Chapter 1430  

Transit Facilities

1430.01 General

This chapter provides guidance and information for designing transit facilities in Washington State.

The design criteria provided represent recognized principles and are primarily based on criteria developed by AASHTO. Some situations are beyond the scope of this chapter as it is not a comprehensive textbook on public transportation engineering.

When private developers incorporate transit facilities into their designs, it is desirable that they use this chapter as a guide, at the direction of staff from the appropriate public jurisdictions.

Consider each of the following before developing plans for transit facilities:

- The multimodal strategies in the comprehensive plans of applicable local jurisdictions.
- The multimodal strategies in the regional plans of applicable Regional Transportation Planning Organizations (RTPOs).
- The strategies and plans of the applicable transit providers for the site under development.

The design information that follows can help the Washington State Department of Transportation (WSDOT), local jurisdictions, and developers provide efficient and cost-effective transit services to the public.

For additional information, see the following chapters:

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1430.02 References

(1) Federal/State Laws and Codes


Revised Code of Washington (RCW) 46.61.581, Parking spaces for persons with disabilities – Indication, access – Failure, penalty

RCW 70.92.120, Handicap symbol – Display – Signs showing location of entrance for handicapped

Washington Administrative Code (WAC) Chapter 468-46, Transit vehicle stop zones

WAC 468-510-010, High occupancy vehicles (HOVs)

(2) Design Guidance

Manual on Uniform Traffic Control Devices for Streets and Highways, USDOT, FHWA; as adopted and modified by Chapter 468-95 WAC “Manual on uniform traffic control devices for streets and highways” (MUTCD)

Plans Preparation Manual, M 22-31, WSDOT

Roadside Manual, M 25-30, WSDOT

Standard Plans for Road, Bridge, and Municipal Construction (Standard Plans), M 21-01, WSDOT

Traffic Manual, M 51-02, WSDOT

Understanding Flexibility in Transportation Design – Washington, WSDOT, 2005

www.wsdot.wa.gov/eesc/design/Urban/Default.htm

(3) Supporting Information

A Policy on Geometric Design of Highways and Streets (Green Book), AASHTO, 2004

ADA Standards for Accessible Design, U.S. Department of Justice

www.access-board.gov


Guidelines for the Location and Design of Bus Stops, Transit Cooperative Research Program (TCRP) Report 19, Transportation Research Board, 1996


www.access-board.gov/
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1430.03 Definitions

**articulated bus**  A two-section bus that is permanently connected at a joint.

**bus**  A rubber-tired motor vehicle used for transportation, designed to carry more than ten passengers.

**bus pullout**  A bus stop with parking area designed to allow transit vehicles to stop wholly off the roadway.

**bus shelter**  A facility that provides seating and protection from the weather for passengers waiting for a bus.

**bus stop**  A place designated for transit vehicles to stop and load or unload passengers.

**carpool/vanpool**  A group of people who share the use and cost of a car or van for transportation on a regular basis.

**detectable warning surface**  A tactile surface feature of truncated dome material built into or applied to the walking surface to alert persons with impairments of vehicular ways (see Chapter 1510).

**drop and ride**  An area of a park & ride lot or other multimodal facility where patrons are dropped off or picked up by private auto or taxi.

**feeder service**  Bus service that provides connections with other bus or rail services.

**flyer stop**  A transit stop inside the limited access boundaries.

**high-occupancy vehicle (HOV)**  A vehicle that meets the occupancy requirements of the facility as authorized by WAC 468-510-010.

**HOV direct access facility**  A ramp and its connection to an HOV lane, exclusively for the use of high-occupancy vehicles to move between the ramp and the HOV lane without weaving across general-purpose lanes.

**pedestrian access route**  A continuous, unobstructed pedestrian route where all components comply with the ADA requirements for accessible design. (See Chapter 1510 and the ADA Standards for Accessible Design for more information.)

**public transportation**  Passenger transportation services available to the public, including buses, ferries, rideshare, and rail transit.

**sawtooth berth**  A series of bays that are offset from one another by connecting curb lines, constructed at an angle from the bus bays. This configuration minimizes the amount of space needed for vehicle pull in and pull out.

**transit**  A general term applied to passenger rail and bus service used by the public.

**transit facility**  A capital facility that improves the efficiency of public transportation or encourages the use of public transportation.
1430.04 Park & Ride Lots

Park & ride lots provide parking for people who wish to transfer from private vehicles to public transit or carpools/vanpools. Most park & ride lots located within urban areas are served by transit. Leased lots, such as at churches or shopping centers, may have no bus service and only serve carpools and vanpools. Park & ride lots located in rural areas not served by buses serve carpools and vanpools.

For the larger park & ride lots, consider HOV facilities to improve access for transit and carpools (see Chapter 1410).

Early and continual coordination with the local transit authority and local government agencies is critical. When a memorandum of understanding (MOU) or other formal agreement exists that outlines the design, funding, maintenance, and operation of park & ride lots, it must be reviewed for requirements pertaining to new lots. If the requirements in the MOU or other formal agreement cannot be met, the MOU must be renegotiated.

