Chapter 2
Design Control

2-1 Layout

2-1.1 Functional Classification

The first step in the design process is to identify the functional classification of the roadway. The functional classification of existing Pierce County roadways is established by ordinance by the Pierce County Council and are identified in Chapter 12.08 of the Pierce County Code. A narrative of the existing and future adjacent land use and environment must accompany the proposal for functional classifications of new facilities. This narrative should include, but not limit itself to, the following items:

- Urban or rural environment
- Proximity to schools or parks
- Expected pedestrian and bicycle activity
- Industrial or commercial sites to be served

Existing and future traffic volumes must be documented. The estimated future traffic volumes serve as the design year for the roadway. All interim designs must contribute to the long-range or ultimate roadway design.

2-1.2 Functional Classification System

Roads and highways are most effectively classified by their function, according to the character of service they are intended to provide. The primary functions of roads and highways are to provide mobility and to provide access, and the degree to which these functions are provided is considered an integral part of classifying roads. The functional classification system creates a hierarchy of classified roads.

For example, a freeway provides a high degree of mobility but very limited access, which is available only at interchanges that could be spaced several miles apart. Higher vehicle speeds and volumes are typical on these types of facilities and are, in fact, desirable. On the other hand, a local road within a residential neighborhood provides a high degree of access by way of numerous driveway approaches to adjacent lots, and lower vehicle speeds and volumes are desired. Between these two extremes are the remainder of the roads, commonly called the arterial system, which must provide both mobility and access.

Roads are grouped into a number of different classifications for administrative, planning, and design purposes. For example, the classification system can be used for planning for new routes, improvements to existing roads, and planning for area development in concert with the transportation network. It can also be used for providing minimum design standards or criteria to encourage the use of the road as intended.

The main considerations for classifying roads into functional groups are the travel desires of the public, land service needs based on existing and expected land use, and the overall continuity of the system. A classification plan which fits the various classes of roads together into a logical pattern and assigns realistic improvement standards to each class will promote the highest overall level of service for the funds that are available.

Pierce County definitions for each functional classification are presented below. The Pierce County Transportation Plan includes transportation plans for modes other than passenger vehicles. These modal plans are intended to overlay onto the functional classification system. For example, the bicycle plan would overlay the functional classification system to identify those roadways that should include bicycle facilities as a design element of the roadway.

The Pierce County functional classification system directly addresses all roads in unincorporated Pierce County that are under the jurisdiction of Pierce County. State highways under the jurisdiction of the Washington State Department of Transportation are all legally designated arterials (RCW 46.61.195). In some cases, particularly in rural areas of the County, no major County arterials are designated since this function is served by the state highway route.

2-1.3 Functional Classification Definitions

2-1.3.1 Major Arterials

Major arterials provide service for major traffic movements within the County. They serve major centers of activity and offer intra-area travel between suburban centers, between larger communities, and between major trip generators. Major arterials serve the longest trips and carry the major portion of trips entering and leaving the overall area. They frequently carry important bus routes within urban areas and between urban communities. Typically, they are one of the highest traffic volume corridors in the County. Examples of major arterials are Canyon Road East, Spanaway Loop Road, and 112th Street East in the urban area, and Key Peninsula Highway and Orting-Kapowsin Highway in the rural area. Traffic volumes commonly range from 7,000 to 40,000 or more vehicles per day in the urban area, and from 1,000 to 10,000 or more vehicles per day in the rural area.

The spacing between major arterials usually varies from about 1 mile in highly developed business areas to 5 miles or more in rural areas. Service to abutting land should be subordinate to the provision of travel service to major traffic movements; this service should be incidental to the primary functional responsibility of the road. Major arterials would preferably be located on community and neighborhood boundaries or adjacent to but not through major shopping centers, parks, and other homogeneous areas.

