

CITY OF AUMSVILLE
Public Works Design Standards

Division 2
Streets

DIVISION 2 STREETS

2.1 PURPOSE

- a. In addition to the purposes outlined under Division 1 of these Design Standards, the purpose of these Standards is to:
- 1) provide design guidance criteria to the private sector for the design of public and private streets within the City;
 - 2) establish standard right-of-way widths and improvement requirements for the appropriate street classifications;
 - 3) require the use of design and materials to provide streets with a minimum practical design life of not less than 30 years.
 - 4) ensure the development of a street system which will:
 - a) be of adequate design to handle the traffic needs for the City of Aumsville;
 - b) be designed in a manner to allow economical future maintenance;

Alternate materials and methods will be considered for approval on the basis of these objectives.

- b. These Standards cannot provide for all situations. They are intended to assist but not to substitute for competent work by professional design engineers.

2.2 APPLICABILITY

- a. These Standards shall govern all construction and upgrading of all public and private streets in the City of Aumsville and applicable work within its service areas.
- b. All properties shall be provided with access to a public or private street prior to or concurrently with the development of the property. This shall generally be interpreted to mean that permanent streets and associated improvements (*including but not limited to paving, curbs, non-deferred sidewalks, street lights, storm drains to drain the street improvements, etc.*) shall be provided for existing lots of record at the time development occurs, and for new legal lots of record created by a major or minor partitioning or subdivision of land at the time of partitioning or subdivision.
- c. ADA & PROWAG Applicability.
- 1) New Construction: Newly constructed facilities within the project limits shall

be made to comply with ADA and PROWAG standards as applicable. Designers are encouraged to reference the complete PROWAG document for additional information (www.access-board.gov).

- 2) Alterations: When alterations are made to the pedestrian circulation path (*including pedestrian crossings*), the pedestrian access route shall be made to comply with ADA and PROWAG standards as applicable, to the maximum extent feasible within the scope of the project. Alterations shall not be allowed to gap pedestrian circulation paths in order to avoid compliance with ADA and PROWAG standards.
- a) When elements are altered or added to existing facilities in a manner that does not alter or impact the pedestrian circulation path, the pedestrian circulation path is not required to be modified. However, elements that are added shall be made accessible to the extent required by ADA or PROWAG standards.
 - b) Sidewalk improvements or replacement which includes or impacts curb ramps, landings or turning spaces will trigger a requirement to upgrade the affected ramp, landing or turning space.
 - c) Street resurfacing (*including overlays*) is an alteration which triggers the requirement to upgrade curb ramps if it involves work on a street or roadway spanning from one intersection to another, or spanning a mid-block pedestrian crossing.
 - d) Accessibility improvements are not required for work that is considered as maintenance. Examples of work considered to be maintenance include, but are not limited to, the following.
 - Painting and/or other traffic control surface markings, excluding delineations of new accessible parking spaces.
 - Crack filling & sealing
 - Slurry seals or chip seals
 - Localized high friction treatments
 - Minor street patching (*less than 50% of the pedestrian street crossing area*)
 - Minor sidewalk repair which does not include or impact curb ramps, landings or turning spaces.
 - Filling potholes
 - e) If a project includes work which is not included in the lists above, or which consists of a combination of several maintenance items occurring at or near the same time, the City will determine whether the project should be considered maintenance or an alteration.

2.3 SPECIAL ITEMS

- a. The design of the following are considered special items and are not covered in detail in these Standards:
 - 1) Intersections with State highways
 - 2) Intersections with railroads
 - 3) Commercial/Industrial entrances
 - 4) Signalized Intersections
 - 5) Bridges or Culverted Stream Crossings, including private bridges for fire lanes (see OFC 503.2.6).
- b. Review and approval of the above special items by the City Engineer and Public Works Director shall be required. When requested by the City, full design calculations shall be submitted for review prior to approval. Bridges or culverts on fire lanes shall also be subject to review & approval by the fire code official per OFC 501.3.

2.4 APPROVAL OF ALTERNATE MATERIALS AND METHODS

- a. Any alternate material or method not explicitly approved herein will be considered for approval on the basis of the objectives set forth in Paragraph 2.1, Purpose. Persons seeking such approval shall make application in writing to the City Engineer and Public Works Director. Approval of any major deviation from these Standards shall be in written form. Approval of minor matters will be made in writing, if requested. Any and all such requests shall be submitted in writing to the Public Works Director prior to City approval of the design drawings.
- b. Any alternate must meet or exceed the minimum requirements set forth in these Design Standards (*also see "equal" & "substitute" definitions under PWDS 1.4*).
- c. The written application is to include, but is not limited to, the manufacturer's specifications and testing results, design drawings, calculations and other pertinent information.
- d. Any deviations or special problems shall be reviewed on a case-by-case basis and approved by the City Engineer. When requested by the City, full design calculations shall be submitted for review with the request for approval.

2.5 CONSTRUCTION DRAWINGS

- a. Construction drawings shall conform to the requirements of Division 1 of these Design Standards.

- b. Detail drawings shall be included on the construction drawings for all street system components including typical sections, curbs, sidewalks, handicap ramps, drainage facilities, etc.

2.6 STANDARD DETAILS

- a. Standard details included in the Appendix are supplemental to the text of these design standards and show the City's minimum requirements for the construction of certain standard system components.
- b. In the case of conflicts between the text of these design standards and the standard details, the more stringent as determined by the City Engineer and Public Works Director shall apply.
- c. As required by Division 1 of these standards, all applicable standard details shall be included on the construction drawings.

2.7 EXISTING STREET CLASSIFICATIONS

- a. The classification of arterials and collectors is established by the Aumsville Comprehensive Plan and other documents, while industrial and commercial streets are established by the surrounding land use designation. Streets currently designated as arterial and collector streets are as outlined below.

1) Arterial:

- Main Street (*County R/W*)
- N 1st Street (*County R/W*)
- S 8th Street (*south of Main, County R/W*)
- N 11th Street (*north of Main, County R/W*)

2) Collector:

- Cleveland Street
- Del Mar Drive (*1st to 9th*)
- Olney Street (*4th to 11th*)
- N 4th Street (*Del Mar to Olney*)
- N 5th Street (*Cleveland to Del Mar*)
- N 8th Street (*Cleveland to Del Mar*)
- N 9th Street (*Del Mar to Olney*)

- 3) Commercial/Industrial Streets include those streets within or fronting commercial or industrial zones.

2.8 OTHER JURISDICTIONS

- a. Other than the City, there are two other agencies with jurisdiction over streets or roads within the City Limits. These agencies are the Oregon Department of Transportation (ODOT) and Marion County.
- b. In all cases, the City design standards shall be considered to be the minimum allowable standards for any streets within the City Limits. ODOT and Marion County may have additional or more stringent requirements. Approval from ODOT and Marion County will be required prior to construction activities on any street or road under their jurisdiction.

2.9 DEFINITIONS AND TERMS

- a. In addition to the definitions contained in Division 1 of these Standards, the following definitions may apply particularly to street systems. Unless otherwise defined in these Design Standards, the following definitions and abbreviations shall apply whenever used. Other definitions as outlined in the Oregon Standard Specifications for Construction – OSSC (ODOT/APWA) shall also apply.
 - 1) Abbreviations: Acceptable abbreviations for pavement materials are as follows:
 - a) AC - Asphalt Cement
 - b) PCC - Portland Cement Concrete
 - 2) Alley: A public right-of-way not more than 20 feet and not less than 10 feet in width, which intersects with a public street.
 - 3) Arterial Street: A street of considerable continuity which is used for moving large volumes of traffic to and from the highway and for interconnection between major areas of the City.
 - 4) Bike Lanes: A designated travel-way for bicyclists which is established within the roadway directly adjacent to the outside vehicular lane or on the shoulder.
 - 5) Bike Path: A designated travel way for bicyclist which is completely separated from the vehicular travel lanes and is within independent right-of-ways.
 - 6) Bike Route: A designated travel-way for bicyclists which can be shared with vehicular traffic. The roadway is designated with signs for bicycling (*no pavement markings for the bike route or delineation of parking spaces is used*).
 - 7) Clear Vision Area: A triangular area on a lot at the intersection of two streets or a street and a railroad, the sides of which are lines measured from the corner intersection of the right-of-way lines. The third side of the triangle is a line across the corner of the lot joining the ends of the other two sides. Where the lines at the intersections have rounded corners, the right-of-way lines will be extended in a straight line to the point of intersection.