(1) Site Selection

Current and future needs are the main considerations in determining the location of a park & ride lot. Public input is a valuable tool. The demand for and the size of a park & ride lot are dependent on a number of factors. Many of these factors vary with the state of the economy; energy availability and cost; perceived congestion; and public attitude, which are difficult to predict. Therefore, consider sizing the facility to allow for a conservative first-stage construction with expansion possibilities. As a rule of thumb, 1 acre can accommodate approximately 90 vehicles in a park & ride lot. This allows approximately 40% of the area for borders, landscaping, passenger amenities, bus facilities for larger lots, and future expansion.

Contact the local transit authority for input, which is critical, as the need for a park & ride lot and its location may already have been determined in the development of its comprehensive transit plan. Failure to obtain transit input could result in a site that does not work well for transit vehicle access.

Develop a list of potential sites. This can be simplified by the use of existing aerial photos, detailed land use maps, or property maps. The goal is to identify properties that can be most readily developed for parking and that have suitable access.

Factors influencing site selection and design of a park & ride facility include:

- Local transit authority master plan
- Regional transportation plan
- Local public input
- Demand
- Traffic
- Local government zoning
- Social and environmental impacts
- Cost and benefit/cost
- Access by all modes of travel
- Security and lighting impacts
- Maintenance
• Stormwater outfall
• Available utilities
• Existing right of way or sundry site
• Potential for future expansion

Purchasing or leasing property increases costs substantially. Therefore, the first choice is state-owned right of way, assuming the other selection criteria are favorable. Also give prime consideration to the use of city- or county-owned right of way. Select a site that does not jeopardize the current and future integrity of the highway.

Investigate each potential site in the field. The field survey serves to confirm or revise impressions gained from the office review. When conducting the investigation, consider the following:

• Physical characteristics of the site.
• Current use and zoning of the area.
• Whether the site is visible from adjacent streets (to enhance security).
• Potential for additional expansion.
• Accessibility for motorists and other modes of travel, including transit.
• Proximity of any existing parking facilities (such as church or shopping center parking lots) that are underutilized during the day.
• Potential for joint use of facilities with businesses (such as day care centers or dry cleaners) or land uses compatible with park & ride patrons.
• Congestion and other design considerations.
• Avoid locations that encourage noncommuter use (such as proximity to a high school).

The desirable location for park & ride lots along one-way couplets is between the two one-way streets, with access from both streets. When this is not practicable, provide additional signing to guide users to and from the facility.

Establish potential sites, with transit agency input, and complete public meetings and environmental procedures prior to finalizing the design. Follow the procedures outlined in Chapter 210.

(2) Design

Design features to be in compliance with any local requirements that may apply. In some cases, variances to local design requirements may be needed to provide for the safety and security of facility users.

Include the following design components when applicable:

• Geometric design of access points.
• Efficient traffic flows, both internal and external circulation, for transit, carpools, vanpools, pedestrians, and bicycles.
• Parking space layout.
• Pavements.
• Shelters.
• Exclusive HOV facilities.
• Bicycle facilities.
- Motorcycle facilities.
- Traffic control devices, including signs, signals, and permanent markings.
- Illumination.
- Drainage and erosion control.
- Security of facility users and vehicles.
- Environmental mitigation.
- Landscape preservation and development.
- Restroom facilities.
- Telephone booths.
- Trash receptacles.
- Traffic data.
- Facilities that accommodate elderly and disabled users and meet barrier-free design requirements.

The degree to which the desirable attributes of any component are sacrificed to obtain the benefits of another component can only be determined on a site-specific basis. However, these guidelines present the optimum design elements of each factor.

Large park & ride lots are transfer points from private automobiles to transit buses. The same basic principles are used in designing all park & ride lots.

(a) **Access**

Six basic transportation modes are used to arrive at and depart from park & ride lots: walking, bicycle, motorcycle, private automobile (including carpools), vanpool, and bus. Provide for all these modes.

It is desirable that access to a park & ride lot not increase congestion on the facility it serves. The desirable access point to a park & ride lot is on an intersecting collector or local street. Locate entrances and exits with regard to adjacent intersections, so that signal control at these intersections can be reasonably installed at a later time. Provide storage for vehicles entering the lot and for exiting vehicles. Ease of access will encourage use of the facility.

When access is provided to an arterial, carefully consider the location and locate the access to avoid queues from nearby intersections.

The minimum width of entrances and exits used by buses is 15 feet per lane. (See 1430.09 for corner radii for buses and Chapter 1340 and the Standard Plans for design of other access points.)

Design entrances and exits to conform to Chapter 1340 or other published design guidelines used by the local agency.

Design the access route for transit to a park & ride lot, the circulation patterns within the lot, and the return route to minimize transit travel time. Exclusive direct access connections for buses, vanpools, and carpools between park & ride lots and freeway or street HOV lanes may be justified by time savings to riders and reduced transit costs. (See Chapter 1420 for information on direct access design.) Coordinate routing for transit with the transit authority.
(b) **Internal Circulation**

Locate major circulation routes within a park & ride lot at the periphery of the parking area to minimize vehicle-pedestrian conflicts. Accommodate all modes using that part of the facility. Take care that an internal intersection is not placed too close to a street intersection. Consider a separate loading area with priority parking for vanpools. Whenever possible, do not mix buses with cars.

Design bus circulation routes to provide for easy movement, with efficient terminal operations and convenient passenger transfers. A one-way roadway with two lanes to permit the passing of stopped buses is desirable, with enough curb length and/or sawtooth-type loading areas to handle the number of buses using the facility under peak conditions (see 1430.05). Close coordination with the local transit authority is critical in the design of internal circulation for buses and vanpools.

