

Street Design Guideline for Venema Natural Drainage – Final Draft

Revision: June 2006

Roadway:

1. Roadway shoulder should be 2' wide with 2% maximum slope towards the swale. Shoulder material shall be soil or rock material compacted and capable of supporting vehicle loading and passengers to access the vehicle. Acceptable road shoulder materials should meet the performance criteria in the city of Seattle (COS) standard specifications. Alternative materials can be considered.
2. Where repaving a full roadway width, cross slope range is between 2% and 4%. The cross slope shall be toward the curb and/ or swale.
3. Where repaving/adding part of roadway width, cross slope should be a continuation of existing slope or slope to drain the surface runoff from the pavement. Cross slope should be between 2% and 4%. Where existing cross slope is greater than 4%, regrading to the standard cross slope is not necessary if there is no repaving performed.
4. Roadway curb should be 6" high.--(Ref. Seattle Right-of-Way Improvement Manual v1.1 Section 4.10.2).
5. Minimum profile is 1% for curbed asphalt roadway and 0.5% for curbed concrete roadway.--(Ref. Seattle Right-of-Way Improvement Manual v1.1 Section 4.4.2). The curb & gutter section shall be the same as the roadway profile or at least shall meet the minimum required profile.
6. Vertical curve should be provided where total roadway profile algebraic grade difference is greater than 1%. The minimum vertical curve length should be 3 times the design speed.—(Ref Seattle Right-of-Way Improvement Manual v1.1 Section 4.4.2)
7. The new roadway grade, cross slope and profile shall be transitioned to match the existing intersection or existing roadway.
8. Minimum horizontal curve on residential street should be 205ft.--(Ref Seattle Right-of-Way Improvement Manual v1.1 Section 4.4.2)
9. The following parking condition applied for 20' wide roadway.
 - If the sidewalk is adjacent to the roadway, on-street parking is allowed on 1 side of the street located on the side opposite the sidewalk.
 - If sidewalk is separated from the roadway, on-street parking may be allowed on 1 side of the street.
 - SDOT reserves the right in all cases to remove parking if conditions are warranted. This may be determined before the project begins or after completion.
10. The curb radius at intersection is 20' for residential and 25' for arterial streets.--(Ref Seattle Right-of-Way Improvement Manual v1.1 Section 4.8.2). Curb radii may be modified for specific design vehicles.
11. A 20' straight section and a minimum 20' wide roadway are required at the intersection matching intersection approaches. The straight section is measured back from the right-of-way line farthest from the centerline of the centerline of the intersecting street. The straight section is applied for all proposals, including curvilinear and shifted streets.
12. At a T intersection, the proposed approach roadway can be shifted from the existing roadway alignment for the leg that intersects the through street.
13. Roadway taper $L=WS^2/60$ should be applied when proposed roadway is shifted from the existing road alignment.--(Ref Seattle Right-of-Way Improvement Manual v1.1 Section 4.6.2)
14. NDS project is considered a final drainage improvement within the street right-of-way, and as such roadway profile and cross section must be determined and set to the final improvement grade.
15. If a drainage project reshapes a road shoulder and does not change or damage the street surface, then there is no requirement to restore the road surface.
16. If a drainage project reshapes the road shoulder and the adjacent chip seal street is damaged during construction, SDOT and SPU will decide when one of the following shall be done:
 - a. Spot repair the damage with hot mix asphalt and repave per SDOT Pavement Restoration Rules.
 - b. Spot repair the damage with crushed rock and repave the entire street with chip seal.

