
Modern Green Roof Technology
presented by
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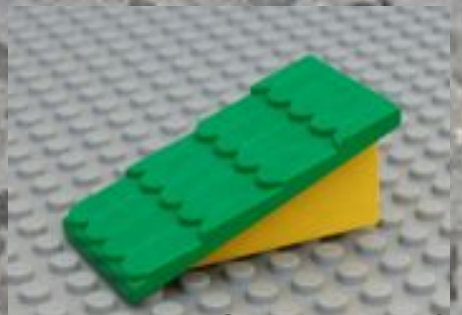
Syracuse , New York
November 17, 2011
GREEN ROOF TECHNOLOGY


• Our Living Green – Green Roof Experience
• Performance of American Green Roofs
• Myths and Common Mistakes
• Maintenance
• Market Future
GREEN ROOF TECHNOLOGY



My First Green Roof

Green Roof Service LLC is the first engineering and consulting firm for modern green roof technology in the United States. As the founder and CEO of Green Roof Service LLC, I am one of the founding fathers of modern green roof technology in the States. I have been building a portfolio in ecological excellence for more than 30 years. My designs and applications allow living green systems on impervious areas to last as along as the underlying structure does. I pride myself as a mentor and expert advisor to the market's key players like Ed Snodgrass, Penn State University, Charlie Miller, Furbish Company, and Skyland LLC.

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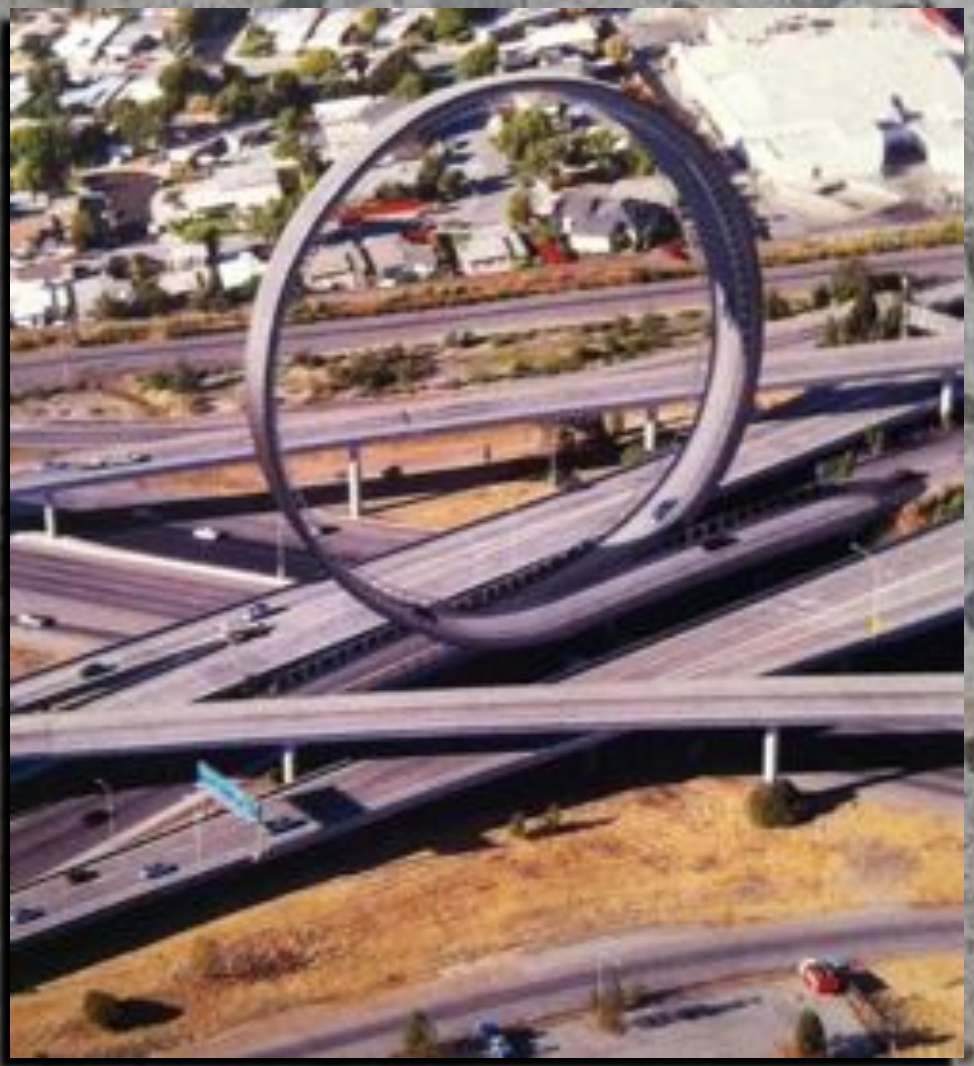

