

# Campus Sustainability Through Vegetated Roofs

## Acopian Engineering Center **Green** Roof



A vegetated roof has been installed on a portion of Acopian Engineering Center. A green roof not only looks great, but also has many environmental advantages. The roof prolongs the life of the roof system, slows the rate of storm water runoff, removes impurities in the storm water runoff, reduces the heat island effect (localized raised temperatures) and insulates the space below the roof.



# Work in Progress



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# Plant Material

The plant material is largely comprised of sedum. Sedum is a hard and attractive plant with water storing leaves, thereby allowing it to tolerate wet or dry conditions with minimal maintenance.



The students will be using this vegetated roof installation to measure storm water rate of runoff and effects on interior and exterior temperatures.

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# History

*Special thanks to Daniella Colón for her enthusiasm and her efforts in researching and collating the data below.*



Green roofing systems are hardly a new technology as they date back to the Hanging Gardens of Babylon in the 7th century BC. For centuries, Scandinavians have built green roofs out of sod for insulation. The first recognizable green roof was constructed on Rockefeller Center in the 1930's. The German Landscape Research, Development and Construction Society (FLL) was created in 1977 after German professor Hanz Luz proposed an expansion to the use of green roofs for their ability to improve the quality of life in urban settings. Today, some cities such as Stuttgart require green roofs on all new industrial roofs, and the green roof concept has spread throughout the world.

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# The Basics

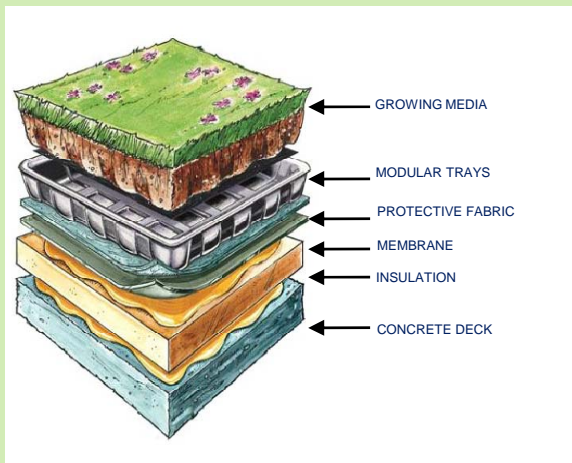
**Extensive Roof:** (low-profile)  
uses low lying plants for maximum  
ground cover and other benefits.

**Intensive:** (high-profile)  
natural landscape that happens  
to be on a roof.

Characteristic	Extensive	Semi-Intensive	Intensive
Growing Media Depth	6" or less	25% above or below 6"	More than 6"
Accessibility	Often inaccessible	May be partially accessible	Usually accessible
Fully Saturated Weight	Low 10-35 lb/ft <sup>2</sup> (48.8-170.9 kg/m <sup>2</sup> )	Varies 35-50 lb/ft <sup>2</sup> (170.9-244.1 kg/m <sup>2</sup> )	High 50-300 lb/ft <sup>2</sup> (244.1-1,464.7 kg/m <sup>2</sup> )
Plant Diversity	Low	Greater	Greatest
Cost	Low	Varies	High
Maintenance	Minimal	Varies	Varies, but is generally high

## Vegetated Roof Components

### Modular System



### Loose Laid System



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# The Benefits

A vegetated roof may appear to be merely ornamental to the typical onlooker but vegetated roofs have numerous benefits that upgrade the functionality of the structure and enrich the environment. A green roof not only looks great, but also has many environmental advantages:

Extensive	Semi-intensive	Intensive
Lightweight	Combines best feature of extensive and intensive	Greater diversity of plants
Suitable for large areas	Utilizes areas with greater loading capacity	Best insulation properties and storm water management
Low maintenance costs and may be designed for no irrigation	Greater coverage at less cost than intensive	Greater range of design
More suitable for retrofit projects	Average maintenance	Usually accessible
Lower capital costs	Greater plant diversity than extensive	Greater variety of human uses
Easier to replace	Greater opportunities for aesthetic design than extensive	Greater biodiversity potential

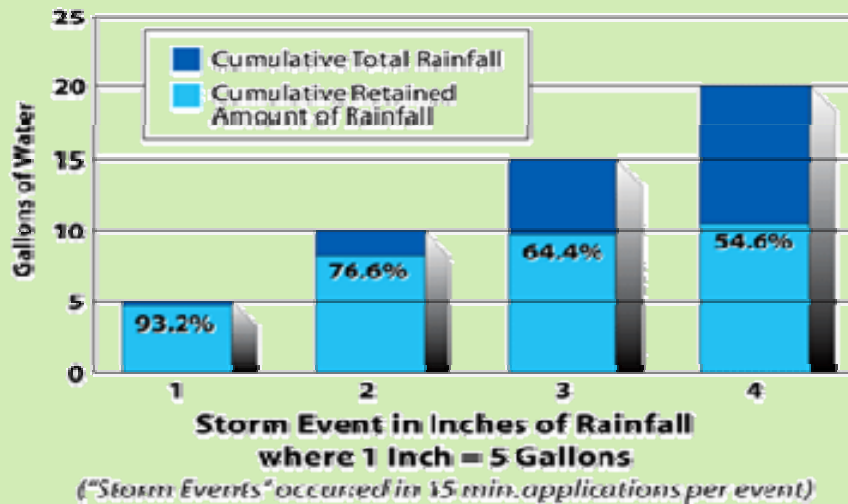
- ◆ Improvement in the reduction of external noises
- ◆ Filtration of water and air
- ◆ Water retention
- ◆ Creates a habitat for wildlife
- ◆ Extends the life of a roof by blocking UV rays and offering protection from acid rain
- ◆ Increases property value
- ◆ Stores carbon

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# Additional Benefits

- ◆ Reduces the amount of runoff produced at peak flow



<http://www.greengridroofs.com/advantages/greenroofben/chart3.htm>

- ◆ Better roof insulation which lowers heating and cooling costs

	Referenced Roof	Green Roof	Reduction
Heat Gain	19.3 kWh/m <sup>2</sup> (5900 BTU/ft <sup>2</sup> )	.9 kWh/m <sup>2</sup> (270 BTU/ft <sup>2</sup> )	95%
Heat Loss	44.1 kWh/m <sup>2</sup> (135000 BTU/ft <sup>2</sup> )	32.8 kWh/m <sup>2</sup> (10100 BTU/ft <sup>2</sup> )	26%
Total Heat Flow	63.4 kWh/m <sup>2</sup> (19400 BTU/ft <sup>2</sup> )	33.7 kWh/m <sup>2</sup> (271 BTU/ft <sup>2</sup> )	47%

(green roofs for healthy cities)

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# Lafayette's Plan

Site: Acopian Engineering Center



Before



After

Size: 588 square feet

Warranty: guaranteed for 20-25 years, plants guaranteed to live, grow and be healthy for 3-5 years

Plants: sedums, long grasses or native plants suggested by the local Nature Conservancy

Ongoing Plans: collecting rainfall for irrigation, monitoring temperature, rainfall and runoff; a loading capacity analysis

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# References

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