Pierce County

Department of Planning and Land Services
Development Engineering Section

PROJECT NAME: _____ DATE: _____

APPLICATION NO.: _____ PCDE NO.: _____

Circled items need to be addressed. Checked items are OK. A determination cannot yet be made on items left blank. Address these items. If you believe a particular blank item does not apply, state this explicitly.

RETENTION SYSTEM REVIEW CHECKLIST
ORDINANCE 2004-56S
TITLES 18C AND 17A

RETENTION SYSTEMS DRAWINGS

OVERFLOWS

1. ____ Runoff control facilities incorporate a means of bypassing the primary outlet in the event of failure. (6.6.6)

2. ____ Spillway located to direct overflows towards the downstream conveyance system. (6.6.6)

3. ____ Located in existing soil where feasible. (6.6.6)

4. ____ Emergency overflow spillway armored with rip rap in conformance with Table 6.10 and extends to the toe of each face of the berm embankment. (6.6.6)

5. ____ See Appendix "A," Detail 2.0. (6.6.6)

6. ____ Rip rap spillway elevation set to prevent flow through for maximum design stormwater surface elevation. (6.6.6)

SETBACKS

7. ____ Runoff quantity control BMPs not built within a natural buffer area. (1.2.5) (6.6.7)

8. ____ Retention ponds maintain minimum horizontal setback distances. (6.6.7)

9. ____ Stormwater vaults and tanks a minimum of 20' from any structure or property line. (6.6.7)

FENCING OF PUBLIC PONDS

10. ____ Minimum 6' high WSDOT Type 1 chain link fence, per State Standard Plan L-2. (6.6.8)

11. ____ Minimum of 1 locking access road gate provided that is 14' wide, consisting of 2 swinging sections 7' in width, per WSDOT State Standard Plan L-3. (6.6.8)

12. ____ Pedestrian access gates a minimum of 4' in width and meet WSDOT State Standard Plan L-3. (6.6.8)

13. ____ Fencing placed 1' inside the tract or easement boundary or a minimum of 5' from the top slope catch point. (6.6.8)

14. ____ Fence material No. 9 gauge galvanized steel fabric with bonded vinyl coating. (6.6.8)

15. ____ Vinyl coating green in open areas and black in wooded areas. (6.6.8)

16. ____ All posts, cross bars, and gates painted or coated the same color as the vinyl clad fence. (6.6.8)

17. ____ Any pipe stem access to a basin fenced with a WSDOT Type 4 chain link fence has a 14' gate. (6.6.8)

POND EMBANKMENTS

18. ____ Pond berm embankments constructed on native consolidated soil (or adequately compacted and stable fill soils analyzed by a geotechnical report) which is free of loose surface soil materials, roots and other

organic debris. (6.6.9)

POND EMBANKMENTS (Continued)

19. ____ Pond berm embankments constructed by excavating a "key" equal to 50% of the berm embankment cross-sectional height and width (except on till soils where the "key" minimum depth can be reduced to 1’ of excavation into the till). (6.6.9)

20. ____ Pond berm embankment cores constructed of compacted soil (a minimum of 95% of the maximum dry density, standard proctor method per ASTM D1557). (6.6.9)

21. ____ Placed in 6” lifts, with the following soil characteristics per the United States Department of Agriculture's Textural Triangle: a minimum of 30% clay, a maximum of 60% sand, a maximum of 60% silt, with nominal gravel and cobble content or as recommended by a geotechnical engineer. (6.6.9)

22. ____ Anti-seepage collars placed on outflow pipes in berm embankments impounding water greater than 8’ in depth at the design water surface. (6.6.9)

23. ____ Exposed earth on the pond side slopes sodded or seeded with appropriate seed mixture (see Chapter 8, Erosion and Sedimentation Control). (6.6.9)

24. ____ Maintenance access along the top of the berm; the minimum width of the top of the berm 15’. (6.6.9)

25. ____ Embankments < 6’ in height a minimum 6' top width and slopes $\leq$ 2H:1V. (6.6.9)

26. ____ Embankments adjacent to a stream or other body of water sufficiently protected to prevent erosion of the pond embankment. (6.6.9)

27. ____ Exterior and interior side slopes of detention ponds > 2H:1V analyzed for stability by a qualified civil or geotechnical engineer. (6.6.9)

POND ACCESS

28. ____ Pond access roads provided when ponds do not abut county right-of-way. (6.6.10)

29. ____ Pond access roads located in tracts when the ponds themselves are in tracts. (6.6.10)

