CHAPTER 2

ROADWAY AND RELATED WORK

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2-1 GENERAL REQUIREMENTS

All construction and improvements of roadway and related work, whether public or private, shall be in accordance with the plans approved by the City Engineer and shall be completed to the satisfaction of the City Inspector in accordance with these Standards and the construction permits issued for the project. The AMC and these Standards establish policy for the installation of street improvements. Specific applications may be reviewed with the applicant at a scheduled pre-application conference or will be determined at the time of permit application and/or issuance. In general, except where modified or amended in these Standards, all work and materials shall conform to the latest editions of the WSDOT/APWA Standard Specifications.

2-2 ROADWAY CLASSIFICATIONS

2-2.01 ROAD CLASSIFICATIONS

Most streets are provided a classification by the Transportation Element of the Comprehensive Plan in accordance with the AMC 20.56.010. Where a street is not classified therein, the classification shall be based upon the projected volume of traffic to be carried by the street, stated in terms of the number of trips per day.

The number of dwelling units to be served by the street may be used as an indicator of the number of trips but is not conclusive.

Whenever a subdivision street continues an existing street that formerly terminated outside the subdivision or it is expected that a subdivision street will be continued beyond the subdivision at some future time, the classification of the street will be based upon the street in its entirety, both within and outside of the subdivision.

The City's Official Street Map contained in the Transportation Element of the Comprehensive Plan classifies the City's streets into Principal Arterial, Minor Arterial, Collector, and Local Access.

1) Principal arterials provide for movement across and between large subareas of the City and serve predominantly "through trips" with minimum direct service to abutting land uses.

2) Minor arterials provide for movement within large subareas of the City. They may serve secondary traffic generators and traffic from neighborhood to neighborhood within a large community.

3) Collectors promote the flow of vehicles, bicycles and pedestrians from arterial roads to lower-order roads. Secondary functions are to serve abutting land uses and accommodate public transit. Traffic volumes typically range between 1,000 to 3,000 ADT.

4) Local access roads are designed to convey vehicles, pedestrians and bicycles to and from higher-order roads. Local access roads do not carry through traffic. Traffic volumes of 250 ADT or less are typical.

Typical sections and roadway appurtenances are shown in Standard Details R-010 through R-050. Modifications to the typical road sections may be required to address site specific soil conditions, drainage considerations and vehicle loads. Where higher than normal truck traffic is projected, the developer's traffic and geotechnical engineers should evaluate the adequacy of the proposed section and recommend any additional specific measures necessary to provide a minimum 20-year design life for the new asphalt pavement section. A minimum of 40-year design life is to be used for concrete pavement sections.

2-2.02 RIGHT-OF-WAY AND EASEMENTS

Standard right-of-way widths for road classifications are specified in AMC 20.56.080 and shown in AMC Table 20.56-5. These right-of-way widths shall apply for road design, except where these Standards specify other right-of-way requirements. Additional right-of-way and traffic lanes may be required to accommodate turning movements at intersections and parking as determined through special traffic studies for proposed projects.

Deeded or dedicated right-of-way is required for all public street and roadway improvements in accordance with these Standards, the AMC and the Transportation Element of the Comprehensive Plan. All portions of the traveled lanes, parking lanes, curbs, gutters, sidewalks, medians, bike lanes, trails, drainage facilities and other required public utilities shall be located within the right-of-way.

Where existing right-of-way width is not sufficient for the required improvements, the Developer shall obtain additional right-of-way and arrange for dedication to the City at his/her expense per AMC 20.56.170.

Under certain circumstances, it may be desirable to reduce right-of-way width and locate facilities, such as sidewalks, walkways or trails, in separate tracts of land outside the right-of-way. Such tracts shall be owned and maintained by the homeowners association and guaranteed by covenants recorded with the plat. The recorded covenants shall be referenced on the approved final plat documents.

Easements for the purpose of construction, access, maintenance, sight distance preservation, roadway slopes, and utilities may be required in addition to required right-of-way, and in conjunction with roadway improvements. See Section 1-3 of these Standards for easement requirements. Street landscaping, as required by the City, may be included in the easements. It shall be the Developer's responsibility to obtain necessary easements. When off-site easements are required, they shall be approved and recorded prior to construction plan approval unless otherwise directed by the City Engineer.

Fire accesses into residential short plats shall be regulated by the AMC. If the access is for two dwelling units, the minimum width of access easement shall be 20 unobstructed feet and the minimum width of pavement shall be 12 feet. The access serving three or four dwelling units shall have a minimum of 25 feet of easement and a minimum of 20 feet of pavement. The accesses serving commercial/industrial or multi-family developments shall have a minimum of 25 feet of easement and a minimum of 20 feet of pavement.

2-2.03 BIKE LANES AND TRAILS

Requirements for bike lanes and trails are established in the City Transportation Element of the Comprehensive Plan. Exact locations and widths of bike lanes and trails with respect to sidewalks and road lanes will be determined on a project specific basis. The Director of Public Works will determine final locations, widths, and related requirements. If the required bike lane or trail will not fit within the existing right-of-way available, then the Developer shall obtain, at his/her cost, and/or dedicate to the City additional right-of-way and easements necessary. Design and construction of bike lanes and trails shall conform to AASHTO standards for bike lanes, trails and paths.

2-2.04 UTILITIES

Typical locations of public utilities in roadways are shown on Standard Detail R-060 for design purposes. Deviations from the typical locations in the Standards Details may be proposed by the Developer's Engineer and reviewed/approved by the City. Refer to Chapters 3, 4 and 5 of these Standards for storm drainage, water and sanitary sewer design and construction considerations. Prior to design and construction, the Developer's Engineer or Surveyor shall arrange for underground utility locations to be marked on the ground, surveyed and included on the construction drawings. The Engineer/Surveyor shall also research available utilities records for use during the design, permit and construction process.

2-2.05 PRIVATE STREETS

Unless specifically approved by the Director of Community Development, private streets shall not be allowed, unless they serve four (4) or fewer dwelling units now and in the future as described by the City Land Use Code. Private Streets may be approved only when they are:

1) Located in an established tract providing legal access to each affected lot, sufficient to accommodate the required improvements;

2) Not in conflict with the goals of the City Comprehensive Plan;

3) Not going to result in land locking of present or future parcels;

4) Not needed as public roads to meet the minimum road spacing requirements of the Comprehensive Plan and these or other legal entity made up of all benefited property owners as noted on the face of the plat;

5) Built to the pavement thickness outlined in these Standards;

6) Accessible at all times for emergency and public service vehicles; and

7) Clearly described on the face of the plat as a private street not maintained by the City. After construction the street must be clearly signed as a private street.

2-3 ROADWAY GEOMETRICS

Roadway geometrics within the City shall be in conformance with the guidelines of the American Association of State Highway and Transportation Officials (AASHTO) *Policy on Geometric Design of Highways and Streets* and the WSDOT *Design Manual*. The City reserves the right to determine the final project geometric requirements. All new frontage improvements or other street improvements, whether public or private, shall conform to the minimum design geometrics of AASHTO for safe stopping and entering sight distance requirements consistent with the procedure described in these Standards unless otherwise approved by the City.

2-3.01 BLOCKS

1) The maximum length of the residential blocks in an existing or extended grid system shall be 400 feet; those not in the grid system shall be 1200 feet, and the minimum length should be 400 feet, unless no other practicable alternative is available. Variations from these requirements shall be approved by the Director of Community Development in cases of extreme topography and in multiple family residential, commercial, and industrial developments.

2) The maximum and minimum width of blocks shall be sufficient to provide for two rows of lots with an alley or utility easement. The City Engineer may approve a single row of lots where the lots abut a major arterial, a collector street, a drainage course, a railroad right-of-way or a single row of lots in an abutting subdivision of record.

3) Where blocks are longer than 800 feet in length, and where access to a school, park, or shopping center is necessary, a pedestrian walkway between lots approximately mid-block, with a minimum right-of-way width of 10 feet, may be required by the City. The walkway may require surfacing, fencing, and barriers.

2-3.02 ROAD LAYOUT

Road layouts for new developments shall conform to the Transportation Element of the Comprehensive Plan, AMC Chapter 12, and Land Use Code Chapter 20.56. The arrangement of streets shall meet the following requirements:

1) Provide for the continuation or appropriate projection of existing streets in surrounding areas. This shall include but not be limited to new/completed street linkages compatible with an overall city circulation network to provide improved connectivity of the transportation street system.

2) Conform to a plan for the neighborhood approved or adopted by the Director of Community Development to meet a particular situation where topography or other conditions make continuance or conformance to existing streets impracticable.

3) When a subdivision abuts or contains an existing or proposed arterial street. The City may require marginal access streets, reverse frontage lots with screened vegetation contained in an easement along the rear property line, deep lots with rear service alleys, or other treatment that may be necessary for adequate protection of residential properties and to afford separation of through and local traffic.

4) The principals of traffic calming shall be used for residential access streets where it is determined by traffic study that cut-through traffic is probable and the development will contribute to or exacerbate neighborhood cut-through traffic or speeding.

5) Reserved strips controlling access to streets shall be prohibited except where they can be controlled by the City under conditions approved by the City Engineer. They must also provide access to adjoining undeveloped property as determined by the City.

6) Where a proposed development shall create or cause to exist 49 or more dwelling units (new or combination of new and existing), either single family, multi-family, retirement, or similar, a minimum of two vehicular access points to the street system are required. Such access points shall be located for circulation, alternate emergency vehicle access routes, through access and general area transportation design considerations. The emergency access (crash gate) shall be approved by the Fire Chief and shall not be considered a vehicular access point.

7) Property lines at street intersections shall be rounded with a radius of 10’ or greater if required by the City. The City may permit comparable cutoffs or chords in place of rounded corners.

2-3.03 INTERSECTIONS

1) Angle of Intersection; streets shall be laid out so that intersecting streets are at nearly right angles (80 to 90 degrees) unless otherwise approved by the City Engineer. Not more than 2 streets shall intersect at any one point unless the City Engineer certifies that such an intersection can be constructed with no extraordinary danger to public safety.

2) Grades at Intersections; road grade transitions at intersections shall be designed using vertical curves wherever the grade change exceeds 1%. This includes the transition from the slope of the intersecting road to the cross-slope of the road being intersected.

   For safety reasons, a landing or safe stopping area must be provided before the intersection. The landing may be part of the vertical curve transition between the slope of the intersecting road and the cross-slope of the road being intersected. The standard to be met for an acceptable landing is no more than one foot of elevation change for a distance of 30 feet from an arterial road or 20 feet from a non-arterial road, measured from the ultimate right-of-way line of the road being intersected.

   For low-volume roads (<1,000 ADT) approaching a stop sign controlled intersection, a 20 mph design speed with a minimum vertical curve length of 60 feet may be used for the final curve at the intersection.

3) Centerline Offsets; whenever possible, proposed intersections along one side of a street shall coincide with existing or proposed intersections on the opposite side of such street. In any event, where a centerline offset (jog) occurs at an intersection, the distance between centerlines of the intersecting streets shall not be less than 150 feet. On any street classified as arterial, the distance between centerlines of the intersecting streets shall not be less than 300 feet. Except when no other alternative is practicable or legally possible, no two streets may intersect with an arterial on the same side at a distance of less than 1,000 feet.

4) Every intersection shall be designed to accommodate the design vehicle appropriate for the highest classified street forming the intersection. All elements of the intersection, including turning lanes and channelizing islands, shall be designed so that a design vehicle will not encroach onto curbs, sidewalks, traffic control devices, channelizing islands, or center divisional medians, or encroach into the travel lanes of opposing flow traffic.

2-3.04 CURB RETURN RADII

For the intersection of two residential access streets, the minimum allowable curb radius shall be 25 feet, which is to be measured from the radius point to the face of curb. For the intersection of a residential access street with any collector or arterial, the minimum radius shall be 30 feet.

