

CHAPTER 4. SURFACING

4.1 Local and Private Streets, Sidewalks, Shoulders, Walkways, and Bikeways

The minimum paved section, with alternative combinations of materials, for new and reconstructed local and private streets, lanes, shoulders, sidewalks and bikeways shall be as indicated in Table 4-1. These sections are acceptable only on stable compacted subgrade constructed with suitable materials. A geotechnical analysis of the proposed road design may be required at the discretion of the Director or designee. Any proposed exception to these materials will be subject to soils strength testing and traffic loading analysis, and subject to review and approval by the Director or designee as outlined in Section 4.4. At any time during construction, should a question on the suitability or placement of native soil or import materials exist, the inspector may require a geotechnical evaluation to address soil conditions. When required, the report shall be prepared, stamped, and signed by a licensed engineer registered in the State of Washington and include an assessment of the site conditions and recommendations for corrective actions. A copy of maximum density curves and all associated compaction test reports shall be included with the report. All materials shall meet the requirements of the WSDOT Standard Specifications unless otherwise approved.

Table 4-1
Local and Private Streets, Shoulders, Sidewalks, Walkways and Bikeways

TYPE OF FACILITIES	MINIMUM THICKNESS HOT MIX ASPHALT (HMA) CLASS 1/2"	MINIMUM THICKNESS CRUSHED SURFACING BASE COURSE (CSBC)	MINIMUM THICKNESS PORTLAND CEMENT CONCRETE
LOCAL STREETS			
Typical Pavement Section	3"	6"	
PRIVATE STREETS			
Typical Pavement Section - Residential	2"	4"	
Typical Pavement Section - Commercial	4"	6"	
SHOULDERS			
Typical Pavement Section – paved shoulder	3"	6"	
Vertical Curb Design Section			4" Class
Rolled Curb Design Section			5" Class
SIDEWALKS			
Residential		2"	4"
Commercial		4"	6"
Commercial (Heavy Truck)		4"	8"
WALKWAYS AND BIKEWAYS			
Alternative I	2"	2"	
Alternative II		2"	4"

Notes:

1. The entire surface of the base course of HMA shall be clean and a tack coat shall be applied to the surface prior to placement of the wearing course of HMA as specified in Section 5-04.3(5)A of the WSDOT Standard Specifications.

4.2 Driveway Surfacing

Driveways may be surfaced as desired by the owner, except:

1. On curbed streets with sidewalks, driveway shall be paved with Portland cement concrete Class 4000 or pervious concrete from curb to back edge of sidewalk. See figures 3-012, 3-0013 and 3-014.
2. On shoulder and ditch sections, the driveway between edge of pavement and right-of-way line shall be paved as required by figure 3-003.
3. On thickened edge roadways, Portland cement concrete may be used for driveways between the thickened edge and the right-of-way line provided that a construction joint is installed at the right- of-way line.

4.3 Street Widening

1. When an existing asphalt paved street is to be widened, the edge of the driving lane shall be sawcut to provide a clean, vertical edge for joining to the new asphalt. The existing asphalt may require grinding and/or removal as directed by the Inspector, depending on the condition of the surface and as needed to control surface water flow. After placement of the new asphalt section, the joint shall be sealed and the street overlaid with a minimum of 2 inch HMA, Class 1/2" full width throughout the widened area. All failures on road surfaces must be repaired prior to the overlay, see Section 4.8. The limits of the overlay will be based on the condition of existing pavement and the extent of required changes to the surfacing and channelization. When the Director or designee determines that potential impacts from a development warrant subgrade repairs prior to the overlay, the applicant must provide a geotechnical report that includes recommendations for repairing the subgrade. The exception to this requirement must be through the engineering variance process.
2. If an existing shoulder is proposed to be incorporated into a future traveled way, a pavement evaluation shall be performed. This evaluation shall analyze the structural capacity and determine any need for improvement. Designs based on these evaluations are subject to review and approval by the Director or designee. The responsibility for any shoulder material thickness improvement shall be considered part of the requirement for roadway widening. The shoulder shall be replaced in width as specified in Section 2.2.
3. Any widening of an existing roadway, either to add traveled way, or paved shoulder, shall have the same surfacing material as the existing roadway.

4.4 Requirements for Local and Private Streets on Poor Subgrade

The minimum material thickness indicated in Section 4.1 is not acceptable if there is any evidence of instability in the subgrade. This includes but is not limited to free water, swamp conditions, fine-grained or organic soil, slides or uneven settlement. If any of these characteristics are present, the soil shall be sampled, tested, and a pavement section designed in accordance with Section 4.5. Both the soils test report and the resulting pavement design will be subject to review and approval by the Director or designee.

