STREETS AND SIDEWALKS

1.00 DESIGN STANDARDS

1.01 PURPOSE

These standards are meant to provide a consistent policy under which certain physical aspects of street design and plan preparation shall be implemented. These standards apply to both public and private street work.

These standards cannot provide for all situations and are not intended to substitute for competent work by design professionals. It is expected that the Engineer of Record representing the Applicant will bring to each project the best professional skills from their respective disciplines.

These standards are also not intended to limit any reasonable, innovative, or creative effort which could result in better quality and/or lower costs. Any proposed departure from these standards, however, shall be brought to the attention of the City Engineer and City Traffic Engineer, and will be judged on the likelihood that it will produce a comparable result that will be satisfactory for the user and Springfield.

1.02 DESIGN STANDARDS - GENERAL

These standards are intended to be consistent with the current Springfield Development Code (SDC), the Eugene-Springfield Metropolitan Area General Plan (Metro Plan), any relevant refinement plans, the TransPlan, and the current Springfield Standard Construction Specifications. These standards pertain to the design of streets within Springfield and its Urban Growth Boundary; establish appropriate right-of-way widths and improvement requirements; and provide standards for the various City street classifications.

All public streets are considered fire department emergency apparatus access roads and shall meet the fire code minimum design standards. Private streets may or may not be considered fire department emergency apparatus access roads as determined by the Fire Marshal.

Streets shall be engineered in a manner to allow economical future maintenance, provide the lowest life cycle cost, and to ensure a minimum practical street design life of at least 20 years for local streets and 30 years for arterial and collector class streets.

1.02.1 Basic Geometry

The location, width, and grade of streets shall be considered in their relation to existing and planned streets, topographical conditions, and the planned use of land to be served by the streets. Grades, tangents, curves, and intersection angles shall be appropriate for the traffic to be carried, considering the terrain. Construction specifications and design standards for private streets shall be the same as for public streets.

1.02.2 Design Speed

Unless otherwise approved by the City Engineer and City Traffic Engineer, the design speeds identified in Table 1-1, Minimum Design Speeds, shall be used in the design of all City streets. The Engineer of Record is responsible for evaluating and choosing the necessary design speed for the conditions. In the event that a project is a continuation of an existing street, the design speed of the new project shall be appropriate for the context of the extended street.

Table 1-1: Minimum Design Speed

Street Classification	Zoning	Minimum Design Speed (MPH)
Local	Residential	20 in nodal overlay zones, otherwise 25
	Non-Residential	20 in nodal overlay zones and business districts of high pedestrian activity, otherwise 25
Collector	Residential	25 in nodal overlay zones, otherwise 30
	Non-Residential	25 in nodal overlay zones and business districts of high pedestrian activity, otherwise 35
Arterial	All	35 - 50

1.02.3 Right-of-Way and Street Width

Right-of-way and street width shall be determined by applying standards specified in this Manual and other adopted policies such as the SDC; the Metro Plan, applicable refinement plans, and TransPlan. Final decisions on street width may be a function of information provided in a Traffic Impact Study (TIS). A TIS may be required by the City Traffic Engineer for streets within, or adjacent to, developments.

1.02.4 Vertical Alignment

A vertical curve shall be used at all grade transitions on collector and arterial class streets. Grade breaks may be utilized on low speed local class streets where the grade transition is 2 percent (algebraic difference) or less. Multiple grade brakes shall not be used in lieu of a vertical curve.

Vertical curves shall be designed in accordance with the current standards set forth in *"A Policy on Geometric Design of Highways and Streets"* published by AASHTO. Vertical curves shall be of adequate length to provide ample sight distance and safe stopping sight distances for wet pavements based on minimum design speeds identified in Section 1.02.2 or as determined by the Engineer of Record and approved by the City Traffic Engineer and City Engineer.

1.02.5 Horizontal Alignment and Super-elevation

Horizontal alignment and super-elevation shall be designed in accordance with the current standards set forth in *"A Policy on Geometric Design of Highways and Streets"* published by AASHTO.

Horizontal curves shall be of adequate lengths to provide ample sight distance and safe stopping sight distances for wet pavements based on minimum design speeds identified in Section 1.02.2 or as determined by the Engineer of Record and approved by the City Engineer and City Traffic Engineer.

