowing around the bulb.

Additional Design Considerations

- **Amenities:** Because bus bulbs provide additional pedestrian space, bus shelters and other passenger amenities should generally be provided. Bus bulbs may include bicycle racks, provided they do not conflict with clear landing zone requirements.
- **Curb Cuts:** Bus bulbs may be located adjacent to driveways, alleys and other curb cuts provided that adequate space and return angle is provided for their access and egress.

Utility Considerations

- Bus bulbs should be designed not impede stormwater drainage from the street.
- Bus bulbs may introduce utility conflicts and must be carefully coordinated.
- Utility vaults should not be located in bus bulbs.

Sustainability Considerations

- Bus bulbs may include pervious pavement and landscaping. Landscaping may include opportunities for stormwater retention and/or filtration provided it does not conflict with transit landing zones.

Design References

- The NACTO Urban Street Design Guide provides additional guidance on how to design a bumpout.
- The AASHTO Green Book offers guidance on the appropriate placement and configuration of transit bumpouts.
- More information on bus bulbs can be found in the TCRP Report 65 “Evaluation of Bus Bulbs” sponsored by the Federal Transit Administration.

http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_65-a.pdf

MAINTENANCE & MANAGEMENT

Special Maintenance

- Bus bulbs, like other curb extensions, may complicate street repaving and other maintenance activities.

Seasonal Use & Maintenance

- Like bus stops, bus bulbs will need to be cleared of snow in such a way that maintains clear passenger access to and from bus doors, including providing for the deployment of wheelchair lifts.
- Bus bulbs should be designed with roadway snow removal and storage in mind and ensure that the design angles do not inhibit plowing or street sweeping.

Reviews & Approvals

- Bus bulbs, like bus stops will be approved the AAATA and the Ann Arbor Engineering Unit.

Transit bumpouts can improve the transit riding experience while increasing space for pedestrians. Built in 2011, the reconstruction of Dexter Avenue in Seattle turned a three-lane street into a two-lane street with bus bulbs and buffered bicycle lanes. A shared parking/bicycle lane, as well as a center turn lane, were reconfigured to create the bumpouts and 6 foot wide bicycle lanes with 2 foot buffers. 10 of the 12 bus stops along the 1.5 mile long corridor have bus bulbs, which allows buses to stop without pulling out of traffic. Each bus bulb is 10 feet wide and approximately 80 feet long.

Since the project was implemented, the street has become a primary transit and bike corridor. Over 300 cyclists use the lanes going southbound towards downtown Seattle, more than one-third the number of motorists. While bus travel times have not changed significantly, ridership increased by 30% between 2010 and 2013.

ROADWAY

TRANSIT LANES

Functional Emphasis	Frontage Context: Des. Comm.	Comm.	Mixed	Civic & Uni.	Near NBH
Pedestrian	⊗	⊗			
Transit		!	!	!	
Vehicle		■	■	■	
Bicycle		■	■		■
Balanced		⊗	⊗	⊗	⊗

DESCRIPTION & INTENT

Transit may operate in lanes shared by general traffic or in dedicated facilities. Dedicated bus lanes are used to speed up bus service on busy streets with frequent transit service. A single bus can carry 40 or more passengers, allowing a bus lane to drastically increase the amount of people a street can move.

Transit lanes reduce traffic delays and increase the reliability of high-quality transit service. Transit lanes are an important part of encouraging transit use, making the service faster, more reliable, and more enjoyable.

Transit lanes can occupy several different places on a street, depending on the type of service offered and the available space. The variety of options are described here, though curbside and offset lanes are the most likely in the DDA District.

- **Curbside lanes** are immediately adjacent to the curb on the right-hand side of the street. They work best on streets with few driveways and high volume right turns.
- **Offset lanes** operate outside of a parking lane. Bus stops are located in bumpouts in the parking lane. Offset lanes are compromised by vehicles entering, exiting, and waiting for curbside parking.
- **Median lanes** occupy the center of the street. They may operate within a median, typically then separated from general traffic by median islands, or adjacent to a median with doors on both sides of the transit vehicle to permit left and right side boarding. Given the narrow right-of-way typical of most downtown Ann Arbor streets, median lanes are unlikely and therefore not discussed.
- **Contra-flow bus lanes** are generally implemented on one-way streets where the transit lane operates in the opposite direction of general traffic and is located adjacent to the curb.
- **Transit streets or plazas** are street segments that prohibit private vehicle traffic and reserve the entire travel way for transit vehicles only. Bicycles and pedestrians are generally permitted. Transit plazas are typically used where transit services are extremely frequent, transit use is concentrated, and right-of-ways are severely constrained.