Locate the passenger loading zone either in a central location to minimize the pedestrian walking distance or near the end of the facility to minimize the transit travel time.

Large lots may need more than one waiting area for multiple buses.

In an undersized or oddly-shaped lot, circulation may have to be compromised in order to maximize utilization of the lot. Base the general design for the individual user modes on the priority sequence of: pedestrians, bicycles, feeder buses, and park & ride area. Design traffic circulation to minimize vehicular travel distances, conflicting movements, and the number of turns. Disperse vehicular movements within the parking area by the strategic location of entrances, exits, and aisles. Align aisles to facilitate convenient pedestrian movement toward the bus loading zone.

Design bus routes within the internal layout, including entrance and exit driveways, to the turning radius of the bus. Additional considerations for internal circulation are:

- Design the lot to be understandable to all users (auto, pedestrian, bicycle, and bus).
- Do not confront drivers with more than one decision at a time.
- Provide adequate capacity at entrances and exits.
- Make signing clear and ADA-compliant.
- Provide for future expansion.

(c) **Parking Area Design**

Normally, internal circulation is two way with 90° parking. However, due to the geometrics of smaller lots, one-way aisles with angled parking may be advantageous.

For additional information on parking requirements for the disabled, see 1430.10. For information on parking area design, see the *Roadside Manual*. 
(d) **Pedestrian Movement**

Pedestrian movement in parking areas is normally by way of the drive aisles. Make a pedestrian’s path from any parking stall to the loading zone as direct as possible.

Provide walkways to minimize pedestrian use of a circulation road or an aisle and to minimize the number of points at which pedestrians cross a circulation road. Where pedestrian movement originates from an outlying part of a large parking lot, consider a walkway that extends toward the loading zone in a straight line.

For additional criteria for pedestrian movement, see Chapter 1510 and the *Roadside Manual*.

Include facilities for disabled patrons. For additional information on accessibility for the disabled, see 1430.10.

(e) **Bicycle Facilities**

Encouraging the bicycle commuter is important. Provide lots that are served by public transit, with lockers or with a rack that will support the bicycle frame and allow at least one wheel to be locked. Locate the bike-parking area relatively close to the transit passenger-loading area, separated from motor vehicles by curbing or other physical barriers, and with a direct route from the street. Design the bicycle-parking area to discourage pedestrians from inadvertently walking into the area and tripping. Consider providing shelters for bicycle racks. For bicycles, the layout normally consists of stalls 2.5 feet x 6 feet, at 90° to aisles, with a minimum aisle width of 4 feet. For additional information on bicycle facilities, see Chapters 1515 and 1520.

(f) **Motorcycle Facilities**

Provide parking for motorcycles. For information on motorcycle parking, see the *Roadside Manual*.

(g) **Drainage**

Provide sufficient slope for surface drainage, as ponding of water in a lot is undesirable for both vehicles and pedestrians. This is particularly true in cold climates where freezing may create icy spots. The maximum grade is 2%. Install curb, gutter, and surface drains and grates where needed. Coordinate drainage design with the local agency to make sure appropriate codes are followed. For additional drainage information, see Chapter 800 and the *Roadside Manual*.

(h) **Pavement Design**

Design pavement to conform to design specifications for each of the different uses and loadings that a particular portion of a lot or roadway is expected to handle. For pavement type selection, see Chapter 620.

(i) **Traffic Control**

Control of traffic movement can be greatly improved by proper pavement markings. Typically, reflectorized markings for centerlines, lane lines, channelizing lines, and lane arrows are needed to guide or separate patron and transit traffic. Install park & ride identification signs. For signing and pavement markings, see Chapters 1020 and 1030 and the MUTCD.
(j) **Shelters**

Consider pedestrian shelters in areas where environmental conditions make their use desirable. To satisfy local needs, shelters may be individually designed or selected from a variety of commercially available designs. Consider the following features in shelter design:

- Design shelters to accommodate the disabled (see 1430.10).
- Select open locations with good visibility to minimize the potential for criminal activity.
- If enclosed, locate the open side away from nearby vehicle splashing.
- Select materials and locations where the bus driver can see waiting passengers.
- Do not provide doors, unless need dictates otherwise, because of maintenance and vandalism potential.
- Allow for a small air space below side panels to permit air circulation and reduce the collection of debris.
- Optional features that may be provided are lighting, heat, telephone, travel information (schedules), and trash receptacles.
- Coordinate shelter design and placement with the local transit authority. Shelters are usually provided by the local transit agency, with the state providing the shelter pad.

For additional information on passenger amenities, see 1430.07.

(k) **Illumination**

Lighting is important from a safety standpoint and as a deterrent to criminal activity in both the parking area and the shelters. For guidance, see Chapter 1040 and the Roadside Manual.

(l) **Planting Areas**

Selectively preserve existing vegetation and provide new plantings to give a balanced environment for the park & ride lot user. For guidance, see the Roadside Manual.

(m) **Fencing**

For fencing guidelines, see Chapter 560.

(n) **Maintenance**

Develop a maintenance plan, either as part of a memorandum of understanding with the local authority or for use by state maintenance forces. Maintenance of park & ride lots outside state right of way is the responsibility of the local transit authority. Encourage the local transit authority to maintain park & ride lots inside state right of way by agreement. Negotiate agreements for maintenance by others during the design phase and document in the Design Documentation Package (DDP) (see Chapter 300).