Green Roof Service LLC

- **Independent**
- **Most experienced**
- **Common Sense**
- **Engineering the impossible**

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Independent

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Most Experienced

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Common Sense

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Designing the Impossible

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Performance of
Green Roofs
Not All Green Roofs Are Created Equal
CRIME SCENE DO NOT CROSS
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Performance of Green Roofs

Inadequate modular systems fail to meet their performance and aesthetic expectations.

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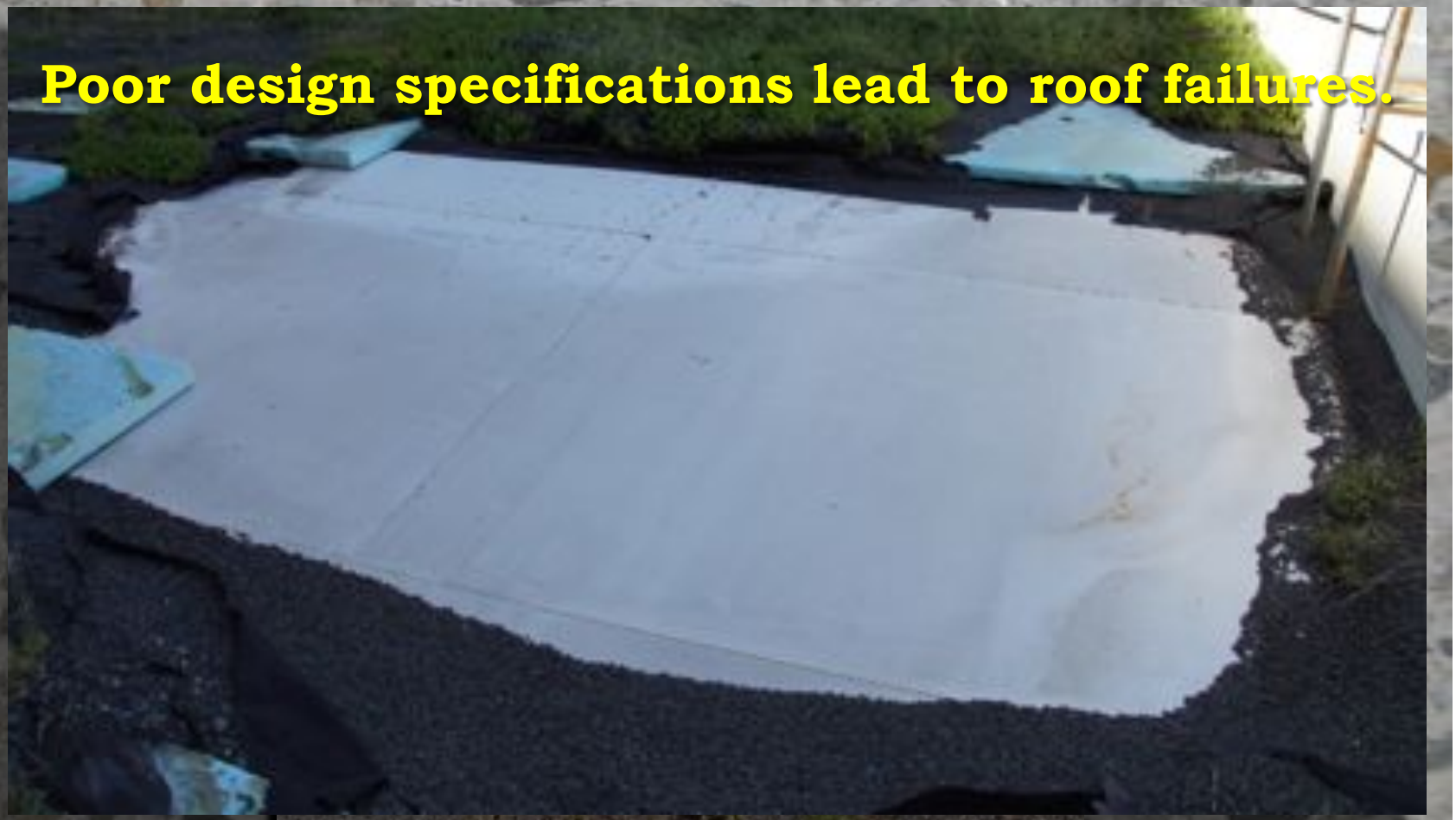
Performance of Green Roofs