USE & APPLICATION

Location

- Transit lanes are used only on corridors where transit service is very frequent (10 minutes or less), ridership is high, and traffic congestion significantly and routinely impedes transit operations.
- Transit lanes are recommended on transit emphasis streets and can be an opportunity on vehicle emphasis streets where there is room and on bicycle emphases streets where transit lanes can be coupled with bike facilities. Transit lanes are generally discouraged on other street types, particularly destination commercial and commercial streets.

- Transit lanes may be permanent or temporal – reserved for transit vehicles only at peak hours of the day and permitted for other uses (such as parking or general traffic) at other times. They may be reserved exclusively for the use of transit vehicles or may have shared use.

Related Design Elements

- **Auto Travel**: Transit lanes may be exclusive for transit use or may be in mixed traffic. Although high-occupancy vehicle (HOV) facilities are not common in Michigan at present, MDOT continues to explore their use. In some instances bus lanes are shared with HOV vehicles to provide advantage to both.
- **Transit Signals (Bus Queue Jump Lanes)**: Implementing transit signal priority in conjunction can provide even further advantage to transit service.
- **On-Street Parking**: Offset bus lanes where the curbside is used for parking can cause conflicts with drivers entering and exiting the parking lane. Drivers parking can cause significant delays to the bus service, reducing its reliability and efficiency.
- **Loading Zones**: Removing parking for a bus lane can make loading access difficult for commercial buildings. Give additional consideration to the design of bus lanes in areas with curbside loading.

DESIGN & OPERATIONS

Design Requirements

A **Lane Width**: The minimum acceptable width for a bus lane is 10 feet for an offset lane or 11 feet for a curbside lane. 12 feet is preferred.

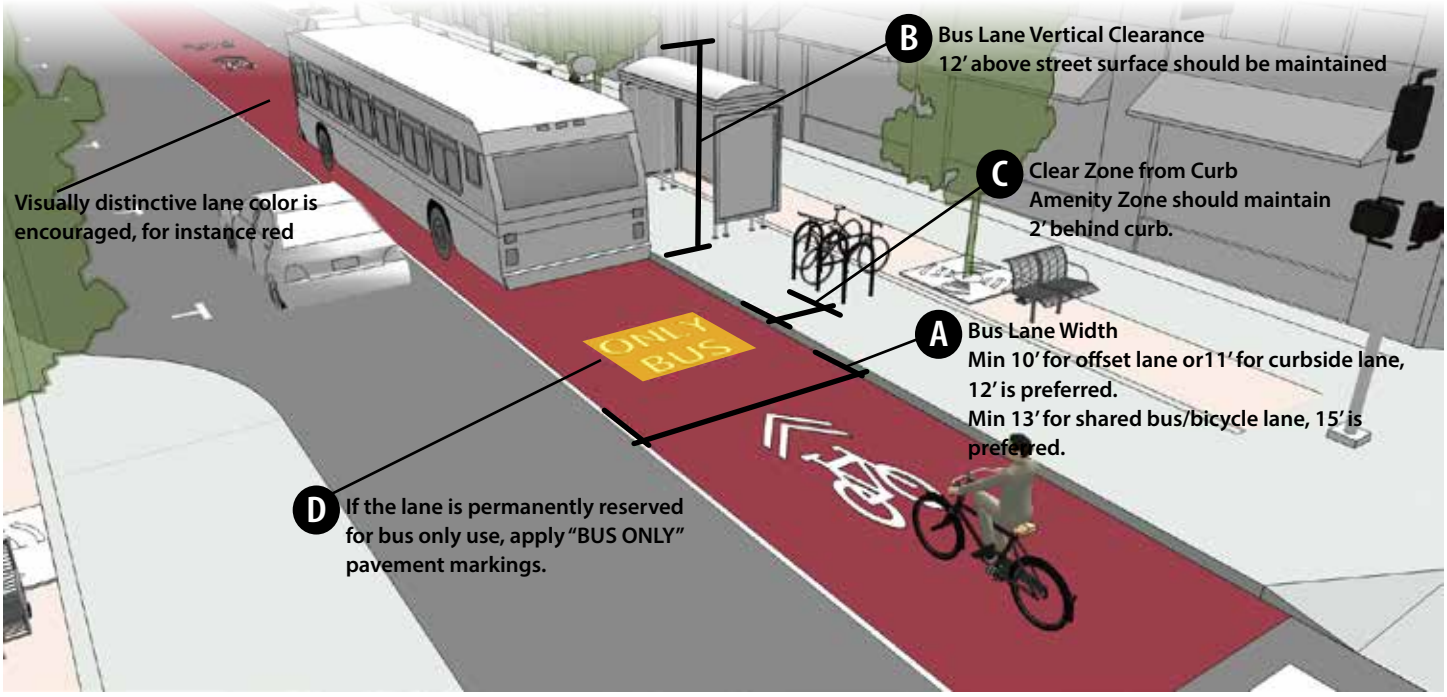
» Shared bus/bicycle lanes shall be at least 13 feet wide. 15 feet is preferred to allow room for passing.