Spiral curves shall not be used on any City streets unless otherwise approved or required by the City Engineer and City Traffic Engineer.

Super-elevation shall be considered for use on all collector and arterial streets in Springfield. A maximum super-elevation rate of 4 percent shall be used unless otherwise approved by the City Engineer and City Traffic Engineer.

1.02.6 Maximum Street Grades

Standard street grades shall not exceed the following grades:

Street Class	Grade (Percent)
Arterial	8
Collector	10
Local Streets	12*

* Street grades may exceed the 12 percent local street standard only where topographical conditions make it impractical to meet the 12 percent standard, subject to the following conditions:

(a) No driveways or intersections shall be permitted where street grades exceed 12 percent;

(b) No street with a grade of 15 percent or greater shall be permitted for a distance of more than 200 feet; and

(c) In no case shall a street grade exceed 18 percent for any distance.

Refer to Chapter 7 Hillside Development and related Sections for special design considerations and conditions for developing on hillsides in Springfield.

1.02.7 Pavement Design

A pavement design shall be submitted for review with the construction plans for all street construction projects in Springfield with the following exceptions:

A. The proposed street completes a partial width street (2/3 or 1/2) and the existing design is utilized.

B. The proposed street is classified as a "local street" in a residentially zoned area with internal circulation only, and will never carry through traffic, as approved by the City Engineer. In this case, the minimum flexible pavement design structure of 4 inches of Asphalt Concrete on 12 inches of crushed rock or the minimum rigid pavement design structure of 7 inches of Portland Cement Concrete pavement on 6 inches of crushed rock and geotextile fabric shall be utilized.

C. The requirement is waived by the City Engineer.

All local street pavements shall have a minimum of a 20-year or greater design life. Collector and Arterial class streets shall have a 30-year or greater design life.

Transitions between pavement types (flexible and rigid) shall be made at or near an intersection. **On all collector and arterial streets and selected local streets (as determined by the City), both flexible and rigid pavement designs shall be included in the plan set and bid as alternates.** The Engineer of Record shall then submit the cost difference to the City Engineer for review and approval prior to construction. If requested by the City Engineer, the Engineer of Record shall prepare life-cycle cost analysis to show the difference in cost savings over time. If the City Engineer determines the more expensive alternate is required, Springfield will reimburse the developer for the cost difference between the two alternatives after the project is accepted.

All plan sets, regardless of the anticipated construction schedule, shall include a wet weather construction provision. The wet weather design shall be used for any project which initiates excavation for street construction prior to May 1st. The City Engineer will begin considering the use of the dry weather standard after May 1, depending on ground conditions and existing and forecasted weather conditions. In addition, any project that is started after May 1st, but is not scheduled for pavement by October 15th of that same calendar year, shall use the wet weather construction standard. Minimum wet weather provisions include 8 inches of additional crushed rock and geotextile fabric under the dry weather design pavement structure (rigid or flexible). These minimum provisions may be increased at the Construction Inspector's discretion if materials tests and field inspection dictate.

In all cases the pavement structure shall be placed on a subgrade that is firm and unyielding (verified by proof rolling) and compacted according to the specifications. The Construction Inspector, at their discretion, may require additional measures to ensure the pavement structure meets the design standard intent.

1.02.7.1 Flexible Pavement Design

Asphaltic Concrete (flexible) pavement structures shall be designed in accordance with the current edition of the "*AASHTO Guide for Design of Pavement Structures.*" Alternate design standards which provide an equivalent or more durable road structure may be used if approved by the City Engineer. The following steps are necessary to calculate a flexible pavement design.

Step 1: Order soils test from independent testing laboratory to obtain the Effective Roadbed Soil Resilient Modulus, M_r.

Soils tests shall be made at a depth of the proposed subgrade, no less than 2 feet below the existing ground level. Soils tests shall be gathered from enough locations within the proposed right-of-way for the sampling to be representative of actual conditions. At a minimum, one soil test shall be obtained for every 500 feet of proposed roadway. Where possible, a soil test shall be taken in the intersection of two newly proposed roadways. Soil test information shall be submitted with the pavement design. As an alternative, the Effective Roadbed Soil Resilient Modulus, $M_{r,}$ can by determined if the Effective Modulus of Subgrade Reaction, k, is known by the relationship: $M_r = 19.4 * k$

Step 2: Determine the estimated total 18-kip Equivalent Single Axle Load Applications, W_{18}, as described in Appendix D of the AASHTO guide.