Consider the following in the maintenance plan:

- Cost estimate
- Periodic inspection
• Pavement repair
• Traffic control devices (signs and pavement markings)
• Lighting
• Mowing
• Cleaning of drainage structures
• Sweeping/trash pickup
• Landscaping
• Shelters
• Snow and ice control

When the maintenance is not by state forces, include funding source and legal responsibilities.

1430.05 Transfer/Transit Centers

Transfer centers are basically large multimodal bus stops where buses on a number of routes converge to allow riders the opportunity to change buses or transfer to other modes. Transfer centers are of particular importance in many transit systems, since riders in many areas are served by a “feeder” route; to travel to area destinations not served by the feeder, residents must transfer.

Transit centers are frequently major activity centers. In this case, the activity is beyond a simple transfer between buses; it involves the transit center as a destination point.

When designing a transit center, consider such features as passenger volume; number of buses on the site at one time; local auto and pedestrian traffic levels; and universal access (see 1430.10). These factors dictate the particular needs of each center.

(1) Bus Berths

Where several transit routes converge and where buses congregate, multiple bus berths or spaces are sometimes needed. Parallel and shallow sawtooth designs are the options available when considering multiple berths.

An important aspect in multiple bus berthing is proper signing and marking for the bus bays. Clearly delineate the route served by each bay. Consider pavement marking to indicate stopping positions.

Portland cement concrete pavement is desirable for pedestrian walkways, for ease of cleaning.

Where buses are equipped with a bicycle rack, provide for the loading and unloading of bicycles.

Exhibit 1430-1 shows typical parallel and sawtooth designs for parking 40-foot buses for loading and unloading passengers at a transfer center. The sawtooth design does not require buses to arrive or depart in any order. The parallel design shown may require that buses arrive and/or depart in order. Where space is a consideration, the sawtooth design can be modified for independent arrival but dependent departure.

Exhibit 1430-2 is an example of a sawtooth transit center. In an in-line berthing design, space requirements are excessive if this same access is to be provided. More commonly in an in-line design, buses pull into the forward-most available berth. Buses must then leave in the order of arrival. Involve the local transit authority throughout the design process, and obtain its concurrence for the final design.
In the design of parallel bus berths, additional roadway width is needed for swing-out maneuvers if shorter bus loading platforms are utilized. The roadway width and the amount of lineal space at the bus loading platform are directly related where designs allow departing buses to pull out from the platform around a standing bus. The shorter the berth length allowed, the wider the roadway. Check the final design with a template for the design vehicle.

Considerable length is needed in a parallel design to permit a bus to pass and pull into a platform in front of a parked bus.

Parallel designs, even when properly signed, require strict parking enforcement, since they give the appearance of general curbside parking areas. Pavement marking is most critical for parallel design. Sawtooth designs offer the advantage of appearing more like a formal transit facility, which tends to discourage unauthorized parking.

### (2) Flow/Movement Alternatives

Two primary alternatives for vehicle and passenger movement are possible for transfer centers, regardless of the type of bus berths used. As shown in Exhibit 1430-3, buses may line up along one side of the transfer center. This type of arrangement is generally only suitable for a limited number of buses due to the walking distances for transferring passengers. For a larger number of buses, an arrangement similar to Exhibit 1430-4 can minimize transfer time by consolidating the buses in a smaller area.

### 1430.06 Bus Stops and Pullouts

The bus stop is the point of contact between the passenger and the transit services. The simplest bus stop is a location by the side of the road. The highest-quality bus stop is an area that provides passenger amenities (such as a bench) and protection from the weather. Bus stops must meet the requirements for universal access (see 1430.10).

Bus pullouts allow the transit vehicle to pick up and discharge passengers in an area outside the traveled way. The interference between buses and other traffic can be reduced by providing bus pullouts.

### (1) Bus Stop Designation and Location

It is desirable to locate bus stops uniformly to promote predictability. However, do not substitute uniformity for sound judgment.

Consider the following when locating bus stops:

- Bus stop placement needs the consent of the local transit authority and the jurisdiction with authority over the affected right of way.
- The physical location of any bus zone is primarily determined by safety, operational efficiency, the minimization of adjacent property impacts, and user destination points.
- Public transportation agencies are typically responsible for maintenance of transit facilities within the public right of way.

On limited access facilities, bus stops are only allowed at designated locations. (See Chapter 530 for guidance.)
Work with the local transit agencies to locate bus stops at acceptable locations. For additional information on bus stop locations, see *Understanding Flexibility in Transportation Design – Washington*.

### (2) Bus Stop Placement

On roadways where traffic volume is low and on-street parking is prohibited, the bus stop may simply be a designated location where the bus can pull up to the curb or the edge of the roadway. The location is to be dictated by patronage, the intersecting bus routes or transfer points, the security of the rider, and the need for convenient service.

The specific bus stop location is influenced not only by convenience to patrons, but also by the design characteristics and operational considerations of the highway or street. Bus stops are usually located in the immediate vicinity of intersections. Where blocks are exceptionally long or where bus patrons are concentrated well away from intersections, midblock bus stops and midblock crosswalks may be used. Consider pedestrian refuge islands at midblock crosswalks on multilane roadways.

The bus stop capacity of one bus is typically enough for up to 30 buses per hour.

