Green Roofs

This checklist is intended to highlight items critical to the performance of green roofs that need to be addressed in the design plans and verified by a City of Seattle (COS) Seattle Public Utilities (SPU) plan reviewer or a designated representative. Some items have detailed requirements that may not be explicitly stated; refer to the Stormwater Flow Control and Water Quality Treatment Technical Requirements Manual (Manual) for specifics. Resources and their links are listed at the bottom of this checklist.

Items identified by a **FC** are GSI Engineering Design Feasibility Considerations as discussed in Appendix B of the "Requirements for Green Stormwater Infrastructure to the Maximum Extent Feasible" Director's Rule that may prevent this technology from being implemented on the project site.

Technology Description
Green roofs are areas of living vegetation installed on top of buildings to provide flow control via attenuation, soil storage, and losses to interception, evaporation, and transpiration. Green roofs are also known as ecoroofs, vegetated roofs, and roof gardens. Design components typically include a waterproofing material, a root barrier, a drainage layer, a separation fabric, a growth medium (soil) and vegetation.

Design Requirements (Manual Volume 3, Section 4.4.8)

	Review Item
FC	1. Not required to be evaluated to meet GSI requirement for SFR projects, trail or sidewalk projects, roadway projects, or parcel projects with less than 5,000 sf new plus replaced impervious surface
FC	2. Roof slope is less than 5H:1V (20%)
	3. A waterproof membrane is shown on the drawings
	4. Root barrier minimum requirements:
	▪ Root barrier is shown on the plans
	▪ If waterproofing membrane is being used to also provide root barrier function, supporting manufacturer documentation is provided
	▪ A MSDS sheet is provided that demonstrates that the root barrier materials do not contain leachable water quality contaminants (e.g., herbicides, copper, zinc)
	5. Drainage layer design minimum requirements:
	▪ Drainage layer included for intensive and extensive multi-course green roofs
	▪ If aggregate drainage layer used, the aggregate specifications are provided that show the following are met:
	▫ Minimum total pore volume of 25 percent by volume (per ASTM E2399)
	▫ Minimum saturated hydraulic conductivity of 425 inches per hour (ASTM E2396-05); maximum of 4,500 inches per hour
	▫ Maximum total organic matter of 1 percent by mass (per loss-on-ignition test)
	6. Separation fabric minimum requirements:
	▪ For intensive and extensive multi-course green roofs, the separation fabric is

	shown between the growth medium and the drainage layer and between the growth medium and all surrounding areas, roof edges, penetrations, and structures.
	▪ Separation fabric specification states that it is non-woven geotextile.
	▪ Fabric has an average opening size sufficient to retain media
	▪ Fabric has permissivity sufficient to pass anticipated peak rainfall intensity
	7. Growth medium (soil) minimum requirements:
	▪ Growth medium is a minimum of 4 inches deep and plans or specifications indicate that it shall have the following characteristics (see GSI website for additional specifications, http://www.seattle.gov/util/greeninfrastructure)
	▫ Minimum pore volume is 45 percent by volume for multi-course systems and 30 percent by volume for single-course systems (per ASTM E2399)
	▫ Water capacity is at least 25 percent for single-course systems, 35 percent for extensive (shallow) multi-course systems, and 45 percent for intensive (deep) multi-course systems (per ASTM E2399)
	▫ Saturated hydraulic conductivity (permeability) shall be between 14 and 1,200 inches per hour for single-course systems and 2.8 and 28 inches per hour for multi-course systems (per ASTM E2396-05)
	▫ Minimum are content at maximum water capacity shall be 5 percent by volume (per ASTM E2396-05), or 10 percent by volume (per FLL method)
	▫ Maximum total maximum organic matter shall be 4 percent by mass for single-course systems, 6 percent by mass for extensive (shallow) multi-course systems, and 8 percent by mass for intensive (deep) multi-course systems (per loss on ignition test).
	▪ Growth medium depth and characteristics must support growth for selected plant species and are approved by a licensed landscape architect.
	▪ The green roof is not subject to any use that will significantly compact the growth medium
	▪ If the green roof area is accessible to the public, plans show measures for protecting the green roof, unless designed for foot traffic
	▪ Plans or specifications state that mulch, mat or other measures to control erosion of growth media shall be maintained until 90 percent vegetation coverage is achieved.
	8. Vegetation minimum requirements:
	▪ Plans specify that vegetation coverage of selected plants shall achieve 90 percent coverage within 2 years or that additional plantings shall be provided until this coverage is met
	▪ Plant spacing and plant size is designed to achieve specified coverage by licensed landscape architect
	▪ Landscape Management Plan submitted and demonstrates that fertilizers, pesticides or herbicides will not be used
	9. Irrigation Plan minimum requirements:
	▪ Provisions are provided for irrigation during the first two growing seasons following installation to achieve and maintain 90 percent plant coverage after 2 years following installation.

	▪ If a system isn't provided, then at minimum a water tap should be shown on the roof to allow for manual watering
	▪ Any permanent irrigation system that relies on potable water must be designed to apply no more than 0.2 inches of water every 14 days from June through September, after the 2-year establishment period.
	▪ Irrigation design and operation are included in the Landscape Management Plan
	10. Drain system is shown on plans capable of safely collecting and conveying water to an approved discharge point.
	11. GSI credit provided based on Table A.4 of the GSI to the MEF Director's Rule, or if applicable, flow control credit provided based on Table 4.23 or green roof is evaluated using continuous modeling and the assumption in Table 4.24.

Resources:

- Green Stormwater Infrastructure (GSI) website (specifications, CADD drawings, plant lists, links to other resources)
  http://www.seattle.gov/util/greeninfrastructure

- Stormwater Code, Director's Rules (Manual and GSI to MEF), Client Assistance Memos (CAMs), GSI and flow control calculators for pre-sized facilities
  http://www.seattle.gov/dpd/Codes/StormwaterCode/Overview/default.asp