

# BEST PRACTICES



## Green Roofs: Beauty & Functionality for the Environment

If you are looking for a way to retrofit or build your home according to the latest environmentally friendly methods, try using live plants! In Germany, it is estimated that green roofs already comprise 12% of flat roofs. In Copenhagen, Denmark it is mandatory that all flat roofs under a 30° pitch be vegetated. Now, in the eco-friendly atmosphere of the Pacific Northwest, this trend has caught on. With the new low impact development regulations to help control stormwater on the horizon and with the encouragement of public utilities, green roofs are increasing in popularity and frequency throughout the Pacific Northwest.

Also known as eco-roofs, vegetated roofs and living roofs, green roofs capture both the literal and buzzword meanings of the word green. Vegetation is installed over several underlayments as the top part of the roof surface to create an aesthetically pleasing living medium. Green roofs can be installed on roof pitches ranging from 5° to 40°. Vegetated roofs treat pollution in stormwater and also store a significant amount of water, further preventing polluted stormwater runoff from entering our waterways and combined sewer systems.



### Some of the many ecological benefits of green roofs include:

#### Energy use reduction

During an 80° F summer day, a black roof can reach 180° F as opposed to a plant-covered roof which only reaches 85°. During the winter, a green roof will retain 15-30% more heat than a conventional roof. This insulation translates into lower cooling and heating costs! (Lui & Baskaran 2003, National Research Council of Canada)

#### Urban heat island reduction

The more green roofs in an urban area, the lower the ambient temperature of the city.

#### Greenhouse effect mitigation

Green roofs radiate less energy than black roofs into the atmosphere. A University of California at Berkeley lab study found that switching to “cool” or “white” roofs alone would be the equivalent of removing 300 cars from the roads for 20 years.

#### Air quality improvement and carbon sequestration

Photosynthesis removes carbon from the atmosphere and stores it as biomass.



**Added habitat**

Native vegetation attracts butterflies, birds and bees.

**Sound proofing**

Outside noise can be reduced from between 40-50 decibels depending on the type of green roof. (Peck et al. 1999)

**Less waste**

According to research, a green roof will lengthen roof life by up to 20 years. (Miller, C. 1998)

**Stormwater treatment**

Green roofs reduce the amount of stormwater runoff and also delay the time at which runoff occurs, resulting in decreased stress on stormwater and combined sewer systems at peak flow periods.

**Green roofs can be designed and engineered in two ways. The initial investment pays off in terms of reduced energy costs and the increased longevity of the roof:**

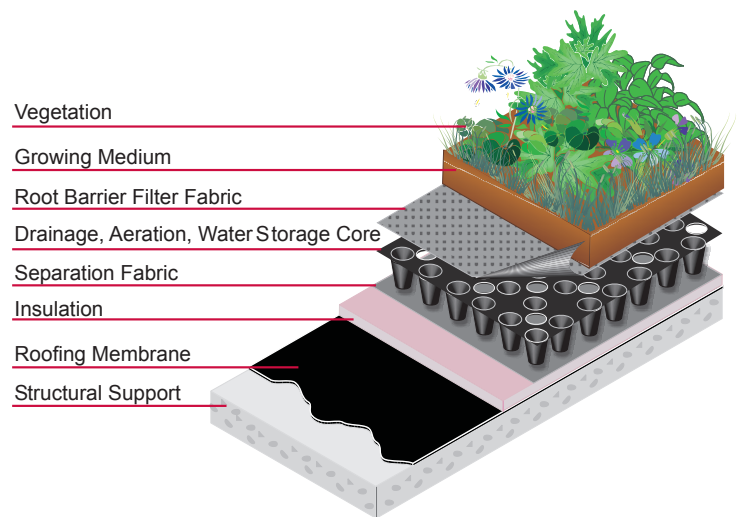
**Intensive**

These roofs require a flat surface and are well suited to public or private businesses that want to encourage rooftop gardening and/or a park-like setting. A deep substrate of 8-24 inches of soil is able to accommodate lawns, edible crops, small trees and shrubs. This high load (35-120 lbs. per square foot) requires additional structural support to increase load-bearing capacity. Because of their increased weight and the possible need to add an irrigation system, these roofs have a higher capital cost. They also have higher maintenance requirements. Cost of installing an intensive green roof begins at \$25 a square foot.

**Extensive**

These roofs generally weigh 10-50 lbs. per square foot and are within the load bearing capacity of a typical roof. They are suitable for home or business owners who want a self-sustaining roof that requires low to no-maintenance. The planting substrate is shallow, containing four to six inches of engineered soil mix and best accommodates low-growing, fire resistant, drought-tolerate vegetation such as local wildflower mixes, sedums, herbs, mosses and grasses, typically on a 5-20° pitch. Extensive roofs are only accessible for maintenance activities. It costs approximately \$10-24 per square foot to install an extensive green roof with root repellent/waterproof membranes and other key underlayments.

Components of a green roof will vary depending on the type and size of installation as well as the manufacturer. A waterproofing membrane is critical if the system is going to succeed in the long-term. However, several layers of other protective materials are often included to achieve waterproofing and to convey water away from the roof deck. The following diagram illustrates the possible components:



**SPOTLIGHT ON LOCAL PROJECTS: Interested in seeing some green roofs in person? Here is a partial list of green roofs that you can visit:****OLYMPIA:**

**The Evergreen State College:** Seminar II Bldg, 2700 Evergreen Pkwy NW, 98505

Type: Extensive | Year: 2004

**Woodland Trail Restroom,** 1600 Eastside Street SE, 98501

Type: Extensive | Year: 2007

**Olympia City Hall,** 601 4th Ave E, 98501

Type: Extensive | Year: 2011

**TACOMA:**

**Troy's Green Roof** (Drive by only), 3108 South 9th St., 98405

Type: Extensive | Year: 2004

**SEATTLE:**

**Seattle Justice Center,** 600 5th Ave., 98104

Type: Extensive | Year: 2002

**Russell Investments Center,** 1301 Second Avenue, 18th Floor, 98101

Type: Intensive | Year: 2006

**PORTLAND:**

**Hawthorne Hostel,** 3031 SE Hawthorne Blvd., 97214

Type: Extensive | Year: 2002

**Multnomah County Multnomah Bldg,** 501 SE Hawthorne Blvd., 97214

Type: Extensive | Year: 2003

**Oregon Health & Science University (OHSU) Center for Health & Healing,** 3303 SW Bond Ave., 97239

Type: Extensive & Intensive | Year: 2006

**Resources for further reading and information on the green roof industry:**

<http://tinyurl.com/7q8k9ff> (Great photos of European green roofs)

<http://tinyurl.com/kpegg3s> (A contractor's YouTube page)

<http://tinyurl.com/ojn79eq> (Article on the largest green roof in Portland for stormwater treatment)

[www.greenroofs.org](http://www.greenroofs.org) (Promotes the green roof industry through education and advocacy)

[www.lid-stormwater.net/](http://www.lid-stormwater.net/) (Information on low impact development)

[www.greenroofs.com/](http://www.greenroofs.com/) (A treasure trove of information on the industry)

[www.ecobuilding.org/](http://www.ecobuilding.org/) (Local resources for low impact development)

[www.solterra.com](http://www.solterra.com) (Seattle company; Sustainable Urban Developments)

<http://tinyurl.com/m8t8qk9> (Facts from the EPA)

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