- 8) Collector Street: A centrally located street for moving traffic from arterials to local streets.
- 9) Cross Slope (Pedestrian Path): The grade that is perpendicular to the direction of pedestrian travel.
- 10) Cross Slope (Vehicle Path): The grade that is perpendicular to the direction of vehicular travel.
- 11) Crosswalk: See Pedestrian Street Crossing.
- 12) Curb Ramp: A ramp that cuts through or is built up to the curb. Curb ramps can be perpendicular, parallel, or a combination of parallel and perpendicular.
- 13) Detectable Warning: Detectable warnings consist of small, truncated cones built in or applied to a walking surface that are detectable by cane or underfoot. On pedestrian access routes, detectable warning surfaces indicate the boundary between a pedestrian route and a vehicular route for pedestrians who are blind or have low vision. Detectable warnings shall contrast visually with the surrounding sidewalk surface.
- 14) Downstream Intersection: The nearest intersection from a driveway located in the direction of traffic flow of the nearest lane of the abutting street.
- 15) Expansion Joint: A joint to control cracking in the pavement structure and filled with preformed expansion joint filler.
- 16) Grade: The degree of inclination of a road, sidewalk or slope, in the direction of travel.
- 17) Half Street Improvement: Where allowed by the development code, half street improvements shall fully comply with the fire lane requirements of the Oregon Fire Code, including provision of additional width if on-street parking is allowed. Generally half-street improvements are allowed only if the other side of the street was previously improved and the current development is required to complete the street improvement to full urban width (*three-quarter street improvements are the minimum typically required if there are frontage improvements required in conjunction with development, and where the far side of the street will be improved in the future in conjunction with other developments*). See PWDS 1.10.h.2 for full street design requirements in conjunction with partial street improvements.
- 18) Intersection: The meeting point of two streets having at least three legs.
- 19) Local or Residential Street: A facility not designed as an arterial or collector. It serves primarily to provide direct access to abutting land and offers the lowest level of traffic mobility. Through traffic movement is deliberately discouraged.

- 20) Longitudinal Joint: A joint which follows a course approximately parallel to the centerline of the roadway.
- 21) Natural Grade: The grade with the land in an undisturbed state.
- 22) One-Way Driveway: A driveway of either ingress or egress, but not both.
- 23) Parking Space: A designated space in a parking area for the parking of one motor vehicle. An off-street parking space is a designated space for the parking of one motor vehicle, which is located on private property rather than on a public street.
- 24) Pedestrian Access Route: A continuous and unobstructed path of travel provided for pedestrians with disabilities within or coinciding with a pedestrian circulation path (*typically concrete, pavement or similar hard surface*).
- 25) Pedestrian Circulation Path: A prepared exterior or interior surface provided for pedestrian travel in a public right-of-way (*typically concrete, pavement or similar hard surface*).
- 26) Pedestrian Street Crossing: A marked or unmarked route, providing and accessible path to travel from one side of the street to the other. Pedestrian street crossings are a component of the pedestrian access route and/or the pedestrian circulation path.
- 27) PROWAG: See definition in Division 1.
- 28) Running Slope: The grade that is parallel with the direction of pedestrian travel.
- 29) Sidewalk: A right-of-way deeded, dedicated, and designated for the use of non-motorized vehicles and pedestrians.
- 30) Streets or Roads: Any public highway, road, street, avenue, alley, easement or right-of-way used or to be used for vehicle movement. Full street improvements include curb and sidewalk on both sides, storm drainage and fully improved in accordance with these standards.
- 31) Structures: Those structures designated on the standard plans as catch basins, manholes, etc. Detailed drawings of structures or devices commonly used in City work and mentioned in these standards are included in the standard construction specifications.
- 32) Superelevation: The vertical distance between the heights of the inner and outer edges of pavement on horizontal curves.
- 33) Three-Quarter (3/4) Street: A ± 75 percent portion of the ultimate width of a

street, but not less than 25½ feet from face of curb to edge of pavement, usually along the edge of a development, where the remaining portion of the street shall be provided when adjacent property is developed. ¾ street improvements include curb, piped storm drainage and sidewalk on one side, storm drainage improvements stubbed across the street for future catch basins on the unimproved side, and a full depth gravel shoulder per PWDS 2.19.c & drainage facilities on the non-curbed side of the street.

- 34) Transition: The taper between portions of a street with different pavement widths.
- 35) Transverse Joint: A joint which follows a course approximately perpendicular to the centerline of the roadway.
- 36) Travelled Way: That portion of the roadway for the movement of vehicles, exclusive of shoulder and auxiliary lanes.
- 37) Turnaround Area: A paved area of sufficient size and configuration that emergency vehicles may maneuver around to head in the opposite direction without having to move in reverse more than once.
- 38) Turning Space: An area at the top or bottom of a curb ramp, providing a space for pedestrians to stop, rest, or change directions.
- 39) Turnpike Street: Any public street, road or right-of-way which has been paved for vehicular movement and does not have curbs on either side of the street.
- 40) Two Way Driveway: A driveway functioning as both an exit and entrance.
- 41) Upstream Intersection: The nearest intersection from a driveway located in the direction opposite the traffic flow of the nearest lane of the abutting street.

2.10 MATERIALS

a. General

- 1) Unless otherwise approved by the City Engineer, materials shall conform to the minimum requirements outlined herein and as shown on the Standard Details. This listing is not intended to be complete nor designed to replace the City's Public Works Construction Standards (PWCS).
- 2) In the case of conflicts between the provisions of these design standards and the PWCS, the more stringent as determined by the City Engineer and Public Works Director shall apply. Acceptable materials shall be as outlined in these Design Standards.
- 3) It is not intended that materials listed herein are to be considered acceptable for all applications. The design engineer shall determine the materials suitable for

the project to the satisfaction of the City Engineer.

b. **AC Pavement**

- 1) Bituminous Material: The asphalt cement shall be PG 64-22 and shall meet the requirements of OSSC (ODOT/APWA) 00744.11, Asphalt Cement & Additives.
- 2) **AC Design Mix:**
 - a) AC pavement shall meet the requirements of OSSC (ODOT/APWA) 00744, hot mixed Asphalt Concrete Pavements (ACP), 3/4" dense graded mix (*base course*) or 1/2" dense graded mix (*leveling or wearing course*) as summarized below.
 - (1) Where noted on the drawings, Class B pavement refers to the 3/4" dense graded mix, and Class C refers to 1/2" dense graded mix.
 - b) AC pavement for public streets shall be Level 2 Job Mix Formula (JMF).
 - c) Unless otherwise specified or shown on the drawings, AC pavement for private streets and parking lots shall be Level 2 Job Mix Formula (JMF).
 - d) Where identified on the drawings, AC pavement for collector or arterial streets shall be Level 3 Job Mix Formula (JMF).
- 3) AC mix design shall be submitted to the City for review and approval prior to use.

c. **Granular Baserock**

- 1) Granular baserock shall conform to OSSC (ODOT/APWA) 02630.10 (Dense Graded Base Aggregate), with no more than 10% passing the #40 sieve and no more than 5% passing the #200 sieve. Gradation shall be as follows:
 - a) Base Rock: 1½"-0
 - b) Leveling Rock: ¾"-0
 - c) Alternate single size 1"-0 aggregate as approved by the Engineer.

d. **Concrete (Cast-in-Place)**

- 1) All concrete shall conform to the requirements of OSSC (ODOT/APWA) 00440, Commercial Grade Concrete, 3300 psi min @ 28 days, max 5" slump, 4.5% air (±1.5%).

- 2) Concrete mix design shall be submitted to the City for review and approval prior to use.

e. **Street Lights**

- 1) Unless otherwise approved by the City Engineer and Public Works Director, street light poles shall be fiberglass poles designed to produce a 25-foot mounting height, with a mounting arm per the standard details. Poles shall be grey or brown in color, have a natural finish, and be provided with a direct bury base sleeve for landscape areas, and a precast concrete pole foundation for sidewalk areas where required by the Public Works Director or the City Engineer.
- 2) Unless otherwise approved by the City Engineer and Public Works Director, all luminaries shall be Cobrahead flat lens type using a 49 watt LED cobrahead fixture (*ie. equivalent to 100 watt high pressure sodium*) and photoelectric control relay.
- 3) All street lighting materials, including wire, and installation procedures shall meet current requirements for maintenance by the local electric utility company. Any line extension fees shall be the responsibility of the developer.

f. **Geotextile Fabric.**

- 1) Unless otherwise required by City Engineer, geotextile fabric shall conform with OSSC (ODOT/APWA) 02320, Geosynthetics, with minimum property values conforming to Table 02320-1 as noted below.
- 2) **Reinforcement Fabric.** Unless heavier is specified or noted on the drawings, reinforcement fabric (*for over-excavation or under embankments*) shall be non-woven fabric (*Propex Geotex 1001, Mirafi 1000N, Linq 250EX or approved equivalent*), or woven fabric (*Propex Geotex 250ST, Mirafi 550X, Linq GTF250, or approved equivalent*). Slit film fabrics are not allowed.
 - a) Minimum for non-woven: grab tensile strength of 315 lb; tear strength of 110 lb, puncture strength of 620 lbs; AOS of 30.
 - b) Minimum for woven: grab tensile strength of 200 lb; tear strength of 80 lb, puncture strength of 430 lbs; AOS of 30.