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Performance of Green Roofs

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Performance of Green Roofs

Poor engineering and ignorance is extremely dangerous!

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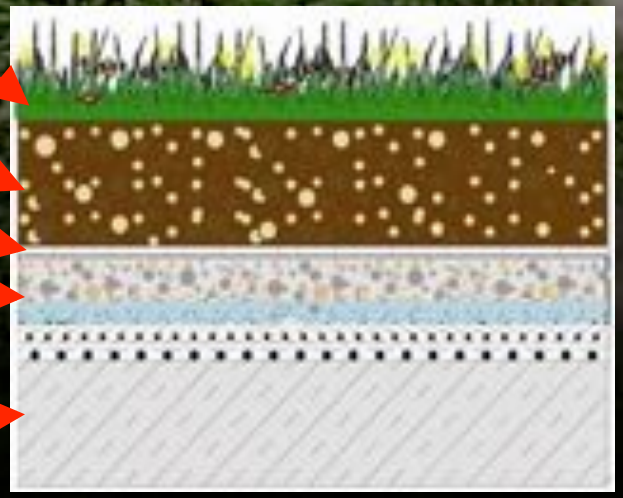
Performance of Green Roofs

Summary of Key Problems:

- Inexperienced designers and engineers.
- Hardly any horticultural experience and insufficient education in the market. -- It seems when you are a farmer you are more qualified than a butcher; however, I know that neither of them is qualified.
- Too many “inventors” who use their clients as guinea pigs.
- Poor common sense and little common knowledge.
- The “Grass grows everywhere” misconception.
- The English spoken web.
- No attention to details and no understanding of roofing.
- Roofing companies who create dependencies e.g. through warranties.
- Nice, colorful brochures and well trained sales forces.

Myths and Common Mistakes

Modern green roof technology is an engineered setup of different high performance layers that mimic nature's soil profile and allow for a much thinner and lighter profile. Against any other statements you may find on the English spoken market, modern green roof technology has nothing in common with ancient projects and their setups. The modern technology was developed in the 1970's in Germany and is engineered to function in any climate zone. Modern green roof technology can be applied on all impervious areas – not only on roofs.



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“Green Roofs are an effective replacement for open space”

Green roofs can replicate open space conditions during storm events. The effectiveness depends on the thickness of the system – especially the thickness and properties of the green roof growing media. Shallow green roofs (below 4 inch depth) will be effective in controlling small rainfall events, while deep assemblies may be required to control large storms.

The generalization that green roofs can replace open space must be qualified. “Open space” isn’t the same everywhere. Decades of studies in Europe show that there is a “best value” or BMP for each project. However, since qualifying each project will increase costs and likely won’t be that accurate, because weather is rather unpredictable, this is not typically the best approach.

The studies show that a 4-5 inch deep green roof offers best economic, environmental and self sustaining value, assuming all components and the entire setup are according the FLL guidelines. Quality matters.