On all other street intersections, the minimum allowable radii shall be 30 feet, except where high concentrations of pedestrians (i.e. the downtown business core) would encourage smaller radii. The City Engineer may approve a reduced radius to minimize pedestrian crossing length so long as the turn movement is not subject to a high degree of large truck/bus movements.

Radii of 40 feet or more shall be provided where large trucks and buses turn frequently. Radii of 40 feet or more shall be designed to fit the paths of appropriate design vehicles. Larger

radii are also desirable where speed reductions would cause problems. The WSDOT *Design Manual* shall be used as a guide in evaluating such designs.

2-3.05 DEAD END STREETS

Dead end streets shall be avoided. Cul-de-sacs may be used only when conditions warrant their use. Maximizing the number of lots in a project does not warrant their use. When roads have a potential for extending to adjacent properties (either current or future) they shall do so.

Cul-de-sacs shall be provided at all permanent street ends, and/or on any temporary dead end location when the length of the street is more than 150 feet in length. Cul-de-sacs shall be per Standard Detail R-070 and shall not be longer than 600 feet measured from center of cul-de-sac to the nearest street intersection, unless written approval is granted by the Fire Chief and confirmed with the City Engineer. Private access roads serving less than 3 lots do not require a turnaround.

The maximum slope in any direction within a cul-de-sac bulb is 6%. A temporary road end may exceed 6% with the approval of the Fire Chief.

A drop-curb cul-de-sac is a design option that may be used where multiple driveways around a cul-de-sac bulb will reduce the functionality of vertical curbs, planter strips and sidewalks. Where five or more access points are taken around the bulb, vertical curb and planter strips may be eliminated and a drop-curb (1-inch lip) or rolled curb installed around the cul-de-sac.

On temporary dead ends, when the street is less than 150 feet in length, the required turnaround area may be a hammerhead type (see Standard Detail R-080). However, if four or more access points are located within 50 feet of the road end, then a cul-de-sac is required.

2-3.06 ALLEYS

1) The width of an alley shall be as shown in the Standard Detail R-040.

2) Alley intersections and sharp changes in alignment shall be avoided. Corners shall be cut off sufficiently to permit safe vehicular movement if necessary.

3) Dead-end alleys shall be avoided where possible. If it is unavoidable, adequate turnaround facilities shall be provided at the dead-end as determined by the Fire Chief.

2-3.07 HALF STREETS

Temporary three-fourth streets (i.e., streets of less than the full width of right-of-way and pavement width) may be allowed at the discretion of the City under the following conditions.

1) Where such street, when combined with a similar street developed previously, simultaneously, or anticipated to be built within a reasonable time frame on property adjacent to the subdivision, creates or comprises a street that meets the right-of-way and pavement requirements.

2) Where no more than ten (10) dwelling units will use the three-fourth (¾) street.

3) Where a temporary three-fourth (¾) street is allowed, the portion to be built shall be paved, at a minimum, to a width equal to three-fourth (¾) of ultimate paved width. Curb, gutter, sidewalk, landscape strip, and street trees are to be built in conjunction with each respective half-street (½) on the side adjacent to the proposed project.

4) Where a public right-of-way has been or is being dedicated to the City over those portions of the adjacent property to be used as a half-street.

5) When a temporary three-fourth street is eventually completed to a full-width street, the then Developer shall obtain the right-of-way or easements needed to complete the above improvements and reconstruct the street as necessary to produce a full-width street to meet the current City Standards at their expense.

2-3.08 LOTS

Depth, width, area and shape of lots for commercial or industrial purposes will be in conformance with the *City's Land Use Code*. Off-street service and parking facilities may be required by the type of use and development contemplated.

All corner lots shall have additional width to provide for proper yard setback on the side street and provide an adequate building area.

Double frontage lots shall access only one street, except that the City Engineer may approve dual access for lots where it is essential to provide separation of residential development from major traffic arterial or to overcome specific disadvantages of topography. A 20 foot buffer easement with appropriate screening shall be provided along the lot lines of lots abutting an arterial or railroad. There shall be no right of vehicular access across the buffer easement to eliminate traffic conflicts.

When the rear or side of any lot borders a freeway, highway, or parkway, the Developer may be required to provide a 30 foot, Type A landscape buffer for residential use adjacent to such thoroughfare. No lot shall be created which is divided by County, City, school, or other taxing district boundary lines.

2-3.09 DRIVEWAYS

1) The City shall have the authority to restrict the number, size and location of access driveways. In critical on street parking areas, additional off street parking space(s) are required for the on-street parking spaces eliminated by any driveway(s).

2) No driveway approach shall be permitted to encompass any infrastructure. Permit conditions may authorize the applicant to relocate infrastructure, such as valves, hydrants, meters, blow-offs, pump stations, manholes, catch basins, and etc.

3) At intersections, no portion of any driveway approach, including end slopes, shall be permitted closer than four (4) feet to the end of the curb return.

4) Shared driveways are encouraged to minimize the number of access points on arterials. Shared driveway access for more than one parcel may be approved with the contingency that the driveway is jointly owned and maintained, and that covenants, as approved by the City, are established to provide for this maintenance in perpetuity.

5) Driveways shall not be located adjacent to one another in such a manner as to create a “double width” driveway without any landscaping between the driveways.

6) Commercial and multi-family driveway centerlines shall align with opposing driveways or be offset by a minimum of 125 feet, unless otherwise approved by the City Engineer. Driveways on the same side of streets shall have a separation of least 125 feet if possible.

7) Driveways giving access directly onto arterials may be denied if alternate access is available.

8) The width of residential driveway approaches shall not exceed 25 feet unless otherwise approved by the City Engineer. The driveway approach is defined as the area between full sections of a street’s vertical curb that are lowered to allow vehicular access into the property.

9) The width of commercial driveway approaches shall be a minimum of 35 feet and maximum of 40 feet, or otherwise approved by the City Engineer.

10) Commercial driveways located closer than 150 feet from the approach to an arterial intersection may require medians, type "C" curbing, and/or signing to restrict access to safe movements as determined by the City Engineer.

11) The maximum allowable grade for residential driveways shall be 15% per AMC 20.56.070. The maximum recommended grade for commercial driveways is 8%; however, grades up to 15% may be allowed subject to the approval of the Fire Chief and City Engineer. Vertical curves should be used for smooth transitions at significant grade differentials. See Standard Detail R-090.

2-3.10 HORIZONTAL ALIGNMENT

1) Design speed is a speed selected to determine the various geometric design features of a roadway. Design speed shall be used to determine stopping sight distance (SSD) and intersection sight distance (ISD) requirements for new road facilities. A full discussion of sight distance analysis is provided later on in this section.

   Arterial road design speeds are established by the City during project design process. The design speed for a collector is typically 35 mph. The design speed for a sub-collector or residential access is 25 mph.

2) Operating speed is the observed speed of vehicles during free flow conditions. Operating speed shall be the 85th percentile speed of a roadway as determined by recorded data by the Public Works Department. Where circumstances create a safety concern, the City Engineer may direct that a speed study be performed to determine the 85th percentile (85%) speed.

   Operating speed shall be used on existing roads to determine stopping sight distance and intersection sight distance requirements where the traffic volume on the minor road is less than 80 ADT.

3) Horizontal Curve Radii and Superelevation; the minimum horizontal curve design criteria, including curve radii and superelevation, for design speed of 40 mph or less, should be determined using the AASHTO *Policy on Geometric Design*.

   For design speed above 40 mph, horizontal curve design shall comply with Chapter 6 of the WSDOT *Design Manual*.

   A tangent between reverse curves shall be at least 100 feet long on arterial and collector streets, and 50 feet long for residential access streets.

   The maximum superelevation rates allowed for arterial roads, with design speeds of 35 mph or greater, shall be 6% unless otherwise approved by the City Engineer. The maximum superelevation rates for roads with design speeds of 30 mph shall be 4% or as directed by the City Engineer. Superelevation is not recommended for use on non-arterials in the City with design speeds of less than 30 mph.

2-3.11 VERTICAL ALIGNMENT

1) Grades; road grades shall be 0.5% or greater to provide proper drainage. The maximum grade on any new or reconstructed road shall not exceed the limits in Table 2-1. Grade transitions shall be constructed as vertical curves except at new intersections where the difference in grade is 1% or less.

Table 2-1 Maximum Grade

Road Classification	**Max. Grade**
Arterial	8%
Collector Arterial	10%
Local Collector	12%
Local Access	14%
Alley	14%
Cul-de-Sac	14%
Cul-de-Sac Bulb	6%
Private Access	15%
Pedestrian Way	Per ADA

2) Vertical curves shall meet or exceed the criteria in AASHTO *Policy on Geometric Design* for crest vertical curves and sag curves, to ensure that minimum stopping sight distance is provided.

2-3.12 SIGHT DISTANCE

1) Sight distance criteria established in this section are based upon AASHTO *A Policy on Geometric Design*, 2001 edition.

   Each new intersection or access point connection must meet the stopping sight distance (SSD) and intersection sign distance (ISD) requirements set forth in this Chapter.

   Sight distance requirements in this section are based on passenger car operation and do not account for heavy vehicle operating characteristics. Access points or intersections that will handle significant numbers of heavy vehicles or trucks, as determined by the City Engineer, shall be designed in accordance with Chapter 9 of AASHTO.

2) Stopping Sight Distance (SSD) is the distance needed for a vehicle traveling at or near design speed to stop before reaching a stationary object in its path. The provision of stopping sight distance at all locations along each highway or street, including intersection approaches, is fundamental to intersection operation.

   SSD requirements as shown in Table 2-2 shall be the minimum acceptable values for designing new vertical and horizontal road alignments and evaluating the adequacy of existing vertical and horizontal alignments. Design speed shall be used to determine SSD requirements for new facilities. Operating speed shall be used to determine SSD for existing facilities.

Table 2-2 Stopping Sight Distance

Speed (mph)	Distance, D (feet)
20	115
25	155
30	200
35	250
40	305
45	360
50	425
55	495

Adapted from Exhibit 3-1, A Policy on Geometric Design of Highways and Streets, AASHTO (2001)

When measuring SSD, the height of the driver's eye is assumed to be 3.5 feet and the height of the object to be seen by the driver is 1.5 feet above the pavement. The driver's line-of-sight may not fall within the limits of the road; for example, on a horizontal curve the sight line will be a chord of the curve. SSD is measured along the center line of the vehicle's travel lane.

3) Effect of Grade on Stopping Sight Distance; the SSD in Table 2-2 is based on flat road grades. For downgrades or upgrades of 3 percent or greater, SSD requirements are shown in Table 2-3. Grades other than those shown in the table may require interpolation.

Table 2-3 Stopping Sight Distance on Grades

SSD (feet) for Downgrade				SSD (feet) for Upgrade			
Speed* (mph)	3%	6%	9%	Speed (mph)	3%	6%	9%
20	116	120	126	20	109	107	104
25	158	165	173	25	147	143	140
30	205	215	227	30	200	184	179
35	257	271	287	35	237	229	222
40	315	333	354	40	289	278	269
45	378	400	427	45	344	331	320
50	446	474	507	50	405	388	375
55	520	553	593	55	469	450	433

** Design speed for new facilities. Operating speed for existing facilities.*

Adapted from Exhibit 3-2, A Policy on Geometric Design of Highways and Streets, AASHTO (2001).

4) Intersection Sight Distance (ISD) is the distance necessary for the driver of a vehicle stopping at an intersection to decide when to enter or cross the intersecting roadway, and for the driver of a vehicle traveling at or near the posted speed on the intersecting roadway to reduce speed to avoid overtaking a vehicle that has entered the roadway.