Where on-street auto parking is permitted, provide a designated area where the bus can pull in, stop, and pull out. Exhibit 1430-5 illustrates the following types of bus stops:

- Far-side, with a stop located just past an intersection
- Near-side, with a stop located just prior to an intersection
- Midblock, with a stop located away from an intersection

In general, a far-side stop is preferred. However, examine each case separately and determine the most suitable location, giving consideration to service to patrons, efficiency of transit operations, and traffic operation in general. Near-side and midblock bus stops may be suitable in certain situations. Bus stops normally utilize sites that discourage unsafe pedestrian crossings, offer proximity to activity centers, and satisfy the general spacing discussed previously. Following are descriptions of the advantages and disadvantages of each type of site.

#### (a) Far-Side Bus Stops

Advantages:

- Right turns can be accommodated with less conflict.
- A minimum of interference is caused at locations where traffic is heavier on the approach side of the intersection.
- They cause less interference where the cross street is a one-way street from left to right.
- Stopped buses do not obstruct sight distance for vehicles entering or crossing from a side street.
- At a signalized intersection, buses can find a gap to enter the traffic stream without interference, except where there are heavy turning movements onto the street with the bus route.
- Waiting passengers assemble at less-crowded sections of the sidewalk.
- Buses in the bus stop do not obscure traffic control devices or pedestrian movements at the intersection.
Disadvantages:
- Intersections may be blocked if other vehicles park illegally in the bus stop or if the stop is too short for occasional heavy demand.
- Stops on a narrow street or within a traffic lane may block the intersection.

(b) **Near-Side Bus Stops**

Advantages:
- A minimum of interference is caused at locations where traffic is heavier on the departure side than on the approach side of the intersection.
- They cause less interference where the cross street is a one-way street from right to left.
- Passengers generally exit the bus close to the crosswalk.
- There is less interference with traffic turning onto the bus route street from a side street.

Disadvantages:
- Heavy vehicular right turns can cause conflicts, especially where a vehicle makes a right turn from the left side of a stopped bus.
- Buses often obscure sight distance to stop signs, traffic signals, or other control devices, as well as to pedestrians crossing in front of the bus.
- Where the bus stop is too short for occasional heavy demand, the overflow may obstruct the traffic lane.

(c) **Midblock Bus Stops**

Advantages:
- Buses cause a minimum of interference with the sight distance of both vehicles and pedestrians.
- Stops can be located adjacent to major bus passenger generators.
- Waiting passengers assemble at less-crowded sections of the sidewalk.

Disadvantages:
- Pedestrian jaywalking is more prevalent.
- Patrons from cross streets walk farther.
- Buses may have difficulty reentering the flow of traffic.
- Driveway access may be negatively impacted.

(d) **General Guidelines**

Some general guidelines for locating bus stops include:
- At intersections where heavy left or right turns occur, a far-side bus stop is desirable. If a far-side bus stop is infeasible, move the stop to an adjacent intersection or to a midblock location in advance of the intersection.
- It is important that the bus stop be clearly marked as a NO PARKING zone with signs and/or curb painting.
- At intersections where bus routes and heavy traffic movements diverge, a far-side stop can be used to advantage.
Midblock stop areas are desirable under the following conditions: where traffic or physical street characteristics prohibit a near- or far-side stop adjacent to an intersection, or where large factories, commercial establishments, or other large bus passenger generators exist. Locate a midblock stop at the far side of a pedestrian crosswalk (if one exists), so that standing buses do not block an approaching motorist’s view of pedestrians in the crosswalk.

Sight distance conditions generally favor far-side bus stops, especially at unsignalized intersections. A driver approaching a cross street on the through lanes can see any vehicles approaching from the right. With near-side stops, the view to the right may be blocked by a stopped bus. Where the intersection is signalized, the bus may block the view of one of the signal heads.

For security purposes, the availability of off-street lighting is an important consideration.

**Bus Pullouts**

Bus pullouts are generally most appropriate when one or more of the following situations exists:

- Traffic in the curb lane exceeds 250 vehicles during the peak hour.
- Passenger volume at the stop exceeds 20 boardings per hour.
- Traffic speed is above 45 mph.
- Accident patterns are recurrent.

The separation of transit and passenger vehicles is critical in cases of high bus or traffic volumes or speeds. Bus stops in the travel lane might impede the free flow of traffic. Consider bus pullouts at locations with high passenger loading volumes that cause traffic to back up behind the stopped bus.

To be fully effective, incorporate a deceleration lane or taper with the pullout, a staging area for all anticipated buses, and a merging lane or taper. As roadway operating speeds increase, increase the taper length accordingly.

Exhibit 1430-6 illustrates the dimensions and design features of bus pullouts associated with near-side, far-side, and midblock bus pullouts.

There are no absolute criteria for locating bus pullouts. Where a pullout is being considered, involve the local transit agency. Factors controlling the appropriate location and eventual success of a pullout include:

- Operating speed
- Traffic volume
- Number of passenger boardings
- Available right of way
- Roadway geometrics (horizontal and vertical)
- Construction costs
- Location of curb ramps

Exhibit 1430-7 illustrates the dimension and design of far-side bus zones and pullouts where buses stop after making a right turn. Adherence to these designs allow buses to stop with minimal interference to legally parked vehicles.
It is important in the design of bus pullouts to consider the need to provide pavement structure to support a bus (see Chapter 62); otherwise, the surfacing may be damaged by the weight of the buses.