30. ____ Pond access roads provide access alongside the pond. (6.6.10)

31. ____ For ponds with forebay bottoms that cannot be accessed from the top edge of the forebay by a backhoe with a maximum reach of 20’, an access road constructed extending to the bottom of the forebay, having a minimum width of 15’ and a maximum grade of 12%. (6.6.10)

32. ____ For pond forebays < 15’ wide, an access road extended along 1 side of the forebay. (6.6.10)

33. ____ Access roads $\geq$ 15’ in width. (6.6.10)

34. ____ Access roads located either within a separate tract or within a minimum 15’ wide access road easement. (6.6.10)

35. ____ Vehicle access limited by a double-posted gate, if fenced, or by bollards. (6.6.10)

36. ____ Bollards consist of 2 fixed bollards and 2 removable bollards equally spaced between the fixed bollards. (6.6.10)

Pond access roads constructed by utilizing:

37. ____ Construct an asphalt surface roadway meeting the County's Road Standards. (6.6.10)

OR

____ Construct a gravel surface road by removing all unsuitable material, laying a geotextile fabric over the native soil, placing quarry spalls (2"-4") 6” thick, then 2” thick crushed rock surface. (6.6.10)

38. ____ When the length of a pond access road to control structures exceeds 75’, a vehicle turn-around provided, designed to accommodate vehicles having a maximum length of 31’ and having an inside wheel path radius of 40’. (6.6.10)

39. ____ Access roads have a maximum slope of 12%. See Appendix “A,” Detail 22. (6.6.10)

GENERAL POND CRITERIA

40. ____ Open ponds designed to have a minimum length to width ratio of 2:1 at the maximum water surface. Baffles may be used to reduce this length ratio provided the residence time does not decrease. (6.6.12)

41. ____ Minimum of 1’ of freeboard above the design water elevation. (6.6.12)

GENERAL POND CRITERIA (Continued)

42. ____ If the pond water surface area exceeds 20,000 square feet and the site is not fully fenced, a safety bench provided around the basin with a width of 5' and a depth ≤ 1' during non-storm periods. (6.6.12)

43. ____ Interior side slopes of all ponds ≤ 4H:1V unless a fence is provided. (6.6.1)

44. ____ Pond walls designed with retaining walls, provided that:

45. ____ At least 25% of the pond perimeter has a vegetated soil slope of ≤ 3H:1V. (6.6.12)

AND

___ Maintenance access provided to the bottom of the pond. (6.6.12)

AND

___ A fence provided around the entire perimeter of the pond. (6.6.12)

46. ____ Signs placed so that at least 1 is clearly visible and legible from all adjacent streets, sidewalks or paths. (6.6.12)

47. ____ Signs meet the design and installation requirements illustrated in Appendix "L." (6.6.12)

48. ____ Energy dissipation provided at all inlet and outlet structures to ponds and natural drainage courses. (6.6.12)

49. ____ Rip rapping size and apron size in accordance with Table 6.9 and Appendix "A," Details 3.0 and 3.1. (6.6.12)

50. ____ All metal parts and surfaces made of corrosion-resistant materials. (6.6.12)

DESIGN CRITERIA FOR RETENTION PONDS

A retention facility may be used for temporary sediment and erosion control, subject to the following conditions:

51. ____ The sediment trap or pond is left at least 2 feet above the finished grade of the infiltration facility

OR

52. ____ The sediment trap or pond is completely lined with filter fabric or other device to prevent migration of sediment to the plane of infiltration and is at least 6 inches above the finished grade. (8.10.7)

53. ____ See Appendix "A," Detail 5.0, "Infiltration Pond Schematic." (6.6.14)

54. ____ Infiltration ponds designed for a 100-year, 7-day storm event and a 100-year, 24-hour storm event. (6.6.14)

55. ____ Until all project improvements are completed which produce surface runoff and all exposed ground surfaces are stabilized by revegetation or landscaping, ponds may not be operated, and no surface runoff may be permitted to enter the system. Add note to construction sequence. (6.6.14)

EXCEPTION: Residential developments relying upon infiltration facilities will be allowed to use the facilities after construction activities for the development, i.e. roads, utilities, etc., have been completed and before all lots have been built upon so long as the Applicant agrees to maintain the facility until 80 percent of the lots have been constructed and permanently stabilized.

