

Siplast & Green Roof Technology



Siplast Was "Green" Before Green Was Cool.

Siplast has been associated with the green roofing business for over 30 years. Paradiene and Teranap membrane systems have been successfully keeping buildings watertight beneath vegetative roofs in France and Germany since the 1970s. The interest in green roofing in the United States has grown considerably since 2000, and Siplast has been an active part of that movement.



Why Green Roofs?

There are a number of benefits associated with green roofs. The most commonly recognized benefits are:

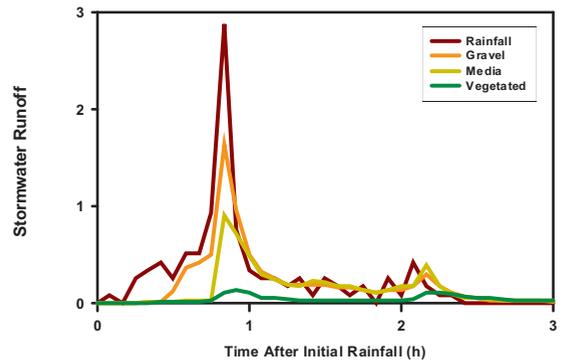
- Stormwater management.
- Reduction of building energy use.
- Increased roof longevity.
- Reduction of Urban Heat Island Effect.
- Providing urban green space.



Stormwater Management.

The mitigation of stormwater runoff is considered by many to be the primary benefit of green roof systems because of the prevalence of impervious surfaces in urban areas. The rapid runoff from roof surfaces can exacerbate flooding, increase erosion, and result in raw sewage that is discharged directly into rivers. The larger amount of runoff also results in a greater quantity of water that must be treated before it is potable. A major benefit of vegetative roofs is their ability to absorb stormwater and release it slowly over a period of several hours, as shown by the graph at the right. Green roof systems have been shown to retain 60-100% of the stormwater they receive.

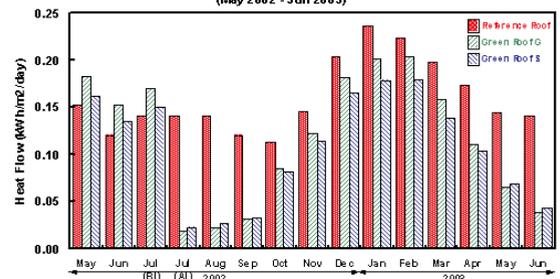
Stormwater Runoff Hydrograph



Reduce Building Energy Use.

Vegetative roofs can reduce heating and cooling demands, as shown by the bar graph at the right. During a cold winter, the insulation layer and growing medium of a vegetative roof can add thermal value. In the summer, the impact is more significant. Plant material evaporating moisture will cool the rooftop surface, reducing cooling demand considerably.

Average Daily Heat Flow Through Roof Surfaces (May 2002 - Jun 2003)



Increased Roof Longevity.

Waterproofing membranes covered by vegetative roofs have a longer life-span than exposed membranes because they are protected from ultraviolet radiation and the extreme fluctuations in temperature that cause roof membranes to deteriorate. The graph at the right shows the results of a 10-month study on the temperature fluctuations between the surface of an exposed roof (reference) and beneath a green roof cover over the referenced roof. Temperature differences were as much as 55°C (130°F).

**GREEN ROOF THERMAL STUDY -
MICHIGAN STATE UNIVERSITY
July 2006, 3 pm
Ambient Temperature = 89°F**

A 2006 study by Michigan State University verified temperature differences at various locations both inside and outside a test building, including a comparison between a gravel ballast roof and a vegetated roof. Sample results from the study are shown below.

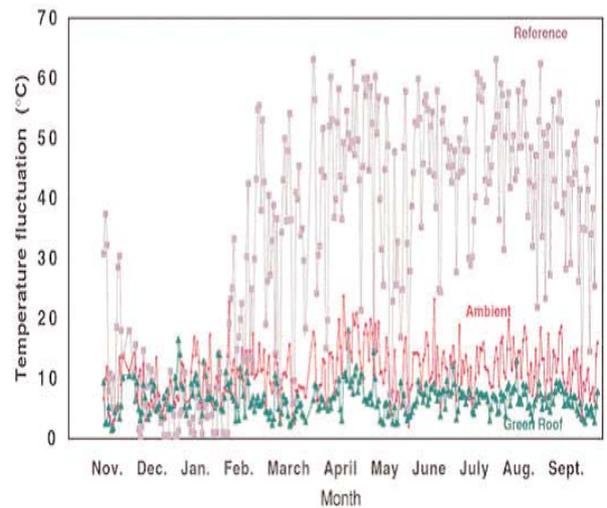
Temperature Reading	Gravel Ballast	Vegetated Roof	ΔT
1 meter above surface	90°F	88°F	2°F
On surface	122°F	98°F	24°F
On roof membrane	118°F	92°F	26°F
Inside building	92°F	83°F	9°F

Reduce Urban Heat Island Effect.