» Gutters may be included in the calculated dimension of a curbside transit lane.

B **Vertical Clearance**: The street shall be clear for a vertical distance of 12 feet above the street surface. Banners or trees overhanging a Curbside Zone used for bus travel shall be maintained above this height.

C **Horizontal Clearance**: Fixtures or plantings in the Amenity Zone shall maintain a 2 foot clear zone behind the curb where buses or other vehicles travel in the curb lane.

D **Pavement Markings**: If the lane is permanently reserved for bus only use, apply "BUS ONLY" pavement markings. If the Transit Lane is shared for HOV or bicycle use, include appropriate markings.



Additional Design Considerations

- **High Visibility Marking**: Making bus lanes visually distinctive may discourage encroachment by other road users. Red paint can color dedicated transit lanes, but is not required.
- **Right Turn Lanes**: At intersections, bus lanes may become right-turn only lanes. Use a dotted line to denote where private vehicles may enter the bus lane.
- If the dedicated lane is only in effect for certain hours, consider restricting right turns to keep the lane clear.
- **Barriers**: Transit lanes may be separated from general traffic by soft barriers, such as rumble strips or physical barriers like concrete curbs or rubber bumpers. Given the narrow dimensions of Ann Arbor streets, physical separation is not generally expected.

Utility Considerations

- When utility work requires occupying part or all of a dedicated transit lane, have a plan in place to prevent a significant disruption of transit service. Consider re-purposing a general traffic lane temporarily, signal changes, or other efforts to reduce delays.

Design References

- The NACTO Urban Street Design Guide provides recommendations on how to design bus lanes and necessary considerations for installing them.
- The AASHTO Green Book describes how to design transit lanes, including operational issues, dimensions, and metrics for measuring success.
- The TCRP Report 19 provides guidance for roadway design factors for bus service.

MAINTENANCE & MANAGEMENT

General Maintenance

- Colored pavement may require more frequent maintenance than regular pavement.

Seasonal Use & Maintenance

- **Snow Removal:** Transit lanes should not be used for snow storage.
- Keep access to transit lanes and transit stops clear for both the vehicles and riders.
- Physically separated transit lanes may require additional or special equipment for snow removal.

Reviews & Approvals

- The Ann Arbor Engineering Unit is responsible for permitting bus lanes on city streets, while MDOT is responsible for permitting transit facilities on state-owned roads. The AAATA would most likely determine which corridors are most appropriate for bus lanes, based on where significant bus routes are located and where existing and projected ridership is highest and coordinate identification and designation of such lanes.

ROADWAY

BUS QUEUE JUMP LANE

Functional Emphasis \ Frontage Context	Des. Comm.	Comm.	Mixed	Civic & Uni.	Near NBH
Pedestrian	⊗	⊗			
Transit		!	!	!	
Vehicle		!	!	!	
Bicycle		⊗	⊗		⊗
Balanced		⊗	⊗	⊗	⊗

DESCRIPTION & INTENT

A bus queue jump lane, also known as a bus bypass lane, is a short bus lane located at the approach to a traffic signal. Buses use a bus queue jump lane to bypass waiting traffic queues, significantly improving transit travel time.