Traffic volumes shall be based upon actual counts and/or traffic studies. See Table 1-2 below for minimum terminal serviceability values based on roadway classification when using the AASHTO design method. Assume an initial structural number, SN, of 3 and a minimum of 10 percent truck traffic. This calculation shall be submitted with the pavement design.

Step 3: Obtain the minimum acceptable values of the Reliability (R%), Overall Standard Deviation (S_o), and Design Serviceability Loss (ΔPSI) from Table 1-2 below based on the roadway classification.

Table 1-2: Minimum Acceptable Values for Flexible Pavement Design

	Local	**Collector**	**Arterial**
Reliability, R%	90	95	99
Overall Standard Deviation, S_o	0.35	0.35	0.35
Initial Serviceability, P_o	4.2	4.2	4.2
Terminal Serviceability, P_t	2.5	2.5	3
Design Serviceability Loss, ΔPSI	1.7	1.7	1.2

Step 4: Obtain the Design Structural Number (SN) from the "Design Chart (nomograph) for Flexible Pavement Based on using Mean Values for Each Input," Figure 3.1 in the AASHTO design guide, using the specific and constant values determined in Steps 1-3.

Step 5: Determine the thickness of the pavement layer based on the formula:

$$SN <= a_1 D_1 + a_2 D_2 m_2 + a_3 D_3 m_3$$ [1]

Where:

a_1, a_2, a_3 = layer coefficients representative of the surface, base and subbase courses respectively. Maximum values for each construction material are identified in Table 1-3 below.

D_1, D_2, D_3 = actual thicknesses (in inches) of the surface, base, and subbase courses, respectively. No less than 4 inches of asphalt or 12 inches of crushed rock shall be specified in any pavement structure in Springfield. Deep lift asphalt may be approved by the City Engineer under certain circumstances.

m_2, m_3 = modifying coefficients to allow for drainage effects. Acceptable values are identified in Table 1-3 below.

Table 1-3: Coefficients for Flexible Pavement Structural Layers

Material	**Layer, (Subscript No.)**	**Layer Coefficient, a**	**Modifying Coefficient, m**
Asphalt Concrete, Plant Hot Mix	1	0.42	N/A
Crushed Rock	2	0.14	0.80
Cement Treated Base, CTB	2	0.25	1.00
Bituminous Treated Base, BTB	2	0.22	1.00
Sandy Gravel	2,3	0.11	0.60
Sand, Sandy Clay	3	0.08	0.40
Lime Treated Soil	3	0.11	0.40
Lime Treated Clay, Gravel	3	0.16	0.40

[1] Only imported or treated subbase shall be considered to contribute to the pavement structural section. Native subbase shall not be used in the structural section.

Flexible Pavement Design Notes:

A. The minimum thicknesses of asphaltic concrete and crushed rock for permanent pavement are 4 inches and 12 inches, respectively, for local streets, and 6 inches and 14 inches, respectively, for collectors and above classifications.

B. Where crushed rock base is specified, 1 inch of asphalt is considered equivalent to 3 inches of crushed rock.

C. Full depth asphalt may be approved by the City Engineer under certain circumstances where the underlying soil type is free draining. Even when the AASHTO method yields a design thickness less than 8 inches, the minimum full depth asphalt design thickness shall be 8 inches.

D. All design thicknesses shall be rounded up to the nearest 1/2 inch.

E. In all cases, the pavement structure shall be placed on a subgrade that is firm and unyielding (verified by proof rolling) and compacted according to the specifications.

F. All designed cross-sections shall include wet weather construction provisions including geotextile fabric and an additional 8 inches of crushed rock between the native material and base of the asphalt concrete pavement structure.

1.02.7.2 Rigid Pavement Design

Portland Cement Concrete (rigid) pavement structures shall be designed in accordance with the AASHTO Guide for Design of Pavement Structures, 1993. Alternate design standards which provide an equivalent or more durable road structure may be used if approved by the City Engineer. The following steps are required to calculate the rigid pavement design.

