

CHAPTER 3

STREET DESIGN STANDARDS

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CHAPTER 3

STREET DESIGN STANDARDS

3.00 Objective

Street and related infrastructure improvements shall be provided on all development projects, public and private infrastructure improvements, and related infrastructure improvements to be reviewed by the City of Keizer Department of Public Works. Applicability of the requirements stated herein shall be determined in accordance with Chapter 1 of these Design Standards as interpreted by the City.

The standards have the objective of developing a street system that will:

- a. Be of adequate design to handle the traffic needs of the City;
- b. Provide design guidance criteria to the private sector for the design of streets within the City;
- c. Establish right-of-way widths, improvement requirements, and construction and design standards for the City street classification;
- d. Be designed in a manner to allow economical future maintenance; and
- e. Require the use of materials to ensure a minimum practical design life of 20-years.

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

3.01 Additional Referenced Standards

Design of street and related improvements in the City of Keizer shall conform to these Design Standards, City of Keizer Standard Construction Specifications, and certain sections (as required by the City Engineer) of the current edition of the following referenced standards or documents:

1. “A Policy on the Geometric Design of Highways and Streets”
American Association of State Transportation and Highway Officials (AASHTO)
2. “Manual on Uniform Traffic Control Devices (MUTCD) for streets and highways”
US Department of Transportation Federal Highway Administration
3. “Guide for the Design of Pavement Structures”
American Association of State Transportation and Highway Officials (AASHTO)
4. “Roadside Design Guide”
American Association of State Transportation and Highway Officials (AASHTO)

5. “Standard Specifications for Highway Construction”
Oregon Department of Transportation (ODOT)
6. Uniform Fire Code

3.02 Construction Plan Requirements

a. Cover Sheet

The Cover Sheet shall be prepared in accordance with the requirements of Chapter 1 of these Design Standards.

b. Plans And Profiles

Plan view of the street improvement shall be to a scale not greater than 1”=50’ on new subdivisions and street improvements and shall contain the following information:

1. Adjacent street curbs, driveways, and property lines, right-of-way, and utility easements referenced to property corners, street intersections, or section lines. On construction permit projects, 50-foot minimum cross sections and curb elevations shall be required to determine if finish grade design meets existing ground line, and to determine if curb line or property line walks will be required. **Also, curb and gutter elevations for beginning and end of project, and curb elevations at existing side street intersections shall be required to show how new curbs will join existing curbs.**
2. Catch points and limits of slope easements for all cuts and fills.
3. Location of water courses, stream and railroad crossings, water mains, culverts, sanitary sewers, and storm sewers within 250-feet of the proposed project. Use arrows on both existing watercourses and storm drains, and on proposed storm drains, indicating direction of flow.
4. Location of wells (public or private), gas mains, underground power, and any other utility (public or franchised) within 100-feet of the proposed project.
5. On horizontal curves, show stationing of the point of tangency and the point of curvature. Show the length of tangent, length of centerline curve, the delta angle, radius point, and centerline radius distance.
6. On half or three-quarter street improvements show the existing centerline, edges of pavements, and the extent of the proposed widening, i.e. the location of the opposite curb and right-of-way.

7. Show all ADA ramps on each curb radii.
8. The location of each manhole, catch basin, beginning and end of radius, point of curvature, and point of tangent shall be stationed to facilitate checking the plans with the profiles. The stationing shall be tied to existing property corners, centerline, centerline of intersections, and/or street monuments.
9. Side streets shall be stationed with 0+00 starting at the centerline of the intersection.

Profiles for the individual street shall be to the same horizontal scale on the same sheet and drawn immediately below the corresponding plan view to a vertical scale of 1"=5' reading from 0+00 left to right (where conditions warrant, right to left may be approved as well as a different vertical scale), and shall contain, in addition to the above, at least the following information:

1. Location of catch basins, manholes, and other appurtenances with each numbered and stationed.
2. Profile of existing and finished ground line at property line and/or pavement, left and right curb line, and proposed centerline.
3. Percent of all street grades.
4. Beginning of all vertical curves, points of vertical intersection, ends of vertical curve, low point of vertical curve (if a sag curve) and length of vertical curve.
5. Design speed used and "K" value applied.
6. On half street or three-quarter improvements show elevations of the centerline, edge of pavement, and proposed top of curb for 250-feet in each direction of the improvement.
7. Profiles on stub streets shall be shown 250-feet past the terminus of the street.

