

Vegetated Rooftop

Known also as “green” roofs, vegetated rooftops gained early popularity in Europe for their ability to not only control storm water runoff from buildings, but also to reduce energy costs.

The general design consists of waterproofing layers topped by soil and low-lying vegetation that absorb rainwater hitting the roof.

More recently, several cities in the United States have turned to green roofs as a promotion of environmentally-conscious design. Portland, Chicago, San Francisco and Detroit all boast large facilities or multiple buildings with vegetated rooftops.



Advantages

- Provide both retention and detention
- Urban wildlife natural habitat replacement
- Carbon dioxide absorption
- Reduced heating/cooling costs
- Can last up to twice as long as a conventional roof

AT-A-GLANCE SUMMARY

Benefit

- Major/
Significant ●
- Secondary ◐
- Minor/None ○

Benefits

- Flow attenuation ●
- Runoff volume reduction ●
- Costs ●
- Maintenance ○

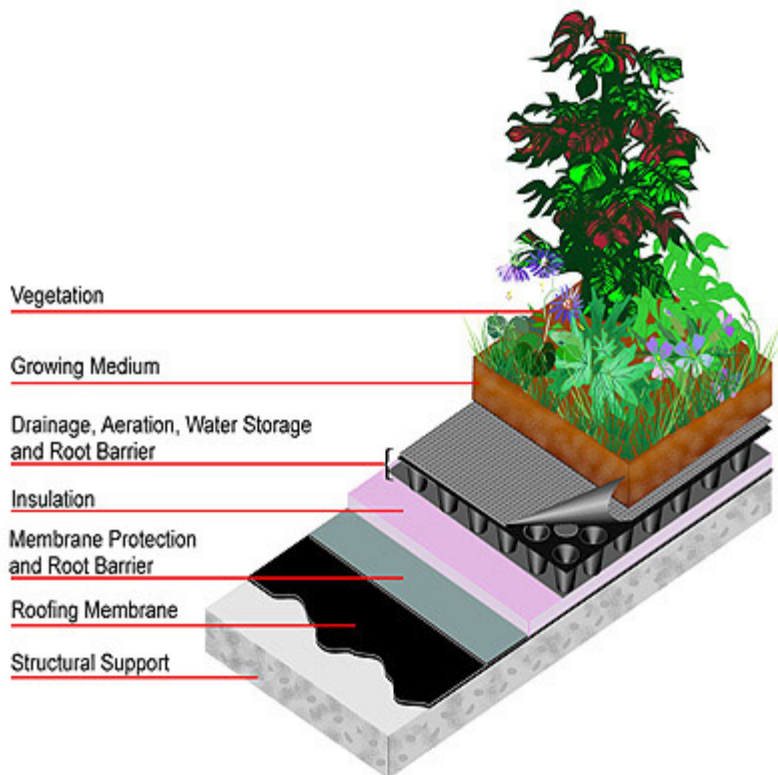
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Limitations

- May be difficult or more expensive to install on sloped roofs
- Initially more expensive to install than conventional roofs
- Planting on a sloped roof requires special erosion control measures.
- Extreme sun and wind conditions may cause difficulty in establishing and maintaining vegetation.
- Maintaining waterproofing is essential to preventing water damage to the building.

Costs

Vegetated rooftops generally cost \$10 - \$15 per square foot.



Layers of a vegetated roof system.

Source: University of Wisconsin, Milwaukee, Great Lakes Water Institute

Maintenance

Maintenance for vegetated rooftops is fairly minimal, as compared with other practices. Weeding should be done at least twice annually, in order to remove any plants taller than one foot. In addition, an annual survey should be performed to ensure that the waterproofing system is functioning properly.

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Design Specifications

- Vegetated rooftops weighing more than 17 pounds per square foot saturated require consultation with a structural engineer.
- Flat roofs (those with a pitch of up to 1.5 percent) are the easiest and least complex to install. The maximum slope for a vegetated rooftop is 25%.
- Consider sun and shade when designing vegetation for a vegetated rooftop and design planting plans accordingly.
- Non-vegetative materials should be installed around all rooftop openings and at the base of all walls that contain openings.
- Monolithic membrane or thermoplastic sheet membranes are typically the first layer laid down for water proofing. Typically, both types of membrane are installed directly on the roofing deck, so existing roofing will need to be removed.
- Tests for watertightness should be conducted after the membrane has been installed and before the protective layer is installed.
- Protective layers should then be placed over the membrane: a modified bituminous protective sheet for the monolithic membrane and high density polyethylene (HDPE) over sheet membrane.
- A physical or chemical root barrier is then installed over the protective layer.
- A drainage system is installed on top of the root barrier and creates a series of depressions for the collection of water that will be utilized by plants during dry weather and allow for the uptake of excess water during rainy periods. The depth of this drainage layer can vary, depending on the project.
- Soils for a vegetated roof are normally much lighter than conventional soils and consist of 75% mineral and 25% organic material.
- Vegetation planted on a “green” rooftop should be extremely resistant to high wind, drought and low winter temperatures, due to a lack of ambient heat usually present in the ground. This type of vegetation normally includes a variety of sedums, wildflowers and grasses, all of which should grow no higher than a foot and should be able to tolerate shallow soils.

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Suggested Resources

Additional information on vegetated rooftops may be obtained from the following organizations. This list provides examples and does not serve as an endorsement for any of the proprietary organizations listed.

United States Environment Protection Agency (EPA)
<http://www.epa.gov/owow/nps/roofcover.pdf>

Whole Building Design Guide
National Institute of Building Sciences
<http://www.wbdg.org/design/resource.php?cn=0&rp=41>

Greenroofs.com

Roofscapes, Inc.
Philadelphia, PA
www.roofscapes.com

The Garland Company, Inc.
Cleveland, OH
<http://www.garlandco.com/green-roofs.html>

City of Portland, OR
Ecoroof Program
http://www.cleanrivers-pdx.org/clean_rivers/ecoroof.htm

Annual International Green Roof Infrastructure Conference, Awards and Trade Show
Green Roofs for Healthy Cities
<http://www.greenroofs.ca/grhcc/conference.htm>