When measuring ISD, the driver's eye location is assumed to be 15 feet from the edge of the traveled way. The height of driver's eye is assumed to be 3.5 feet and the height of the object to be seen, assumed to be another vehicle, is 3.5 feet above the pavement. Clear sight triangles are shown in Standard Detail R-100.

The ISD requirement is determined by the type of intersection and the traffic volume.

Table 2-4 shall be used for low-volume, non-arterial intersections where the minor road or access point traffic volume is projected to be 80 ADT or less. This table corresponds to the stopping sight distance requirements of AASHTO.

Table 2-5 shall be used when the ultimate traffic volume for the proposed road or access point is projected to be more than 80 ADT, or the intersecting major road is an arterial.

A private residential driveway, serving 20 ADT or less, that intersects an arterial shall use Table 2-4 instead of Table 2-5.

Table 2-4 Intersection Sight Distance < 80 ADT

Speed* (mph)	Distance, D** (feet)
20	115
25	155
30	200
35	250
40	305
45	360
50	425
55	495

** Design speed or new facilities; Operating speed for existing facilities.*
***Table 2-3 applies if grade is 3% or greater.*

Adapted from Exhibit 3-1, A Policy on Geometric Design of Highways and Streets, AASHTO (2001)

Table 2-5 Intersection Sight Distance > 80 ADT

Speed (mph)	Distance, D (feet)
20	225
25	280
30	335
35	390
40	445
45	500
50	555
55	610

Adapted from Exhibit 9-55, A Policy on Geometric Design of Highways and Streets, AASHTO (2001)

For low-volume, non-arterial intersections with 80 ADT or less, use Table 2-3 instead of Table 2-4 to account for an intersecting (major) road with a downgrade or upgrade 3% or greater.

For arterial intersections or intersections serving more than 80 ADT, a driver's time gap acceptance time must be adjusted, and therefore the values of Table 2-5, when vehicles other than passenger cars will be present, or where the intersecting major road has multiple lanes, or where the minor road approach has a significant grade.

Adjustment factors are provided in AASHTO Exhibit 9-54. Note that the adjustment for minor road approach grade is necessary only if the rear wheels of the design vehicle would be on an upgrade that exceeds 3% when the vehicle is at the stop line of the minor road approach.

If a time gap acceptance time is adjusted, then ISD must be recalculated using AASHTO Formula 9-1:

$$\mathbf{ISD = 1.47\ V_{major} T_s}$$

Where ISD = intersection sight distance in feet, measured along the major road.
V_{major} = design speed of major road in mph
T_s = time gap for minor road vehicle to enter major road in seconds (see Exhibit 9-54)

5) Clear Sight Distance; at any intersection or access point connection, there must be a clear sight triangle to allow a driver stopped on an approach to depart from the minor road and enter or cross the major road.

The triangle is defined by the line of sight from a vehicle stopped on a minor road to a vehicle approaching on the major road and back to the intersection. This area, along the intersection approach legs and cross their included corners, must be clear of obstructions that might block a driver's view of potentially conflicting vehicles. Visibility applies to not only drivers on the minor road, but also drivers on the major road, allowing them to see vehicles stopped at an intersection and to prepare to slow or stop, if necessary.

The vertex, or decision point, of the sight triangle on the major road or access point shall be 15 feet from the edge of the major road traveled way. The edge of the traveled way shall be the outside edge of the travel lane. Bicycle lanes, walkways or paved shoulders are not included.

The driver's eye location may be reduced to a minimum of 10 feet from the edge of traveled way, with the approval of the City Engineer, where the reduction in driver's eye location will not adversely affected safety or operation. Examples where this may be allowed include: an intersection on the outside of a horizontal curve; an intersection where one approach is in a cut or fill; or where a bridge abutment obscures the line of sight from 15 feet back but not 10 feet.

The line of sight defining one side of the clear sight triangle may cross private property and be obstructed by objects or vegetation outside the existing public right-of-way. To ensure that sight distance is maintained, the area within a clear sight triangle shall be acquired and conveyed to the City as new public right-of-way or a sight distance easement recorded to allow maintenance of the clear sight triangle.

When provision of sight distance is a condition of an application approval, it shall be the Developer's responsibility to accomplish any activities necessary to provide sight distance, such as trimming or removal of vegetation or regrading of earth.

6) Special Circumstances; if circumstances are different from those presented in these Standards, the City Engineer may establish sight distance standards and requirements that generally conform to the intent of the sight distance guidelines in the latest edition of AASHTO.

7) Documentation of Sight Distance; to verify acceptable sight distance, the City Engineer may require a Developer to evaluate and document an existing sight distance condition. The evaluation and documentation of sight distance shall include the following, or such additional information as may be necessary to make a determination:

- Plan, profile and cross-section drawings along the sight line
- Posted speed, operating speed and/or speed study data
- Right-of-way and easement limits (existing and proposed)

When the City Engineer determines from the documentation presented that a location has insufficient sight distance, a plan to improve the sight distance to meet these Standards will be required.

2-3.13 TRANSIT STOPS

1) Land development applications and City road projects are reviewed by Community Transit for provision of appropriate transit facilities. Facilities may include pedestrian accessibility improvements, bus stops or pullouts, or other related facilities.

   Bus pullouts will be required if (1) traffic volume and passenger loading/unloading conditions warrant; (2) traffic flow would be greatly hindered by in-lane stopping, or (3) the posted speed limit is 35 mph or greater.

2) Bus pullout location shall be determined by the City Engineer in consultation with Community Transit. Generally, bus pullouts should be placed on the far side of both signalized and non-signalized intersections, and immediately following the intersection is preferred. The distance between bus pullouts should be greater than 1,000 feet.

   Bus pullouts should be constructed on both sides of a two-way street in a complementary pair, if possible.

   Driveways should not be located within the limits of a bus pullout.

2-4 TRAFFIC IMPACT ANALYSIS

2-4.01 RESPONSIBILITY AND PURPOSE

Traffic impact analysis (TIA) is governed by the AMC, adopted Ordinances, and the Public Works Department policies on preparation of these analyses. All developments subject to the traffic threshold identified by the City requires a TIA, the extent of which is dependent on the type and size of development. The primary responsibility for assessing the traffic impacts associated with a proposed development rests with the applicant, with the City serving in a review capacity. The analysis is the responsibility of the applicant and must be prepared by a professional engineer, registered in the State of Washington, with experience in traffic engineering and/or transportation planning.

The extent of the analysis will be determined at the pre-application conference for the project and must be consistent with department policies and procedures for the preparation of such analyses. Scoping the requirements for the analysis is intended to identify key issues early in the project planning and development stage, and assist the City during the review and approval process. A checklist will be prepared documenting the requirements for the analysis. Required number of copies of the TIA must be submitted with the land use

application and other completed forms as required by the City permit application procedures. A copy of the completed checklist must also be submitted with the application.

TIA must show how the proposed development will affect the existing and future transportation network. If the final use(s) of the proposal are not determined at the time of the study, the land use with the greatest overall traffic impact must be assumed for the study. Once the City has reviewed the analysis and comments have been returned to the applicant, any required changes must be incorporated in the analysis and a revised report must be submitted to the City for final review and approval.

2-4.02 TRAFFIC IMPACT ANALYSIS CONTENTS

While individual reports may vary in style and format, certain information must be included as identified in the Public Works Department TIA checklist and guidelines on preparation of TIA. The amount of detail required, as well as the overall extent of the study, will be provided during the pre-application conference on a project specific basis. General requirements of the TIA are outlined below with more detailed description of intent provided in the Public Works Department checklist and guidelines.

Project Description

1) Project type and size.

2) Project location, with vicinity map.

3) Proposed site access, with site plan.

4) Horizon planning year (minimum 2 years from existing condition). Longer horizon years may be necessary when determining ultimate sizing of a roadway facility or addressing multiple phases of a project.

Existing Conditions

1) Existing traffic volumes, daily turning movements.

2) Daily and intersection counts completed within one year prior to a complete application date.

3) Roadway network, including traffic control.

4) Level of service calculations at impacted intersections and site entrances, if applicable.

5) Parking supply.

Accident/Safety Conditions

1) Sight distance analysis at intersections and access points. Minimum stopping and entering sight distance as defined by AASHTO is required.

2) Clear zone analysis (document poles, hydrants, or other obstructions near travel edge).

3) Evaluation of accident data as available.

Trip Generation and Distribution

1) Trip generation using the latest ITE Trip Generation Manual or other approved method.

2) Trip distribution and assignment map showing turning movements assigned to roadway network. The proposed development's trips are to be distributed through the street network to a level as prescribed in the City's TIA Guidelines.

Public Transit and Non-Motorized Facilities

1) Identification of existing transit service.

2) Identification of existing trails, bicycle lanes, and other non-motorized facilities.

Future Conditions

1) Annual growth rate determined by actual data or other approved source.

2) Future conditions, with and without the project, with commentary on compliance with concurrency requirements as needed.

3) Level of service calculations sheets at all impacted intersections and site access points, with and without the proposed project.

4) Effect of proposed development on public transit and non-motorized facilities.

5) Any transportation facilities proposed by the Comprehensive Plan which may affect the development.

Mitigation Measures

1) All developments are subject to the City's Traffic Mitigation Ordinance and mitigation payments to the City, County and State are calculated accordingly.

2) Proposed mitigation to correct any deficiencies not addressed through the Traffic Mitigation Ordinance.

3) Dedication of right-of-way and associated frontage improvements.

4) Evaluation of change in accident potential with proposals to correct safety deficiencies.

Other

1) Analysis of internal site circulation for vehicles, transit, non-motorized users, and handicap access.

2) Safe walk analysis - evaluation and coordination with the School District and Public Works for providing safe walking conditions for all new residential short plats and subdivisions.

2-5 TRAFFIC CONTROL

2-5.01 DISTRIBUTION OF TRAFFIC

All construction and/or maintenance within the City right-of-way shall conform to the provisions of the applicable connection/access permit, the MUTCD, WSDOT *Design Manual*, and other applicable referenced requirements of these Standards. The Department of Public Works may restrict hours of construction to minimize traffic disruption on the street system. If construction activity within the right-of-way causes undue disruption of traffic, creates safety hazards on the street system, or if the construction activity is not in compliance with the traffic control specifications in the permit, the City Engineer will advise the Developer or the Developer's Contractor of the need for immediate corrective action, and may order immediate suspension of all or part of the work if deemed necessary. Failure to comply with this provision may result in permit modification or revocation.

All traffic control devices, signing, striping and other pavement delineation shall utilize the latest edition of the MUTCD as a guideline when preparing designs and traffic control plans. It shall be the Developer's responsibility to furnish all materials and labor as necessary to install all traffic control to satisfy project requirements. All required signage, striping, and other delineation, shall be shown on the street improvement plans prior to plan approval.

2-5.02 TRAFFIC SIGNAL PLANS AND SPECIFICATIONS

Preparation of traffic signal plans and specifications and other traffic control devices shall be consistent with Department of Public Works policies and procedures for maintenance and operations. All designs must be prepared by a Professional Engineer, licensed in the State of Washington, with experience in preparation of traffic signal plans and specifications. The

applicant may be required to schedule a pre-design meeting to coordinate with the City on general requirements and identify the parameters of the design.

The permittee is responsible for securing any State and local permits needed for traffic signalization and regulatory signing and marking.

All signals shall be equipped with preemption that is compatible with the equipment approved by the Fire Chief. New traffic signal installations shall include a minimum of one spare conduit run for any arterial crossing.

Warrants for traffic signals shall be consistent with the practices set forth in the MUTCD. The City Engineer shall determine consistency with these practices based on submitted information by the applicant when determining if a traffic signal is warranted and consistent with City planning.

Traffic signal interconnect to nearby affected signals may be required for any new traffic signal installation to promote progression of traffic and improved efficiency of the travel stream.