The soil infiltration rate used for the design of the infiltration trench system based on a:

56. ____ Textural analysis, according to Table 6.3. (6.6.14)

OR

Infiltration rate will be established based on the results of either a falling head percolation test, Appendix "M." (6.6.14)

OR

Concentric ring infiltrometer testing, ASTM 3385-88 "Standard Test Method for Infiltration Rate of Soils in Field Using Double Ring Infiltrometers". (6.6.14)

57. ____ A safety factor of 2 applied to the infiltration rate. (6.6.14)

58. ____ Allowable infiltration rate does not exceed the rates as determined by use of Table 6.3. (6.6.14)

DESIGN CRITERIA FOR RETENTION PONDS (Continued)

59. ____ Erosion protection of inflow points to the basin provided. (6.6.14)

60. ____ A soils report provided. (6.6.14)

61. ____ A minimum of 1 soil log shall be required for each 5000 square foot of pond bottom area (plan view area) and minimum of 3 soil logs per pond. (6.6.14)

62. ____ Each soil log extends a minimum of 3' below the bottom of the pond, describes the USDA textural class of the soil horizon(s) through the depth of the log, and notes any evidence of high groundwater level, such as mottling. (6.6.14)

63. ____ Location of impermeable soil layers or dissimilar soil layers noted. (6.6.14)

64. ____ Bottoms a minimum of 3' above seasonal high ground water and relatively impermeable layers. (6.6.14)

65. ____ Meet the setbacks established in 6.6.7. (6.6.14)

66. ____ Minimum of 50' from the top of any slope > 25%. (6.6.14)

67. ____ All stormwater, except runoff from athletic fields and parks with no contributing impervious surfaces, passes through a designed biofiltration swale system or through a presettling basin for water quality treatment (see Chapter 7) prior to discharge to pond. (6.6.14)

PARKING LOT PONDS

68. ____ Maximum depth of water $\leq$ 0.5' at any location in the parking lot. (6.6.16)

69. ____ Limits of ponded water at maximum water depth does not encroach into any established fire lanes. (6.6.16)

70. ____ Limits of ponded water at maximum water depth does not encroach into the principal driveway lanes providing ingress and egress from the adjacent public right-of-way to any buildings. (6.6.16)

71. ____ Permanent signs shown adjacent to the parking lot pond area identifying the area as a stormwater detention control area subject to ponding and identifying the specific parking spaces subject to flooding. (6.6.16)

72. ____ The parking lot pond designed to completely drain, leaving no areas of entrapped water in puddles or behind curbs. (6.6.16)

73. ____ Overflow control provided by installing at least 1 Type 1 catch basin on the perimeter of the parking lot pond area, with the grate elevation equal to the design maximum water surface elevation. (6.6.16)

74. ____ Parking lot pond detention systems privately maintained. (6.6.16)

TANKS AND VAULTS

75. ____ Structures are not perforated so as to provide infiltration. (6.6.17)

76. ____ Accessible for maintenance. (6.6.17)

77. ____ Surface sediment containment pond upstream of the tank or vault, or the tank/vault oversized to allow for the temporary accumulation of sediment in the tank. (6.6.17)

78. ____ Where the tank or vault is designed to provide sediment containment, a minimum of 0.5' of dead storage provided and the tank/vault bottom is at 0% slope. (6.6.17)

DESIGN CRITERIA FOR TANKS

79. ____ Located outside the traveled way within public road rights-of-way. (6.6.17.1)

80. ____ Single-family plats, PUDs, PRDs, or PDDs tanks located in separate tracts. (6.6.17.1)

81. ____ Designed as flow through systems unless separate sediment containment is provided. (6.6.17.1)

82. ____ The minimum pipe size 36". If the collection pipe is designed to also provide storage, the resulting maximum water surface elevation has a minimum 1' of freeboard in any catch basin below the catch basin grate. (6.6.17.1)

Pipe material, joints, and protective treatment for tanks designed in accordance with WSDOT/APWA Standard Specifications Section 9.05, and AASHTO designations as noted below:

DESIGN CRITERIA FOR TANKS (Continued)

83. ____ Corrugated iron or steel pipe and pipe arch, Treatment 1 through 6. (6.6.17.1)

84. ____ Aluminized Type 2 corrugated steel pipe and pipe arch (meets AASHTO designations M274 and M36). (6.6.17.1)

85. ____ Steel spiral rib pipe, Treatment 1 - 6. (6.6.17.1)

86. ____ Aluminum spiral rib pipe. (6.6.17.1)

87. ____ Corrugated aluminum pipe and pipe arch. (6.6.17.1)

88. ____ Reinforced concrete pipe. (6.6.17.1)

