

GREEN STORMWATER INFRASTRUCTURE (GSI) FACT SHEET BEST MANAGEMENT PRACTICE

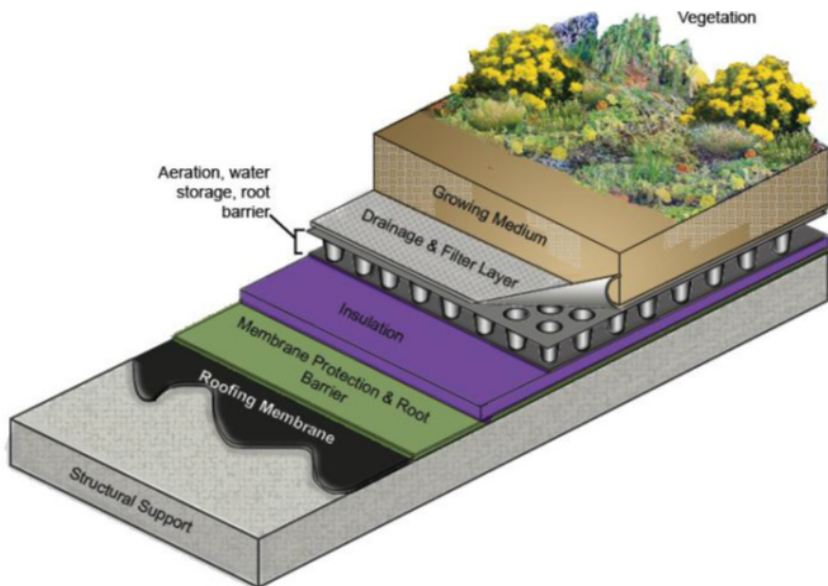
Green Roof

WHAT IS IT?

Green roofs are a type of roof partially or completely covered with vegetation and a growing medium. These elements intercept and absorb precipitation which is later taken up by plants and/or evapotranspired into the atmosphere. As a result, many green roofs do not discharge any stormwater except from exceptionally large storms.

Green roofs fall into two categories: intensive and extensive. Intensive green roofs have deeper planting media, can support a wider variety of plants, and are often called “rooftop gardens.” Due to their weight, they are often best employed as part of new construction. Extensive green roofs have shallower planting media that supports fewer plants. They can be added to existing roofs if the building is structurally able to accommodate the increased weight.

CRITICAL COMPONENTS



- Plants - allium, sedum and other low growing species (more diverse in intensive roofs)
- Soil media - engineered soil substrate (greater than 6” in intensive roofs)
- Layers - drainage and filter layer, water storage layer (with overflow to a cistern if necessary), insulation, root barrier, waterproof membrane

APPROPRIATE USE AND CONSTRAINTS

Correct implementation of green roofs is largely determined by the supporting structural strength of the building and desired additional uses. Intensive green roof designs must be able to support up to 150 lbs./square foot of: a soil layer of 6-24 inches depth, a wider variety of plants (including crops and small trees), and (in many cases) pedestrian access. Intensive rooftop gardens are often integrated into the design of new buildings. Extensive green roofs are constructed in a more light-weight fashion that have a focus on functionality rather than public use. They are designed to support up to 35 lbs./square foot of: a soil layer of 1.6-6 inches depth and 2-3 species of drought-tolerant plants. Extensive roofs can be adapted to existing structures with flat or low-slope roofs.

BENEFITS

Stormwater Volume Reduction:

Moderate

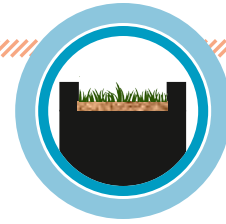
Stormwater Treatment: High

Factsheet prepared by the Vermont Green Infrastructure Initiative, a program of the Watershed Management Division of the VT Department of Environmental Conservation (<http://watershedmanagement.vt.gov/>).



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BEST MANAGEMENT PRACTICE: GREEN ROOF



COSTS

Construction:

\$5-\$50/square foot

Annual Maintenance:

\$0.25-\$1.25/square foot

MAINTENANCE

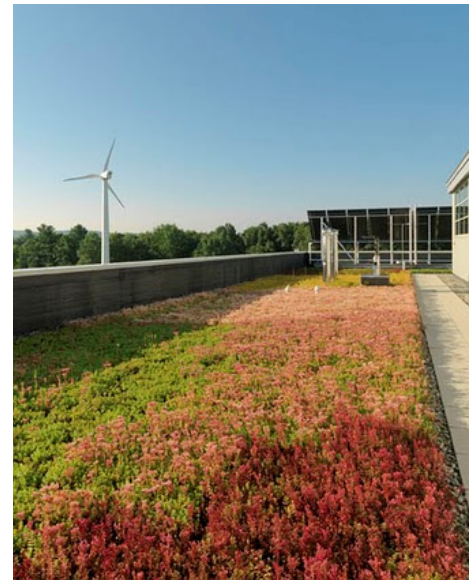
Establishment of live plants on green roofs is critical to their function. The initial establishment phase of maintenance will last 2-5 years during which plants may need to be watered. Quarterly surveys to identify and replace initial plantings that have died and removal of invasive weeds are required to promote the spread of vegetation over the roof surface. The initial maintenance phase is over when there is a healthy, resilient bed of plants covering the entire roof surface that resists invasion by weeds and requires no watering.

Once the roof is well established, maintenance needs decline to weeding (especially before weeds set seed) and removal of dead vegetation 2 or 3 times a year. Fertilization should only be conducted when indicated by soil testing to prevent leaching of nutrients from the roof to stormwater. Annual inspections of the roof structural components, including membrane, should be made just like any traditional roof.

ADDITIONAL CONSIDERATIONS

Green roofs are very effective at reducing stormwater volume but provide little direct pollutant reduction since the precipitation they absorb is relatively clean. In fact, some green roofs may actually export nutrients during larger storm events.

In addition to volume reduction, green roofs provide other useful benefits such as reduced heat-island effect, reduced need for heating and cooling of the building, and a longer lifespan when compared to a traditional roof. In urban areas, green roofs can provide valuable open space where little exists.



INTENSIVE GREEN ROOF, HERITAGE AVIATION, SOUTH BURLINGTON, VERMONT

WAGNERHODGSON.COM



EXTENSIVE GREEN ROOF, NEW YORK

INSPIRATIONGREEN.COM

REFERENCES

City of Lancaster, Pennsylvania. 2011. City of Lancaster Green Infrastructure Plan Appendix A: Green Infrastructure Technology Fact Sheets. <http://www.dcnr.state.pa.us>

Minnesota Pollution Control Agency. 2005. Minnesota Stormwater Manual Chapter 12: Best Management Practice Details. <http://www.pca.state.mn.us>

Milwaukee Metropolitan Sewerage District. 2013. Regional Green Infrastructure Plan-Chapter 5: Green Infrastructure Benefits and Costs. Retrieved from: <http://www.fresh-coast740.com>

District of Columbia Department of Environment. 2010. Cost Analysis of Proposed District of Columbia Stormwater Regulations. <http://www.anacostia.net>

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