2-5.03 CHANNALIZATION PLANS

All designs shall be consistent with the MUTCD, WSDOT *Design Manual* and these Standards. Plans must be prepared by a professional engineer licensed in the State of Washington, with experience in preparation of channelization plans. A pre-design meeting may be required to identify key parameters of the design.

All new crosswalk installations shall be Dura-Stripe or equalivalent with supplemental signing as determined necessary by the City. Mid-block crosswalks shall require supplemental lighting or special treatment to maximize safety as determined by the City. Use of raised pavement markers supplemental to pavement lane striping may be required as determined by the City.

Post mounted street signs shall be as shown in Standard Detail R-110. Traffic regulatory signs shall be installed per Standard Detail R-120.

2-6 FIRE DEPARTMENT ACCESS

As required by the Fire Chief, every commercial or industrial building constructed or moved into the City of Arlington shall be accessible by the Fire Department, both during and after construction, by way of access roadways approved by the Fire Chief. The access roadways shall be no less than 20 feet in width and placed within an approved access tract that is no less than 25 feet in width plus slope easements that may be necessary. There shall be no parking or any other obstruction within the required 20 feet. The inside turning radii for all access roadways shall be no less than 30 feet. The minimum outside diameter for cul-de-sac driving area shall be 100 feet measured from inside face of curb to inside face of curb on the opposite side. If an island is proposed in a cul-de-sac it shall be no larger than 30 feet in

diameter. In all cases at least 35 feet of paved surface shall be provided around a cul-de-sac. If landscape islands are provided on public or private streets at least 20 feet of paved roadway shall be provided on either side.

Fire Department access roadways shall be designed and constructed to support the imposed weight of the fire apparatus. The minimum design weight for fire apparatus access roadways shall be 25 tons. All Fire Department access roadways, regardless of width, shall have a clear unobstructed vertical clearance of 13 feet 6 inches.

The maximum allowable grade on fire lanes, fire access roadways, access easements, or any other roadway that may be used by the Fire Department to access a structure within the City, shall not exceed 15%. However, if unusual circumstances exist this requirement may be modified up to an 18% grade if agreed upon by the Fire Chief and City Engineer. Additional fire protection requirements may be necessary.

Fire Department access roadways serving only one or two single family lots may be reduced to 12 feet of paved surface when approved by the City Engineer and the Fire Chief. This access roadway shall be placed in a separate tract at least 20 feet wide plus any slope easements that may be necessary. There shall be no parking or any other obstructions allowed within the required 20 feet.

Prior to the start of combustible construction a temporary approved access roadway shall be constructed of 4 inches of either ATB or the first lift of Class "B" asphalt and must be capable of supporting the imposed weights identified above. At no time during the construction of a project should the access roadway surface consist primarily of dirt, mud, sand or other material that, in the opinion of the Fire Chief, may impair fire fighting or rescue operations. The above required 20 feet width must be maintained so that the driving surface is recognizable day and night and shall not be obstructed in any manner, including the parking of vehicles and the staging of any construction materials or equipment. Temporary construction gates may be used if approved by the Fire Chief. The Fire Chief may stop construction at anytime if he/she believes the conditions of the road has deteriorated or is not adequate for providing emergency services.

2-7 SURVEY MONUMENTS AND CORNERS

2-7.01 GENERAL

1) In accordance with Chapter 332-120 WAC, no survey monument as defined therein shall be removed or destroyed without first obtaining a permit from the Department of Natural Resources. Any party causing the removal or destruction of a survey monument shall be responsible for ensuring that the original survey point is perpetuated.

2) All existing survey control monuments that are disturbed, lost, or destroyed during surveying or construction shall be replaced, at the expense of the Developer, by a Professional Land Surveyor licensed in the State of Washington.

3) Boundaries of final plats, short plats and binding site plans shall be established with standard steel reinforcing bar or steel pipes permanently marked with the Professional Land Surveyor's registration number. The same corner shall be used to mark the subdivision lot, tract and NGPA easement boundaries. Boundary lines or corners that are section or quarter section corners shall be marked with standard monuments.

4) If a property corner is occupied by a fence post, an offset standard steel reinforcing bar shall be installed along one of the boundary lines. Offset concrete monuments shall only be set to witness section and quarter-section corners.

5) A monument shall be installed at each intersection of a new plat road centerline with the centerline of an existing City right-of-way. Monuments at intersections with state highways are subject to the requirements and approval of WSDOT.

6) Each monument, case, and cover shall be set in accordance with Standard Detail R-130, for all PC, PT, center of cul-de-sac, and street centerline intersection points. The point of intersection (PI) will be acceptable in lieu of a PC and PT for plat road curves, provided that PI falls within the paved roadway and approved by the City Engineer.

7) If monuments have not been set prior to recording of a plat or short plat, then a signed and sealed Certificate of Monumentation shall be submitted by the Developer's professional land surveyor prior to construction acceptance of all land subdivision activities and/or road improvements requiring monumentation.

8) Where an existing monument is on the same tangent line, visible and within 250 feet of the nearest plat boundary line projected to the centerline of a City right-of-way, only one monument is required. However, a backsight monument must be on the same tangent and visible at a distance of not less than 250 feet from a controlling monument. The distance tie between the existing monument and the intersection shall be shown on all plat or short plat drawings and the final plat or short plat.

2-7.02 MATERIALS AND INSTALLATION

Materials for monumentation shall conform to Standard Detail R-130. The cover and seat shall be machined so as to have perfect contact around the entire circumference and full width of bearing surface.

Standard steel reinforcing bar shall be 24 inches in length and at least ½ inch in diameter; steel pipes shall be at least ¾ inch inside diameter. Pipe or rebar shall be permanently tagged with the land surveyor's registration number.

2-7.03 PRESERVATION OF MONUMENTS

The Developer or Contractor shall not disturb any survey monuments or markers during excavation until ordered to do so by the City Engineer. All street monuments, property corners, bench marks and other monuments disturbed during the progress of the work shall be replaced by a land surveyor, at the expense of the Developer, to the satisfaction of the City Engineer.

2-8 LIGHTING

All public streets, sidewalks, and other common areas or facilities in new subdivisions shall be sufficiently illuminated to ensure the security of property and the safety of persons using such streets, sidewalks, and other common areas or facilities.

All roads, driveways, sidewalks, parking lots, entrances, exits, and other common areas and facilities in commercial/industrial and multifamily developments shall be sufficiently illuminated to ensure the security of property and the safety of persons using such roads, driveways, sidewalks, parking lots, entrances, exits, and other common areas or facilities.

Street lighting systems shall conform to the applicable portions of the WSDOT/APWA Standard Specifications Section 8-20, except as modified by the City herein, according to the standards of the Snohomish County PUD and AMC 20.60.400. Street light poles shall meet the requirements of PUD. The extent of lighting shall include as a minimum, illumination of all affected frontage roads and internal roads, whether public or private, related to the development. Additional lighting beyond project limits may be required to address safe walk connections as determined by the traffic study for the development. Special pole styles may be installed with the approval of the City Engineer.

All outdoor lights shall be low sodium or similar lamp type and down shielded to prevent light pollution.

Street light locations must be shown in site/civil plans. The City may require the Developer to add, reduce, or relocate street lights at Developer's expense. Street light plans shall be prepared in accordance with PUD standards and approved by PUD. The Developer shall provide the City with a copy of the approved street light plans before Site Civil plan approval.

Operation and maintenance of public street lights are provided by PUD and paid by the City. The Developer is responsible for construction of street lights and all accessories necessary to energize the street light system, which shall be consistent with City and PUD Standards. When feasible, all new street light wiring, conduit and service connections shall be located underground. Other special luminaries, which are not consistent with the PUD Standards, must be approved by the City Engineer. The installation of special luminaries, not provided by PUD, shall be the responsibility of the Developer.

Maintenance of the completed lighting system in City right-of-way is provided by PUD and paid by the City. Maintenance of private lighting shall be the responsibility of the property owner.

2-9 ASPHALT CONCRETE PAVEMENT & PAVEMENT PATCHING

2-9.01 DESCRIPTION

This work shall consist of asphalt concrete paving and the patching of various types of pavement cuts, the performances of which shall be in accordance with these Standards and the WSDOT/APWA Standard Specifications.

The City may require the final lift of asphalt to be bonded for and delayed for up to one (1) year due to weather and other considerations. A geotechnical study and recommendations will normally be required for any proposed new road construction, widening existing roadways or major repair and overlay work. The Developer shall be responsible for providing such reports, prepared by a Professional Engineer licensed in the State of Washington, for review by the City.

2-9.02 MATERIALS

All materials shall conform to the requirements specified in the WSDOT/APWA Standard Specifications as follows:

1) Asphalt concrete pavement, including patching, shall conform to "Class B" meeting the requirements of Section 5-04, 9-02.1(4) and 9-03.8.

2) Asphalt for temporary patch shall be cold mix (MC 250) meeting the requirements of Section 9-02.

3) Asphalt Treated Base (ATB) shall meet the requirements of Section 4-06 and all others referenced therein.

4) Tack coat shall be emulsified asphalt grade CSS-1 as specified in Section 9-02.1(6).

5) Crack sealing shall conform to Section 5-04.3(5)C.

6) Geotextile fabric for pavement reinforcement shall be needle-punch non-woven 100% polypropylene Products such as "Petromat" or "Supac" as manufactured by Phillips Fiber Corporation, or approved equal. Other products may be submitted by the Developer to the City Engineer for review "as equal" substitutions.

7) Asphaltic binder for use with geotextile fabric shall conform to the manufacturer’s recommendations for the fabric used. Cutback asphalts cannot be used with polypropylene fabrics due to reactions with solvents at high temperatures.

8) Crushed Surfacing Top and Base Courses (CSTC) shall meet the requirements of Section 9-03.9(3).

9) Cement concrete pavement patch shall be Class 4000 High Early Strength (HES) meeting the requirements of Section 6-02.

2-9.03 CONSTRUCTION REQUIREMENTS

General

Signs, barricades, lights and other warning devices shall be installed per the requirements of the MUTCD and shall be maintained 24 hours a day until the roadway work is completed and ready for traffic. See Section 1-3.18 TRAFFIC CONTROL PLAN for instructions.

The placing and compaction of the trench backfill and the preparation and compaction of the sub-grade shall be in accordance with the various applicable sections of the WSDOT/APWA Standard Specifications except as approved by the City Engineer.

Compaction of the sub-grade shall be completed prior to the required asphalt work or patching as determined in the WSDOT *Design Manual*.

Pavement patching shall be scheduled to accommodate the demands of traffic and shall be performed as rapidly as possible to provide maximum safety and convenience to public traffic.

Before the pavement patch is to be constructed the pavement shall be saw cut so that the marginal edges of the patch will form a rectangular shape with straight edges and vertical faces.

When required, cold planing along the edge of existing roadways and at interfaces with existing pavements, shall be completed to the widths and depths established in the plans and specifications. The cold planing should be completed prior to trenching, when feasible, so that remaining pavement patching and overlays can be completed in a uniform manner.

Geotextile fabric materials, when required in the plans and specifications, shall be placed and constructed according to the manufacturer's recommendations. Only contractors experienced in the placement of the material shall be responsible for placement. The manufacturer should make available a representative to review the project conditions, proposed placement methods and equipment to be used, with the contractor and the City Inspector.

Asphalt Concrete on Granular Base

After the Crushed Surfacing Top Course subgrade or ATB has been leveled and compacted, Asphalt Concrete Pavement Class B shall be placed to the thickness indicated on the plans. Asphalt shall be compacted to a minimum 92% of the reference maximum density as determined by WSDOT Test Method 705.