17. SDOT can repair and repave the street with asphalt chip seal at \$4.20/SY per 2005 estimate. SPU would fund this repair and SPU would not be required to repair and repave the street after construction.
18. If a drainage project changes the configuration of a street segment, especially if the street width is narrowed, increasing the likelihood that the unprotected street edge will be driven on and damaged. The pavement edge needs to be constrained with a curb or concrete band so it doesn't break away. Therefore, chip seal will not be acceptable.
19. The 2' wide and 7" thick concrete band or 6" curb is recommended to constrain the edge of asphalt pavement from breaking away. Other materials will be considered if meeting the following 3 performance criteria and SPU Materials Laboratory may need to assist the performance testing.
 - a. Provide strength and lateral support to the pavement edge.
 - b. Protect edge of asphalt pavement from spalling due to a combination of vehicular loading, shoulder condition, and weathering.
 - c. Delineate edge for drivers and other users from landscaping and swale area.
20. On an asphalt road where a curb is installed adjacent to the existing edge of pavement, saw cut along the existing pavement edge to have a min. 2' wide patch and replace with a new pavement section.
21. On an asphalt road where widening or adding the pavement width is proposed, the existing pavement shall be saw cut or neat lined along the existing pavement and then paved with 3" Asphalt CI A over 6" crushed rock as required.
22. Existing pavement inventory and restoration measure is based on the SDOT Pavement Restoration Rules. The process is summarized as follows:
 - a. As part of the project, an inventory of existing pavement condition should be recorded by SDOT prior to bidding or construction and the pavement condition will be evaluated by SDOT after construction to verify the pavement restoration requirements.
 - b. Pavement damage may include spalling, rutting/channel, potholes, raveling, alligator cracks, shrinkage cracks, corrugation, shoving, distortion and settlements.
 - c. The contractor shall perform spot base repair as directed and then repave with hot mix asphalt. If 30% or more of the pavement of an asphalt pavement lane is damaged, then the full width of affected lane(s) shall be resurfaced (plus 1' on each edge). – Per SDOT Pavement Restoration Rules.
23. The pavement restoration for trenching on residential streets shall be 3" asphalt CI A over 6" crushed rock. Pavement restoration on arterial street should be per SDOT Pavement Restoration Rules.
24. Recycling existing asphalt chip seal into new pavement is not feasible. The existing pavement is not thick enough to grind without contaminating with native soil
25. Existing asphalt pavement may be recycled for use as pavement subbase. When grinding the existing asphalt do not include native soil subgrade.
26. The East-West streets, NW 120th and NW 122nd Streets, can be 20' wide. The end approaches may be 26' wide (or larger) to accommodate single unit vehicle turns. The width will be determined during the project's design phase.

Driveways:

1. 10' driveway is minimum width where the site is workable. For public development in the street right-of-way, the City Traffic Engineer maintains the operation and public safety within the street right-of-way. If the existing driveway is wider than 10', evaluation for a wider driveway needs to be performed and driveway width will be matched up to 20'. Negotiation with private property owner may be needed if narrowing driveway width is desired.
2. If sidewalk is adjacent to curb, driveway should be concrete per COS standard plans 430. If sidewalk is separated from curb, driveway can be 3" Asphalt CI A over 4" crushed rock type 2 or 6" concrete driveway. 5-foot driveway wings should be considered to accommodate vehicle turns to & from 20' roadway. Using pervious pavers can be explored. The pervious pavers driveway shall meet driveway requirements within the standard specifications. SDOT does not maintain driveways. SPU shall contact private property owners for concurrence to the type of driveway.

3. Provide 2' wide compacted shoulder with 2% cross slope on both sides of new driveway before swale or berm starts.
4. Driveway profile slope within the sidewalk in the street right-of-way should be between 1% and 2% in compliance with City and ADA Standard, see COS Std Plan 430.

Sidewalk/Walkways:

1. Public development within the street right-of-way needs to provide pedestrian passage that accommodates pedestrians and disabled access. A concrete sidewalk is considered a permanent improvement. The need for a new walkway providing a connection from the sidewalk to private property is to be evaluated. Replacement of existing private walkways shall match the original width but shall not be less than 4 feet and should match the existing material.
2. New Sidewalk adjacent to the curb should be 6' wide, measured from the face of the curb. Also, sidewalk should be a minimum of 6' wide if separated from the curb. (Ref Seattle Right-of-Way Improvement Manual v1.1 Sect 4.11.2) Sidewalk should be built per COS std plans 420.
3. To achieve natural drainage benefits, SDOT can support the change from 2 sidewalk system to a sidewalk located on 1 side of the street. The total length of existing sidewalk (concrete and asphalt) shall be calculated and additional sidewalk replacement will be done within the project area to offset that which was removed. SPU will be responsible presenting this concept to the community and acquiring the community's support. SDOT believes SPU should aim for a majority of community support.
4. At intersection corners, the sidewalk cross slope shall be 2% maximum and should be wide enough to accommodate wheel chair ramps and pedestrian space.
5. Sidewalk cross slope is 1% to 2% and longitudinal or transition slope is 1:12 (8.33%) maximum for a distance of 30' before a level landing must be provided. – Ref. ADA Standards and COS Std plan 420. Sidewalk profile should be consistent along the block length. Change in profile should be kept to a minimal and should have smooth transitions.
6. Where sidewalk is adjacent to the swale, provide 1' wide compacted shoulder & 2% cross slope toward the swale.