89. ____ Corrugated high density polyethylene pipe (CPEP) - Smooth Interior (with prior approval). (6.6.17.1)

90. ____ Tanks placed on stable, well consolidated native material with a suitable bedding. (6.6.17.1)

91. ____ Not allowed in fill slopes unless analyzed in a geotechnical report for stability and construction practices. (6.6.17.1)

92. ____ The maximum depth to a tank invert 20'. (6.6.17.1)

93. ____ Spacing between access openings for tanks ≤ 100', measured from center of opening to center of opening. (6.6.17.1)

94. ____ Each access provides a standard ladder for access to the tank. Note: CMP riser-type manholes are not allowed for use in roadways, driveways, parking stalls, or anywhere subjected to vehicular loads. (6.6.17.1)

95. ____ Tank access openings readily accessible by maintenance vehicles. (6.6.17.1)

96. ____ See Appendix "A," Detail 10.0. (6.6.17.1)

97. ____ Access risers: Outside of any areas subject to vehicular loads, 36" (minimum) Ø access risers of the gage as the tank material may be used for access along the length of the tank and at the upstream terminus of the tank if the tank is designed with a common inlet/outlet so that it is a backup system rather than flow-through system. (6.6.17.1)

98. ____ Access roads to all tank access openings and control structures. (6.6.17.1)

99. ____ Tank access openings have round, solid, locking lids using ½" Ø allen head screw locks. (6.6.17.1)

DESIGN CRITERIA FOR VAULTS

100. ____ For single-family plats and PUDs, or PDDs or PRDs, vaults shall be located in separate tracts. (6.6.17.2)

101. ____ All vaults designed as flow-through systems unless separate sediment containment is provided. (6.6.17.2)

102. ____ Vaults constructed of a minimum 3000 psi structural reinforced concrete. All construction joints provided with water stops. (6.6.17.2)

103. ____ Vaults designed by a structural engineer. (6.6.17.2)

104. ____ Structural designs bear the seal of a civil engineer. (6.6.17.2)

105. ____ Structural designs for cast-in-place vaults accompanied with a commercial building permit. (6.6.17.2)

106. ____ Vaults placed on stable, well consolidated native material with suitable bedding. (6.6.17.2)

107. ____ Vaults not be allowed in fill slopes unless analyzed in a geotechnical report for stability and construction practices. (6.6.17.2)

108. ____ 1 minimum 36" Ø access cover per 50' of length or width provided, and at least 1 access cover with ladder to the bottom of the vault per cell (if the vault is divided into cells) provided. (6.6.17.2)

109. ____ Minimum internal height 7' and the minimum width 4'. (6.6.17.2)

110. ____ Maximum depth to the vault invert 20'. (Note: concrete vaults may be a minimum of 3' in height and width if used as tanks with access manholes at each end). (6.6.17.2)

111. ____ Access roads to access covers for each cell for vaults not located in rights-of-way. (6.6.17.2)

DESIGN CRITERIA FOR VAULTS (Continued)

112. ____ Access roads meet the requirements for access roads for ponds described in Section 6.6.10. (6.6.17.2)

113. ____ Vault access openings have round, solid, locking lids using ½" Ø allen head screw locks. (6.6.17.2)

INFILTRATION TRENCHES

114. ____ See Appendix "A," Details 10.1 and/or 10.2 for infiltration trench details. (6.7)

ONE OF THE FOLLOWING mitigations will be required for all systems:

115. ____ All stormwater, prior to discharge to an underground facility passes through a designed biofiltration swale system or through a presettling basin designed to treat the 2 yr.-24 hrs. event. (6.7)

OR

In lieu of designing the presettling basin designed to the 2 yr.-24 hr. event, the proponent may provide a reserve infiltration system area and shows it on the Drainage Plans. (6.7)

116. ____ Emergency overflow path identified for infiltration trench systems and noted on the plans. (6.7)

117. ____ The infiltration facility area should be marked off prior to construction to prevent compaction related to vehicle traffic. Add note to construction sequence. (6.7)

DESIGN CRITERIA FOR INFILTRATION TRENCHES

118. ____ Trench bottoms a minimum of 3' above seasonal high ground water and relatively impermeable layer, and meet the setbacks established in 6.6.7. (6.7.1)

119. ____ Flow distribution lines installed at a minimum spacing of 10' or less between pipes. (6.7.1)

120. ____ A structure with a sump located upstream of the trench, which provides a minimum of 12 inches of depth below the outlet riser. (6.7.1)