2-1.3.2 Secondary Arterials

Secondary arterials interconnect with and augment the major arterial system. Secondary arterials connect major arterials to collector arterials and small trip generators. They provide service to medium-size trip generators, such as less intensive commercial

development, high schools and some junior high/grade schools, warehousing areas, active parks and ball fields, and other land uses with similar trip generation potential. They distribute travel to smaller geographic areas and communities than those identified with the major arterial system. They provide service to trips of moderate length of a somewhat lower level of travel mobility than major arterials. Examples of secondary arterials are Golden Given Road, "C" Street South, and 138th Street South in the urban area, and South Prairie Road and Webster Road East in the rural area. Traffic volumes commonly range from 4,000 to 15,000 vehicles per day in the urban area, and from 500 to 5,000 vehicles per day in the rural area.

Spacing between secondary arterials usually varies from less than 1 mile in fully developed areas to about 3 miles or more in rural areas. They provide intra-community continuity and are typically a continuous road with a direct rather than a meandering alignment. They may carry local bus routes.

Secondary arterials allow for more emphasis on land access than the major arterial system. They usually do not penetrate identifiable neighborhoods.

2-1.3.3 Collector Arterials

Collector arterials distribute trips from major and secondary arterials to the ultimate destination or may collect traffic from local roads and channel it into the major and secondary arterials systems. They carry a low proportion of traffic traveling through the entire subarea but carry a high proportion of local traffic with an origin or destination within that area. They may be on a somewhat meandering alignment and need not be particularly long or continuous. Examples of collector arterials are "A" Street and "B" Street in the urban area, and Mathias Road, Prairie Ridge Drive, and 36th Street NW / Horsehead Bay Road in the rural area. Traffic volumes commonly range from 2,000 to 6,000 vehicles per day in the urban area, and from 300 to 3,000 vehicles per day in the rural area.

Spacing ranges from 1/4 mile in developed areas to 3 miles in rural areas. Collector arterials provide land access service and traffic circulation within residential neighborhoods, commercial, and industrial areas. They may penetrate identifiable residential neighborhoods.

2-1.3.4 Local Road System

The local road system provides circulation and access for residential neighborhoods away from the arterial system. The local road system consists of the Local Road Feeder, Local Road Minor, Local Road Cul-de-sac, Neighborhood Street, and Access Lane.

A. A **Local Road Feeder** serves as primary access to the development from the adjacent street system. It distributes traffic from the Local Road Minor in residential neighborhoods and channels it to the arterial system. There are usually no bus routes, with the exception of possible school buses. There is no direct lot access from local road feeders. They directly serve any major traffic generators within the neighborhood, such as an elementary school or

a church. They usually serve one moderate size neighborhood or a combination of a few small developments, rather than interconnecting two or more larger neighborhoods. Local road feeders serve little, if any, that is traffic generated outside the neighborhood. Typical Average Daily Traffic (ADT) may range from about 800 to 2,000 vehicles per day. Abutting residences are oriented away from the feeder road.

B. A **Local Road Minor provides** direct access from abutting land to the Local Road Feeder. There are usually no bus routes on local road minors. They are typically an internal subdivision road providing circulation within the subdivision and between subdivisions. Higher speeds and traffic volumes are deliberately discouraged. A Local Road Minor is designed so that it can never become a higher classification roadway. Typical ADT may range from about 200 to 800 vehicles per day.

C. A **Local Road Cul-de-sac** is an internal subdivision road with a single outlet. Direct lot access is provided from the stem and the bulb. A Local Road Cul-De-Sac is only allowed when connectivity requirements identified in Section 2-1.5 are infeasible. When allowed, a Cul-De-Sac shall be greater than 100 feet and less than 1,000 feet in total length and serve less than 50 residences with an ADT less than 500 vehicles per day. Cul-de-sacs with 30 or more residences shall provide emergency response mitigation in accordance with Appendix D107 of the International Fire Code. A Local Road Cul-de-sac should not be designed so that its first intersection is another Local Road Cul-de-sac

D. A **Neighborhood Street** is a local road allowed only within an Urban Infill development (see Chapter 18J.17 of the Pierce County Code). A Neighborhood Street is intended to: provide circulation between clusters of dwelling units; and to provide for access to higher classified roads, such as a Local Road Feeder or an arterial. A Neighborhood Street operates similarly to a Local Road Minor except it has lower operating speeds and lower traffic volumes. Typical ADT may range from 200 to 600 vehicles per day. On-street parking is provided.