Step 1: Order soils test from independent testing laboratory to obtain the Effective Modulus of Subgrade Reaction, k (pci).

Soils tests shall be made at a depth of the proposed subgrade, no less than 2 feet below the existing ground level. Soils tests shall be gathered from enough locations within the proposed right-of-way for the sampling to be representative of actual conditions. At a minimum, one soil test shall be obtained for every 500 feet of proposed roadway. Wherever possible, a soil test shall be taken in the intersection of two newly proposed roadways. Soil test information shall be submitted with the pavement design. As an alternative, the Effective Modulus of Subgrade Reaction, k, can by determined if the Effective Roadbed Soil Resilient Modulus, M_r is known by the relationship:

$$k = M_r \ / \ 19.4$$

Step 2: Determine the Concrete Elastic Modulus, E_c (psi)

Specify, in the design calculations and in the plans, the compressive strength, f'_c (psi) of the concrete mix design. The Concrete Elastic Modulus, E_c (psi) can be determined from the relationship:

$$E_c = 57{,}000 \sqrt{(f'_c)}$$

Step 3: Determine the Mean Concrete Modulus of Rupture, S'_c (psi).

The minimum Mean Concrete Modulus of Rupture, S'_c (psi), is specified in the Springfield Standard Specification 311.3.02c, Flexural Strength.

Step 4: Determine the Load Transfer Coefficient, J

Pavements with a monolithic or tied curb and gutter that provide additional stiffness and keeps traffic away from the edge may be treated as a tied shoulder. If the curb is not integral with the pavement section, rebar shall be provided to join the curb to the slab section (Refer to Springfield Standard Specifications for requirements). Under normal circumstances, load transfer devices are not required on City streets. Obtain the value from Table 2.6 in the AASHTO guide.

Step 5: Determine the Drainage Coefficient, C_d

The Engineer of Record shall determine this value using Table 2.5 of the AASHTO guide and information gathered from soils test and references such as the USGS Soil Survey of Lane County.

Step 6: Determine the estimated total 18-kip Equivalent Single Axle Load Applications, W_{18}, as described in Appendix D of the AASHTO guide.

Traffic volumes shall be based upon actual counts and/or traffic studies. See Table 1-4 below for minimum terminal serviceability values based on roadway classification when using the AASHTO design method. Assume an initial pavement thickness of 6 inches and a minimum of 10 percent truck traffic. This calculation shall be submitted with the pavement design.

Step 7: Obtain the minimum acceptable values of the Reliability (R%), Overall Standard Deviation (S_o), and Design Serviceability Loss (ΔPSI) from Table 1-4 below based on the roadway classification.

Table 1-4: Minimum Acceptable Values for Rigid Pavement Design

	Local	Collector	Arterial
Reliability, R%	90	95	99
Overall Standard Deviation, S_o	.25	.25	.25
Initial Serviceability, P_o	4.5	4.5	4.5
Terminal Serviceability, P_t	2.5	2.5	3
Design Serviceability Loss, ΔPSI	2	2	1.5

Step 8: Obtain the Design Slab Thickness, D (inches)from the "Design Chart (nomograph) for Rigid Pavement Based on using Mean Values for Each Input Variable," Figure 3.7 segments 1 and 2 from the AASHTO design guide, using the specific and constant values determined in Steps 1-7. The minimum design thickness allowed in the City of Springfield is 6 inches.

Rigid Pavement Design Notes:

A. The minimum thicknesses of Portland cement concrete and crushed rock for permanent rigid pavement are 7 inches on 6 inches respectively for local streets, and 8 inches on 6 inches respectively for collector and above classifications. This minimum is based on a minimum compressive strength, f'_c, of 4000 psi and a minimum beam strength, based on a beam strength, S'_c, of 600 psi.

B. All pavement structures shall include a minimum of 6 inches of crushed rock and a layer of geo-textile fabric.

C. All design thicknesses shall be rounded up to the nearest 1/2 inch.

D. In all cases the pavement structure shall be placed on a subgrade that is firm and unyielding (verified by proof rolling) and compacted according to the specifications.

E. All designed cross-sections shall include wet weather construction provisions including an additional 8 inches of crushed rock between the required geotextile fabric and the base of the concrete pavement structure.