Asphalt-Treated Base (ATB)

This work shall consist of one or more courses of ATB placed on the properly prepared subgrade. The ATB shall be compacted per the requirements of WSDOT 4-06.3(7).

Temporary Pavement Patching

The Developer shall furnish, place and maintain temporary pavement patching, at locations as directed by the City, until such time as a permanent pavement patch can be made. Generally, the permanent patch shall be completed within 2 weeks of the completion of trenching and road repairs, unless an extension is granted by the City. Temporary pavement patch shall consist of asphalt treated base (ATB) compacted to at least 90% of maximum dry density as established for the mix by WSDOT Test Method 705.

Temporary asphalt patching shall be required where roadway or walk is needed for vehicular or pedestrian traffic during the construction period, until permanent pavement and sidewalks can be constructed.

In the event that the temporary surface subsides after the initial placement, additional MC 250 and Crushed Surfacing shall be applied to maintain the surface.

Cement Concrete Pavement Patching

Streets which have cement concrete pavements overlaid with asphalt concrete shall be patched as shown on Standard Detail R-140. After the Crushed Surfacing Top Course subgrade for the pavement has been constructed and compacted to line and grade, the cement concrete pavement patch shall be placed and struck off to a thickness of 1 inch greater than the existing pavement or 8 inches minimum, whichever is greater. All work shall be in accordance with Section 5-05 of the WSDOT/APWA Standard Specifications, except as modified by these Standards.

The cement concrete portion of the patch shall be Class 4000, High Early Strength (HES). The thickness shall be 1 inch thicker than the existing concrete base or 6 inches whichever is greater. The top surface of the concrete patch shall match the top surface of the existing concrete base; in no case shall the top of the concrete be higher than the top of the existing concrete base. Joints shall be placed to match existing or as directed by the City.

Expansion joints and control joints shall be placed to match existing or as directed by the City. The surface of the concrete patch shall be finished and brushed with a fiber brush to improve bonding with the asphalt overlay. Approved curing compound shall be placed on the finished concrete immediately after finishing.

Asphalt concrete plant mix shall not be placed until 3 days after the cement concrete base has been placed or otherwise permitted by the City. The asphalt concrete plant mix shall not be placed until the concrete base has received a tack coat of CRS-2 at a rate of 0.12 to 0.20 gallons per square yard. The edges of the existing asphalt and castings shall also be painted with the tack coat. The asphalt concrete pavement shall then be placed, leveled, and compacted to conform to the surface of the existing asphalt pavement. Immediately, thereafter, all joints between the new and original asphalt pavement shall be painted with CSS-1 asphalt emulsion and covered with dry sand before the asphalt solidifies.

2-10 UNDERGROUND UTILITIES

2-10.01 GENERAL

The WSDOT/APWA Standard Specifications shall apply unless modified herein by these Standards.

When excavating existing pavement, the trench cut shall be a neat line made by either saw cutting or jack-hammering. Saw cutting will be required unless the cut is made prior to reconstruction or an overlay.

Temporary pavement patch shall be accomplished by using cold mix (MC 250), Asphalt Treated Base (ATB) or steel plates.

Where trench excavation equals or exceeds a depth of 4 feet, the Developer shall provide, construct, and maintain safety systems that meet the requirements of the Washington Industrial Safety and Health Act (WISHA), RCW 49.17 and WAC 296-155. The trench safety systems shall be designed by a qualified person, and meet accepted engineering requirements. See WAC 296-155.

The Developer shall furnish, install, and operate all necessary equipment to keep trenches free from water during construction, and shall dewater and dispose of the water so as not to cause damage to public or private property or nuisance to the public. Sufficient pumping equipment in good working condition shall be available at all times for all emergencies, including power outage, and shall have available at all times competent workmen for the operation of the pumping equipment.

Compaction tests will be required to ensure adequate compaction on all lifts. All compaction tests shall be conducted by a licensed testing laboratory at the expense of the Developer. Water jetting or settling of backfill in trenches is not permitted.

2-10.02 TRENCH EXCAVATION

Dimensions

The length of trench excavation in advance of pipe laying shall be kept to a minimum and in no case shall exceed 150 feet unless specifically authorized by the City Inspector. The maximum permissible trench width between the foundation level and the top of the pipe shall be 40 inches for pipe 15 inches or smaller; or 1½ times the pipe diameter, plus 18 inches for pipe 18 inches or larger. See Standard Details W-270 and SS-120. If the maximum trench width is exceeded without written authorization of the City Engineer, the Developer will be required to provide pipe of higher pressure class or to provide a higher class of bedding, as required by the City Engineer.

Interferences

The Developer shall not interfere with any existing utility without the written consent of the City Engineer and the utility owner. If it becomes necessary to remove or relocate an existing utility, this shall be completed by its owner. If a utility owned by the City has to be removed or relocated to accommodate the Developer, it shall be approved by the City Engineer and at the Developer's cost. The cost of modifying other public or private utilities shall be similarly paid by the Developer unless other arrangements have been made with the utility owner(s). The Developer shall support and protect by timbers or otherwise all pipes, conduits, poles, wire or other apparatus which may be in any way affected by the excavation work, and do everything necessary to support, sustain and protect them under, over, along or across the work. If any of the pipes, conduits, poles, wires or apparatus are damaged, they shall be repaired by the utility owner and the expense of such repairs shall be charged to the Developer, and their bond shall be liable.

Protection of Adjoining Property

The Developer shall at all times and at their expense preserve and protect from injury any adjoining property. Where in the protection of such property it is necessary to enter upon private property for the purpose of taking appropriate protective measures, the Developer shall obtain permission from the owner of such private property for such purpose. If they cannot obtain permission from such owner, the City Engineer may authorize him to enter the private premises solely for the purpose of making the property safe. The Developer shall at their expense, shore up and protect all buildings, walls, fences or other property likely to be impacted during the progress of the excavation work and shall be responsible for all damage to public or private property or highways resulting from the Developer's failure to properly protect and carry out the work. Whenever it may be necessary for the developers to trench through any lawn area, the sod shall be carefully cut and rolled and replaced after ditches have been backfilled as required in this chapter. All construction and maintenance work shall be completed in a manner to leave the lawn area clean of earth and debris and in a condition as nearly as possible which existed before such work began. The Developer

shall not remove any trees or shrubs which exist in parking strip areas or easements across private property without first having notified and obtained the consent of the property owner, or in the case of public property, the appropriate City Department or City Official having control of such property.

Fences and Barriers

The Developer shall erect the fence, railing or barriers at the project site to prevent danger to pedestrians using the City street or sidewalks, and the protective barriers shall be maintained until the work is completed or the danger removed.

A half hour prior to sunset lights shall be placed on any excavation materials, structures or other obstructions in the streets. These lights shall be maintained throughout the night and must be placed on the street every night until the obstructions are removed. It is unlawful to remove the fence, railing, other protective barriers or any lights provided for the protection of the public.

Removal of Attractive Nuisance

It is unlawful for the Developer to suffer or permit to remain unguarded, at the place of excavation or opening, any machinery, equipment or other device having the characteristics of an attractive nuisance likely to attract children and be hazardous to their safety or health.

2-10.03 TRENCH BACKFILL

Trench backfill shall conform to City Standard Details W-270 and SS-120.

Unsuitable backfill material shall be removed from the site and hauled to an approved disposal site. The Contractor shall provide the City Engineer with the location of all disposal sites to be used and also copies of the permits and approvals for such disposal sites.

Imported material shall meet the requirements of Gravel Borrow, as specified in Section 9-03.14 of the WSDOT/APWA Standard Specifications, or Crushed Surfacing Top Course, as specified in Section 9-03.9(3) of the WSDOT/APWA Standard Specifications.

2-10.04 COMPACTION

Trench backfill shall be spread in layers and compacted by mechanical tampers of the impact type approved by the City Engineer. The backfill material shall be placed in successive layers with the first layer not to exceed 2 feet above the pipe, and the following layers not exceeding 12 inches in loose thickness, with each layer being compacted to the density specified below:

Improved areas such as street and sidewalks shall be compacted to at least 90% of maximum dry density to within 4 feet of sub-grade. The last 4 feet shall be compacted to at least 95% of maximum dry density. Unimproved area or landscape areas shall be compacted to at least 90% of maximum dry density.

2-10.05 TRENCHING LONGITUDINAL TO ROADWAY

All utilities, including but not limited to: sewer, water, drainage, gas, telephone, power, and cable TV, that are within the roadway section and longitudinal to the roadway, shall be backfilled according to the requirements listed in City Standard Details W-270 and SS-120 to the pavement patch level or sub-grade, whichever applies. CDF backfill will be required as directed by the City Engineer.

Pavement restoration of longitudinal trenching for all underground utilities including water, sewer, power, gas, etc. shall be completed according to City Standard Details W-270, SS-120, or R-140. The limits of paving shall be as determined by the City Engineer on a project specific basis, and may require street grinding and overlays.

2-10.06 TRENCHING TRANSVERSE TO ROADWAY

Utility trenching that crosses transversely to the roadway alignment will not be permitted unless it can be shown that alternatives such as jacking, auguring or tunneling are not feasible or unless the utility can be installed just prior to reconstruction or an overlay of the road. Should an open cut be approved, the trench shall be backfilled according to the requirements listed in City Standard Details W-270 and SS-120. One lane shall remain accessible to emergency vehicles at all times unless previous arrangements with the Police, Fire, and Public Works Departments have been approved.

Pavement restoration of transverse trenching for all underground utilities including water, sewer, power, gas, etc., shall be completed according to Standard Details W-270, SS-120, or R-140. The limits of paving shall be as determined by the City Engineer on a case-by-case basis.

2-10.07 JACKING, AUGERING, OR TUNNELING

Tunneling may be required as a condition of permit approval, in certain situations, by the City Engineer, under pavements, buildings, railroad tracks, etc. The Developer shall install the pipe by jacking, auguring or tunneling, or installing the pipe in a casing pipe by a combination of these methods. The Developer shall be liable for damage to any existing facilities as a result of the jacking, auguring, or tunneling installation work. Approvals from other agencies or companies may be required for the proposed work.

The Developer shall obtain all necessary permits, approvals and easements as may be necessary and shall provide copies to the City during the permit review process.

When use of a casing pipe is required, the Developer shall be responsible to select the gauge and size required, unless otherwise indicated on the drawings, and consistent with their jacking or auguring operation, and shall be set to line and grade. During jacking or auguring operations, particular care shall be exercised to prevent caving ahead of the pipe which will cause voids outside the pipe. When the carrier pipe is installed within a casing pipe, the carrier pipe shall be skidded into position in an acceptable manner and to the line and grade as designated. The annular space between the casing and the pipe shall be filled with sand or as otherwise approved.

Prior to jacking or auguring activities, shop drawings describing these activities, including dimensioning of pit length and size of underground borings and complete description of shoring, shall be submitted to the City Engineer for approval.

2-11 SIDE SLOPES

Side slopes along arterial and collector roads shall be constructed no steeper than 3:1 for fill and 2:1 for cut slopes. Along local access and residential roads, fill slopes shall not be steeper than 2:1 and cut slopes shall not be steeper than 1.5:1. Steeper slopes may be approved by the City Engineer upon showing that the steeper slopes, based on geotechnical and hydraulic analysis, will be stable.

Guardrails shall be installed where appropriate pursuant to the WSDOT *Design Manual* and Roadside Safety Manual.

Side slopes shall be stabilized by grass sod, seeding or by other planting or surfacing materials acceptable to the City Engineer.

Slope easements adjacent to the right-of-way may be required for maintenance of cut or fill slopes.

2-12 GUARDRAILS

Beam guardrails shall be designed and installed per WSDOT Standards.

2-13 MAILBOXES

2-13.01 US POSTAL SERVICE (USPS)

Mailbox type, number and location require approval of the Arlington Postmaster. Coordination with the Postmaster early in the project design process is important.