E. An **Access Lane** is a local road allowed only within an Urban Infill development (see Chapter 18J.17 of the Pierce County Code). An Access Lane provides for circulation and access within clusters of dwelling units. The Access Lane operates similarly to a Local Road Cul-de-sac, with a typical ADT of 200 vehicles per day or less. Cul-de-sac bulbs are prohibited for access lanes, and more than a single outlet is commonly provided.

2-1.3.5 Alley and Shared-Access Facility

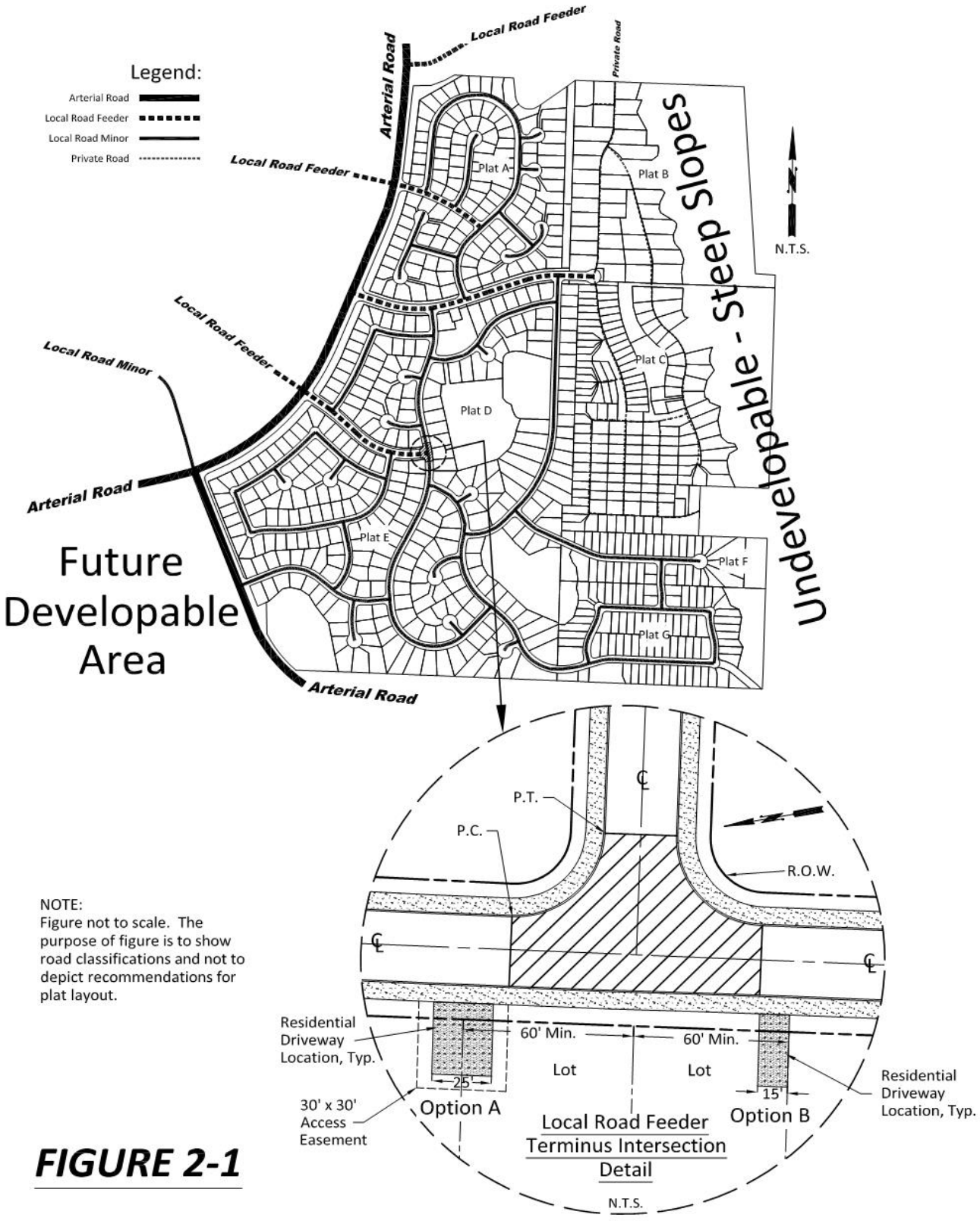
A. An **Alley** is a privately-owned vehicle driving surface not designated for general travel that is primarily used as a means of access to the rear of residences. An alley can only connect to the local road system. Dead end alleys are strongly discouraged. Alleys are less than 750 feet in total length. Alleys must serve a minimum of two lots. With the exception of lots within an Urban Infill Development (reference Title 18J), lots served by alleys must also abut a local road.