SPECIAL NOTE: The design engineer shall field locate and verify the alignment, depth, and inverts of all existing facilities shown on the plans that will be crossed by proposed facilities and shall certify them with a note on the plans. City as-builts are only to be used as an aid to the design engineer when field verifying the existing facilities.

3.03 General Design Standards

a. Catch Basins

Catch basins shall be designed according to Chapter 4 of these Standards.

b. Manhole Cover And Valve Box Adjustments

Manhole covers and valve boxes shall be adjusted to finish grade of the improved street.

c. Brick Crosswalks/Sidewalks Or Alternate Designs

All brick crosswalks/sidewalks or alternate designs shall be submitted by a professional engineer and are subject to the review and approval of the City.

d. Minimum Street Overlay

The minimum overlay for a full, $\frac{3}{4}$, or $\frac{1}{2}$ width street improvement shall be 2" depth.

e. Street Reconstruction

When an existing street is to be incorporated into a project the City Engineer shall determine if the street can be overlaid or should be reconstructed.

If a street reconstruction is required where a new street section is proposed over an existing street, the existing pavement shall be broken up and removed. Alternatively, if the existing pavement is to be used within the base of the new street section, it shall be broken up, reprocessed, and compacted such that it is comparable in gradation to the aggregate required for the new base rock.

f. Street Transitions

Street tapers to match new or widened streets to existing adjacent street improvements shall normally be in accordance with AASHTO standards, but shall be a minimum of 10:1 for Local Streets and 20:1 for Collector and Arterial Streets.

STREET DESIGNATION	DESIGN SPEED	MINIMUM HORIZONTAL CURVE RADIUS
LOCAL STREET I, II, III	30 mph	270 Feet
COLLECTOR STREET	40 mph	710 Feet
ARTERIAL STREET	45 mph	930 Feet

Note: Reduction in the Minimum Horizontal Curve Radius may be granted by the City if adequate stopping sight distance and additional street illumination is provided.

The horizontal centerline of improvements shall be parallel to the centerline of the right-of-way.

The centerline of proposed street extensions shall be aligned with the existing street centerline.

Sharp horizontal curvature should not be introduced at or near the top of a pronounced crest vertical curve. Similarly, sharp horizontal curvature should not be introduced at or near the low point of a pronounced sag vertical curve.

b. Vertical Alignment

Vertical curves are required at changes in grade greater than 1.5%.

Streets intersecting a Collector or Arterial Street shall be provided with a Landing averaging 5%, or less. Landings are that portion of the street within 20-feet of the nearest curb on the intersecting street at its required design full improvement width.

Street grades, intersections, and super elevation transitions shall be designed to not allow concentrations of storm water to flow out of the gutter, across the street, or in a manner that is unsafe for vehicular travel.

Vertical curves shall normally provide for desirable stopping sight distance, but shall at least provide for minimum stopping sight distance shall.

Vertical curves shall be parabolic and of a minimum length computed from the formula:

$$L = K * A$$

where:

L = length of vertical curve in feet

K = design constant (rate of vertical curvature)

A = algebraic difference in grades, in percent

“K” is a constant for each design speed; its selection for crest vertical curves is based on stopping sight distance (SSD) requirements and, for sag vertical curves, on headlight sight distance. K values to be used for the design of vertical curves are as follows:

Design Speed MPH	CREST Minimum	V.C. SSD Desirable	SAG Minimum	V.C. SSD Desirable
20	10		20	
25	20		25	
30	30	30	35	35
35	40	50	45	50
40	60	80	55	70
45	80	120	80	90
50	110	160	85	110
60	190	310	120	160

c. Super-elevation

The maximum super-elevation rate permitted on City streets shall be 4% for residential and collector streets, and 6% for arterial streets.