- 3) Separation Fabric. Unless heavier is specified or noted on the drawings, separation fabric (*where successful proofroll allows compaction testing of subgrade to be waived*) shall be non-woven fabric (*Propex Geotex 601, Mirafi 160N, Linq 150EX or approved equivalent*), or woven fabric (*Propex Geotex 200ST, Mirafi 500X, Linq GTF200, or approved equivalent*). Slit film fabrics are not allowed.
 - a) Minimum for non-woven: grab tensile strength of 113 lb; tear strength of 41 lb, puncture strength of 223 lbs; AOS of 30.
 - b) Minimum for woven: grab tensile strength of 180 lb; tear strength of 68 lb, puncture strength of 371 lbs; AOS of 30.
- 4) Drainage Fabric. Unless heavier fabric is specified or noted on the drawings, drainage fabric shall be conform with Type 2 Drainage Geotextile (OSSC/ODOT/APWA 02320), non-woven fabric (*Propex Geotex 601, Mirafi 160N, Linq 150EX or approved equivalent*). Slit film or woven fabrics are not allowed.
 - a) Minimum for non-woven: grab tensile strength of 160 lb; tear strength of 56 lb, puncture strength of 310 lbs; AOS of 40.
 - b) Minimum for woven: grab tensile strength of 250 lb; tear strength of 90 lb, puncture strength of 495 lbs; AOS of 40.
- 5) Riprap Fabric. Unless heavier is specified or noted on the drawings, fabric under riprap shall be conform with Type 2 Riprap Geotextile (OSSC/ODOT/APWA 02320), non-woven fabric (*Propex Geotex 1071, Mirafi 1120N, Linq 275EX or approved equivalent*). Slit film or woven fabrics are not allowed.
 - a) Minimum for non-woven: grab tensile strength of 200 lb; tear strength of 80 lb, puncture strength of 430 lbs; AOS of 40.
 - b) Minimum for woven: grab tensile strength of 315 lb; tear strength of 110 lb, puncture strength of 620 lbs; AOS of 40.

2.11 IMPROVEMENT STANDARDS BY STREET CLASSIFICATION

a. The table below summarizes the improvement standards for each road classification.

IMPROVEMENT REQUIREMENTS		
Street Classification	Min. Right-of-Way Width	Min Curb to Curb Width
Arterial ¹ <i>(see listing under PWDS 2.7)</i>	60' case-by case	40'-84' case-by case
Collector ² <i>(see listing under PWDS 2.7)</i>	60'	40'-74'
Commercial/Industrial	60'	40''
Local	60'	40'
Residential Cul-de-sac ³	55'	40'
Cul-de-sac Bulb (Residential)	60' radius	45' radius
Alleys	20	18' ⁵

Parking both sides typical all streets except as noted.
¹ Per ADO 20.73.B, Arterial widths to match County standards.
² Collector street widths determined on a case by case basis (ADO 20.73.B), with widths noted above as typical minimums.
³ See ADO 20.73.F for additional information.
³ Parking both sides for all local streets and cul-de-sacs, unless otherwise approved by City.

OFC Notes:

- For reference, the minimum clear widths required for fire apparatus access roads (*fire lanes*) under the Oregon Fire Code (OFC) may take precedence in some situations (*20' fire lane width required where there are no fire hydrants, 26' fire lane width required for streets with fire hydrants, OFC 503 & OFC App. D*).
- Fire lanes up to 26 feet wide shall have fire-lane/no-parking signs posted on both sides, while fire lanes wider than 26 feet (*but less than 32 feet*) shall be posted on one side (OFC D103.6.1&2).
- The OFC requirements cannot be modified solely by a land use approval.

⁵ Width listed refers to driveable paved width, whether or not curbs are provided or required. Where curbs are not provided, gravel shoulders shall be provided on each side of paving to the extent possible.

Notes:

-If a land use variance is granted for no parking on one or both sides of the street, curb(s) along the no parking side(s) shall be painted and signed for no parking at time of street construction.
 -Right-of-way widths must be adequate to accommodate the specified street, curb, and sidewalk widths (*including planter strips if required*), while allowing a minimum of 0.5 feet from the back of sidewalk to the right-of-way line to ensure that survey monuments are not disturbed during construction or reconstruction of sidewalks (*see also ORS 209.140-155 & 92.044.7*).

b. The number of travel lanes for arterial and major collector roads shall be determined by the volume of traffic. The City may require additional turning lanes where required by Public Works Director or a traffic engineer's report evaluating the need for additional turning lanes.

c. Additional pavement and right-of-way width may be required to accommodate turning lanes, parking and bike lanes.

2.12 STREET DESIGN MINIMUM SECTIONS

- a. The street design shall result in streets which:
 - 1) are of adequate design to handle the traffic needs of the City,
 - 2) are designed in a manner to allow economical future maintenance, and,
 - 3) provide a minimum practical pavement design life of 30 years for all streets.
- b. The minimum pavement section for public streets shall conform to the following table. These pavement sections are based on subgrade compacted to 95% of AASHTO T-180 (Modified Proctor). Where subgrades cannot be compacted and tested to this standard (*or if subgrades are not compacted by choice*), a thicker baserock section will be required.

MINIMUM PAVEMENT SECTIONS		
Street Classification	AC Pavement Thickness (inch)	Baserock Thickness ³ (inch)
Arterial ¹	4	15
Collector	4	12
Commercial	4	12
Industrial	4	15
Local Residential ²	3½	12
Cul-de-sac (Residential)	3½	10
Private Street (<i>3 or more dwelling units</i>)	3	9
Alley in Residential Zone ³	2½	9
Alley in Commercial Zone ³	3	10
¹ – Thicker baserock & AC sections may be required by ODOT or Marion County wherein each has jurisdiction. ² – See ADO _____ for additional information on streets. ³ – Assumes alleys are not used as primary vehicular access route, in which case public street rock & AC sections will be required. ³ – Minimum baserock thickness assuming subgrade compacted to 95% of Modified Proctor and passes a proofroll. Thicker baserock sections over fabric are required otherwise. Thicker rock & AC sections may be required by the Public Works Director where heavier location traffic exists or is anticipated.		

- c. The City reserves the right to require an engineer designed pavement section in lieu of the standard section. This will typically be required for streets for which the City

Engineer has reason to suspect unsuitable soil conditions, high percentage of trucks, where overlays are proposed, or any other conditions that may significantly affect the pavement structure design.

- d. Where required by the City, the design of overlays shall include non-destructive falling weight deflectometer tests or other tests approved by the City Engineer and the preparation of an engineering analysis of street improvements required for the design life required with all anticipated traffic, including truck traffic.
- e. Unless otherwise approved by the City Engineer, pavement designs shall be based on AC pavement conforming to OSSC (ODOT/APWA) 00744, hot mixed Asphalt Concrete Pavements (ACP), for standard duty mix and compacted to a minimum of 91% of maximum density (*at all locations*) as determined by the Rice Standard Method.

2.13 OVERLAYS

- a. All AC pavement overlays shall include non-woven fabric specifically designed for use with AC pavement.
- b. The standard minimum overlay thickness shall be 2-inches. In no case shall the overlay thickness be less than 1½-inches. This minimum thickness shall be increased as necessary to provide the required cross slopes, with smooth transitions between all variations in cross slope.
- c. Design of overlays shall be based on an analysis of the existing pavement condition by a registered professional engineer experienced in the design of pavements, and shall result in the minimum practical design life as specified. Unless otherwise approved by the City Engineer, testing of the existing pavement shall include the following as a minimum.
 - 1) Coring of the street at maximum 50 foot intervals to establish the thickness and condition of existing pavement and aggregate base.
 - 2) Non-destructive falling weight deflectometer tests on the existing pavement proposed for overlay.
 - 3) Preparation of an engineering analysis of overlay thickness required to provide the specified design life with all anticipated truck traffic.
- d. Areas of existing pavement and baserock which exhibit deflection or alligator cracking or have otherwise failed shall be excavated and replaced with new compacted baserock and AC pavement prior to the overlay. Baserock and AC pavement repair thicknesses shall match standard section thicknesses. All cracks greater than 1/8-inch in width shall be cleaned out and filled with an asphalt emulsion slurry and sand, or other method approved by the City Engineer. All crack sealing, skin patching and plugging of digout areas must be approved by the City Engineer prior to the placement of the final fabric and overlay.

- e. Overlay fabric shall be Petromat as manufactured by Amoco Fabrics & Fiber Company, or approved equivalent. Hot oil tack coat (*PBA-5 or approved equivalent*) shall be used prior to placement of the overlay fabric. Use of emulsion tack coats shall be prohibited.
- f. Asphalt overlays shall include grinding as required to allow the minimum overlay thickness at existing paving, catch basins, gutter pans and other structures which cannot be raised to grade. Unless otherwise approved by the City Engineer, all existing manholes, valve boxes and other structures shall be raised to grade before the overlay. Structures raised to grade following placement of the overlay shall have the pavement sawcut around the structure as required by the City Engineer and a reinforced PCC concrete patch placed around the structure.
- g. Any existing survey monuments within AC pavement overlay areas shall be provided with a monument box to City and County Surveyor standards, installed prior to overlay paving, unless the Public Works Director allows the survey monuments to be reset by a licensed surveyor to finish pavement grade with aluminum caps (*case-by-case basis*).

2.14 HORIZONTAL ALIGNMENT

- a. Horizontal centerline alignments of improvements shall be parallel with the centerline of the right-of-way. Centerline of the proposed street extensions shall be aligned with the centerline of corresponding existing streets.
- b. Unless required to match curvature of existing right-of-ways, horizontal curves shall be to an even 5 feet, and shall meet the minimum requirements listed below:

MINIMUM HORIZONTAL CURVE RADIUS	
Street Classification	Minimum Horizontal Curve Centerline Radius
Arterials	300 feet
Collectors and Continuing Residential Streets	200 feet
Commercial/Industrial	250 feet
Cul-de-sac	160 feet
Alleys and Private Streets	100 feet
<p>NOTE: Horizontal curve lengths shall conform to the minimums outlined herein, or the length required by AASHTO for the posted speed, whichever is greater.</p>	

- c. Staggering or T intersections at collectors and arterials shall be avoided within 300 feet of an opposing intersection. Intersections of local streets shall not be offset staggered less than 200 feet from an opposing intersection.