B. A **Shared Access Facility** is a privately-owned driving surface which provides vehicular access to at least two lots.

For single-family and two-family dwelling unit lots, a shared-access facility carries a maximum of 90 ADT and is a maximum of 500 feet in length.

A shared-access facility may serve any number of commercial use or industrial use lots when the intent of the shared-access facility is to provide access through interlinked or shared parking facilities as are common in commercial centers (e.g., shopping malls).

For formal plats located in the urban area that contain up to 35 lots, up to 20 percent of the lots within the plat may be served by a shared-access facility. For formal plats located in the urban area with more than 35 lots, up to 10 percent of the lots within the plat may be served by a shared-access facility.



NOTE:
Figure not to scale. The purpose of figure is to show road classifications and not to depict recommendations for plat layout.

FIGURE 2-1

2-1.4 Subdivision Road and Access Layout

Subdivision road and access layout is guided by a few basic principles such as, (1) safety for both the vehicular and pedestrian traffic, (2) efficiency of services for all users of the roadway connectivity, (3) livability of the residential environment, and (4) economic use of the land, construction of the infrastructure, and maintenance of the facilities.

Roads serving as primary access to and from the bordering arterial system should be considered for local road feeder classification with no direct lot access and abutting residences oriented away from it. Traffic generators within residential areas, such as schools or churches, should be considered within the local circulation pattern, not only from within the subdivision, but from adjacent neighborhoods as well.

The roads, shared accesses, and alleys that provide access to lots within a proposed subdivision or proposed Planned Development District shall be designed in a way to ensure that emergency vehicles can legally and physically access each lot.

The number of access points with the arterial roads that border the subdivision shall be arranged to maximize connectivity and promote safety. The subdivision road layout should be designed to maintain relatively uniform low volumes of traffic upon full development. The system should be designed to discourage excessive speeds and should minimize the necessity for traffic control devices, particularly for internal roads with direct lot access.

Figure 2-1 presents a conceptual example of each local road classification working together as a local road system.

2-1.5 Connectivity

Developments shall be designed in a manner that maximizes opportunities for connectivity. Connectivity shall be implemented as the primary consideration for new development proposals in accordance with the standards identified below. A highly connected transportation system within the County will provide choices for drivers, bicyclists, public transit passengers, and pedestrians; promote walking, bicycling and public transit; connect neighborhoods to each other and to local destinations such as schools, parks, and shopping centers; reduce vehicle miles of travel and travel times; improve air quality; reduce emergency response times; increase effectiveness of municipal service delivery; and free up arterial capacity to better serve regional long distance travel needs.

Each of the following standards shall be met (as applicable), unless it is determined that there are barriers that make it infeasible, or implementation of the standard will produce an undesirable impact.

The final determination of infeasible or undesirable impact will be made by the County Engineer or his/her designee.

The following standards should apply (as applicable):

A. Roadway connectivity shall be accomplished through the design and connection of arterials, Local Road Feeders, or Local Road Minors, rather than cul-de-sacs or dead-end neighborhoods. Arterials and Local Road Feeders are recommended as a means of safely accommodating the projected traffic volumes while minimizing impacts of through traffic to those residing in the subdivision prior to the connection. Local Road Minors shall be utilized for connectivity of small subdivisions under low volume, low speed situations.