USPS requires installation of cluster box units (CBU) to serve four or more addresses. Specific requirements can be obtained from the Arlington Postmaster.

2-13.02 CONSTRUCTION PLAN

Construction plans shall clearly show the proposed location or relocation of mailboxes, whether single or cluster boxes.
The Developer shall provide the Postmaster with 2 copies of the preliminary project site plans for use in establishing locations, types and numbering of the mailboxes. The Postmaster will retain one copy and return the other redlined set to the Developer for use in preparing the final plan.

Postmaster approval of the proposed mailbox type(s) and location(s) shall be documented as part of the construction plan approval process. Any change of mailbox type(s) or location(s) shall be re-approved by the Postmaster.

2-13.03 LOCATION AND INSTALLATION

Where a choice of roadway location exists, mailbox shall be located on the lower volume roadway unless otherwise approved by the City Engineer and the Postmaster.

Mailboxes shall be located so as not to impede access or sight distance visibility.

Mailboxes located within a roadway clear zone shall have breakaway features in accordance with WSDOT Standard Plans.

If it becomes necessary to remove or otherwise disturb existing mailboxes within the limits of any project, the Developer shall coordinate through the Arlington Postmaster for acceptable box locations and to ensure uninterrupted mail service. Approved locations for mailboxes shall be shown on street construction plans. The mailboxes shall be temporarily placed in such a position that their function will not be impaired. The boxes shall be reinstalled in accordance with the approved construction plans. Any damage caused by the relocation of mailboxes shall be repaired at the expense of the responsible party. If mailboxes are installed within a sidewalk where the sidewalk is next to a curb, the sidewalk shall be widened to provide a minimum horizontal clearance of 48 inches from back of mailbox structure to back of sidewalk.

2-13.04 ROAD IMPROVEMENTS

Turnouts for mail delivery vehicles shall be installed to serve cluster mailbox units located along arterial or collector roads, or any road with a posted speed of 35 MPH or above.

A turnaround shall be provided at the end of any non-through road along which mailboxes are located.

2-14 BOLLARDS

Bollards may be installed at the City Engineer's discretion to deny motor vehicle access to an easement, tract, or trail. This may include one or more fixed bollards on each side of the traveled way and removable, locking bollards across the traveled way to allow maintenance and emergency vehicle access.

Spacing intervals shall not exceed 50 inches on center.

Bollard design shall be in accordance with WSDOT Standard Plan H-13 and H-13a.

Fire apparatus access roads shall not be blocked in this manner without the concurrence of the Fire Chief.

2-15 ROADWAY BARRICADES

Temporary or permanent barricades shall conform to the MUTCD and these Standards.

1) Type I and Type II barricades are intended for use where traffic is maintained through an area under construction. They may be used singly or in groups to mark a specific hazard or in a series for channeling traffic.

2) When a road section is closed to traffic, Type III barricades shall be erected at the points of closure. Type III barricades may extend completely across a roadway and its shoulders or from curb to curb. Where provision must be made for authorized access, Type III barricades may be provided with movable sections that can be closed when work is not in progress, or with indirect openings that will discourage public entry. Where job site access is provided through a Type III barricade, the Developer or Contractor shall ensure proper closure at the end of each working day.

3) Type III permanent barricades shall be installed to close arterial roadway or other through roads when hazardous to traffic. They shall also be used on lanes where tapers are not sufficiently delineated.

4) Road signs may be erected on fixed barricades. The Road Closed, Detour Arrow, and Large Arrow warning signs can be mounted effectively on or above a barricade on a closed road.

5) For night use, it is desirable to add flashing warning lights when barricades are used singly and steady-burn lights when barricades are used in a series for channelization.

2-16 ROCKERIES AND ROCKWALLS

2-16.01 GENERAL

1) Rockeries shall be designed by a Geotechnical Engineer if the height will exceed 6 feet in a stable cut section or 4 feet in a fill section. Construction of rockeries requiring an engineering design shall be carried out under the periodic or full-time observation of a Geotechnical Professional. A typical rockery is shown in Standard Detail R-150.

2) Terracing of rockeries is subject to approval by the Engineer.

3) Where a rockery or retaining wall is proposed, all warrants for a guardrail or pedestrian safety rail shall apply.

2-16.02 MATERIALS

1) Rock material shall be as rectangular as possible. No stone shall be used which does not extend through the wall. The quarried rock shall be hard, sound, durable and free from weathered portions, seams, cracks and other defects. The rock density shall be a minimum of 160 pounds per cubic foot, measured according to WSDOT Test Method 107 (Bulk Specific Gravity - S.S.D. basis). Additionally, rock subjected to the U.S. Army Corps of Engineers Test Method CRD-C-148 (Method of Testing Stone for Expansive Breakdown on Soaking in Ethylene Glycol") must have less than 15% break down.

2) Size requirements shall conform to the Table 2-7:

Table 2-7 Material Size Requirements

MATERIAL SIZE REQUIREMENTS		
SIZE	**WEIGHT (LBS)**	**DIAMETER (INCHES)**
2-MAN	200-700	18-28
3-MAN	700-2000	28-38
4-MAN	2000-4000	36-48
5-MAN	4000-6000	48-54
6-MAN	6000-8000	54-60

2-16.03 KEYWAY

A keyway, consisting of a shallow trench of minimum 12-inch depth, shall be constructed the full rockery length, and slightly inclined downward toward the face being protected. It shall be excavated the full rockery width and its subgrade shall be firm and acceptable to the City Engineer.

2-16.04 UNDERDRAINS

A minimum of 4 inch perforated drain pipe shall be placed in a shallow excavated trench located along the inside edge of the keyway. The pipe shall be bedded on and surrounded by "Gravel Backfill for Drains", WSDOT/APWA 9-3.12(4) to a minimum height of 18 inches above bottom of pipe. The perforated pipe shall be connected to the storm drain system or to an acceptable outfall. No drain shall discharge onto the face of a slope.

2-16.05 ROCK SELECTION AND PLACEMENT

Rock selection and placement shall be such that there will be minimum voids and, in the exposed face, no open voids over 6 inches across in any direction. The final course shall have a continuous appearance and be placed to minimize erosion of the backfill material. The larger rocks shall be placed at the base of the facing so that it will be stable and have a stable appearance. The longitudinal axis of each rock shall be at right angles to the face. Inclined rock faces shall slope to the back of the rockery. Each course of rocks shall be seated tightly and as evenly as possible on the course beneath. The rocks shall be placed so that no continuous joint planes are created, either horizontally or vertically. After setting each course of rock, all voids between the rocks shall be placed on the back with quarry spalls to eliminate any void sufficient to pass a 2 inch square probe.

2-16.06 ROCK FILTER LAYERS

The rock filter layer shall consist of a layer of quarry spalls, with a maximum size of 4 inches and a minimum size of 2 inches, placed on the back of the rock facing and a minimum 12 inch thick layer of drain rock between the quarry spalls and the cut or fill slope. The drain rock shall meet WSDOT/APWA Standard Specification 9-03.12(4). The backfill material shall be placed in lifts to an elevation approximately 6 inches below the top of each course of rocks as they are placed, until the uppermost course is placed. Any backfill material on the bearing surface of one rock course shall be removed before setting the next course.

2-16.07 EMBANKMENTS

Embankments behind rockeries, in fill sections exceeding four feet in height above the keyway, shall be reinforced with a geosynthetic fabric or geogrid specifically manufactured for soil reinforcement and designed on a project specific basis by a Professional Engineer licensed in the State of Washington.

2-16.08 SIDEWALKS ABOVE ROCKERY FACINGS

When a sidewalk is to be built over a rock facing, the top of the facing shall be sealed and leveled with a cap constructed of cement concrete Class 3000 in accordance with the applicable provisions of Section 6-02 of the WSDOT/APWA Standard Specifications. Water content shall be reduced so that slump does not exceed 2 inches.

2-16.09 FENCES AND HANDRAILS

A chain link fence or metal handrail shall be installed when a rockery is 30 inches or greater in height.

2-17 PEDESTRIAN HAND RAILINGS AND GUARDRAILS

Safety railings may be required for pedestrians and/or bicyclists along roadways, bridges or pedestrian facilities. See Standard Detail R-160. Reference standards for design and installation, depending on the type of facility may be constructed, include the following:

- AASHTO Standard Specifications for Highway Bridges
- International Building Code
- WSDOT *Design Manual*

2-18 CEMENT CONCRETE SIDEWALKS

This work shall consist of constructing cement concrete sidewalks, thickened edge for sidewalks, curb ramps, and bus shelter pads, including excavation for the depth of the sidewalk and sub-grade preparation, in accordance with these Standards, the WSDOT/APWA Standard Specifications and City Standard Detail R-170.

2-18.01 SIDEWALKS

1) Sidewalk cross slopes shall not exceed 2 percent.

2) Sidewalk located along a road shall follow the road grade in most cases. Where a sidewalk is separated from a road, its grade may or may not be controlled by the road grade. If not, the sidewalk grade shall not exceed 8.33% (1 foot vertical in 12 feet horizontal).

3) In single-family residential zoned areas, the minimum width of sidewalk is 5 feet. In commercial/industrial and multi-family residential zoned areas, sidewalks of 6 or 7 feet may be required by the City Engineer. Where a sidewalk is located adjacent to a curb, the width of sidewalk is measured from the back of the curb to the back of the sidewalk.

4) If it is necessary to install facilities, such as mailboxes, fire hydrants, sign posts, poles, pedestals, etc. within a sidewalk, then the sidewalk shall be widened to provide a minimum horizontal clearance of 48 inches around any part of the obstruction.

5) Meandering sidewalks, where approved by the City, shall be constructed to maintain a full 5-foot width plus 1 foot of clearance around obstructions, including mailbox mountings that cannot be relocated. Additional right-of-way may be required to accommodate a meandering sidewalk or to relocate the obstruction behind the sidewalk.

6) Sidewalk concrete thickness depends on the type of curb section, sidewalk location and whether the sidewalk is part of the driveway.

- 4 inches in vertical curb section,
- 5 inches in rolled curb section if the sidewalk next to curb (cul-de-sac only),
- 6 inches in driveway approaches.

7) Subgrade compaction requirements shall comply with the WSDOT Standard Specifications and shall be as shown in Standard Detail RR-170.

8) In cut areas, a drainage collection system shall be installed behind the sidewalk.

2-18.02 CURB RAMPS

In accordance with State law, curb ramps shall be provided at all pedestrian crossings with curb sections. It is required that when a ramp is constructed giving handicap access to the roadway area, the corresponding ramp at the opposite side of the roadway will also be required. Exact locations at each curb return will be determined in the field during construction.

Curb ramps shall be constructed in accordance with the WSDOT Standard Plan F-40.10-00. Curb ramps shall be constructed where shown on the plans or as directed by the City Engineer. This work shall include curb ramps installed in new sidewalks and curb ramps to be installed in existing sidewalks. Existing sidewalks shall be neatly saw cut full depth prior to construction of curb ramps.

Curb ramps shall fall within crosswalks, marked or unmarked. Ramps may be as wide as the approaching sidewalk or walkway, but shall have a minimum width of 3 feet.

A diagonal curb ramp, located at the midpoint of a curb radius, is not permitted in a new construction sidewalk. It may be allowed only when required in the modification of an existing curb/sidewalk.

A curb ramp shall not be located outside a curb radius unless approved by the City Engineer. Such a location places pedestrians where they are not readily seen by right turning vehicles.

Curb ramps shall not be obstructed by fire hydrants, sign posts, poles, pedestals or other utilities, or any other obstruction. A drainage low point and a catch basin or inlet within a curb ramp or crosswalk shall be avoided.