In a compact downtown area like Ann Arbor, right turn bays may be used as a bus queue jump lane. While other vehicles must turn right, the bus is allowed to proceed straight through from the turn lane to the bus lane. These facilities may need to be combined with a dedicated transit signal, such as an advanced green light for buses, and a merge lane to permit transit vehicles to reenter general travel lanes on the other side of the intersection.

There are three configurations of bus queue jump lanes that may be appropriate for Ann Arbor:

- **Transit Exemption for Right-Turn Lanes**: The bus queue jump lane shares space with the right-turn lane, but transit vehicles are allowed to proceed straight through the intersection.
- **Advanced Stop Bar**: In this configuration, the main stop bar is pushed back several car lengths and a transit-only or "right and transit" lane is placed along the curb ahead of the stop line, so that transit vehicle can pull ahead of other traffic.
- **Shared Right-Turn/Bus Lane**: The entire curbside lane is reserved for transit vehicles, but drivers are allowed to use it for right turns at intersections. This gives buses even more priority, but requires the removal of parking or travel lanes.

Bus queue jump lanes can contribute to faster, more reliable transit service that increases ridership and supports the development of a more vibrant public realm in downtown Ann Arbor. However, they also may require additional street space for buses, which may mean narrowing general traffic lanes or re-purposing general traffic lanes or parking, which may have a negative effect on the street environment.

USE & APPLICATION

Location

- Bus queue jump lanes are only applicable on transit emphasis and vehicle emphasis streets at congested intersections where transit vehicles are likely to experience significant delays.
- Bus queue jump lanes will generally have very limited applicability in downtown and should only be used in conjunction with well developed transit priority plans.

Related Design Elements

- **Traffic Signals**: To be fully effective, use transit signal priority alongside a bus queue jump lane to speed buses through the intersection.
- **Transit Lanes**: Where right-of-way is available, consider upgrading bus queue jump lanes to full transit lanes, which increase the speed and reliability of transit and reduce the risk of drivers encroaching on the lane.

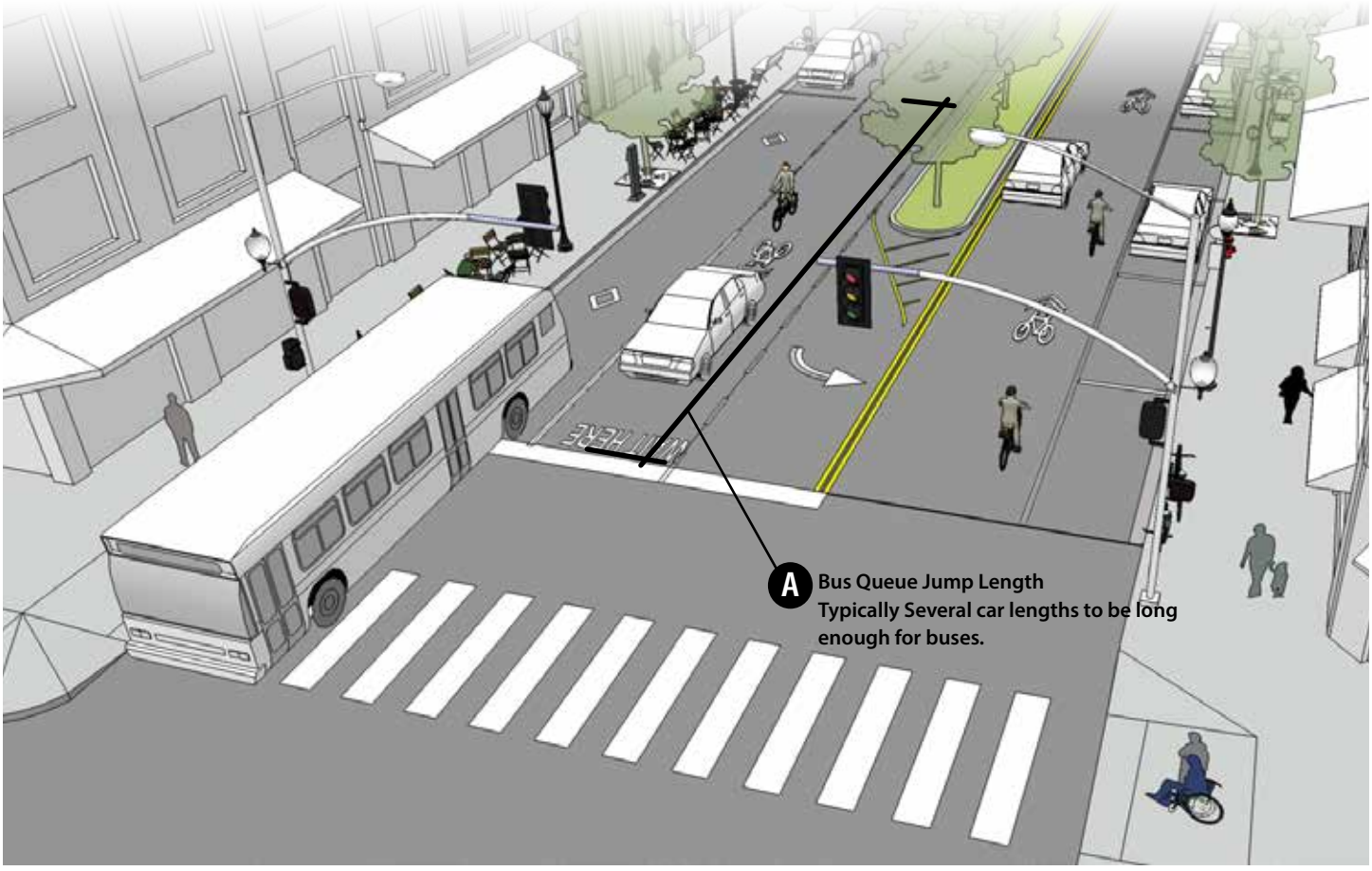
- **On-Street Parking**: Place bus queue jump lanes in a parking lane, which preserves parking space while creating an opportunity to give transit priority over other vehicles.
- **Bus Stops and Shelters:** Provide substantial bus stops with shelters, seating areas, and real-time information. Consider instituting other elements of bus rapid transit, such as off-board fare collection that can reduce wait time at stops.