B. When a future extension of a proposed road is planned, the new road shall be public. New private roads are allowed when it is determined that there is no opportunity for a connection to a neighboring parcel or development, or when there is not a public road available for providing access to a development.

C. When new development abuts land where road stub-outs, easements, or right-of-way has been used to provide the opportunity for future road connections, the development should be designed to utilize these connections.

D. When new development abuts vacant or underdeveloped parcels of land the development shall provide for future connection to its interior road and sidewalk network by constructing a road stub to the property line of the abutting property.

E. When multiple vacant or underdeveloped parcels abut a new development a connection to each parcel may not be required. Connection points will be determined based upon an overall consideration of existing and desired circulation patterns in the area. Emphasis shall be given to connections with larger parcels and parcels which would permit future connections to other existing roadways.

F. A road connection between residential developments and abutting commercial or industrial zones may not be required, however, will be evaluated depending on the proposed and existing adjacent use. Pedestrian connections shall be provided.

The following additional standards shall apply for Commercial, Office/Business, and Civic Uses:

G. Vehicular and pedestrian connections to adjacent non-residential or non-industrial properties shall be provided through the use of cross access easements, common entryways, shared internal roadways, shared parking lots, or similar techniques. In situations where a connection will not be immediately obtained, the parking should be designed to connect in the future.

H. Frontage roads and/or parking access roads shall be established.

The following additional standard shall apply within Towne Center, Urban Corridor, Neighborhood Corridor, and Employment Corridor zones:

I. Roadway sections shall extend the full frontage of development.

2-1.6 Temporary Cul-de-Sac

A Temporary Cul-de-sac shall only be allowed when the road will likely be extended to connect to another road, thus making it a future through road. Temporary cul-de-sacs shall be provided for all roadways longer than 100 feet that will be extended in the future. Construction plans shall include an end-of-roadway marker (OM4-3) at the end of the driving surface. Above the end-of-roadway marker a regulatory sign with the following legend "THIS ROAD IS PLANNED TO BE EXTENDED IN THE FUTURE" shall be placed. At the roadway end, a row of fast-growing evergreens (hedge variety of *American Arborvitae*) shall be installed along the property line. The developer shall be responsible to ensure the establishment and survival of the evergreen trees prior to the release of the 18-month financial guarantee. When conditions such as a non-traversable slope past the pavement warrant a stronger treatment, a Type 3 barricade shall be used in lieu of the trees. When using the Type 3 barricade the sign with the legend "THIS ROAD IS PLANNED TO BE EXTENDED IN THE FUTURE" shall be placed in the middle of the barricade, immediately above the top rail. All barricades shall meet the MUTCD Section 3F.01.

When an asphalt concrete raised edge roadway is proposed, the roadway cross section (including any curbing and sidewalks) shall be constructed through the temporary cul-de-sac area.

When a cement concrete traffic curb and gutter or asphalt concrete barrier curb roadway is proposed, the roadway cross section shall terminate at the beginning of the temporary cul-de-sac.

Appropriate provisions for storm drainage runoff shall be provided for the temporary cul-de-sac.

When the roadway is extended the temporary cul-de-sac shall be removed and the applicable full roadway section (including any applicable curbing, sidewalks, shoulder, etc.) within the temporary cul-de-sac area shall be completed. This work shall be completed by the proponent of the roadway extension.

2-1.7 Urban Infill Roads

Chapter 18J.17 of the Pierce County Code provides for unique roadway cross sections to be allowed for certain development types and areas of the County. These requirements provide for public road designations of Neighborhood Street and Access Lane.

Neither a Neighborhood Street nor an Access Lane shall be longer than 150-feet in length without a turn-around at the end of the street or lane, or a through connection to another road. The use of cul-de-sac bulbs are prohibited. Acceptable turnarounds for neighborhood streets and access lanes can be found in the Standard Drawings.