121. ____ Outlet riser pipe bottom designed so as to be submerged at all times, and a screening material installed to prevent material from entering the infiltration system or a second basin placed in-line prior to the infiltration system. See Appendix "A," Details 11.0 and 11.1. (6.7.1)

122. ____ The aggregate material for the infiltration trench shall consist of a clean aggregate meeting the following sieve parameters (6.7.1):

100%	pass	6"
80-100%	pass	4"
0-10%	pass	1 ½"
0-2%	pass	1"
0-1%	pass	#200

123. ____ The aggregate fill material completely surrounded with a geotextile filter fabric, or a 6 inches deep layer of sand below the trench bottom may be used in lieu of a filter fabric liner on the trench bottom. (6.7.1)

124. ____ All trenches a minimum of 50' from the top of any slope steeper than 25% or as reduced per a geotechnical engineering report. (6.7.1)

125. ____ An infiltration trench shall not be constructed or placed into service until all of the contributing drainage area has been stabilized and approved by the County. Add note to construction sequence. (6.7.1)

126. ____ Perforated pipe systems ≤ 150' in length from a structure. (6.7.1)

127. ____ Type 1 catch basins with solid lids installed at the end of the system. (6.7.1)

128. ____ An observation well will be installed for every 50' of infiltration trench length with a minimum of one installed and constructed per Appendix "A," Detail 10.4. (6.7.1)

129. ____ Observation well located in the center of the trench. The depth of the well will be clearly and permanently marked on the well cap. (6.7.1)

When used in conjunction with drywells:

130. ____ Drywells within the road right-of-way a minimum of 18' from the road centerline to the centerline of the drywell. (6.7.1)

131. ____ Pipe is not be installed under the paved roadway surface or in fill material. (6.7.1)

132. ____ Maximum trench width is 5' and the maximum depth is 4' deep. (6.7.1)

DESIGN CRITERIA FOR INFILTRATION TRENCHES (Continued)

133. ____ 1 soil log a minimum of 3' below the bottom of the drywell, that describes the USDA textural class of the soil horizon through the depth of the log, and notes any evidence of high groundwater level, such as mottling, shall be obtained for each proposed drywell location. (6.7.1)

134. ____ Drywell bottoms a minimum of 3' above the seasonal high groundwater table and impervious layers. (6.7.1)

DOWNSPOUT INFILTRATION SYSTEMS

135. ____ Designed not to receive surface water from paved areas. (6.7.2)

136. ____ Soils in the location of the proposed infiltration system are not a silty clay loam, clay loam, clay, or any other soil having a percolation rate < 60 min/in. (6.7.2)

EXCEPTIONS: Soils with infiltration rates as slow as 0.5 inches/hour may be used if designed by a Professional Engineer.

137. ____ Slopes in the location of the proposed infiltration system do not exceed 25%. (6.7.2)

138. ____ A minimum of 1 soil log, a minimum of 18" below the bottom of the trench, that describes the USDA textural class of the soil horizon through the depth of the log, and notes any evidence of high groundwater level, obtained for each proposed individual downspout system location. (6.7.2)

139. ____ Trench bottoms a minimum of 18" above seasonal high ground water or relatively impermeable layer. (6.7.2)

140. ____ Flow distribution lines installed with spacing ≤ 10'. (6.7.2)

141. ____ The aggregate material for the infiltration trench consists of a clean aggregate meeting the criteria in Section 6.7.1. (6.7.2)

142. ____ All trenches a minimum of 10' away from any structure or property line. (See Section 6.6.7) (6.7.2)

143. ____ Geotextile filter fabric wrapped entirely around trench drain rock prior to backfilling EXCEPT that a 6 inch layer of sand below the trench bottom may be used in lieu of a filter fabric liner on the bottom. (6.7.2)

144. ____ A structure with a sump (see Appendix "A," Detail 11. 0) located upstream of the trench, which provides a minimum of 24 inches of depth below the outlet riser. (6.7.1)

145. ____ Outlet riser pipe bottom designed to be submerged at all times with screening material on the pipe outlet. (6.7.2)

146. ____ Trenches are a minimum of 25' from any slope > 25%. This distance may be reduced if based on a geotechnical engineering report. (6.7.2)

147. ____ Total trench length ≤ 100' from the inlet sump. (6.7.2)

DRYWELL SYSTEMS

148. ____ Individual drywells, typically Type II perforated catch basins, designed to receive stormwater from paved areas incorporate upstream stormwater quality treatment through the use of either a bio-filtration system or a filter media suitable for particulate removal and soluble pollutant removal. (6.7.3)