F. A jointing plan shall be included in the public improvement plan set for review with the project.

1.02.8 Curbs and Gutters

A Springfield standard curb and gutter shall be used on any fully improved City street unless approved by the City Traffic Engineer and City Engineer. The minimum gutter grade shall be 0.30 percent, and preferably 0.50 percent. The minimum gutter grades along short-radius curves, such as curb returns and cul-de-sac bulbs, shall be 0.50 percent.

No intruding structures, including, but not limited to, manholes, valves, and junction boxes shall be located within 2 feet of the curb or gutter.

On partial (i.e. 1/2 or 2/3 width) street sections, an ODOT extruded concrete curb, or equivalent, shall be used to delineate traffic. Where necessary to allow drainage to pass through, 1 foot wide curb cuts shall be provided, a minimum of 20 feet on center. A Springfield standard curb and gutter shall be used when drainage conveyance is necessary or required.

Where intermittent emergency or maintenance vehicular access is to be provided and pedestrian access is to be discouraged, an ODOT mountable concrete curb, or equivalent, shall be used.

1.02.9 Valley Gutters

Valley gutters shall not be used within the public right-of-way, unless approved by the City Traffic Engineer and City Engineer.

1.02.10 Cross Slope

Streets shall be designed with a 2 percent cross slope with the crown in the middle of the street. Parabolic crown sections may only be used when approved by the City Engineer and Traffic Engineer.

Shed sections may be used, when approved by the City Engineer and Traffic Engineer, where upslope runoff is collected in a formal drainage system and is not allowed to travel across the roadway. Steeper cross slopes may be approved in accordance with AASHTO standards.

1.02.11 Sidewalks

Concrete sidewalks shall be located on both sides of the street for all major and minor arterial, collector and local streets, and shall be designed to the following criteria:

A. In conformance with the existing or planned street grades.

B. In conformance with current ADA standards.

C. Sidewalks shall be 7 feet wide along all arterial class streets, and 5 feet wide along all collector and local class streets and cul-de-sac bulbs unless otherwise specified in the SDC or adopted development plans.

D. All streets shall have setback sidewalks placed within the public right-of-way unless approved by the City Traffic Engineer and City Engineer. When replacing damaged sidewalk new work shall be located in the same position as the existing sidewalk. When extending a sidewalk along a block frontage with existing curbside sidewalk the applicant may select either curbside or setback sidewalk.

E. Sidewalks that are not installed with the street improvements shall be shown on the public improvement plans and labeled “FUTURE SETBACK SIDEWALK”. All sidewalks that do not abut future building lots shall be installed as a part of the public improvement plans and may not be delayed.

F. Obstructions including, but not limited to, mail boxes, water meters, valves, junction boxes, manholes, utility poles, trees, benches, fire hydrants, signs, and bus stops shall not be located within the sidewalk. Said obstructions shall be removed or relocated prior to the construction or reconstruction of the sidewalk, unless otherwise approved by the City Engineer. If these obstructions are permitted to remain, provisions shall be made to maintain at least 5 feet of unobstructed width on arterial class streets and 4 feet on all other streets.

G. All sidewalks shall be a minimum of 4 inches thick concrete placed on a minimum of 2 inches of compacted 3/4 inch-minus crushed rock base. Sidewalks behind or integral with driveway approaches shall be designed to the standards set forth in Section 1.02.13 “Driveway Approach.” All concrete shall meet or exceed the mix design standards specified in the current version of the Springfield Standard Specifications.

1.02.12 Pedestrian Access Ramps

All Pedestrian Access Ramps shall conform to the current Americans with Disabilities Act (ADA) federal regulations. Refer to the current version of Springfield Standard Construction Specifications for specifications and sample drawings. Sample drawings are available in electronic format via the City Website.

Pedestrian access ramps shall be designed within the following guidelines:

A. Ramp approaches shall be aligned with, and be wholly contained within, the crosswalk markings.

B. Ramp approaches shall not be positioned directly in the path of catch basin grates.

C. Ramp approaches shall be directly aligned with one another with no offset through the intersection.

D. Ramp approaches and crossings shall be (as close as possible to) perpendicular to the street they are crossing in order to minimize the crossing distance.