- d. Streets intersecting an arterial or collector street but not continuing through the arterial or collector street along the same horizontal alignment (*ie. a staggered or tee intersection*) shall not be located within 300 feet of another street intersecting the opposite side of the arterial or collector street. Similarly, opposing-intersections of local streets shall be separated by not less than 200 feet.

2.15 MONUMENTATION

- a. In accordance with ORS 92.060 Subsection (2) and/or 209.15 Section 2, the centerline of all street right-of-way shall be monumented before the City shall accept a street improvement. Monuments shall be set under the direction of a registered Professional Land Surveyor. A record of survey must then be filed in compliance with ORS 209.250 and any additional requirements set forth by the City.
- b. Any existing or new street or property survey monuments within the paved street improvement areas, driveways, sidewalks or other hard surface areas or areas subject to vehicular traffic shall be set flush with the finish pavement surface with 2-inch aluminum caps. The City reserves the right to require monument boxes per standard details where directed by the Public Works Director.
- c. The following centerline monuments shall be set as a minimum:
 - 1) All centerline - centerline intersections.
 - 2) The centers of all cul-de-sacs.
 - 3) Curve points in accordance with ORS 92.06 and 209.15.
- d. All public utilities within the right-of-way shall be placed in positions that do not interfere with centerline monumentation.

2.16 INTERSECTIONS & PEDESTRIAN CROSSINGS

- a. Intersection Angle. The interior angle at intersecting streets shall be kept as near to ninety degrees (90°) as possible and in no case shall it be less than eighty degrees (80°), per ADO 20.73.F.

b. Centerline Horizontal Tangents.

- 1) There shall be a straight horizontal tangent section on each leg of an intersection having a length not less than shown in the table below.
- 2) The length of the horizontal tangent on each leg shall be measured from the extension of the curblines of the intersected street.
- 3) Where streets are not fully improved, horizontal tangent length shall be measured from the future curb location.

Street Classification	Minimum <u>Horizontal</u> Tangent Length (ft)
Arterial	100
Collector	75
Commercial/Industrial	75
Residential	50

c. Primary & Secondary Street Designation.

- 1) The designation of primary streets versus secondary streets for intersection design shall be made by the City Engineer.

d. Intersection Street Grades.

- 1) The maximum street grade through intersections and within the landing area (*vertical intersection approach as defined below*) shall be 5% for the primary street and 2% for the secondary street, or as required to meet ADA and PROWAG standards where applicable.

e. Vertical Intersection Approach.

- 1) The beginning of secondary street vertical curve at intersections (*from the cross-slope of the primary street to the centerline/curb street grade of the secondary street*) shall not begin prior to the end of curb radius unless otherwise approved or required by the City Engineer based on detailed drawings showing compliance with all ADA and PROWAG standards.
- 2) Vertical intersection approaches shall have straight street grades within the limits specified, with no more than a 1% grade break from the adjacent intersection cross slope (*street grade break at the curblines extension*).

f. Intersection Pedestrian Street Crossing.

- 1) A pedestrian street crossing (*marked or unmarked as approved by the City*) shall be provided for all legal crossing location as required by state law, unless the City Engineer determines that a crossing should not be provided based on consideration of safety and traffic issues. Pedestrian street crossings shall comply with requirements for pedestrian access routes herein and PROWAG standards.
- 2) Sidewalk access ramps meeting current ADA and PROWAG standards shall be provided at all corners of intersections where crossing is permitted, regardless of curb type (*or absence of curb*).
- 3) Street Grades at Pedestrian Crossings. The street cross slope for pedestrian street crossings at intersections shall not exceed 2% maximum at crossings of secondary streets, nor 5% maximum at crossings of primary streets.
- 4) The pedestrian grade of the pedestrian street crossing (*along the pedestrian access route*) shall not exceed 5% maximum at any point in the crossing, including at gutter pans.

g. Midblock Pedestrian Street Crossing.

- 1) Unless specifically approved in writing by the City Engineer, mid-block pedestrian street crossings are not permitted.
- 2) Street Grades at Pedestrian Crossings. Where pedestrian access routes are contained within midblock street crossings, the pedestrian cross slope (*cross slope of the pedestrian street crossing*) shall be permitted to equal the street grade, unless otherwise required by PROWAG.
- 3) The pedestrian grade of the midblock pedestrian street crossing (*along the pedestrian access route*) shall not exceed 5% maximum at any point in the crossing, including at gutter pans.

- h. Curb Radius. Curb radii at intersections shall be as shown below for the various functional classifications. The right-of-way radius at intersections shall be sufficient to maintain the same right-of-way to curb spacing as the lower classified street.

MINIMUM INTERSECTION CURB RADIUS¹				
Street Classification	Arterial Street	Collector Street	Commercial/Industrial Strt	Local Street
Arterial Street	35 feet	-	-	-
Collector Street	30 feet	30 feet	-	-
Commercial or Industrial Str.	35 feet	35 feet	35 feet	-
Local Street	25 feet	25 feet	30 feet	20 feet

¹ Smaller or alternate curb radius may be required or approved by Public Works Director on a case-by-case basis, including the use of pedestrian bulbouts on wider streets where deemed applicable by Public Works Director or the City Engineer. Larger radius may be required by Public Works Director to accommodate truck turning movements.

- i. Street Signs. All newly platted or newly improved streets shall be posted with a name sign approved by the City. In the case of development, installation of any required street signs or traffic control signs shall be the responsibility of the developer.

2.17 VERTICAL ALIGNMENT AND STREET GRADES

- a. Street grades shall be designed to allow drainage to the curb of areas within the public right-of-way, as well as lot drainage. In general, this requires the curbs of new streets be set a minimum of 6-inches below existing grade.
- b. Unless otherwise approved in writing by the City Engineer and Public Works Director and applicable City planning authorities, street grades shall not exceed the following:
- 1) Collectors - 6%
 - 2) All others -6% except as noted below
12% maximum, with 12% grades not exceeding 100 feet in length and not at intersections.
 - 3) Notwithstanding these maximum street grades, street grades through intersections and intersection approaches must allow for the installation of pedestrian ramps & pedestrian crossings conforming to PROWAG standards.
- c. Minimum tangent street gradients shall be 0.4% along the crown and curb for all streets (*Type A curb & gutter required*).

- d. Streets intersecting with streets not constructed to full City standards shall be designed to match both present and future vertical alignments of the intersected street. The requirements of these standards shall be met for both present and future conditions.
- e. Street grade changes of more than one percent (1%) shall be accomplished with vertical curves. Vertical curve K-values shall conform to the values listed below. The vertical curve K-value shall be defined as the length of the vertical curve divided by the algebraic difference between the tangent street grades ($K = L/A$).

Vertical curve length shall not be less than the length computed from the formula $L = K \cdot A$ (ie. K value shall not be less than the values listed below), where:

L = length of vertical curve in feet

K = vertical curve design constant (K-value)

A = algebraic difference between the tangent street grades each way.

DESIGN CONTROL FOR VERTICAL CURVES BASED ON STOPPING SIGHT DISTANCE		
Design Speed MPH	Crest Vertical Curve, Minimum K-value	Sag Vertical Curve, Minimum K-value
15 ¹	3	10 (8 ²)
20	7	17
25	12	26
30	19	37
35	29	49
40	44	64
45	61	79
50	84	96
55	114	115

¹ Applies only to vertical curves in alleys or at the intersection of a secondary street (*side street*) to a primary (*thru*) street (ie. transition from primary street cross slope to street grade of secondary street).

² Reduction in K-Value (for sag curves on secondary street intersections) which is allowed provided the intersection is fully illuminated with a street light (*per these standards*) adjacent to the sag vertical curve.

- f. Street grades, intersections and super-elevation transitions shall be designed to not allow concentrations of stormwater to flow across travel lanes.

- g. Slope easements shall be dedicated or obtained for the purposes of grading outside of the right-of-way or to ensure that roadway fill slopes are not disturbed.

2.18 STREET CROSS SECTIONS AND STREET CROSS SLOPES

a. General

- 1) Cross-slope of the street section shall be two percent (2%) unless otherwise approved by the City Engineer, based on a demonstration by the design engineer that PROWAG standards are met..
- 2) Symmetrical street cross sections with opposite curbs at the same level are preferred.
- 3) Off-set crown cross-sections are acceptable only where required due to sidehill lies and to match existing facilities. Off-set crowns shall not exceed 12 inches between the high curb and the low curb, and the crown location shall not be less than 12 feet from the face of curb.
- 4) Inverted crown sections are not acceptable for public streets.
- 5) Shed roof cross sections are not acceptable for public streets, except within and immediately adjacent to street intersections. The design of shed cross sections shall include provisions to avoid concentrated drainage sources from flowing across the pavement surface.

b. Superelevation

- 1) Use of superelevations shall be prohibited unless specifically authorized by the City Engineer. Criteria for approval of the use of superelevations shall generally conform to the requirements for variances as outlined under Division 1.
- 2) Off-set crown sections are not acceptable as super elevation sections.
- 3) Maximum superelevation allowed for City streets shall be five percent (5%) *(except at intersections or pedestrian crossings where lesser slopes are required by PROWAG)*.
- 4) Super elevation transitions shall be designed to not allow concentrations of storm water to flow over the travel lanes.