Super-elevation design shall meet all requirements for vertical alignment, and shall be reviewed on a case-by-case basis.

d. Intersections

The interior angle at intersecting street shall be kept as near to 90 degrees, or perpendicular to the intersecting street, as possible. In no case shall the interior angle be less than 75 degrees. A tangent section shall be carried a minimum of 25 feet each side of intersecting right-of-way lines.

Standard curb radii at intersections are as follows:

INTERSECTION TYPE	MIN. CURB RADIUS
Local/Local	20 Feet
Local/Collector	25 Feet
Local/Arterial	30 Feet
Collector/Arterial	35 Feet

ADA sidewalk ramps shall be provided at all intersections in accordance with the requirements of these Design Standards.

3.07 Street Grades & Slopes

Maximum grade on streets shall be as follows:

- | | | |
|----|-------------|-----|
| a. | Arterials | 6% |
| b. | Collectors | 8% |
| c. | Residential | 12% |

Note: The maximum residential street grade may be increased to 15% at the discretion of the City Engineer.

Minimum grade on streets shall be based upon the type of curb proposed:

- | | | |
|----|--------------------------|-------|
| a. | Type "A" Curb and Gutter | 0.25% |
| b. | Type "C" Curb | 0.50% |

Note: Minimum grade on a curve or curb radius of less than 30 feet shall be 0.50%.

Cross sectional slopes shall not be less than 2% nor more than 6%, with 2% being standard.

3.08 Asphaltic Concrete Street Construction

Pavement structure design for all streets shall be per AASHTO standards for pavement design referenced in Section 3.01 of these Design Standards.

All laboratory test results required in the AASHTO procedure shall be provided to the City Engineer. Traffic coefficient derivation and data shall be provided to the City Engineer.

In lieu of above design procedure, on local subdivision streets, the engineer may use pavement thicknesses specified in City of Keizer Standard Construction Specifications.

The Project Engineer may be required to submit pavement structure design data for any street for which the City Engineer has reason to suspect unsuitable soil conditions, high percentage of trucks or any other conditions that may significantly affect the pavement structure design.

For street classification (Local, Collector, Arterial), see the City of Keizer Transportation System Plan (TSP).

3.09 Concrete Curbs

- a. In general, Type “A” Curb and Gutter shall be installed on all new construction or reconstruction to control drainage from sheet flow across the street, to preserve curb exposure during subsequent overlays, and to eliminate cracking new curbs during the street paving operation.

The minimum gutter grade permitted shall be 0.25%.

- b. Type “C” curb shall be used for edges of traffic islands only.
- c. A 6-inch curb exposure is normally required on residential streets.
- d. Curb weeps shall be provided on a case-by-case basis during initial street construction.
- e. Materials, construction, measurement, and payment for curbs shall conform to Chapter 3, of the Standard Construction Specifications.
- f. Minimum curb radii at intersections shall be as follows:

	<u>Intersection</u>	<u>Radius</u>
1.	Residential-to-Residential	20-feet
2.	Residential-to-Collector or Arterial	25-feet
3.	Collector-to-Collector or Arterial	30-feet
4.	Arterial-to-Arterial	30-feet

3.10 Sidewalks

- a. Sidewalks shall be constructed on all streets with curbs.
- b. Standard sidewalk width for Residential Streets is 5-feet. Standard sidewalk width for Arterials, Minor Arterials, and Collector Streets is 6-feet. Sidewalks shall be placed 1-foot away from the property line when possible (property line sidewalks).
- c. Four or five foot planter strips may be required on certain residential, collector, or arterial streets.
- d. Sidewalks on certain residential streets may be constructed adjacent to the proposed curb (curb line sidewalk), except in the following situations:
 - 1. On existing streets where standard sidewalks have been established;
 - 2. On existing streets where trees and utilities have been installed in the location of curb line sidewalks;
 - 3. On residential streets identified for planter strips by the City.