149. ____ Have a settling chamber such as shown in Appendix "A," Detail 11.0 or its equivalent prior to it. (6.7.3)

150. ____ Minimum of 25' from any slope >25%. Distance may be reduced based on a geotechnical engineering report. (6.7.3)

RETENTION SYSTEM REPORT

EXEMPTIONS FROM RUNOFF QUANTITY CONTROL REQUIREMENTS

The following projects are exempted from providing on-site peak rate runoff control:

1. ____ Projects which construct < 5,000 square feet of new impervious surface on an individual parcel, with the exception of projects located in close proximity to critical and/or sensitive drainage areas where the County determines that stricter peak runoff rate or volume controls are warranted. (6.4)

2. ____ Projects which do not contribute to an existing capacity problem in a conveyance system and which

discharge directly to a **Major Waterbody** defined as follows:

Puget Sound

Lakes with a surface area > 300 acres and for which the individual new development/redevelopment contributes < 10% of the flow to the water body.

A **major river** as listed below for which the individual new development/redevelopment contributes less than 10% of the flow in the river for the 2, 10, and 100 year flood flow events.

Exempted Rivers

Nisqually downstream from Alder Lake
Puyallup downstream from junction with Carbon River
White downstream from Greenwater River

INFILTRATION RATES/SOILS REPORTS

3. ____ A soils report by a Soils Professional submitted to establish soils types on the proposed project site and to establish field-saturated percolation or exfiltration rates for the stormwater facility and the overall site. The Soils Professional shall provide to the Project Engineer soil log sheets that include all required information as shown in Appendix "F." (4.8.1.1)

COMPUTATIONAL METHODS

4. ____ Runoff quantity control facilities designed using unit hydrograph analysis. (6.5.1)

5. ____ Storage facilities designed using appropriate storage routing techniques. (6.5.1)

CURVE NUMBERS

6. ____ Western Washington SCS "curve numbers" used. See Appendix "E." (6.5.2)

7. ____ For storm durations of 7 days, CN values adjusted correctly. (6.5.2)

ISOPLUVIAL MAPS

8. ____ National Oceanic and Atmospheric Administration (NOAA) isopluvial maps for Pierce County and Tacoma are included in Appendix "E." (6.5.3)

TIME OF CONCENTRATION

9. ____ For lakes and submerged wetlands, the travel time determined with storage routing techniques if the stage-storage versus discharge relationship is known or assume it to be "zero." (6.5.4)

10. ____ Sheet flow travel time calculated correctly. (6.5.4)

11. ____ Maximum allowable distance for sheet flow 300'. (6.5.4)

12. ____ Shallow flow travel time calculated correctly. (6.5.4)

13. ____ Open channel travel time calculated correctly. (6.5.4)

14. ____ k_c values from Table 6.1 used. (6.5.4)

15. ____ Travel time assumed as zero for lakes or wetlands. Where significant attenuation may occur due to storage effects, the flows routed using a "level pool routing" technique. (6.5.4)

DESIGN STORM HYETOGRAPHS

16. ____ Standard design hyetograph is the SCS Type 1A 24 hour rainfall distribution resolved into 10 minute time intervals. Second hyetograph provided for the 100 year, 7-day duration design storm. (6.5.5)

17. ____ For project sites with tributary drainage areas > 1000' MSL, an additional total precipitation must be added to the total depth of rainfall for the 25, 50, and 100 year design storm events. The MSL factor is calculated correctly. (6.5.5)

SUB-BASIN DELINEATION

18. ____ Within an overall drainage basin it is necessary to delineate separate sub-basins based on similar land uses and/or runoff characteristics or when hydraulically "self-contained" areas are found to exist. Separate hydrographs generated, routed, and recombined, after travel time is considered, into a single hydrograph to represent runoff flows into the quantity or quality control facility. (6.5.6)

HYDROGRAPH ROUTING AND PHASING ANALYSIS

19. ____ Hydrographs routed through retention facilities by level pool routing technique. (6.5.7)

OFF-SITE FLOWS

Off-site flows routed around the project site facility unless either of 2 conditions is met:

20. ____ The on-site facility is designed and constructed to control both on-site and off-site flows. Off-site flows are computed for existing conditions. (6.6.4)

OR

The off-site flows for the 100-year, 24-hour event are < 50% of the developed on-site 2-year, 24-hour peak flow rate. (6.6.4)

21. ____ Off-site flows considered as if from a separate sub-basin. (6.6.4)