2-2 Right-of-Way and Easements

2-2.1 Roads

County operated and maintained roads must be dedicated to the County as right-of-way. Roads that are to be operated and maintained by a private organization such as a homeowner's association must be located in an easement or tract. The road right-of-way, easement, or tract width shall be determined by the roadway characteristics involved in the design.

The minimum right-of-way, easement, or tract widths for roads shall be as follows:

Arterials	Urban	Towne Center Urban Corridor Neighborhood Corridor Employment Corridor Zones	Rural
Major	90 feet	n/a	80 feet
Secondary	80 feet	60 feet[e/f]	70 feet
Collector	70 feet	60 feet[e/f]	60 feet

Local Road System	Urban	Towne Center Urban Corridor Neighborhood Corridor Employment Corridor Zones	Rural
Feeder	60 feet[a]	60 feet[d]	60 feet[a]
Minor	60 feet[b]	60 feet[d]	60 feet[b]
Cul-de-sac	60 feet[b]	n/a	60 feet[b]
Neighborhood Street	48 feet[c]	n/a	n/a
Access Lane	40 feet[c]	n/a	n/a

[a] A 50-foot-wide right-of-way, easement or tract may be used when all utilities are located underground.

[b] A 44-foot-wide right-of-way, easement or tract may be used when all utilities are located underground.

[c] All utilities must be located underground.

[d] A 40-foot-wide right-of-way, easement or tract may be used when all utilities are located underground.

[e] Minimum right-of-way widths vary based on required sidewalk widths for each Urban corridor zone.

[f] Minimum right-of-way widths vary based on required type of parking (parallel/back-in angle) for each Urban corridor zone.

Additional right-of-way, easement, or tract width may be required to accommodate all planned roadway improvements (including but not limited to shoulders, drainage facilities, buffers, sidewalks, walkways, traffic control devices, utilities, intersections, design sight lines, retaining walls, all necessary outer slopes and maintenance of the roadway). The overall right-of-way, easement, or tract width shall also provide a minimum distance behind the shoulder/sidewalk/walkway/ditch (on each side of the roadway) to assure accommodation of all traffic control devices, utilities, roadway appurtenances, stopping sight distance and entering sight distance requirements. The minimum distance shall be 4 feet for arterial and feeder road classifications. The minimum distance shall be 1.5 feet for minor, cul-de-sac, neighborhood street, and access lane road classifications. When a buffer width of 6 feet or more is provided, which can accommodate all the necessary traffic control devices, utilities, roadway appurtenances, stopping sight distance and entering sight distance requirements, the County Engineer may reduce this required 4 feet of right-of-way to only 1 foot.

Right-of-way, easement, or tract widths should be provided in 1-foot increments; however, the County Engineer may approve other incremental widths as deemed appropriate for the circumstance at hand.

2-2.2 Projects with Frontage on County Right-of-Way

In instances where a development generates additional traffic onto a public roadway and said development has frontage on that roadway, the County Engineer will require the right-of-way to meet the above minimum widths in accordance with RCW 82.02.020, which shall be processed as either a dedication or deed action and shall occur at the earliest of any of the following development actions:

- Prior to, or concurrent with, the recording of a subdivision of land, alteration of subdivisions, or a Binding Site Plan.
- Prior to issuance of a Site-Development Permit if none of the above land use actions apply.
- Prior to issuance of either a residential or commercial Building Permit.

2-2.3 Conveyance

Any conveyance instrument delivered to Pierce County related to any County road shall be recorded at the Pierce County Auditor's Office. Such recording process shall be administered by the County Engineer.

2-3 Design Vehicle

The physical characteristics of vehicles and the proportions of variously sized vehicles using the road system are positive controls in geometric design. Therefore, it is necessary to examine all vehicle types, select general class groupings, and establish representatively sized vehicles within each class for design use. Design vehicles are selected motor vehicles with the weight, dimensions, and operating characteristics used to establish road design controls for accommodating vehicles of designated classes. For purposes of

geometric design, each design vehicle has larger physical dimensions and larger minimum turning radius than those of almost all vehicles in its class.