2.19 GRADING WITHIN PUBLIC RIGHT-OF-WAY

- a. Grading for local street and commercial/industrial classifications shall not exceed the following cross slopes:
 - 1) From curb to 1 foot behind the sidewalk: One & half (1.5%) upward.
 - 2) From 1 foot behind sidewalk to property line: 5H:1V upward or downward.
 - 3) Within the street frontage public utility easement (PUE): 5H:1V upward or downward.
 - 4) Outside of right-of-way and public utility easement (PUE): 2H:1V up or down outside the public utility easement.
 - 5) Along the edge of turnpike streets (*from the back of the gravel shoulder*): 3H:1V downward, unless otherwise approved on a case-by-case basis by the Public Works Director and City Engineer.
- b. Side slopes may be increased to 2H:1V up or down within 2 feet from the back of the sidewalk with approval from the City Engineer and affected utilities.
- c. Where street improvements do not include curbs along both sides of a street, the design shall include a full depth gravel shoulder on the non-curbed side (*1' minimum width, wider shoulder may be required by the Public Works Director to address site specific circumstances*), and shall address collection of storm water drainage on the non-curbed side of street improvements. Where ditches are necessary along the non-curbed side (*ie. where ground does not slope away from the street*), ditches shall conform with PWDS requirements and standard details (*including driveway culverts which meet City standards*), and shall drain to an approved point of disposal.

2.20 CURBS AND GUTTERS

- a. All streets shall include curbs on both sides except in the situations of interim width improvements. The minimum tangent curb gradients shall be as outlined under Section 2.16, 'Vertical Alignment'.
- b. The standard curb for City Streets shall be Type A curb and gutter for all road classifications.
 - 1) Use of Type C curbs requires written approval by the City Engineer for each location proposed, and is typically limited to replacement of short lengths of existing Type C curbs (*other than at new driveway approaches*), use at raised pedestrian crossing islands, or where required by County or ODOT standards.
 - 2) Where Type A curb and gutter is installed along the edge of existing paved streets (*where pavement widening is not required, and where changes to the*

vertical alignment or cross slope is not required), the pavement shall generally be sawcut at the edge of the gutter pan and the new curb & gutter placed against the sawcut, in order to minimize the need for street patching and repaving.

- c. The ends of all curbs shall be tapered downward to prevent damage to vehicle tires.
- d. A six (6) inch curb exposure is normally required on residential streets and streets with curb and gutter. A seven (7) inch exposure may be required by the Public Works Director on streets where Type C curbs are allowed. Greater curb exposure shall also be provided where required by ODOT standards.
- e. Three (3) inch diameter curb weep holes shall be provided through curbs with inverts 1-inch above the gutter line, at the locations outlined below. Drain pipe shall be provided under all sidewalks to connect to all curb weep holes (*drain pipe under sidewalks shall extend 12-inches behind back of sidewalk and be capped*). The location of all weep holes shall be shown or defined on the drawings as outlined in Division 1.
 - 1) Opposite existing or anticipated roof drain downspouts (*minimum 2 per lot*).
 - 2) At 16 foot on center along low areas where curb top is above adjacent ground.
 - 3) At 16 foot on center adjacent to bank areas to receive groundwater.
- f. When new curbing is being placed, a stamp shall be placed to mark where each water, sanitary sewer or storm drain service lateral crosses the curblines. The curbs shall be marked on the top of the curbs with an imprinting stamp a minimum of 2-inches high. The impression for a water service shall be the letter "W". The impression for a sanitary sewer service shall be the letter "S". The impression for a storm drain service shall be the letter "D".

2.21 SIDEWALKS & MULTI-USE ACCESS ROUTES

- a. Unless otherwise allowed by the Development Code and/or approved through the Planning Department, sidewalks shall be provided on both sides of curbed streets for all road classifications, as well as for private streets.
- b. Monolithic curb & public sidewalk placement is not permitted (*ie. curb concrete & public sidewalk concrete shall be placed separately, except where approved by the City at pedestrian ramps or driveway approaches*).
- c. Drain pipe shall be installed under sidewalks as required to connect to all curb weep holes or other storm drain facilities. Surface discharge of roof drains or other drain pipes across sidewalks is not allowed, nor is the sheet flow from parking lots, commercial/industrial driveways, common residential driveways, or concentrated flow from long flaglot driveways allowed to flow across sidewalks.
- d. All sidewalks shall fully comply with all ADA and/or PROWAG standards as

applicable. Handicap access ramps meeting current ADA and PROWAG standards shall be provided at all corners of intersections where crossing is permitted, regardless of curb type (*or absence of curb*), and at the ends of all sidewalks.

- e. Handicap access ramps shall be located so as to avoid conflict with storm drain catch basins.
- f. Sidewalks shall be constructed of concrete, and shall be a minimum of 4-inches thick except at driveway crossings and pedestrian ramps, which shall be a minimum of 6-inches thick (*8-inch thickness required for commercial type driveways*).
- g. Multi-Use paths shall be a minimum of 4-inches thick concrete (*any pathways used for maintenance vehicle access to utilities shall be 6" thick & reinforced with #4 bar at 12" OC EW, unless 8" concrete thickness is provided*).
- h. Sidewalks shall meet the minimum widths outlined below. The location of sidewalks within the public right-of-way shall be as approved by the City during the design process.

MINIMUM SIDEWALK WIDTHS		
Street Classification	Min. Sidewalk Width from back of curb	Location unless otherwise approved
Highway 20/34	6.0 ft or current ODOT standard	Curblines
Arterial Street	5.0 ft	Curblines
Collector Street	5.0 ft	Curblines
Commercial or Industrial Str. ¹	5.0 ft	Curblines
Local Street	5.0 ft	Curblines
Property line sidewalks, where approved by City, are typically offset 6" to 1' from the rights-of-way line in order to avoid conflicts with right-of-way and property monuments. ¹ Pedestrian walkways may be approved along alternate alignments where approved by the City.		

- i. Water meters, utility poles, etc. are not permitted within sidewalks unless authorized in writing by the Public Works Director.
- j. Where single or clustered mailboxes or other objects are within a sidewalk, the sidewalk shall be widened to provide clearance equal to the required sidewalk width. For retrofit installations only where specifically approved in writing by Public Works Director, the sidewalk clear space may be reduced to 48 inches minimum, provided that all other PROWAG requirements are satisfied. All existing mailboxes shall be set on new posts

at the time of sidewalk construction.

- k. Sidewalks to be constructed in conjunction with street improvements or to be provided as part of a development may be deferred at the City's option until building construction except for the following situations:
 - 1) Arterial or collector streets fronting corner lots.
 - 2) Sidewalks along streets from which vehicular access to the fronting lot is restricted.
 - 3) Sidewalks fronting existing structures.
 - 4) Offsite sidewalks not abutting the property within the development.
 - 5) Pedestrian walkways not along public streets.
 - 6) Sidewalks fronting non-buildable tracts or parcels.
 - 7) All required ADA pedestrian curb ramps within or adjacent to public or private streets, as well as sidewalks required for ADA compliant pedestrian access to CBU mailboxes.
 - a) CBU mailbox location must be acceptable to the local postmaster, and provide for ADA compliant access.
 - b) A pedestrian curb ramp must be located within 50 feet of the CBU (Oregon Structural Specialty Code 1111.4.1).
 - c) Installation of CBU mailboxes within the curb radius at street intersections is prohibited.
 - 8) Existing sidewalks which do not meet City or ADA standards which must be replaced in conjunction with a development.
- l. In all cases where the construction of a sidewalk is deferred, all grading work required for future construction of the deferred sidewalks shall be completed by the developer at the time of street and utility construction, including weepholes through the curb for future rain drain pipes.
- m. Sidewalk Grades & Vertical Alignment.
 - 1) Except for pedestrian street crossings (see Section 2.16, Intersections & Pedestrian Crossings), the sidewalk grade for pedestrian access routes contained within the public right-of-way shall not exceed the general grade of the adjacent street.
- n. Sidewalk/Pathway Separation from Vehicle Route: Where sidewalks or pathways are parallel and adjacent to a driveway or street (*public or private*), they shall be raised

six inches and curbed, or separated from the driveway/street by a 3 foot minimum landscape strip, a landscape berm, bollards, or other physical barrier. If a raised path is used, the ends of the raised portions must be equipped with curb ramps.