Curb ramps shall include detectable warnings, using a raised truncate dome design, in accordance with the ADA Accessibility Guidelines for Buildings and Facilities. A design is provided in WSDOT Standard Plan F-3a.

Ramp texturing is to be done with an expanded metal grate placed and removed from wet concrete to leave a diamond pattern as shown in WSDOT Standard Plan F-40.10-00.

Curb ramps shall not be poured integral with sidewalk. Curb and gutter shall be isolated from curb ramps by expansion joint material on all sides.

2-18.03 MATERIALS

Materials shall meet the requirements of the following section of the WSDOT/APWA Standard Specifications:

Portland Cement	9-01
Concrete Aggregate	9-03
Pre-molded Joint Filler	9-04
Curing Compounds & Mixtures	9-23

Slump of the concrete mix shall not exceed 2½ inches. Lamp black coloring agent for matching the color of newly constructed cement concrete sidewalks to the color of adjacent existing cement concrete sidewalks shall be added to the concrete during mixing in an amount not to exceed 1½ pounds per cubic yard of concrete. No lamp black shall be used in curb ramps. The use of calcium chloride as an admixture is prohibited.

2-18.04 CONSTRUCTION REQUIREMENTS

General

The sidewalk section shall be placed after the placement of the curb and gutter section unless otherwise directed by the City Engineer.

The sub-grade shall be approved by the City Inspector prior to concrete being placed. Expansion joints shall be one-half inch by full depth and placed to match those placed

in curbs if new sidewalk is poured adjacent a curb and gutter, in all other cases the maximum spacing on expansion joints shall be 10 feet on center. Control joints shall be ¼ the thickness of the concrete on 5 foot centers.

A minimum distance of 5 feet is required from the face of curb to any obstruction on or within the sidewalk unless otherwise noted. Mailboxes shall be set at locations approved by the Postmaster and may be adjacent to the curb in residential areas.

Where there is insufficient suitable native material on the project site, the Contractor shall furnish, place and compact Gravel Borrow. All sidewalks shall be constructed over a minimum 2 inches of Crushed Surfacing Top Course meeting the requirements of Section 9-03.9(3) of the WSDOT/APWA Standard Specifications compacted to 95% of maximum dry density.

Form and Fine Grading

Wood forms shall be 2 inch x 4 inch (nominal) in lengths of not less than 10 feet. Steel forms may also be used. Forms shall be staked to a true line and grade. A sub-grade template shall then be set upon the forms and the fine grading completed so that the sub-grade will be a minimum of 4 inches below the top of the forms. Forms shall be provided around all street name sign posts and traffic sign posts that are placed in concrete areas. Forms used for this purpose shall be 1 foot square or 1 foot minimum diameter cutout, as approved by the City.

Placing and Finishing Concrete

The concrete shall be spread uniformly between the forms and thoroughly compacted with a steel shod strikeboard. Expansion joints and control joints shall be located and constructed in accordance with the Standard Details. In construction of expansion joints, the pre-molded joint filler shall be adequately supported until the concrete is placed on both sides of the joint.

Whenever castings are located in the sidewalk area, joints shall be installed at the casting location to control cracking of the sidewalk. If spacing of joints or scoring is such that installation of joint material would be unsuitable, the contractor shall install rebar to strengthen the sidewalk section.

Control joints shall be formed by first cutting a groove in the concrete with a tee bar of a depth equal to, but not greater than the joint filler material, and then working the pre-molded joint filler into the groove. Pre-molded joint filler for both expansion and control joints shall be positioned in true alignment at right angles to the line of the sidewalk and normal to and flush with the surface.

After the concrete has been thoroughly compacted and leveled, it shall be floated with wood floats and finished at the proper time with a metal float. Joints shall be edged with a ¼ inch radius edger and the sidewalk edges shall be tooled with a ½ inch radius edger.

The surface shall be brushed with a fiber hair brush of an approved type in a transverse direction except that at driveway and alley crossings it shall be brushed longitudinally. The placing and finishing of all sidewalks shall be performed under the control of the City Engineer, and the tools used shall meet with his/her approval. After brush finish, the edges of the sidewalk and all joints shall be lightly edged again with an edging tool to give it a finished appearance.

Curing and Protection

The curing materials and procedures specified in Section 5-05.3(13) of the WSDOT/APWA Standard Specifications shall prevail, except that white pigment curing compounds shall not be used on sidewalks.

The Contractor shall have readily available sufficient protective covering, such as waterproof paper or plastic membrane, to cover the pour of an entire day in event of rain or other unsuitable weather.

The sidewalk shall be protected against damage or defacement of any kind until it has been accepted by the City. Sidewalk which is not acceptable to the City because of damage or defacement shall be removed and replaced by the Developer at their expense.

Curing and Hot Weather

In periods of low humidity, drying winds, or high temperatures, a fog spray shall be applied to concrete as soon after placement as conditions warrant in preventing the formation of shrinkage cracks. The spray shall be continued until conditions permit the application of a liquid curing membrane or other curing media. The City Engineer shall make the decision when the use of a fog spray is necessary.

Cold Weather Work

When the air temperature is expected to reach the freezing point during the day or night, the concrete shall be protected from freezing. The Contractor shall provide a sufficient supply of blankets or other suitable blanketing material and spread it over the pavement to a sufficient depth to prevent freezing of the concrete. The Contractor shall be responsible for the quality and strength of the cured concrete. Any concrete damaged by frost action or freezing shall be removed and replaced at the Developer’s expense.

2-19 CURB AND GUTTER SECTIONS

2-19.01 DESCRIPTION

The standard curb and gutter section shall be Type 1, per Standard Detail R-180. Type 1 standard curb and gutter shall be used on both public and private roadways.

Curb sections conforming to City Standard Details R-190 through R-210 are intended for use in parking lot areas, temporary road sections and other locations subject to the review and approval of the City Engineer.

2-19.02 MATERIALS

Materials shall meet the requirements of the following Sections of the WSDOT/APWA Standard Specifications:

Portland Cement	9-01
Concrete Aggregate	9-03
Reinforcing Steel	9-07
Pre-molded Joint Filler	9-04
Curing Compounds & Mixtures	9-23

The Portland Cement Concrete shall meet the requirements of Section 5-05 of the WSDOT/APWA Standard Specifications. Concrete mix for curbs shall be Class 3000. Slump of the concrete shall not exceed 3½ inches.

All new curb and gutter shall be placed over Crushed Surfacing Top Course not less than 4 inches and compacted to 95% maximum dry density.

Forms may be of wood or metal at the option of the contractor, provided that the forms as set will result in a curb, or curb and gutter of the specified thickness, cross section, grade and alignment shown on the construction plans.

2-19.03 PLACING CONCRETE

The sub-grade shall be properly compacted and brought to specified grade before placing concrete. The sub-grade shall be thoroughly dampened immediately prior to the placement of concrete. No new curb and gutter is to be placed until forms have been checked and approved for line, grade and compaction by the City Inspector. Concrete shall be spaded and tamped thoroughly into the forms to provide a dense, compacted concrete free of rock pockets. The

exposed surfaces shall be floated, finished and brushed longitudinally with a fiber hair brush approved by the City Inspector.

The rate of concrete placement shall not exceed the rate at which the various placing and finishing operations can be performed in accordance with these Standards.

If concrete is to be placed by the extruded method, the Contractor shall demonstrate to the satisfaction of the City Engineer that the machine is capable of placing a dense, uniformly compacted concrete to exact section, line and grade.

2-19.04 CURING AND PROTECTION

Transparent curing compounds shall be applied to all exposed surfaces immediately after finishing. Transparent curing compounds shall contain a color dye of sufficient strength to render the film distinctly visible on the concrete for a minimum period of 4 hours after application.

The Contractor shall have readily available sufficient protective covering, such as waterproof paper or plastic membrane, to cover the pour of an entire day in event of rain or other unsuitable weather.

Additional requirements for curing in hot weather shall be as specified in these Standards. Additional requirements for curing in cold weather may be found in of these Standards.

The curb shall be protected against damage or defacement of any kind until it has been accepted by the City. Sidewalk which is not acceptable to the City Engineer because of damage or defacement shall be removed and replaced by the Developer at their expense.

The curing materials and procedures specified in Section 5-05.3(13) of the WSDOT /APWA Standard Specifications shall prevail, except that white pigment curing compounds shall not be used on curb and gutter.

2-20 CEMENT CONCRETE DRIVEWAYS

2-20.01 DESCRIPTION

This work shall consist of cement concrete driveway and alley returns constructed at the locations shown on the construction plans and where directed by the City, and shall be in accordance with these Standards, the WSDOT/APWA Standard Specifications and City Standard Details R-220 and R-230.

2-20.02 MATERIALS

Materials shall meet the requirements of the following sections of WSDOT/APWA Standard Specifications:

Portland Cement	9-01
Fine Aggregate	9-03
Coarse Aggregate	9-03
Joint Materials	9-04
Curing Compounds and Admixture	9-23

The concrete mix shall be as specified for Class 3000 and the slump of the concrete shall not exceed 3 inches.

2-20.03 CONSTRUCTION REQUIREMENTS

General

No driveway approach shall project beyond the extension of the side property line to the curb, unless the owner of the adjacent property is a co-signer of the driveway permit.

There must be at least 20 feet of full height curb between driveways serving any one property frontage.

There must be at least 6 feet of full height curb between driveways on adjacent lots. Driveway aprons shall be constructed per City Standard Details R-090 and R-100 as applicable. The minimum thickness of the driveway apron shall be 6 inches, placed over a minimum of 4 inches of Crushed Surfacing Top Course compacted to 95% maximum dry density over a compacted sub-grade. In all cases, sub-grade and rock grade shall be approved by the City Inspector prior to concrete being placed. Driveway aprons over 15 feet wide shall have an expansion joint placed in the center of the apron. In locations where a new driveway is to be constructed and the sidewalk/curb/gutter is in existence, it must be totally removed and replaced to driveway standards. It is not permissible to "knock-off" existing curb and install driveway apron, the total curb and gutter section must be removed, either by sawcutting or to the nearest expansion joint, and replaced to driveway standards.

New driveways installed in areas where curb and gutter improvements are not existing, and not required to be installed, shall be paved from the existing edge of pavement to

the property line regardless of whether the remainder of the driveway on the private property is paved.

In areas not fully improved with curbs and sidewalks, the elevation of the driveway at the point where it crosses the property line shall not be more than 3 inches higher than the elevation of the centerline of the existing paved street if the driveway is rising on the private property side, and no lower than level with the elevation of the centerline of the existing street if the driveway is going down on the private property side.

Excavation and Sub-grade

Where directed by the City Engineer, unsuitable material in the subgrade shall be removed to a specific depth and backfilled with select material such as Gravel Borrow conforming to the requirements of Section 9-03.14(1) of WSDOT/APWA Standard Specifications.

Before any concrete is placed, the Contractor shall bring the subgrade to the required line, grade and cross-section. The Contractor shall maintain the subgrade in the required condition until the concrete is placed. Compaction shall be to 95% standard density.

Forms and Fine Grading

Forms for the straight sections of the driveway or alley return shall have a minimum thickness of 2 inches and be equal to the nominal depth of the concrete. Plywood or 1 inch lumber may be used on radii. All forms shall be securely staked and blocked to true line and grade.

A template shall be set upon the forms and the subgrade shall be fine graded to conform to the required section. The subgrade shall then be compacted to the approval of the City Inspector. Prior to placement of the concrete, the subgrade shall be thoroughly dampened.

Placing and Finishing

The concrete shall be spread uniformly between the forms and thoroughly compacted with an approved type of strikeboard. Expansion joints and control joints shall be located and constructed in accordance with the City Standard Details. In the construction of expansion joints, the pre-molded joint filler shall be adequately supported until the concrete is placed on both sides of the joint.