4.5 Arterials

Rigid and flexible pavement designs for arterial streets shall be prepared by a licensed professional engineer registered in the State of Washington and in accordance with the current "AASHTO Guide for Design of Pavement Structures, current edition." Flexible pavements shall be designed using a layered design analysis in accordance with the "AASHTO Guide for Design of Pavement Structures," current edition. The pavement design shall be based on soil parameters reflecting actual field or laboratory tests, and a traffic loading analysis. A subsurface investigation shall be performed in order to provide information on any materials that would cause settlement, stability, or drainage problems. Soil used for the design analysis shall be representative of the native subgrade conditions. The traffic loading analysis shall include traffic volume, percentage growth rate, and axle loadings. Materials shall meet WSDOT specifications. The following design inputs shall be used for calculation of the pavement section:

1. Pavement Design Life = 20 years
2. Reliability (R) = 85%
3. Overall Standard Deviation (S_o) = 0.50
4. Serviceability
 - a) Initial Serviceability = 4.5
 - b) Terminal Serviceability = 3.0
5. Drainage Coefficient (m) ≤ 1.0
6. Layer Coefficients
 - a) Hot Mix Asphalt: ≤ 0.44
 - b) Crushed Surfacing Materials: $a_2 \leq 0.14$
7. Resilient Modulus (M_r)
 - a) HMA: $M_r = 450,000$ psi
 - b) Crushed Surfacing Materials: $M_r = 28,000$ psi
 - c) Subgrade Soil: The subgrade M_r is based on actual field or laboratory tests. The subgrade M_r value used in the pavement design is not to

exceed 15,000 psi.

Resilient modulus values for the subgrade soil shall be determined by Laboratory M_r tests or Falling Weight Deflectometer tests (FWD) performed in situ or default M_r values based on soil classification per the Unified Soil Classification System (USCS). The soil classification shall be based on laboratory testing of representative samples of subgrade soil.

USCS soil types shall be determined per ASTM D 2487. Default M_r values based on the USCS are as follows:

Table 4-2
Default M_r Values Based on Soil Classification

Class	M_r (psi)	USCS Soil Type
A	15,000	GW, GP, GW-GM, GP-GM
B	12,500	GM, SW, SP
C	10,000	SW-SM, SP-SM, SM ML ¹
D	7,500	GW-GC, GP-GC, SW-SC, SP-SC, SM ML ²
E	2,500	GC, GC-GM, SC, SC-SM, CL, CL-ML
F	Special Design ³	MH, CH, OL, OH, Peat

(1) Nonplastic

(2) Plastic

(3) Class F soils require a special design required to stabilize the subgrade and will be subject to review and approval by the Director or designee.

Table 4-3 provides typical layer thicknesses for both flexible and rigid pavements. Pavement sections in these tables may be utilized in lieu of the full AASHTO design procedure for use on arterial roads and streets with a native subgrade resilient modulus of 10,000 psi or greater. Resilient modulus values for the subgrade soil shall be determined by Laboratory M_r tests or Falling Weight Deflectometer tests (FWD) performed in situ or default M_r values based on soil classification per the Unified Soil Classification System (USCS).

The soil classification shall be based on laboratory testing of representative samples of subgrade soil. USCS soil types shall be determined per ASTM D 2487. Default M_r values based on the USCS are provided in Table 4-2. Calculation of the equivalent single axle load (ESAL) levels shall be based on a 20 year design period for flexible pavements and a 50 year design period for rigid pavements.

Table 4-3
Flexible and Rigid Pavement Layer Thickness for Arterials

Design Period ESALs	Layer Thicknesses, Inches				
	Flexible Pavement		Rigid Pavement		
	HMA	CSBC	PCC Slab	Base Type and Thickness	
<2,500,000	6.0	6.0	8.0	CSBC Only	4.0
2,500,000 to 5,000,000	7.0	6.0	8.0	CSBC Only	4.0
5,000,000 to 10,000,000	8.0	6.0	9.0	HMA over CSBC	4.0 + 4.0
10,000,000 to 25,000,000	9.0	6.0	10.0	HMA over CSBC	4.0 + 4.0
>25,000,000	10.0	6.0	11.0	HMA over CSBC	4.0 + 4.0

Notes:

1. Pavement design sections shall not be less than 6 inches of HMA over 8 inches of CSBC.
2. The roadway section for a multi-family residential development can be designed and constructed to meet the requirements of a local roadway section.