Three general classes of vehicles have been selected, namely, passenger cars, trucks, and buses/recreational vehicles. The passenger car class includes compacts and subcompacts plus all light vehicles and light delivery trucks (vans and pickups). The truck class includes single-unit trucks, truck tractor-semitrailer combinations, and trucks or truck tractors with semitrailers in combination with full trailers. Buses/recreational vehicles include single unit buses, articulated buses, school buses, motor homes, and passenger cars or motor homes pulling trailers or boats. In addition, where provision is made for bicycles on a road, the bicycle should also be considered a design vehicle.

The dimensions for 19 design vehicles representing vehicles within these general classes are given in the AASHTO Green Book. In the design of any road facility, the largest design vehicle likely to use that facility with considerable frequency or a design vehicle with special characteristics that must be taken into account in dimensioning the facility is used to determine the design of such critical features as radii at intersections and radii of turning roadways. Design vehicle profiles can be determined from the dimensions in the AASHTO Green Book.

Although the Engineer should develop a design in accordance with the anticipated composition of traffic likely to use the facility, the typical design vehicle using AASHTO Green Book nomenclature (for each road class), is as follows:

Arterials	
Major	Bus/Intermediate Semi-trailer Truck (Wheelbase-40)
Secondary	Bus/Intermediate Semi-trailer Truck (Wheelbase-40)
Collector	Single Unit Truck / Bus

Local Road	
Feeder	Single Unit Truck / Passenger Car
Minor	Single Unit Truck / Passenger Car
Cul-de-Sac	Passenger Car
Urban Infill Design	Passenger Car

2-4 Design Speed

Design speed is a selected speed used to determine the various design features of the roadway. Geometric design features of a road facility should be consistent with the design speed appropriate for the facility. It should be noted, however, that the design speed does not necessarily represent the anticipated operating or posted speed.

Design speed for the arterial road system should consider the context of the roadway, local circumstances and characteristics, and the safety of all-users. Design speed should be selected appropriate for the facility character so as to be responsive to established community goals, provide for the safe movement of vehicles, commerce, transit, and non-

motorized users, and provide for traffic flow appropriate for the facility. Since a function of local roads is to provide access to adjacent property, all design elements should be consistent with the character of activity on the adjacent road and should encourage speeds generally not exceeding 30 mph. The Design Speed for each road class, unless otherwise approved by the County Engineer or otherwise specified by ordinance, is as follows:

Arterials	Urban	Rural
Major	45 mph	45 mph
Secondary	40 mph	45 mph
Collector	35 mph	40 mph

Local Road	Urban	Rural
Feeder	30 mph	30 mph
Minor	25 mph	25 mph
Cul-de-Sac		
Stem over 250 feet in length	25 mph	25 mph
250 feet or less in length	20 mph	20 mph
Urban Infill Design		
Neighborhood Street	25 mph	N/A
Access Lane	20 mph	N/A

2-5 Traffic Characteristics

2-5.1 Trip Generation

Trip Generation, as published by the Institute of Transportation Engineers, shall be used when developing traffic generation volumes.

2-5.2 Design Volumes

Road and street capacities should be designed for a specific traffic volume range, using the projected ADT for some future design year, preferably 20 years hence. Current and future land use trends should also be considered in making these decisions. On some low volume facilities, traffic volumes may not normally change significantly for the foreseeable future. In an urban environment, these would typically be relatively short streets that are not likely to be extended. In rural areas, they most likely would be remote agriculture or natural resource access roads where there is little or no likelihood of land use change.

2-5.3 Capacity--Level of Services

Circular 209 - Highway Capacity Manual shall be used when analyzing capacity of roadway or intersection operation. Left-turn pockets and left-turn lanes shall utilize Highway Research Record (HRR) 211 methodology for analysis of needs at unsignalized intersection locations.

2-5.4 Truck Facilities

Truck turning radii as detailed in the "AASHTO Green Book" should be provided where significant volumes of heavy trucks are expected. Truck climbing lanes, where warranted, shall be provided as detailed in the "AASHTO Green Book."