Control joints shall be formed with a tee bar by first cutting a groove in the concrete to a depth equal to, but not greater than the joint filler material and then working the pre-molded joint filler into the groove. Pre-molded joint filler for both expansion and control joints shall be positioned in true alignment and at right angles to the center line of the driveway or alley return.

After the concrete has been thoroughly compacted and leveled, it shall be floated with wood floats and finished at the proper time with a metal float. Joints shall be edged with ¼ inch radius edger and the driveway or alley return edges shall be tooled with ½ inch radius edger.

The surface shall be brushed in a transverse direction in relation to the center line of the driveway or alley return with a fiber hair brush of approved type.

Curing and Protection

The curing materials and procedures specified in Sections 5-05 and 9-23 of the WSDOT/APWA Standard Specifications and these Standards shall be used. The driveway and the alley return shall be protected against damage or defacement of any kind until acceptance by the City. Any driveway or alley return not acceptable, in the opinion of the City Engineer because of damage or defacement, shall be removed and be replaced by the Developer at their expense.

Before placing any concrete, the Contractor shall have on the job site enough protective paper to cover the pour of an entire day, in event of rain or other unsuitable weather conditions.

2-21 PROPORTIONING OF MATERIALS

2-21.01 CONTROLLED DENSITY FILL

Controlled Density Fill (CDF) shall conform to the requirements of Section 2-09.3(1) E of the WSDOT/APWA Standard Specifications.

2-21.02 GRAVEL BORROW

The gradation for Gravel Borrow shall conform to the requirements of Section 9-03.14(1) of the WSDOT/APWA Standard Specifications.

2-21.03 QUARRY ROCK

Quarry Rock shall meet the requirements of Section 9-13.6 of the WSDOT/APWA Standard Specifications.

All percentages are by weight.

2-21.04 NON-SHRINK CEMENT SAND GROUT

Non-shrink cement sand grout shall be proportioned as follows:

1) One part high early strength (HES) cement.

2) Two parts clean fine-grained sand by weight and well-mixed with sufficient water to obtain a stiff consistency.

Unpolished aluminum powder shall be added to the dry cement in the proportion of one heaping teaspoonful per sack of cement no more than 30 minutes before the grout mixture reaches its final in-place position.

The required strength of the non-shrink concrete or grout shall be fc=4,000 psi and be verified by the cube strength test. The strength shall be confirmed by Schmidt hammering of the pads.

Prior to placing the grout, the contact surface shall be thoroughly cleaned, roughened and wetted with water. The grout shall be covered with burlap sacks after the initial concrete set and wetted at regular intervals until the required strength is obtained.

2-22 PARKING

2-22.01 NUMBERS OF PARKING SPACES

Except as exempted by AMC 20.72.010(b), all developments shall provide a sufficient number of parking spaces to accommodate the number of vehicles that are ordinarily and likely to be attracted to the development in question.

Number of parking spaces required for different developments is included in AMC 20.72 and Table 20.72-6. If a type of development is not listed in AMC Table 20.72-6, the Director of Community Development will determine the parking requirements using this table as a guide.

The City may require that bicycle parking facilities be provided for commercial and multi-family residential development projects per AMC 20.72.110.

2-22.02 PARKING SPACE DIMENSIONS

Each parking space shall contain a rectangular area at least 19 feet long and 9 feet wide.

In parking areas containing 10 or more parking spaces, up to 20% of the parking spaces need only contain a rectangular area of 8 feet in width and 15 feet in length. If such spaces are provided, they shall be conspicuously designed as reserved for small or compact cars only.

Where parallel parking is provided, the dimensions of such parking spaces shall not be less than 26 feet by 8 feet.

Aisle widths for parking lots are shown in Standard Detail R-240 and R-250. Aisle widths may be required to be widened if multiple utility lines are located within the aisle corridor.

2-22.03 GENERAL DESIGN REQUIREMENTS

Whenever possible, parking areas shall be designed so that, without resorting to extraordinary movements, vehicles may exit such areas without backing onto a public street. This requirement does not apply to parking areas consist of driveways that serve 1 or 2 dwelling units, although backing onto arterial streets is discouraged.

Parking areas of all developments shall be deigned so that sanitation, emergency, and other public service vehicles can serve such developments without the necessity of backing unreasonable distances or making other dangerous or hazardous turning movements.

Every parking area shall be designed so that vehicles cannot extend beyond the perimeter of such area onto adjacent properties or public right-of-way. Such areas shall also be designed so that vehicles do not extend over sidewalks or tend to bump against or damage any wall, vegetation, or other obstruction.

Circulation areas shall be designed so that vehicles can proceed safely without posing a danger to pedestrians or other vehicles and without interfering with parking areas.

2-22.04 CONSTRUCTION

In accordance with AMC 20.76.060, all parking areas shall be graded and surfaced with asphalt, concrete, or other material that will provide equivalent protection against potholes, erosion, and dust.

All parking lot construction shall be inspected by the City for conformance with the approved plans for size, layout, drainage control and structural section.

The minimum acceptable structural section for parking lots shall be 2 inches of Class “B” asphalt placed over 4 inches of Crushed Surfacing Top Course, unless otherwise approved by the City Engineer. Heavier pavement sections may be required for truck traffic, vehicle storage or as determined by the Developer’s Geotechnical Engineer due to soil conditions. Prior to placing any surfacing material on the parking area, it will be the responsibility of the Developer to provide density test reports certified by a Professional Engineer licensed in the State of Washington or an approved testing laboratory.

Crushed Surfacing Top Course shall be compacted to 95% maximum density. Density testing for asphalt pavement including the necessity and frequency of core samples will be determined by the City Engineer on a case by case basis.

2-22.05 HANDICAP REQUIREMENTS

Handicap parking stalls shall meet the requirements of Washington State Regulations for Barrier Free Facilities (WAC 51-10), RCW 19.27, International Building Code and RCW 70.92, Public Buildings - Provisions for Aged and Handicapped. Safe, convenient handicap access is required from the street to all buildings on site. This is in addition to safe, convenient handicap access between buildings. Sidewalks constructed adjacent to City streets/roadways shall provide handicap access, including ramps, landings and handrails as necessary.

2-22.06 ILLUMINATION

Parking lot illumination shall be provided for all parking lots containing more than ten (10) parking spaces, and shall be designed and constructed to meet the following requirements:

Provide adequate illumination for security and safety to all parking spaces, pedestrian walkways and sidewalks. Driveway entries and exits should receive special illumination and signage, where necessary. Pedestrian scale lighting may be required to illuminate pedestrian trails/paths and walkways on site if required by the City.

Be shielded in a manner that does not disturb residential uses, airport operations, or public rights-of-way adjacent to the parking facility.

2-22.07 PEDESTRIAN CONCERNS

Pedestrian walkways and sidewalks shall conform to requirements of Title 12 of the AMC.

Internal vehicle and pedestrian circulation for parking lots shall be approved by the City Engineer. Parking lot circulation shall allow pedestrians and wheelchairs to easily gain access from public sidewalks and bus stops to building entrances through the use of pedestrian paths which are physically separated from vehicle traffic and maneuvering areas. In shopping center parking lots containing more than 100 spaces, such pedestrian/wheelchair paths shall be a minimum of 5 feet wide and constructed in a manner that they cannot be used as a holding area for shopping carts.

Access driveways for parking areas shall be located to avoid conflict with vehicular and pedestrian traffic on public rights-of-way.

The City may require joint use of driveways by more than one property.

2-22.08 THROAT LENGTH REQUIREMENTS

The throat length is the unobstructed storage length requirement measured from the inside face of curb to the first driveway or parking stall. Distances may be reduced for multiple driveways as approved by the City. The minimum throat length shall be at least 25 feet for all land uses unless it is determined by the City that greater throat length is required, based upon

project specific traffic volumes and site conditions. Throat lengths for collectors and arterials will generally be larger to accommodate higher driving speeds and traffic site distance requirements.

2-23 LANDSCAPING

Landscaping in the City right-of-way provides numerous aesthetic, environmental and safety benefits. The following specifications provide information for the landscaping of City streets and stormwater facilities.

2-23.01 PLANTER STRIPS

A planter strip is the portion of the right-of-way between the curb and the sidewalk or between the sidewalk and the right-of-way line used for the planting of trees, shrubs, groundcover or grass. Planter strips are required, as shown in Standard Details R-260 through R-280, along arterial or non-arterial City roads. Planter strips may be installed, but are not required, around permanent or temporary road ends. The design of planter strips must be approved by the City Engineer through a landscaping plan in which plant maintenance, utilities and traffic safety requirements are addressed.

The preferred planter strip location is between the vertical curb and sidewalk to enhance the urban road appearance. However, planter strips may be located behind sidewalks or on both sides of sidewalks if approved by the City Engineer.

2-23.02 MEDIANS

A median is the portion of the right-of-way separating the traveled ways of traffic in opposite directions.

1) Medians and planting shall be designed so that neither sight distance nor vehicle turning radii are limited.

2) Medians may be covered with grass, landscape plantings, aggregate, asphalt or concrete.

3) Medians design shall be reviewed for pedestrian accessibility based on the WSDOT *Design Manual* and ADA criteria.

4) Medians shall be illuminated as determined by the City.

2-23.03 PLANTING TYPES

Landscape plantings, approved for use in public right-of-way, are grouped into 4 categories described below. Height, spacing, and plant root development have been evaluated to prevent interference with overhead and underground utilities.

1) Small Trees (25 to 35 feet high +/-)
   Suitable for use under overhead utility wires, may be used in planter strips in front of or behind sidewalks. Average tree spacing shall be 25 feet to 30 feet on center.

2) Medium Trees (35 to 50 feet high +/-)
   Not for use under overhead utility wires. May be used in planter strips in front of sidewalks where utilities are located underground. Average tree spacing shall be 35 feet to 40 feet on center.

3) Large Trees (51 feet high or larger)
   Not for use under overhead utility wires. Use only behind sidewalks or where large planter strips, 8 to 10 feet wide, are planned. Conifers may be placed only behind sidewalks. Average tree spacing shall be 35 feet to 40 feet on center.

4) Shrubs and Groundcover
   Suitable for use in narrow planter (2 to 5 feet wide) in front of a sidewalk, where trees are planted behind the sidewalk, or interspersed between trees in planters either in front of or behind sidewalk.

As stated in Chapter 5, no willows, poplars, cottonwoods, birches, soft maple, gum or any other tree or shrub whose roots are likely to obstruct public sewers are allowed within 30 feet of any public sewer. Any of these trees found to be located within 30 feet of a proposed sewer main shall be removed at the Developer's expense.

Due to the sensitive nature of critical areas, no non-native species may be planted for landscaping in a public right-of-way that borders a critical area.

2-23.04 TREE PLANTING AND MAINTENANCE

1) Trees shall be planted so that the center of each trunk is 3 feet from the back of curb or, if planted behind a sidewalk, 3 feet from the back of sidewalk.

2) Where trees are to be planted adjacent to a sidewalk, a root barrier shall be installed on the sidewalk side of each tree, parallel to and 6 inches from the sidewalk. The barrier shall be 15 feet long, centered horizontally on the tree trunk and extend from the ground surface to a depth of 18 inches.

3) Trees shall be trimmed so that no branches extend below 14 feet above a traffic lane, or 7 feet above a bicycle lane or pedestrian facility.

2-23.05 STORMWATER FACILITY LANDSCAPING

Stormwater detention facilities shall be landscaped with vegetative buffer/screens pursuant to AMC 20.76. Fencing around the facilities may be required by the City for safety and security. Chain link fence is specified. To improve the visual appearance of the facility, vinyl-coated fencing in a dark and natural color is preferred.

For additional landscaping guidelines see the *City of Arlington Landscaping Requirements* brochure.