**1430.07 Passenger Amenities**

(1) **Bus Stop Waiting Areas**

Bus passengers desire a comfortable place to wait for the bus. Providing an attractive, pleasant setting for the passenger waiting area is an important factor in attracting bus users.

Important elements of a bus stop include:

- Universal access (see 1430.10)
- Protection from passing traffic
- Lighting
- Security
- Paved surface
- Protection from the environment
- Seating (if the wait may be long)
- Information about routes serving the stop

Providing protection from passing traffic involves locating stops where there is enough space, so passengers can wait away from the edge of the traveled roadway. The buffering distance from the roadway increases with traffic speed and traffic volume. Where vehicle speeds are 30 mph or below, 5 feet is a satisfactory distance. In a heavy-volume arterial with speeds up to 45 mph, a distance of 10 feet provides passenger comfort.

Passengers arriving at bus stops, especially infrequent riders, want information and reassurance. Provide information that includes the numbers or names of routes serving the stop. Other important information may include a system route map, the hours and days of service, schedules, and a phone number for information. The information provided and format used is typically the responsibility of the local transit system.

At busier stops, including park & ride lots, provide a public telephone. For all paved park & ride lots, select a desirable site for a public telephone and provide conduit, whether or not a telephone is currently planned. Where shelters are not provided, a bus stop sign and passenger bench are desirable, depending on weather conditions. The sign indicates to passengers where to wait and can provide some basic route information.

(2) **Passenger Shelters**

Passenger shelters provide protection for waiting transit users. Locate the shelter conveniently for users, without blocking the sidewalk or the drivers’ line of sight. Exhibit 1430-8 illustrates a clear sight triangle that permits shelter sitting with minimal impact on sight distances at urban arterial intersections without traffic controls. The dimensions and locations may vary by local jurisdiction; check local zoning ordinances or with the appropriate officials.
Providing shelters (and footing for shelters) is normally the responsibility of the local transit agency; contact them for shelter design and footing needs. State motor vehicle funds cannot be used for design or construction of shelters, except for the concrete pad.

Provide lighting to enhance passenger security. Lighting makes the shelter visible to passing traffic and allows waiting passengers to read the information provided. General street lighting is usually sufficient. Where streetlights are not in place, consider streetlights or transit shelter lights. For information on illumination, see Chapter 1040.

A properly drained paved surface is needed so passengers do not traverse puddles and mud in wet weather. Protection from the environment is typically provided by a shelter, which offers shade from the sun, protection from rain and snow, and a wind break. Shelters can range from simple to elaborate. The latter type may serve as an entrance landmark for a residential development or business complex and be designed to carry through the architectural theme of the complex. If a nonpublic transportation entity shelter is provided, its design and siting must be approved by the local transit agency. The reasons for this approval include safety, barrier-free design, and long-term maintenance concerns.

Simple shelters, such as the one illustrated in Exhibit 1430-9, may be designed and built by the transit agency or purchased from commercial vendors. The State Bridge and Structures Architect may be contacted for more complex designs.

Consider shelters at bus stops in new commercial and office developments and in places where large numbers of elderly and disabled persons wait, such as at hospitals and senior centers. In residential areas, shelters are placed only at the highest-volume stops.

**1430.08 Roadway Design and Design Vehicle Characteristics**

(1) **Roadway Design**

(a) **Paving Sections**

Coordinate the pavement design (type and thickness) of a transit project, whether initiated by a public transportation agency or a private entity, with WSDOT or the local agency public works department, depending on highway, street, or road jurisdiction. These agencies play a major role in determining the paving section for the particular project.

Paving section design is determined by the volume and type of traffic, design speed, soil characteristics, availability of materials, and construction and maintenance costs. Important characteristics of good pavement design include the ability to retain shape and dimension, drain, and maintain skid resistance.

For guidance on the design of pavements, see Chapters 610 and 620.

(b) **Grades**

Roadway grades refer to the maximum desirable slope or grade, or the maximum slope based on the minimum design speed that a 40-foot bus can negotiate efficiently. For roadway grade criteria, see Chapter 1140 or the *Local Agency Guidelines*. 
Bus speed on grades is directly related to the weight/horsepower ratio. Select grades that permit uniform operation at an affordable cost. In cases where the roadway is steep, a climbing lane for buses and trucks may be needed. Avoid abrupt changes in grade due to bus overhangs and ground clearance.

(c) **Lane Widths**

Roadway and lane width criteria are given in Chapter 1140 or the *Local Agency Guidelines*, based on the functional class of highway or road and jurisdiction.

The desirable lane width for lanes used by HOVs, buses, vanpools, and carpools is 12 feet. Chapter 1410 provides additional information on HOV facilities.

(2) **Design Vehicle Characteristics**

Most transit agencies operate several types of buses within their systems. Vehicle sizes range from articulated buses to passenger vans operated for specialized transportation purposes and vanpooling.

Vehicles within each of the general classifications may vary dimensions such as wheelbase, height, and vehicle overhang. The total gross vehicle weight rating (GVWR) varies considerably among manufacturers. Because of these differences, obtain more specific design information from the local transit authority.