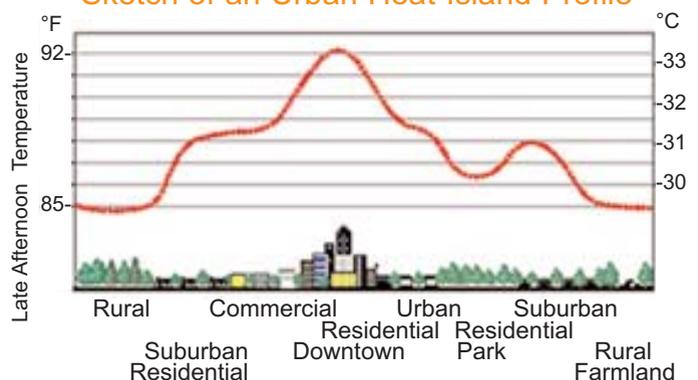
Urban areas are generally 2 – 5° F warmer than surrounding rural areas. This is known as the Urban Heat Island Effect. On top of that, the United States Environmental Protection Agency projects a 2 – 7° F increase in aggregate temperature for urban regions over the course of the 21st century. By cooling rooftop surfaces, green rooftops can help to mitigate this effect.

Green Roof Membrane Temperature

Membrane temperature daily fluctuation
(Nov. 22, 2000 - Sept. 30, 2001)



Sketch of an Urban Heat-Island Profile



Providing Urban Green Space.

Green roofs offer interesting opportunities for architectural design. A green roof can allow a structure to merge with the surrounding landscape, provide a dramatic accent, or reinforce the defining aspects of the structure's geometry. In Germany—and increasingly in the United States—green roofs are frequently integrated into the design of hospitals and care facilities in order to provide a more restful and restorative environment for patients. In fact, city hospital administrators have observed that patients who can see green space outside often recover more quickly. Multi-unit residences and hotels are finding that views of green roofs substantially enhance property values. In commercial settings, job satisfaction and effectiveness could be enhanced by providing window views of garden areas that can be used for breaks.

Green roofs can add serene communal space in urban areas, improving both property values and quality of life.

Additional Benefits

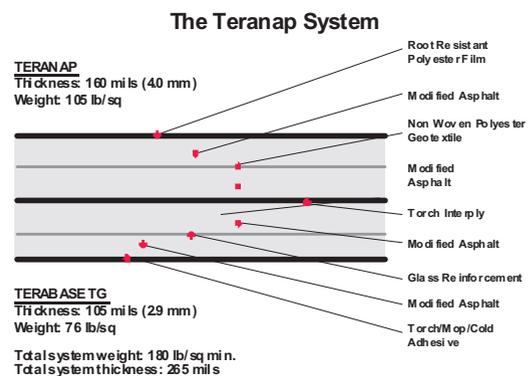
Green roofs provide other environmental, economic, and aesthetic benefits that have yet to be fully studied and quantified. These benefits include potential removal of airborne dust, pollutants, and greenhouse gases, as well as sound reduction and, production of oxygen.

Teranap Green Roof Waterproofing System.

Green roofs add a great deal of aesthetic appeal, utility, and environmental friendliness to a building project, but they also create significant waterproofing challenges. For over 30 years, Teranap has met the needs of these demanding applications.

Teranap green roof applications can be specified with many landscape options, including both extensive green and intensive green assemblies. Teranap Extensive Green Roofs are characterized by low weight, low capital cost, and minimal maintenance. The growing medium is typically composed of a mineral based mix of sand, gravel, crushed brick, leica, and peat organic matter. In an extensive system, soil varies in depth from 2 to 6 inches, and weighs 13-18 lb/sq ft dry and 20-25 lb/sq ft saturated. Plant selections appropriate for extensive assemblies include sedum, grasses, wildflowers, and other low maintenance vegetation. Plants are watered and fertilized until they are established. At that point, minimal maintenance is required.

Teranap Intensive Green Systems are used to waterproof elaborately designed roofscapes that are intended for pedestrian access. In an intensive system, soil depth starts at 6 inches. Therefore, a more diverse plant selection, including trees and shrubs, is possible.



The weight of intensive systems starts at approximately 50 lb/sq ft, so they must be engineered to conform to structural load requirements. Intensive green systems require regular maintenance and watering. Siplast offers all of the components required for green roof installations, including filter fabric, drainage mat, soil, Insulperm Geofoam Extruded Polystyrene, and vegetated growing systems.

Parapro Green Roof System.

For green roof applications where project circumstances, local regulations, or a tight construction schedule make the application of sheet materials difficult, Siplast offers a proven high-performance option: liquid-applied Parapro.

The Parapro System is built on advanced polymethyl methacrylate (PMMA) technology developed for demanding waterproofing applications. PMMA's root and chemical resistance properties make Parapro a smart choice for green roofs and planter waterproofing.

Siplast / Xero Flor Joint Program.

Siplast and Xero Flor have been working together since 2000. This partnership has resulted in a substantial number of projects where Xero Flor and Siplast have collaborated, including the largest green roof in the world: the Ford Rouge River Facility, which is covered by over 4,500 squares of Siplast Teranap and Xero Flor green roof systems.

Xero Flor began in Germany more than 30 years ago. Since then, Xero Flor green roofs have been used on thousands of projects worldwide. With heavy emphasis on academic research, Xero Flor has grown into a unique and reliable green roof supplier with systems that have been refined to suit North American climates and aesthetics.

Siplast and Xero Flor offer an exclusive joint guarantee program whereby the Xero Flor green roof cover is covered under the Siplast guarantee. Please contact Siplast for more details.



SIMPLY. SMARTER. GREEN ROOFS.



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