22. ____ If off-site flows are routed around the project site control facility and out of the existing flow path or if the flow path is altered, the travel time, velocity and storage volume through the altered/relocated channel is not significantly changed from the existing conditions. (6.6.4)

UNCONTROLLED DISCHARGES

23. ____ Uncontrolled area is ≤ 10% of the on-site and upstream naturally contributing basin. (6.6.5)

24. ____ Demonstrate through the downstream analysis and capacity calculations that the downstream drainage course will not be adversely impacted by the increased runoff rate. (6.6.5)

25. ____ The total project release rate, including uncontrolled flows, does not exceed the total allowable rate as if all flows were controlled. (6.6.5)

26. ____ If any downstream impacts are identified, downstream improvements provided with necessary easements. (6.6.5)

OVERFLOWS

27. ____ Quantity control facilities address overflow. (6.6.6)

28. ____ Overflow routes identified to the point of re-entry into the downstream drainage system. (6.6.6)

29. ____ Where the overflow corridor or the quantity control facility itself could be damaged by overflow, improvements made to the downstream drainage system to the point of re-entry to provide sufficient flow capacity for the overflow event or an additional factor of safety of 25% applied to the size of the quantity control facility. (6.6.6)

30. ____ Ponds provided with an emergency overflow spillway designed to safely pass the developed 100-year, 24 hour design storm and calculations shown. (6.6.6)

31. ____ Emergency overflow spillway weir section (see Appendix “A,” Detail 2.0) designed for the maximum developed design storm conditions. (6.6.6)

DESIGN CRITERIA FOR RETENTION PONDS

32. ____ Infiltration ponds designed for a 100-year, 7-day storm event and a 100-year, 24-hour storm event. (6.6.14)

The soil infiltration rate used for the design of the infiltration trench system based on a:

33. ____ Textural analysis, according to Table 6.3. (6.6.14)

OR

Infiltration rate will be established based on the results of either a falling head percolation test, Appendix “M.” (6.6.14)

OR

Concentric ring infiltrometer testing, ASTM 3385-88 "Standard Test Method for Infiltration Rate of Soils in Field Using Double Ring Infiltrometers". (6.6.14)

34. ____ A safety factor of 2 applied to the infiltration rate. (6.6.14)

35. ____ Allowable infiltration rate does not exceed the rates as determined by use of Table 6.3. (6.6.14)

36. ____ Erosion protection of inflow points to the basin provided. (6.6.14)

37. ____ A soils report provided. (6.6.14)

38. ____ Each soil log extends a minimum of 3' below the bottom of the pond, describes the USDA textural class of the soil horizon(s) through the depth of the log, and notes any evidence of high groundwater level, such as mottling. (6.6.14)

39. ____ Location of impermeable soil layers or dissimilar soil layers noted. (6.6.14)

40. ____ Bottoms a minimum of 3' above seasonal high ground water and relatively impermeable layers. (6.6.14)

41. ____ Minimum of 50' from the top of any slope > 25%. (6.6.14)

42. ____ If the field measured soil infiltration rate is > 2.4 inches per hour, the presettling basin or swale lined with a minimum of 18" depth of borrow material having an infiltration rate slower than 2.4 inches per hour or, a geosynthetic liner utilized. (6.6.14)

43. ____ Hydrologic Group D soils not used unless soil percolation testing is conducted between December and April. (6.6.14)

PARKING LOT PONDS

44. ____ Investigation of the emergency overflow path provided. (6.6.16)

TANKS AND VAULTS

45. ____ Tanks and vaults shall be limited to controlling runoff from one acre or less. (6.6.17)

DESIGN CRITERIA FOR TANKS

46. ____ Meet structural requirements for HS-20 live loads under roadway or parking areas. (6.6.17.1)

47. ____ H-20 live loads shall be accommodated for tanks lying outside of these areas. (6.6.17.1)

48. ____ Not allowed in fill slopes, unless analyzed in a geotechnical report for stability and construction practices.

49. ____ In moderately pervious soils where seasonal groundwater may induce flotation, buoyancy tendencies shall be balanced by ballasting with either earth backfill or concrete backfill, providing concrete anchors, by increasing the total weight, or by providing subsurface drains to permanently lower the groundwater table. (6.6.17.1)

50. ____ Calculations shall be submitted which demonstrate stability. (6.6.17.1)

51. ____ The maximum depth to a tank invert 20'.