- e. Sidewalks in residential developments shall normally be constructed in conjunction with residential construction, with the following exceptions:
 - 1. Required sidewalks adjacent to frontage improvements;
 - 2. Sidewalks adjacent to existing houses that are to remain on subdivided parcels;
 - 3. Sidewalk ramps;
 - 4. Midblock walks.
- f. Sidewalks shall be designed for a minimum unobstructed width as indicated in 3.10.b above. Where mailboxes or other obstructions are to be placed in the sidewalk a widened sidewalk shall be required to provide for the minimum unobstructed width.
- g. Midblock walks shall designed and constructed in accordance with City of Keizer Standard Construction Specifications. When a midblock walk is constructed along a side property line the driveway drops for each adjacent parcel shall be constructed on the opposite property line.

3.11 Sidewalk Ramps

- a. Two-directional sidewalk ramps must be provided at all intersections.
- b. Design of sidewalk ramps shall be in accordance with City of Keizer Standard Construction Specifications and Americans with Disabilities Act (ADA) Standards.
- c. Sidewalk ramps shall be located so as to avoid conflict with storm drain catch basins, i.e. no catch basins in ramp base.
- d. Construction projects located adjacent to or fronting an intersection without existing sidewalk ramps shall include the retrofit of the intersection to provide for approved sidewalk ramps.

3.12 Driveways

a. **Driveways - General**

1. Single Family Dwellings shall be limited to one driveway. Corner lots may be allowed two driveways, one driveway per fronting street.
2. Multi-family Dwelling, Apartments, Industrial, and Commercial properties shall be limited to two driveways.
3. One-way driveways shall be no closer than 75-feet between their nearest edges.
4. Corner properties of less than 75-feet frontage on a Major Street shall have no driveway located on a Major Street.
5. All proposed commercial businesses shall be limited to one two-way driveway or two one-way driveways per roadway frontage.
6. Driveways shall be located a minimum of 200-feet from the centerline of an intersection with a Major Street.
7. Variations from these standards shall be approved by the City.

b. **Driveways on Major Streets**

1. One-way driveway entrances onto a Major Street shall be located a minimum of 125-feet from a downstream intersection, and no closer than 75-feet from an upstream intersection.
2. One-way driveway exits shall be located a minimum of 75-feet from the downstream intersection and no closer than 125-feet from an upstream intersection.
3. Two-way driveways shall be located no closer than 125-feet from either downstream or upstream intersections.

c. **Driveway Turnarounds**

Should the length of a residential driveway be greater than 150-feet and the driveway have only one access to the street or does not loop to the street, an approved turnaround meeting City of Keizer and Uniform Fire Code standards shall be provided.

d. **Driveway Grades**

Driveway grades shall not normally exceed 12 percent (back of sidewalk to parking area). The City may permit a driveway slope up to 15 percent.

e. **Driveway Drops**

1. Driveway drops shall normally be constructed in conjunction with building permits. Construct driveway drops by saw cutting and removing the curb portion of the sidewalk.
2. Wings on driveway drops shall normally be 6-feet, but in all cases shall meet all applicable Americans with Disabilities Act (ADA) Standards.
3. Catch basins shall be located on a property line to avoid conflict with driveway drops.
4. Standard residential driveway drops shall be 24-feet. Approval to exceed this standard will be evaluated on a case-by-case basis, but in no case will approval be granted for driveway drops greater than 30-feet.
5. Standard nonresidential driveway drops on Arterials, Minor Arterials, and Collector Streets shall be 36-feet. Approval to exceed this standard will be evaluated on a case-by-case basis.

3.13 Bikeways

Types of Bikeways included Bike Routes, Bike Lanes, and Bike Paths. Geometric and structural design of Bike Routes and Bike Lanes adjacent to streets shall be consistent with the design requirements of the adjacent street. Geometric and pavement section design of Bike Paths shall be as stated in these Design Standards.

To maintain adequate vertical clearance to obstructions for bicyclists, there shall be a minimum of 8-foot clearance between the bikeway surface and the height of the physical object.

On turnpike streets, a minimum 2-foot wide graded area shall be present adjacent to the bike route and bike lane. A minimum 3-foot wide graded area shall be present near trees, poles, walls, fences, guardrails, and other stationary obstructions.

a. **Bike Routes**

Since bike routes share the roadway with vehicular traffic, a bike route shall be incorporated on that roadway only when the paved shoulder has a minimum width of 4-feet or the curb lane has a minimum width of 15-feet and the on-street parking spaces are not delineated.

b. **Bike Lanes**

The width of one-way bike lanes shall be designed according to the particular classification of street.