4.6 Permeable Pavement

The City allows the use of WSDOT's General Special Provisions (GSP's) for Porous Hot Mix Asphalt (PHMA), Porous Warm Mix Asphalt (PWMA), and Pervious Concrete (PConcrete) developed by the Construction Materials Committee of the American Public Works Association (APWA) Washington dated March 9, 2016.

Permeable pavement designs shall be prepared by a Professional Engineer and based on a soils report meeting the requirements of Appendix C, section C.2.7 of the KCSWDM.

4.7 Materials and Lay-Down Procedures:

Materials and lay-down procedures shall be in accordance with WSDOT Standard Specifications and the following requirements:

- A. Prior to placement of the curb, gutter, and pavement section, a proof roll shall be performed and observed by the inspector to confirm the subgrade is firm and unyielding. A single or dual axle dump truck, loaded to a minimum 90 percent maximum gross weight capacity, shall be used to perform the proof roll. The subgrade must comply with the requirements of Section 8.3, 9.4, and 9.5 of these Standards.
- B. During surfacing activities utility covers in roadway shall be adjusted in accordance with Section 8.5.
- C. Asphalt pavers shall be self contained, power-propelled units. Truck mounted pavers are not considered self-propelled.

- D. Hot mix asphalt (HMA) for wearing course shall not be placed on any traveled way between October 1 of any year and April 1 of the following year without written approval from the Inspector. Prior to placement of HMA, a tack coat shall be thoroughly and uniformly applied to all existing paved surfaces in accordance with Section 5-04.3(5)A of the WSDOT Standard Specifications. Asphalt for prime coat shall not be applied when the ground temperature is lower than fifty degrees Fahrenheit without written approval from the Inspector.

When discharged from the mixing batch plant, the temperature of the HMA shall not exceed the maximum temperature recommended by the asphalt binder manufacturer. Documentation of recommended temperatures shall be submitted prior to placement.

A maximum water content of 2 percent in the mix, at discharge, will be allowed providing the water causes no problems with handling, stripping, or flushing. If the water in the HMA causes any of these problems, the moisture content shall be reduced as directed by the Inspector. The asphalt shall have a temperature of not less than 260 degrees Fahrenheit. For surface temperature limitations, see Section 5-04.3(16) of the WSDOT Standard Specifications. Each truckload shall be covered with a suitable tarpaulin while in transit and while waiting to be unloaded to prevent unnecessary heat loss.

- E. Unfavorable Weather

Asphalt shall not be applied to wet material. Asphalt shall not be applied during rainfall or before any imminent storms that might damage the construction. The Inspector will have the discretion as to whether the surface and materials are dry enough to proceed with construction.

4.8 Asphalt Surfacing Repairs:

When repairing shallow holes and gouges in asphalt, the surface must be thoroughly cleaned. The bottom and edges of the hole/gouge shall be swabbed with asphalt tack. HMA shall then be placed into the hole or gouge and thoroughly tamped or rolled. The edges shall then be sealed in accordance with Section 5-04.3(19) of the WSDOT Standard Specifications.

For failures or holes/gouges exceeding 1" in depth, the minimum repair area shall be three feet beyond the perimeter. The existing pavement shall be sawcut or removed by a pavement grinder. Asphalt for tack coat shall be applied to all surfaces of existing pavement in the repair area. HMA shall be placed in lifts of not greater than 0.35 foot compacted depth and shall be thoroughly and uniformly compacted to not less than 91 percent of the maximum density as determined by AASHTO Test Method T-209. Edges shall be sealed in accordance with Section 5-04.3(19) of the WSDOT Standard Specifications.

4.9 Pavement Markings, Markers, and Pavement Tapers

Pavement markings and raised pavement markers shall be used to delineate channelization, transit lanes, bus zones, lane endings, crosswalks and longitudinal

lines to control or guide all users of the roadway system and shall conform to figures 4-001 through 4-009.

Pavement markings for channelization shall be paint or plastic reflectorized with glass beads for initial reflectance. All materials shall have beads throughout to maintain reflectance as the material wears.

Crosswalks shall be installed at all intersections controlled by traffic signals and other locations approved by the Director or designee. Crosswalk markings shall consist of longitudinal thermoplastic lines 8 inches wide by 10 feet long with an eight inch separation between pairs. The center of the eight inch separation shall be in line with lane lines and the midpoints of lanes as much as practical to separate crosswalk stripes from the wheel paths of vehicles.

Bike lane stripes shall be painted wide lines. Thermoplastic arrows and bike lane markings are permitted within or adjacent to bike lanes.

All pavement markings shall be laid out with spray paint and approved by the Director or designee before they are installed.