E. Ramps shall be aligned to point directly to the ramp across the road that is intended to receive the pedestrian.

F. Obstructions including, but not limited to, mail boxes, water meters, valves, junction boxes, manholes, utility poles, trees, benches, fire hydrants, signs, and bus stops shall not be located within the ramp area, including flares.

G. Ramp flares may extend beyond the crosswalk markings.

Pedestrian access ramps shall be located using the following guidelines:

A. Two ramps shall be provided at each curb radius to allow direct access from the ramps into the street. Ramps shall not be directed diagonally into the middle of the intersection unless approved by the City Traffic Engineer.

B. Driveway approaches are not acceptable ADA accessible routes of travel. ADA routes of travel shall be designed and constructed to ADA standards and may not be altered by driveways or other improvements unless an approved alternative route of travel is provided.

C. At some signal-controlled intersections, the crosswalk and pedestrian access ramps may be excluded from a crossing to accommodate unusually heavy turning movements, as approved or required by the City Traffic Engineer.

D. Pedestrian access ramps shall be designed and constructed as specified in the Springfield Standard Specifications. All pedestrian ramps shall be shown with a detailed drawing submitted within the plan set with specific detail sufficient for review and construction.

1.02.13 Driveway Approaches

All driveway approaches shall be defined on the plans as either Residential or Commercial. Any driveway serving property which is used for purposes other than Single Family Residential or Duplexes shall be designated as and built to the standards of a Commercial driveway. A concrete alley apron serving public right-of-way or alley shall also be built to the standards of a Commercial driveway. Refer to the Standard Construction Specifications, Section 314 DRIVEWAYS, SIDEWALKS, HANDICAP RAMPS AND PATHWAYS and Standard drawings for construction details.

1.02.14 Curb Return Radii

A WB-67 design vehicle shall be used when designing curb radii for all truck routes. Unless otherwise directed and/or approved by the City Engineer and City Traffic Engineer, all other curb radii at public street intersections shall be designed in accordance with table 1-5, Suggested Radii and Design Vehicles for Determining Curb Radii:

Table 1-5: Suggested Radii and Design Vehicles for Determining Curb Radii

Primary Street Classification	Secondary Street Classification	Zoning	Suggested Radii (ft)	Design Vehicle
Local	Local	Residential	10	SU or Emergency
Local	Local	Non-Residential	15	SU or Emergency
Collector	Local	Residential	20	SU or Emergency
Collector	Local	Non-Residential	20	SU or WB-50 as appropriate
Collector	Collector	Residential	20	SU or Emergency
Collector	Collector	Non-Residential	20	SU or WB-50 as appropriate
Minor-Arterial	Collector	All	35	WB-67
Minor-Arterial	Minor-Arterial	All	35	WB-67

Note: The above suggested radii and design vehicles are beginning points for design only. Larger or smaller radii and/or design vehicles may be required to accommodate existing or planned turning movements. Designers should try to accomplish the minimum turning radius allowable that incorporates all of the differing elements affected by the radii such as turning movement speed, traffic calming, ADA ramp construction, and pedestrian pathways.

On local to local street intersections, design vehicles may use half of the width of the approach street and all of the width of the departure street exclusive of parking lanes. On non-local streets design vehicles shall begin their turn in the travel lane closest to the curb and if there are multiple approach lanes may straddle the lane line, and they may use the entire width of all departure lanes on the departure street. Three center curves, which are right-of-way efficient and decrease the pedestrian crossing distance, are encouraged when designing for larger vehicles.

1.02.15 Private Improvements

Private improvements shall be privately owned and maintained and be identified on the construction drawings as "private". Private streets shall be designed to the same standards as public streets. When proposed private systems, like water quality/quantity features, are essential for public improvement projects to function properly, they shall be shown on the public improvement plans.

1.02.16 Glenwood Riverfront Street Cross-Section Standards

SDC Table 4.2-1 provides the minimum street right-of-way width and the minimum curb-to-curb width for public streets in Springfield. During the adoption of the Glenwood Refinement Plan, the Springfield City Council approved street design policies and implementation strategies for use within the Glenwood Riverfront to promote the design and character of this area. Appendix 1A of this Chapter provides the standards for designing public streets in the Glenwood Riverfront.