- o. Temporary transitions acceptable to the City shall be provided at points where sidewalks terminate, except where otherwise approved by Public Works Director and the City Engineer (*typically limited to cases where the pedestrian access route does not continue beyond the end of the sidewalk, and subject to a "sidewalk ends" sign being installed on a post conforming with ODOT detail TM240, which post is also shown on Detail 212*).
- p. Sidewalk Maintenance. City standards require that "*Maintenance of sidewalks, curbs, and planter strips is the continuing obligation of the adjacent property owner.*"

2.22 CLEAR VISION AREA

- a. Clear vision areas shall be maintained at each driveway access to a public street and on each corner of property at the intersection of two streets, a street and an alley, or a street and a railroad.
- b. No fence, wall, sign or structure that would impede visibility between three (3) feet and eight (8) feet shall be established in the clear vision area, nor any planting or hedge taller than three (3) feet in height (*except for tree trunks with all branches and foliage removed to a height of eight (8) feet above grade*). Measurement shall be made from the top of curb or, where no curb exists, from the street centerline grade.
- c. The clear vision area shall consist of a triangular area, two sides of which are right-of-way lines or a right-of-way line and access easement line. Where right-of-way lines have rounded corners, the right-of-way lines shall be extended in a straight line to the point of intersection and so measured. The third side of the triangle shall be a line connecting the non-intersecting ends of the other two lines.
- d. For single use residential driveways, the clear vision area shall consist of a triangular area, two sides of which are the curb line and the edge of the driveway. Where no curbs exist, the future location of the curb based on full street improvements shall be used.

e. The following measurements shall establish the clear vision areas:

CLEAR VISION AREA MEASUREMENTS	
Type of Intersection	Measurement Along Each Lot Line or Drive Edge ¹
Controlled Intersection (Stop sign/signal)	20 feet
Uncontrolled Intersection ($\geq 60'$ r/w)	30 feet
Uncontrolled Intersection ($< 60'$ r/w)	40 feet
Commercial/Industrial Driveways	20 feet
Common Use Residential Driveways & Alleys	20 feet
Single Residential Driveways	10 feet
¹ At the intersection of different classification streets, the measurement shall apply to the measurement along the right-of-way line as specified for each street classification.	

f. The preceding provisions shall not apply to the following:

- 1) A public utility pole.
- 2) A tree trimmed (*to the trunk*) to a line at least eight (8) feet above the level of the intersection.
- 3) An official warning sign or signal.
- 4) A place where the natural contour of the ground is such that there can be no cross visibility at the intersection.

2.23 CUL-DE-SACS, TURNAROUNDS

- a. Cul-de-sacs shall be as short as possible and shall have a maximum length of 400 feet long and serve no more than 18 dwelling units unless otherwise approved by the Planning Commission.
- b. The standard details show the minimum requirements for cul-de-sac turnaround areas. Other turnaround geometries may be used when conditions warrant and the City Engineer approves the design and application of its use. Cul-de-sacs in commercial or industrial developments shall provide adequate turnarounds for the type of vehicle serviced by the street, as approved by the City Engineer.

- c. The minimum curb radius for transitions into cul-de-sacs bulbs shall be 25 feet and the right-of-way radius shall be sufficient to maintain the same right-of-way to curb spacing as in the adjacent portion of the street.
- d. The finished pavement grade from the center point of cul-de-sac turnarounds to the curb shall not be less than two and one-half percent negative (-2.5%).
- e. Cul-de-sac curb profiles shall be provided with a smooth vertical alignment. Curblineline grade changes in excess of 1% shall use a vertical curve, with a K-value not less than 3.

2.24 STUB STREETS, VEHICULAR NON-ACCESS PROVISIONS

- a. Stub streets which allow for future extensions shall include a reserve strip at the terminus of the right-of-way provided by deed or plat conveyance to the City. The reserve strip shall be at least one foot in width and extend the full width of the right-of-way.
- b. A vehicular non-access easement to the City (*or a reserve strip tract*) may also be required along new street right-of-ways which front on undeveloped property. Where a reserve strip is allowed, it may be counted as part of the required right-of-way width.
- c. A vehicular non-access easement to the City (*or a reserve strip tract*) is also required along street frontages where vehicular access is not allowed (*such as the non-access frontage of corner lots, one end of double frontage lots, etc.*). Where a reserve strip is allowed, it may be counted as part of the required right-of-way width.
- d. A paved turn around shall be provided for stub streets with lengths greater than 300 feet, or as required by the Oregon Fire Code (*150 foot maximum length without turnaround per OFC D103.4, unless otherwise approved by the Fire Code Official*).
- e. Permanent barricades shall be placed at the end of all stubbed roads without a cul-de-sac turnaround. Vehicular access from the end of stub streets is prohibited unless explicitly authorized in writing by the City (*specific City Council approval typically required for any such permanent vehicular access from the end of stub streets*).

2.25 TRANSITIONS

- a. Street width transitions from a narrower width to a wider width (*based on the direction of traffic flow in the travel lane adjacent to the taper*) shall be designed with a 10:1 taper. Delineators, as approved by the City, shall be installed to mark the edges of the transition.

- b. Street width transitions from one width to a narrower width (*based on the direction of traffic flow in the travel lane adjacent to the taper*), or lane alignment transitions shall be designed with the length of transition taper as follows:

$$L = S \times W$$

Where:

L = minimum length of taper (feet)

S = Designated Speed (MPH)

W = EP to EP offset width (EP – Edge of Pavement)

- c. Delineators, as approved by the City, may be installed to define the configuration. Maximum spacing of delineators shall be the numerical value of the design speed, in feet (*ie. thirty-five (35) foot spacing for thirty five (35) MPH*).
- d. In situations where a tapered transition cannot be provided, a barricade shall be installed at the end of the wider section of the street and a taper shall be appointed and delineated as approved by the City. The barricade shall conform to MUTCD Standards.

2.26 SUBSURFACE DRAINAGE

- a. Subsurface street drainage must be considered in the design of each street. Subsurface drains shall be designed and constructed per the standard drawing details or the recommendations of the soils report.
- b. Subsurface drains shall connect and drain into the storm drainage system at catch basins, curb inlets, gutter inlets, manholes or road side ditches. Surcharge from the storm drainage system shall not be allowed to back up into the subsurface drains. Alternative subsurface drainage measures may be used if approved by the City.

2.27 ACCESSIBLE ON-STREET PARKING

- a. Accessible on-street parking shall be provided as required by PROWAG, or as required by any planning approval for development projects, whichever is more stringent.
- b. Where on-street parking is provided on the block perimeter (*block perimeter is defined as both sides of a street between two adjacent cross street intersections*) and the parking is marked or metered, ADA accessible parking spaces shall be provided in accordance with PROWAG Table R214. Where marked or metered parking on part of the block perimeter is altered, the minimum number of accessible parking spaces required is based on the total number of marked or metered parking spaces in the block perimeter.
- 1) Accessible on-street parking spaces shall conform with the requirements of PROWAG, and shall conform with City parking space or ADA dimensions, whichever is more stringent.

- 2) Accessible on-street parking spaces shall be located as close to an accessible curb ramp as possible. Unless the accessible on-street parking spaces are provided adjacent to the intersection (*ie. at the block end*), an accessible curb ramp shall be installed at the accessible parking location.
- 3) Access aisles adjacent to head-in or angled on-street parking shall be a minimum of 8 feet in width. Parallel accessible on-street parking will require a 5 feet wide access aisle between the parking space and the curb.
- 4) Access aisles shall extend the full length of the parking spaces they serve, where access aisles are required by PROWAG standards. Access aisles (*a minimum of 8 feet in width*) shall extend from the accessible on-street parking space to the accessible curb ramp.
- 5) Slopes within the accessible on-street parking space and access aisle shall not exceed 2% in any direction.

2.28 PARKING LOTS

- a. Minimum pavement sections for parking lots over compacted subgrade shall conform to the following:

PARKING LOT MINIMUM PAVEMENT SECTIONS		
Classification	Pavement Thickness (inch)	Baserock Thickness (inch)
Parking Lot Access Route	3 (AC)	10
Parking Lot	2½ (AC)	7
<p>The minimum pavement sections shown assume competent compacted subgrade and normal light traffic loading, and may not be adequate for all locations, soil conditions or types of development. The developer and/or design engineer shall be responsible to verify adequacy of proposed sections for the use intended. See PWDS 2.30.f for requirements where use of durable non-paved surfaces is proposed.</p>		

- b. Access routes through parking lots which are to be used (1) by delivery trucks, service vehicles or fire trucks, or (2) by automobiles in excess of 500 vehicles per day, shall conform to the minimum access route section outlined above.
- c. The dimensions for the design and layout of parking facilities shall conform to the minimum requirements shown on the Standard Details. In the event of discrepancies between the minimums in the PWDS standard details and the minimums in the development code, the larger minimums will typically apply as determined by the City (*ie. for instance, if minimum parking space dimensions in the PWDS are greater than*

minimums listed in the development code, the larger space requirements will control since the greater size will still comply with the minimum under the development code. The same applies to minimum drive aisle widths required in the development code, the PWDS or the Oregon Fire Code).

- d. Parking lots and associated driveways shall maintain adequate drainage facilities to prevent water ponding or ice formation, and to prevent stormwater from sheet flowing across sidewalks. In general, this requires a minimum cross slope of two percent (2%) perpendicular with contour lines. In no case shall cross slopes less than one percent (1%) be allowed at any point. All drainage facilities shall conform to the requirements of Division 3 of these Design Standards.
- e. Curves and corners within the parking facilities shall have a minimum curb radius of 15 feet except for emergency access lanes, where a minimum curb radius of 28 feet shall be required, unless a smaller radius is approved by the Fire Code Official (*OFC 503.2.4 & OFC Fig D103.1*).
- f. Bumper guards or wheel barriers shall be installed so that no portion of a vehicle projects into the right-of-way or over the adjoining property.
- g. Sidewalks abutting head-in parking stalls shall be a minimum of 6 feet wide, unless wheel stops are provided (*front of wheel stop set 2 feet from the curblin e or edge of the sidewalk*). For purposes of sizing single loaded parking stalls (*without wheel stops*) which abut 6-inch curbs and 6 foot wide sidewalks, a maximum 1 foot bumper overhang may be assumed for standard size parking stalls (*ie. standard parking stall length may be reduced by a maximum of 1 foot from the length listed on the Standard Details*). Length of compact parking stalls are not to be reduced.
- h. Parking lots and associated access driveways shall be provided with security lighting configured to minimize glare onto adjacent property (*see PWDS 1.10.e.1 j*). Wall pack and/or bollard lights may be utilized as the sole source of driveway & parking lot lighting only in locations where they will not need to shine over vehicles to light the parking lot, and it is demonstrated that wall pack lights will not shine onto adjacent property.