The principal dimensions affecting design are the minimum turning radius, tread width, wheelbase, and path of the inner rear tire. The effects of driver characteristics and the slip angle of the wheels are minimized by assuming that the speed of the vehicle for the minimum radius (sharpest) turn is lower than 10 mph.

(a) **City Buses (CITY-BUS)**

These traditional urban transit vehicles are typically 40 feet long and have a wheelbase of approximately 25 feet. Many of these vehicles are equipped with either front or rear door wheelchair lifts or a front “kneeling” feature that reduces the step height for mobility impaired patrons.

(b) **Articulated Buses (A-BUS)**

Because articulated buses are hinged between two sections, these vehicles can turn on a relatively short radius. Articulated buses are typically 60 feet in length, with a wheelbase of 22 feet from the front axle to the midaxle and 19 feet from the midaxle to the rear axle.

(c) **Small Buses**

Some transit agencies operate small buses, which are designed for use in low-volume situations or for driving on lower-class roads. Small buses are also used for transportation of elderly and disabled persons and for shuttle services. Passenger vans are a type of small bus used for specialized transportation and vanpooling. Since the vehicle specifications vary so widely within this category, consult the local transit authority for the specifications of the particular vehicle in question.
1430.09 Intersection Radii

A fundamental characteristic of transit-accessible development is convenient access and circulation for transit vehicles. It is important that radii at intersections be designed to accommodate turning buses. Radii that accommodate turning buses reduce conflicts between automobiles and buses, reduce bus travel time, and provide maximum comfort for the passengers.

Take the following factors into consideration in designing intersection radii:

- Right of way availability
- Angle of intersection
- Width and number of lanes on the intersecting streets
- Design vehicle turning radius
- Intersection parking
- Allowable bus encroachment
- Operating speed and speed reductions
- Pedestrians
- Bicycles

Because of space limitations and generally lower operating speeds in urban areas, curve radii for turning movements may be smaller than those normally used in rural areas. It is assumed that buses making turns are traveling at speeds lower than 10 mph. Exhibits 1430-10 and 1430-11 illustrate the turning templates and design vehicle specifications for a city bus and an articulated bus.

Exhibit 1430-12 gives radii at intersections for four types of parking configurations that may be associated with an intersection. Radii less than the minimum result in encroachment onto adjoining lanes or curbs. As intersection radii increase, pedestrian crossing distances increase.

When other intersection types are encountered, use turning templates (such as those given in Exhibits 1430-10 and 1430-11) to develop designs the design vehicle can use.

To provide efficient transit operation on urban streets, it is desirable to provide corner radii from 35 to 50 feet (based on the presence of curb parking on the streets) for right turns to and from the through lanes. Where there are curb parking lanes on both the intersecting streets and parking is restricted for some distance from the corner, the extra width provided serves to increase the usable radius.

The angle of intersection also influences the turning path of the design vehicle. Exhibit 1430-13 shows the effect of the angle of intersection on the turning path of the design vehicle on streets without parking. Exhibit 1430-13 also illustrates when a vehicle turns from the proper lane and swings wide on the cross street and when the turning vehicle swings equally wide on both streets.
Chapter 1430

1430.10  Universal Access

Public transportation providers have an obligation under both state and federal laws to create and operate capital facilities and vehicles that are usable by the wide variety of residents in a service area. A major need arising from this obligation is to provide transportation service to transit-dependent patrons, among whom are disabled individuals.

Barrier-free design means more than just accommodating wheelchairs. Care needs to be given not to create hazards or barriers for people who have vision or hearing impairments. The key is to design clear pathways with no obstacles and provide simple signs with large print.

(1) Park & Ride Lots

Locate accessible parking stalls close to the transit loading and unloading area. Two accessible parking stalls may share a common access aisle. For information on the number and design of accessible stalls, see the Roadside Manual and the parking space layouts in the Standard Plans.

Sign accessible parking stalls in accordance with the requirements of RCW 46.61.581.

Design pedestrian access routes in accordance with the following:

- Pedestrian access routes must meet the requirements for sidewalks (see Chapter 1510).
- If possible, do not cross access roads en route to the bus loading zone.
- When feasible, do not route behind parked cars (in their circulation path).
- Curb ramps are required.
- Parking stall and access aisle surfaces shall be even and smooth, with surface slopes not exceeding 2%.

(2) Bus Stops and Shelters

In order to use buses that are accessible, bus stops must also be accessible. The nature and condition of streets, sidewalks, passenger loading pads, curb ramps, and other bus stop facilities can constitute major obstacles to mobility and accessibility. State, local, public, and private agencies need to work closely with public transportation officials to provide universal access.

Provide a bus stop boarding and alighting “pad” (see Exhibit 1430-14) for the deployment of wheelchair lifts that meets the following criteria:

- **Surface:** Construct the pad of Portland cement concrete, hot mix asphalt (HMA), or other approved firm, stable, and slip-resistant surface.
- **Dimensions:** Provide a clear area of 10.0 feet in length by 8.0 feet in width. When right of way or other limitations restrict the pad size, it may be reduced—with justification and transit concurrence—to a minimum of 8.0 feet measured perpendicular to the curb or roadway edge by 5.0 feet measured parallel to the roadway.
- **Connection:** Connect the pad to streets, sidewalks, or pedestrian paths with a pedestrian access route (see Chapter 1510).
• **Grade:** Design the grade of the pad parallel to the street or highway the same as the street or highway. The maximum slope perpendicular to the street or highway is not steeper than 2%.