DESIGN CRITERIA FOR VAULTS

52. ____ Meet structural requirements for overburden support and H-20 traffic loading. (6.6.17.2)

53. ____ Cast-in-place wall sections shall be designed as retaining walls. (6.6.17.2)

INFILTRATION TRENCHES

54. ____ Trenches designed to provide storage for stormwater for a given design storm event that exceeds the infiltration rate of the system. (6.7)

55. ____ Storage provided in the void area of drainrock used in the trench design and in the perforated pipe, or a separate storage facility above or below ground may be incorporated into the runoff quantity control design. (6.7)

56. ____ Designed for 100-year, 7-day event as well as 100-year, 24-hour storm event. (6.7.1)

DESIGN CRITERIA FOR INFILTRATION TRENCHES

The soil infiltration rate used for the design of the infiltration trench system based on a:

57. ____ Textural analysis, according to Table 6.3. (6.6.14)

OR

Infiltration rate will be established based on the results of either a falling head percolation test, Appendix "M," "Falling Head Percolation Test Procedure (As Modified for Pierce County)". (6.6.14)

OR

Concentric ring infiltrometer testing, ASTM 3385-88 "Standard Test Method for Infiltration Rate of Soils in Field Using Double Ring Infiltrometers". (6.6.14)

58. ____ A safety factor of 2 shall be applied to the infiltration rate. (6.7.1)

59. ____ A minimum of one soil log shall be required for every 50 lineal feet of trench length, min. 2 soil logs per trench. (6.7.1)

60. ____ Soils log extend a minimum of 3' below the bottom of the trench, should describe the USDA textural class of the soil horizon(s) through the depth of the log, and note any evidence of high groundwater level. (6.7.1)

61. ____ Infiltration through the bottom only, without taking into account sidewall infiltration. Storage volume shall be based on a maximum 30% voids for drainrock. (6.7.1)

62. ____ The location of impermeable soil layers or dissimilar soil layers noted. (6.7.1)

DOWNSPOUT INFILTRATION SYSTEMS

63. ____ Designed to receive only stormwater from roof downspout drains and serve a maximum of 5000 square feet of roof area. (6.7.2)

64. ____ Soils in the location of the proposed infiltration system are not a silty clay loam, clay loam, clay, or any other soil having a percolation rate < 60 min/in. (6.7.2)

65. ____ Slopes in the location of the proposed infiltration system shall not exceed 25%. (6.7.2)

66. ____ A minimum of one soil log, a minimum of 18 inches below the bottom of the trench, that describes the USDA textural class of the soil horizon through the depth of the log, and notes any evidence of high groundwater level, such as mottling, shall be obtained for each proposed individual downspout system location. (6.7.2)

67. ____ Trench bottoms shall be a minimum of 18 inches above seasonal high ground water or relatively impermeable layer. (6.7.2)

68. ____ Flow distribution lines shall be installed at a minimum spacing of 10 feet or less between pipes. (6.7.2)

69. ____ The aggregate material for the infiltration trench shall consist of a clean aggregate meeting the criteria in Section 6.7.1. (6.7.2)

70. ____ All trenches shall be a minimum of 10 feet away from any structure or property line. (See Section 6.6.7) (6.7.2)

71. ____ Geotextile filter fabric shall be wrapped entirely around trench drain rock prior to backfilling EXCEPT that a 6 inch layer of sand below the trench bottom may be used in lieu of a filter fabric liner on the bottom. (6.7.2)

72. ____ A structure with a sump (see Appendix "A," Details 11.1 and 12.0) shall be located upstream of the trench, which provides a minimum of 12 inches of depth below the outlet riser. The outlet riser pipe bottom shall be designed so as to be submerged at all times, and a screening material shall be installed on the pipe outlet. (6.7.2)

73. ____ All trenches shall be a minimum of 25 feet from any slope steeper than 25%. This distance may be reduced if based on a geotechnical engineering report. (6.7.2)

74. ____ Total trench length shall not exceed 100 feet from the inlet sump. (6.7.2)

DRYWELL SYSTEMS

75. ____ Individual drywells, typically Type II perforated catch basins, designed to receive stormwater from paved areas incorporate upstream stormwater quality treatment through the use of either a bio-filtration system or a filter media suitable for particulate removal and soluble pollutant removal. (6.7.3)

76. ____ Receives ≤ 5,000 sq. ft. of impervious surface runoff unless. (6.7.3)

77. ____ Safety factor of 2 applied. (6.7.3)

78. ____ Soils in the proposed location shall not be silty clay loam, clay loam, clay, or any other soil having percolation rates < 60 min/in. (6.7.3)