2.29 DRIVEWAY SPACING & LOCATION

- a. No more than one driveway per property shall be permitted in residential zones except for duplexes (*which can have two driveways*). With approval of the Public Works Director, corner lots which do not front on arterial or collector streets may have two driveways (*one on each side street*), as far away from the intersection as possible.
- b. Where possible, driveways for corner properties (*corner lot*) shall be located on the lowest classification street and as far from the intersection as possible.
- c. Driveways on through lots shall be located on the lowest classification street.

- d. Residential driveways of adjoining properties shall have a minimum of 15 feet clear between the edges of the driveways.
- e. Location of all driveways serving commercial, industrial or multifamily facilities shall be approved by the City.
- f. Driveways shall be separated from an intersection by a minimum of 30 feet or one-half the lot frontage, whichever is greater.

2.30 DRIVEWAYS, DRIVEWAY APPROACHES, ALLEYS

- a. Driveways shall conform to the Standard Details. Curb removal for driveways shall be by saw cutting.
- b. Sidewalks crossing driveway approaches shall be concrete per City standards.
- c. Driveway approaches shall be constructed to meet current ADA and PROWAG standards at all locations where sidewalks cross or will cross the driveway.
- d. For new driveway approaches on streets with curb & gutter, the gutter pan shall be removed and replaced monolithic with the driveway approach.
- e. Driveway approaches on curbed streets shall be constructed of concrete, and shall be a minimum of 6-inches thick (*8-inch minimum for commercial type driveways*). Driveway approaches on turnpike (*non-curbed*) segments may be either concrete or asphalt.
- f. Driveways Not to Block Drainage. Driveways shall be constructed so that they do not block drainage along the street.
- g. Driveways, etc. to be paved. All driveways, parking areas and vehicle maneuvering areas shall be paved with asphalt, concrete or comparable surfacing (*including driveway/parking additions to match the same style as the existing driveway*), except where the use of durable non-paving material is approved by the City on a case-by-case basis, where required to reduce surface water runoff and protect water quality.
 - 1) Durable non-paved surfaces shall be subject to review and approval by the Public Works Director, and will require a maintenance agreement acceptable to the City be recorded against the property.
 - 2) The type of durable non-paved surface proposed shall allow for the installation of permanent marking of parking spaces, driving lanes, fire lanes & turnarounds, etc. (*ie. where permanent surface painting is not feasible, permanent colored surface delineators specifically designed for use with the durable non-paved surface proposed shall be provided and installed*).
- h. New alleys shall be paved.

- i. Alleys Used as Driveways. Existing alleys used as driveways for new structures (whether or not land use approval is required) shall be paved to City standards from the public street along the entire portion of the alley used as a driveway (including turning/backing areas as applicable).
- j. In cases where non-paved surfaces are allowed, driveways and alleys shall be provided with a minimum 10 foot paved or concrete extension of the approach beyond the back of sidewalk location in all cases (from back of future sidewalk location for turnpike streets).
- k. Multiple use, commercial or industrial type driveways (and any driveway exceeding 10% slope) shall be paved completely.
- l. Single family residential driveways: Driveway approach widths shall be as shown on the following table (2nd driveways require specific City approval on a case-by-case basis).

RESIDENTIAL DRIVEWAY APPROACH WIDTHS		
Driveway Type	Minimum Driveway Approach Width	Maximum Driveway Approach Width
One parking space width	10 feet	15 feet
Two parking space width	16 feet	24 feet
Driveway approach serving garage w/3 car width vehicle doors	22 feet	30 feet
2 nd driveway/RV Parking	10 feet	15 feet
See PWDS 2.30.d & n for residential driveway apron requirements on turnpike streets.		

- m. Common driveways serving multiple lots and flag lot driveways over 150 feet in length shall be provided with an emergency turnaround meeting the requirements of the Public Works Director, or as required by the Oregon Fire Code.
- n. Maximum slope of driveways shall not exceed 12% or as required by the Oregon Fire Code.
- o. The angle between a driveway centerline and the parallel vehicle travel lane shall be between 75 degrees and 105 degrees.

- p. For driveways connecting to a street that has not been improved to its ultimate width, the driveway profile (*ie. vertical profile*) shall be designed to allow for future street widening without reconstruction of the driveway. Driveways on turnpike or streets narrower than standard shall be constructed such that the surface of the driveway matches the future back of sidewalk elevation (*ie. future back of sidewalk elevation to be based on design street width and cross slope per current City standards, assuming the future street will be centered in the future right-of-way unless otherwise directed by the City*). This requirement applies both to new driveways and to existing driveways reconstructed in conjunction with street improvements. See also 2.30.e regarding driveway grades constructed so that it does not block drainage along the street.

2.31 PRIVATE STREETS, COMMON DRIVEWAYS AND FLAGLOTS

- a. Private streets serving 3 or more single family lots or parcels shall be constructed to the same cross sectional specifications (*AC & rock sections*) as public streets.
- 1) Private streets or common driveways shall be provided with sidewalks or pedestrian walkways (*servicing all structures*) meeting PWDS requirements and as required by City code and/or planning approval.
 - 2) Private streets shall be located within a separate tract under the common ownership or under the control of all lots/parcels taking legal access from the private street, and shall have a recorded maintenance agreement and a recorded fire lane easement conforming to OFC requirements.
 - 3) Unless otherwise approved by the City Engineer and the Fire Code Official, cross slope for common driveways, private streets and fire lanes shall not exceed limits for public streets (*typically 5% maximum*).
- b. A turn-around shall be required for any private residential street, common driveway, fire lane or flagstem driveway which has only one outlet and which is in excess of 150 feet long, or which serves more than two residences, or as required by the Oregon Fire Code. Non-residential private streets serving more than one ownership shall provide a turn-around if in excess of 200 feet long and having only one outlet, or as required by the Oregon Fire Code. Turn-arounds for private streets shall be either a circular turn-around with a minimum paved radius of 35 feet, or a tee or hammerhead turnaround conforming to the standard details, or as required by the Oregon Fire Code.
- c. Pavement sections and widths for private streets, common driveways, flaglot drives or partition access easements serving single family lots or parcels shall conform to the following (*driveways for commercial, industrial or multi-family developments shall conform with commercial driveway & parking lot access requirements – see details*):

MINIMUM PAVEMENT WIDTH AND SECTIONS (SF homes or duplexes)			
Classification ^{5,6}	Minimum ¹ Paved Width ²	Pavement Thickness (inch)	Baseroack Thickness ⁸ (inch)
Private Streets serving 3 to 6 lots or parcels ^{3,4} Fire Lane minimum (<i>match street section where more than 6 residences, or match parking lot access route where applicable</i>)	20 ft* *sidewalk required on one side ⁴	3 (AC)	9
		8 (PCC)	2
Common Drives serving 2 lots or parcels ^{1,3} (<i>wider widths required for fire lanes</i>)	20 ft	2½ (AC)	8
		6 (PCC)	2
Flag Lot Driveway serving one single family lot or parcel ¹ (<i>wider widths required for fire lanes</i>)	12 ft	2½ (AC)	6
		6 (PCC)	2
Partition Access Easement (1 dwelling unit on a single lot or parcel) with a sole use driveway ^{1,7} (<i>wider widths required for fire lanes</i>)	12 ft	2½ (AC)	6
		6 (PCC)	2
Partition Access Easement (2 dwelling units on a single lot or parcel) with a sole use driveway ^{1,7} (<i>wider widths required for fire lanes</i>)	16 ft	2½ (AC)	6
		6 (PCC)	2
Residential driveway aprons on a turnpike street (no curbs), for portion within ROW ¹ .	D/W width 24 ft max	2½ (AC)	6
		6 (PCC)	2
<p>¹ – Wider pavement widths may be required by the local Fire Code Official or where necessary to meet Oregon Fire Code (OFC) requirements (<i>20' minimum typical</i>). Fire Lanes shall be designed to support 60,000 lb fire apparatus per OFC D102.1. Also, OFC 503.1.1 requires that a fire lane (<i>ie. fire apparatus access road</i>) extend to within 150 feet of the furthest point on any building exterior 1st story wall.</p> <p>² – Paved width shall be measured from the face of curb where curbs exist.</p> <p>³ – See ADO 20.73.M for source of private street standards. Also, a recorded maintenance agreement is required for common driveways serving two or more lots or parcels, or for private streets.</p> <p>⁴ – Sidewalk to City standards required along one side of private street for entire length. Provide PUE along one side of street easement for franchise utilities.</p> <p>⁵ – All common residential driveways & private streets shall be designated as fire lanes and signed for no parking, and shall meet the fire apparatus access road requirements of the Oregon Fire Code where applicable.</p> <p>⁶ – See PWDS 2.29.d for hard surfacing requirements adjacent to sidewalks.</p> <p>⁷ – Recorded maintenance agreement is required.</p> <p>⁸ – Minimum baseroack thickness assuming subgrade compacted to 95% of Modified Proctor and passes a proofroll. Thicker baseroack sections over fabric are required otherwise.</p> <p>Note: Easement widths for fire lanes or driveways across other property, or tracts containing private streets, are to be a minimum of 5 feet wider than the paved or improved width (see also Detail 220).</p>			

- d. Flaglot Drive Earthwork & Grading. As a minimum, all grading for single flag lot drives shall be completed by the developer at the time of street and utility construction, whether or not paving is required at the time of street construction.
- e. Common Use Driveway & Fire Lane Paving. Common use driveways and fire lanes shall be paved by the developer at the time of street and utility construction to ensure that they are serviceable prior to building permit issuance per Oregon Fire Code requirements (OFC 501.4), unless an exemption is granted by the Fire Code Official and the Public Works Director to allow paving to occur prior to occupancy.
 - 1) If such an exception is granted to defer paving, the common driveway and/or fire lane shall be improved with granular baserock to a sufficient depth to accommodate all truck and construction loads during building construction, typically corresponding to the City's standard over-excavation baserock section as a minimum.