Wheel Chair Ramp (WCR) and Landings:

1. Existing WCRs that are disturbed by the project will be replaced in compliance with the current ADA standard. The slope, dimension and landing area of existing WCR, that meet the ADA standard, shall be retrofitted with a detectable warning surface.
2. New WCRs should be in compliance with the current ADA standard and the COS standard specifications and standard plans 422a and 422b.
3. Install companion WCR and landing located across the street where there is existing sidewalk.
4. Where there is a traffic circle at the intersection and there is no existing sidewalk, install a concrete curb with depression for future wheel chair ramp installation.

Structure:

1. 10' minimum clearance is required from existing or proposed street edge to exposed structure above ground; and a 5-foot minimum clearance from driveway edge is also required.
2. 5-foot clearance between exposed structure and alley is suggested.
3. On non-arterial street, structures should have 3' clearance from the face of the curb. Site by site evaluation should be required for structures (such as mailboxes, stairways, & handrail) which are located closer than 3' from the face of the curb

Utility Pole:

1. Clearances: - 3' from the face of pole to curb face, or
- 10' from edge of pavement without curb, and
- pole can be placed at back side of the swale with coordination of utility provider
2. The utility pole should not block the driver visibility. If existing conditions have a pole within sight distance triangle and (this sentence does not make sense) the pole is not planned for relocation for any other reason, submit location to SODT for review and approval.

Swale and Berm:

1. A 1- foot vertical transition may be allowed at the bottom of the swale. The vertical transition rock can be placed at least 5' from the edge of the roadway and the grading between the shoulder and the top of vertical transition should be 4h:1V. The vertical transition can be achieved using rock (aka rockery facing) or soil wrap. The swale depth, including vertical transition, is measured from the edge of roadway or from top of berm (which ever higher) to the bottom of the swale
2. The minimum clear zone distance is 10' from the edge of the roadway and it is varied depending in side slope of the swale. If the swale's side slope is flatter than 4H:1V, the 10' can be measured to include the 2' roadway shoulder plus horizontal distance of the slope plus the bottom of the swale. If the swale's side slope is steeper than 4H:1V, the horizontal distance at the swale slope does not count toward the clear zone distance. e.g: a minimum of 8' swale bottom required prior to place vertical features when the slope is steeper or equal to 4H:1V.
3. When mounding soil to create a berm, the slope adjacent to the roadway should be 2.5H:1V or flatter and the slope on the swale side should be 4H:1V or flatter.

Guardrail:

1. Guardrail is not needed if the street side, upstream and downstream side of the swale cross section is flatter than 4H:1V and the swale depth does not exceed 4'.
2. The following is some guidelines/criteria that SDOT will be evaluating with regard to the construction of swales and berms and if guardrails will be required:
 - a) SDOT will evaluate for the need for a guardrail if the street side, upstream and/or downstream side of the swale cross section is steeper than 4H:1V and/or the depth from the top of the berm or the edge of the driving surface (which ever is greater) to the bottom of the swale is greater than 4'.
 - b) At intersections, alleys and driveways where vehicles will be making turning movements the slope of the swale (either parallel or perpendicular), the depth of the swale and the proximity of the swale to the edge of the roadway will be more of a concern vs. a location where a vehicle is traveling parallel to the swale in a straight forward motion.
 - c) The slope and depth (parallel or perpendicular) at the beginning or end of a swale where vehicle traffic travels towards the swale in the travel lane immediately adjacent to the edge of the roadway where the swale is located will be evaluated or considered more for a guardrail vs. a location where the slope and depth (parallel or perpendicular) at the beginning or end of a swale where vehicle traffic travels towards the swale in the travel lane on the opposite side of the roadway that the swale is located.
3. A guardrail is required to help discourage cars from driving into the bottom of swale, unless safety analysis by SDOT Traffic Management Division shows otherwise.
4. Guardrail placement should have a minimum of 6" clearance from edge of pavement or sidewalk, and 1' shoulder behind the post prior to a drop off or a berm. The guardrail thickness is approximately 2' from the guardrail face to the back of the post.
5. SDOT Traffic Management Division will do safety and guardrail evaluation at 60% design review and at the punch list. If the swale is built per design, SDOT anticipates no guardrail placement. But,

if during the punch list it is determined that the swale requires guardrail mitigation or some other type of visual deterrent then these changes will be incorporated at the projects expense.