For examples of pads with and without shelters, see **Exhibit 1430-14**.

Involve the local transit agency in the pad design and location so that lifts can actually be deployed at the site.

In order to access a bus stop, it is important that the path to the stop also be accessible. This can be accomplished by the use of sidewalks with curb ramps. For sidewalk design and curb ramp information, see **Chapter 1510** and the **Standard Plans**.

Design bus shelters (when provided) with a minimum clear space of 30 inches by 48 inches, entirely within the shelter. Connect to the bus stop pad by a pedestrian access route.

At bus stops where a shelter is provided, the bus stop pad may be located either inside or outside the shelter.

In the design of bus stops and shelters, consider the following:

• Provide universal access for pedestrian facilities within the limits of a project.
• Provide properly sloped and sized curb ramps with detectable warning surfaces (see the **Standard Plans**).
• Identify sidewalk needs.
• Encourage and emphasize designs for new street construction or reconstruction that include sidewalks or pedestrian walkways and curb ramps.
• Identify bus stops with curb painting and/or bus stop signs.
• When practicable, make bus stops accessible.
• Along a route served by accessible vehicles, mark all bus stop signs with the blue international accessibility symbol conforming to the requirements of **RCW 70.92.120**, for easier identification by users.
• Existing as well as future park & ride locations must, by state law, include reserved parking for disabled persons, marked with signs as outlined in **RCW 46.61.581**.

### 1430.11 Documentation

For the list of documents required to be preserved in the Design Documentation Package and the Project File, see the Design Documentation Checklist:  
[www.wsdot.wa.gov/design/projectdev/](http://www.wsdot.wa.gov/design/projectdev/)
Notes:

[1] Dimensions shown are for a 40-ft bus; adjust the length when designing for a longer bus.

[2] Design shown is an example; contact the local transit agency for additional information.
On higher-speed facilities, it may be necessary to provide a greater acceleration/deceleration transition.

Bus Turnout Transfer Center

Exhibit 1430-2

Not to Scale

Transit Center Sawtooth Bus Berth

Exhibit 1430-2

*On higher-speed facilities, it may be necessary to provide a greater acceleration/deceleration transition.
Off-Street Transfer Center

Exhibit 1430-4
Near-Side Bus Stop

Far-Side Bus Stop

Midblock Bus Stop

<table>
<thead>
<tr>
<th>Approx Bus Length</th>
<th>Loading Zone Length (feet)</th>
<th>One-Bus Stop</th>
<th></th>
<th>Two-Bus Stop</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>25</td>
<td>65</td>
<td>90</td>
<td>125</td>
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<tr>
<td>60</td>
<td>100</td>
<td>125</td>
<td>160</td>
<td>160</td>
<td>190</td>
</tr>
</tbody>
</table>

Notes:

[^1] Based on bus 1 ft from curb on 40 ft wide streets. When bus is 0.5 ft from curb, add 20 ft near-side, 15 ft far-side, and 20 ft midblock. Add 15 ft when street is 35 ft wide and 30 ft when street is 32 ft wide.

[^2] Measured from extension of building line or established stop line. Add 15 ft where buses make a right turn.

[^3] Add 30 ft where right-turn volume is high for other vehicles.
Notes:

[1] For right-turn lane design, see Chapter 1310.
[2] Based on a 40 ft bus. Add 20 ft for articulated bus. Add 45 ft (65 articulated) for each additional bus.

Bus Stop Pullouts: Arterial Streets

*Exhibit 1430-6*
Far-Side Bus Stop

Far-Side Bus Pullout After Right Turn

Minimum Bus Zone and Pullout After Right-Turn Dimensions

* Based on 40' bus. Add 20' for articulated bus.
Chapter 1430

Transit Facilities

Shelter Siting

Exhibit 1430-8
Typical Bus Shelter Design

Exhibit 1430-9

Note:
Bench style can vary.
Turning Template for a 40-Foot Bus

Exhibit 1430-10
Turning Template for an Articulated Bus

Exhibit 1430-11
Intersection Design
Exhibit 1430-12
### Cross-Streets Width Occupied by Turning Vehicle for Various Angles of Intersection and Curb Radii

**Exhibit 1430-13**

<table>
<thead>
<tr>
<th>$\Delta$</th>
<th>$d_2$ for Cases A and B Where:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$R=15'$</td>
</tr>
<tr>
<td></td>
<td>A</td>
</tr>
<tr>
<td>30</td>
<td>22</td>
</tr>
<tr>
<td>60</td>
<td>28</td>
</tr>
<tr>
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<tr>
<td>120</td>
<td>46</td>
</tr>
<tr>
<td>150</td>
<td>48</td>
</tr>
</tbody>
</table>

**Case A**
Vehicle turns from proper lane and swings wide on cross street.

$d_1 = 12$ ft; $d_2$ is variable

**Case B**
Turning vehicle swings equally wide on both streets.

$d_1 = d_2$; both are variable
Notes:

- The passenger loading pad must be free of obstructions. For additional information, see 1430.10(2).
- A minimum-width pedestrian access route must be maintained. For pedestrian design criteria, see Chapter 1510.
- Shelter dimensions may vary. For additional information, see 1430.07(2). For an example of a shelter design, see Exhibit 1430-9.

Passenger Loading Pad

Exhibit 1430-14