2.32 STREET LIGHTING

- a. Street lighting design shall be provided as part of the street design and/or development process at the developer's cost. Street lights shall be located as near as possible to lot line extensions and not in the middle of lots.
- b. Spacing and location of street lighting shall be approved by the City based on City spacing standards or a photometric design, subject also to the location and spacing standards summarized herein. The design and installation of street lights shall be paid for by the developer, including any redesign costs required to comply with City spacing or location standards. Any line extension fees shall be the responsibility of the developer.
- c. Any street light relocation, if requested by a resident or developer, must be approved by the Public Works Director, and the resident or developer will be responsible for the cost of such relocation.
- d. Unless otherwise approved by Public Works Director and the utility company, street lights shall be installed a minimum of 1 foot behind curblines sidewalks.
- e. Street lights may be installed between the curb and property line sidewalks provided the street light is a minimum of 3-feet behind the face of curb and 1 foot from the sidewalk.
- f. Street lights shall be placed at all street intersections and at cul-de-sac bulbs. Unless otherwise approved by the City, street light spacing shall not exceed 200 feet or 3 lot widths, whichever is less. As noted above in paragraph 1.1(d) of these standards, lesser spacing must be used whenever required in writing by the City, based on public safety concerns or by a photometric design.
- g. Where pedestrian paths or offsite sidewalks are required in conjunction with a

development project, street lights or pedestrian lighting (*acceptable to the Public Works Director*) shall be provided along the sidewalks or paths where adequate lighting does not already exist.

2.33 BARRICADES AND GUARDRAILS

- a. Guardrails shall be provided on all streets with downhill slopes which drop 6 feet or more at greater than 3H:1V slopes.
- b. Guardrail installation shall be based on information found in AASHTO publication "Guide for Selecting, Locating and Designing Traffic Barriers."
- c. Guardrails shall be designed and constructed per ODOT's "Standard Drawings for Design and Construction.
- d. Permanent barricade installation shall be based on the "Manual of Uniform Traffic Control Devices." Basically red and white reflectorized Type III barricades shall be used at the end of a street, conforming with Detail 225. White and black reflectorized Type III barricades shall be used at the end of a street widening which does not taper back to the existing pavement width. White and black reflectorized signs shall be used at the end of the sidewalk or pedestrian/bike path, mounted on a post conforming with ODOT detail TM240, which post is also shown on Detail 212.

2.34 BIKEWAYS

- a. Bikeway locations shall be determined by the City. Bikeway facilities shall meet the requirements of this document and the American Association of State Highway and Transportation Officials publication, Guide for Development of New Bicycle Facilities, as amended and adopted by the Oregon Department of Transportation.
- b. A bikeway may be constructed adjacent to the curb within the pavement area.
- c. Structural sections of bikeway facilities on streets shall conform to that of the street or be integral with the curb.
- d. Bikeways not within a street shall be constructed as concrete multi-use paths per PWDS 2.21.f.
- e. Design Standards regarding horizontal alignment, grade, sight distance, intersections, signing, marking, structures, drainage and lighting shall conform to the AASHTO Standards. When bikeways are integrated with a curb, all inlet grates shall be designed to protect the bicyclist from the grate or opening.

2.35 STREET SIGNS

- a. Street signs shall be installed on all new or reconstructed public and private streets. Street names for all newly platted streets shall be approved by the City.

- b. All street signs (*material, color, wording, etc.*) shall conform to OSSC (ODOT/APWA) Specifications, City Standards, and the Manual of Uniform Traffic Control Devices (MUTCD). Location and type of signs shall conform with MUTCD and City Standards.
- c. Signs along County or State right-of-ways shall be approved by the County or ODOT as appropriate.
- d. All signs shall be ordered, installed and paid for by the developer. Street names and sign types shall be approved by the City prior to placement of the sign order.

2.36 CUTTING EXISTING STREETS & RESTORATION REQUIREMENTS

- a. Any street pavement cuts shall be repaired to PWDS standards and details, including any work by or for franchise utility companies. Finish pavement grades at transition to existing pavement shall match existing pavement grades or be feathered past joints with existing pavement as required to provide a smooth, free draining surface. Pavement surface shall be a smooth, well-sealed, tight mat without depressions or bird baths. Bony or open graded pavement surfaces, pavement which does not drain, or pavement with cracks or discontinuities along edges between new pavement and existing pavement or curbs shall be repaired to the satisfaction of the City, prior to final acceptance of the work.
- b. Unless otherwise approved in writing by Public Works Director, sawcuts or trenches within arterial or collector streets shall meet same requirements (*below*) as for cutting new streets (*ie. pavement less than 5 years old*).
- c. Street cuts in PCC concrete streets or concrete driveway aprons shall be restored as required by the City Engineer.
- d. Where utility work or other improvements result in more than 50% of the paved road width being removed or damaged, an overlay covering the entire width of the street shall be provided, limits as summarized above and as outlined in PWDS 2.13.
- e. Pavement more than 5 years old. All trench cuts or widening of existing paved streets (*those which do not meet the overlay/inlay requirements below*) shall include a bench grind along the joint between the new AC and existing AC per City standard details (*to avoid a full depth joints*), unless otherwise specifically approved by the City Engineer and Public Works Director for driveway cuts, private street cuts or public streets where existing asphalt is inadequate to support the bench grind.

- f. **Pavement less than 5 years old.** No street in the City shall be cut by a contractor, developer or utility company within 5 years of construction, reconstruction or overlay unless approved by the City Engineer and authorized in writing by the City Council. This time period may be extended in one (1) year increments by resolution by the City Council on a case-by-case basis. In the event that the City allows a street to be cut within the time limit outlined herein, the trench in AC pavement streets shall be restored as follows:
- 1) Unless otherwise approved in writing, the trench shall be backfilled above the pipe zone with a Controlled Low Strength Material (CLSM) backfill (*with an unconfined compressive strength less than 200 psi*) as approved by the City Engineer and Public Works Director. The mix design shall be submitted to the City and approved prior to cutting the street.
 - 2) The trench edges shall be over-cut square and straight to a minimum width of 6-inches from each edge of the trench following completion of the backfill and prior to the final patch work.
 - 3) An asphalt wearing course of Class C mix shall be placed in two lifts to a minimum compacted depth of 4-inches or the depth of the existing pavement, whichever is greater.
 - 4) After the trench cut is plugged as noted above, the street shall be repaved with an overlay or an inlay based on the minimum requirements summarized below, and as approved by the City Engineer and the Public Works Director.
 - a) The overlay shall cover the cut area to a minimum compacted depth of 2-inches and extend a minimum of 50 feet beyond the cut area in each direction along the street. Unless otherwise approved by the City Engineer and the Public Works Director, the overlay shall encompass the entire paved width of the street. A 2-inch deep edge grind shall be provided along all gutter or curblines to allow the new pavement to match gutter or curb grades and at each end to allow the new pavement to match existing pavement grade. Edge grinds shall be tapered to allow the full overlay depth at all locations. Butt grinds at the end of overlays shall be a minimum of 25 feet in length.
 - b) As an alternate to a full width overlay, a grind and inlay may be provided as follows. The grind & inlay shall be 2-inch minimum, or half the pavement depth, whichever is greater (*3" maximum*). Unless otherwise approved by the City Engineer and the Public Works Director, the grind & inlay shall extend a minimum of 15 feet in each direction (*parallel with curbline*) beyond any trench cut, and all inlays shall extend a minimum of 5 feet (*perpendicular to curb*) beyond any trench cut limits, with pavement limits extended as required to ensure that pavement joints do not fall in a wheel track. If the minimum inlay limits extend beyond the street centerline, it is to encompass the entire

street width.

- 5) The overlay *or inlay* shall meet all requirements as outlined in PWDS 2.13, Overlays. A strip of Petrotac fabric shall be installed over all trench patch joints.

If this work is performed by a private party, a maintenance bond for the cost of the original construction and repair shall be posted with the City stating that the party shall be responsible for the condition of said pavement patches for a period of two (2) years, and during that time shall repair to the City's satisfaction any of the patches which become settled, cracked, broken or otherwise faulty."