6. There are options to the City of Seattle standard guardrails, however these are not stocked by SDOT maintenance. The City Standard guardrail is metal flex-beam, per WSDOT Std Plan C-1 for W-Beam. Other options that are approved roadside barriers will be considered, if presented by SPU.
7. Different options to City of Seattle standard guardrail can be explored. Guardrail would need to be funded by the project and approved by the SDOT. SDOT does not have the funding to replace non City standard guardrail when damaged. If the guardrail were hit by vehicle and needed to be replaced, the guardrail would be replaced with the City standard guardrail unless there was an outside funding source to support the replacement of a non-standard guardrail.
8. Other options for guardrails are listed below, these treatments are more expensive than the standard metal flexbeam guardrail.
 - a. If a metal flexbeam guardrail were to be installed, an inexpensive alternative is to paint the guardrail. A lot of guardrails get painted green, brown or white to blend into their surroundings and be more aesthetically pleasing.
 - b. A rusted or weather w-beam guardrail
 - c. A steel-backed timber railing.

Handrail and Fence:

1. Requirements for a fence, handrail or other suitable barrier can be found in Figure 4-24 of the Seattle Right-of-Way Improvement Manual v1.1.
2. If existing steps/ stair in street ROW is considered unsafe by the engineer, the steps will be replaced with new concrete steps. When 4 steps or more are placed, the handrail requirement is triggered and will require the sidewalk width to be increased to support the handrails (see COS Std plan 440).
3. SDOT maintained handrail & fences shall be installed in accordance to the COS Std Specifications and Plans. Other handrail and fence alternatives can be used if SPU maintains them.

Rockeries:

1. Rock facing should have a minimum 10' clearance from the edge of pavement. Rock facing shall be constructed according to the COS Std Specification Section 2-08 and Standard Plan No.141. SDOT will not maintain the rockeries.
2. See Swale and Berm Section #1 for vertical transition or 1' Rockery Facing.
3. Step Down Rock: Field directed rock placement to facilitate access for swale and plant maintenance by SPU and/or property owners. Also, rocks are typically placed to provide level surfaces proximate to entry walks. The rock should be located 7' off the edge of pavement and should be no higher than 9 inches from the ground surface.

Tree Placement:

1. Design standard applicable to full block improvements without curbs shall provide a minimum setback of 10' from paved edge of street and 2' from paved edge of sidewalk (3' clearance where sidewalk and 6" curb are constructed immediately adjacent to street). When located within 10' of street edge, tree placement shall provide 7.5' clearance from driveways and 20' clearance from street lights. When set back further from street, placement shall be provided to meet both sight distance and street light distribution standards.
2. Design standard applicable to incremental (less than full block) improvements shall meet standard setback of 10' from pavement edge traditionally applied to streets without curbs. Trees may be planted 10' minimum clearance from edge of pavement for these frontages when improvements are installed to complete the block.

Planting:

1. locations for plant materials larger than 30" in height at maturity shall be field verified to ensure appropriate sight distances.
2. Trees and other plant materials shall be sized for compatibility with sloped planting conditions (i.e. may be smaller than typical street design standards --1.5" caliper rather than 2-2.5" caliper deciduous trees / 1-gallon or bare root shrubs with only a select few species provided in larger 2 or 5 gallon sizes).
3. Installation shall provide well-constructed level watering rings for all trees and other plants (8" minimum diameter for 1-gallon shrubs, 3' minimum diameter for trees) to reduce erosion and to facilitate maintenance by property owners.
4. Mulch shall be wood chip mulch for the majority of planted swale areas with Bark Mulch used along entry walks for visual contrast and compatibility with typical residential landscape improvements.
5. Grouped shrub plantings provided with larger than standard level watering rings and/or installed among leveled field set rocks shall be used to:
 - a) Visually and functionally reduce swale side slopes to reduce rill erosion, --facilitate access along the slope for maintenance
 - b) Ensure swale grading that is visually compatible with the scale of the adjoining residential landscape.
6. Projects reliant on adjacent property owners for maintenance of landscape improvements shall include a process to involve property owners in species selection and placement. Owner verification of tree locations prior to installation is recommended to ensure compatibility with property owner interests.
7. Distribution of the SPU Natural Systems "owner's manual" to ensure property owner understanding of maintenance responsibilities is recommended to maximize the aesthetic, environmental and social benefits of the project.

This guideline Compiled by: Esther Chinn, SDOT Roadway Design

Input from SDOT Division of:

Roadway Design,
Street Maintenance,
Traffic Management,
Pedestrian & Bicycle Program,
Neighborhood Traffic Engineering,
Landscape Design, and
Project Management