DESIGN & OPERATIONS

Design Requirements

A Design bus queue jump lane long enough so that buses can move ahead of vehicles stopped at an intersection.

- Place an advanced stop bar in the bus queue jump lane to give buses a head start. The stop bar shall be placed at least 2 car lengths ahead of the main traffic stop bar, depending on the length of the queue.
- Consider special pavement markings for the bus queue jump lane to indicate that the space is exclusively for transit vehicles.
- Provide space on the other side of the intersection for the bus to reenter traffic.
- Place bus stops at the far-side of the intersection to allow buses to take advantage of the bus queue jump lane on the near-side of the intersection. If the bus stop is on the near-side, place it behind the bus queue jump lane.



- Use signal timing to allow right-turning drivers to clear the bus queue jump lane in order for transit vehicles to use it. This may require an additional right-turn signal phase. Shorter traffic phases may also help to reduce backups at the intersection, making transit signal priority more efficient.

Additional Design Considerations

- Bus queue jump lanes can give priority to both transit vehicles and cyclists. However, if the bus queue jump lane is physically separated from the rest of the street, bikes should not be allowed to share the lane due to the higher speeds transit vehicles will be able to achieve.
- Exercise caution when placing bicycle lanes next to shared bus queue jump lane/right-turn lanes due to conflicts with drivers merging in and out of the lane. Use colored pavement markings to identify the conflict zone.
- Parking or other uses of the curbside lane should be set back a far distance from the stop line, depending on the typical length of the traffic queue, to ensure that transit vehicles are able to enter the lane.

Utility Considerations

- Ensure that the construction of a bus pad does not interfere with underground utilities. Bus queue jump lanes may require a bus pad or other strengthening of the road surface to support standing or waiting transit vehicles.

Design References

- The NACTO Urban Street Design Guide provides guidelines on how to design a bus queue jump lane.

MAINTENANCE & MANAGEMENT

General Maintenance

- Frequent police enforcement is required to ensure that drivers do not attempt to use the queue jump lane.

Special Maintenance

- Maintain signage and markings for bus queue jump lanes to ensure visibility and encourage driver compliance.

Seasonal Use & Maintenance

- Bus queue jump lanes can be cleared of snow using regular snow equipment. Bus queue jump lanes should never be used for snow storage.

Reviews & Approvals

- The Ann Arbor Systems Planning Management Unit, in close consultation with the AAATA, will determine when and if queue jump lanes are advised.
- The Ann Arbor Engineering Unit is responsible for permitting the construction of queue jump lanes.