<u>Street Classification</u>	<u>Minimum Bike Lane Width</u>
Unimproved Local without Curbs	4-feet
Improved Local with Curbs	5-feet
Collector	5-feet
Arterial	6-feet

c. **Bike Paths**

The minimum width for a two-way (bi-directional) bike path shall be 10-feet. One-way bike paths are not allowed.

The required width of the bike path may be increased to 12-feet if any of the following conditions prevail:

1. The facility is shared with pedestrians.
2. The facility has a high bike traffic volume
3. The facility is planned for use by maintenance vehicles.
4. The facility has steep grades approved by the City Engineer.
5. The facility is where bicyclists will tend to ride two abreast.

Bike Path Design

Geometric design of bike paths shall conform to these design standards, and AASHTO's Policy for the Geometric Design of Highways and Streets.

The maximum design grade for a Bike Path shall be 6%, unless otherwise approved by the City Engineer. The minimum design speed shall be 20-mph except when the grade exceeds 4%. When this conditions occurs, the minimum design speed shall be 30-mph

Cross slopes on bike paths shall be a 2% minimum and 6% maximum.

The minimum design speed shall be 20-mph except when the grade exceeds 4%. When this condition occurs, the minimum design speed shall be 30-mph.

Design of horizontal and vertical curves shall be for adequate Stopping Sight Distance (SSD).

Bike paths shall normally be designed with 2" of 3/4" Dense HMAC

(broadband limits) and 4” of 1” minus crushed rock over stable subgrade unless they are to be designed for use by maintenance vehicles. Bike paths designed for maintenance vehicles shall conform to a structural design for a residential street.

Drainage design for bike paths shall prevent ponding and ice formation on the bike path surface. Ditches, culverts, and catch basins shall be provided to intercept uphill drainage and transmit flows along the natural drainage path. Drainage grates and manholes shall be located outside the travel way of the bicyclists. Where possible, natural ground cover should be included in the design plans to prevent erosion.

Bike Path Lighting & Illumination

Lighting should be included in the bikeway design when nighttime security could be a problem and a high nighttime use is expected i.e., paths serving students or commuters. The horizontal illumination levels shall be 0.5-foot candle (5-lux) to 2-foot candles (22-lux) except when security problems exist. Higher illumination levels should be considered at these locations. The placement of the light standards (poles) shall meet the vertical and horizontal clearances.

Deterring Motor Vehicle Use of Bike Paths

Bike paths intersecting with roadways often require physical barriers to deter unauthorized motor vehicle use of the facility. A lockable, removable post may be used to discourage such use and still permit authorized vehicles to access the facility. The post shall be brightly colored and permanently reflectorized. If more than one post is used, the spacing shall be 5-feet apart.

3.14 Street Lighting

Street lighting shall be provided as part of the street design process. Design illumination levels shall be in accordance with the recommendations of current Illuminating Engineering Society and PGE or Salem Electric standards, and are summarized in the following table.

Recommendations for Roadway Average Maintained Horizontal Illumination

AREA CLASSIFICATIONS

Roadway Classification	Commercial <i>(ft.-candles)</i>	Urban Intermediate <i>(ft.-candles)</i>	Residential <i>(ft.-candles)</i>
MAJOR (ARTERIAL)	2.0	1.4	1.0
COLLECTOR	1.2	0.9	0.6
LOCAL	0.9	0.6	0.4

The average-to-minimum uniformity ratios for roadways classified Major or Collector shall be 4:1 or better. For roadways classified as Local the uniformity ratio shall be 6:1 or better.

The street lighting system shall be provided using fiberglass direct bury poles and flat lens high-pressure sodium vapor luminaries. The design average horizontal illumination and uniformity ratio shall be obtained by considering together the factors of lamp wattage, pole support spacing, maintaining height and luminaire arm overhang. When feasible, every effort should be made in the spacing of the streetlights to locate poles at lot line extensions and not in the middle of a lot.