I personally would NOT rely on any short term studies (less than 4 years) made without standardized materials and components.

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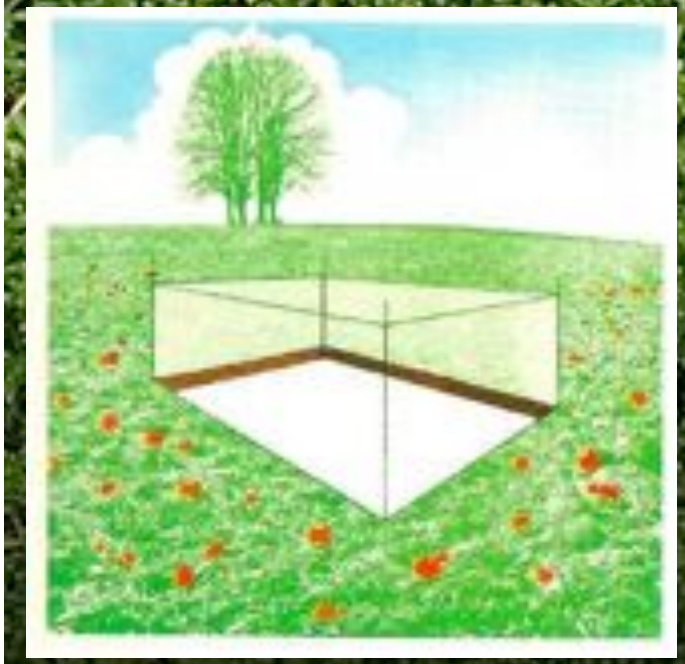

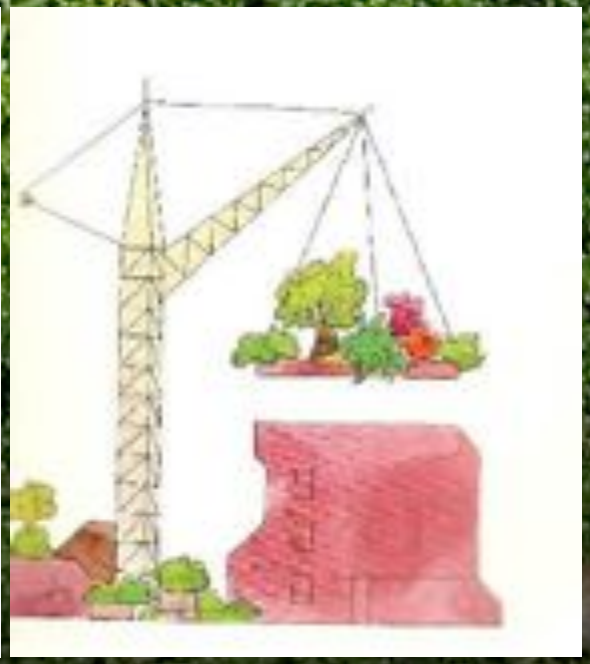

Nature can <u>partially</u> be replaced on top of the buildings.

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“Green Roofs are good insulators?”

Answer: Yes and no.

No, when considered as and insulation with an "R-value."

Yes, because a green roof acts as a thermal mass or heat sink, slowly absorbing and holding energy from sunlight and releasing it when the ambient air cools. In this way, it acts as a heat **“storage battery”** and reduces the heating and cooling demands within the building at certain times or seasons. Energy savings will be greatest in low buildings, due to the high ratio of roof area to the total exposed building skin. The benefits will also be greater in warm climates where cooling is the principal energy cost.

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“Extensive Green Roofs don’t need irrigation.”

In the United States and Canada there are already many green roofs without irrigation. Most of these un-irrigated assemblies are succeeding very well. However, these project are also under a maintenance contract and maintained by experienced professionals.

To achieve this outcome it requires extensive horticultural understanding combined with common sense.

Key elements for un-irrigated, high effective and BMP green roofs are:

- Patience. Adopt the plants to the conditions – don’t spoil them with water and fertilizer.
- Choose the right plants – less varieties are sometimes more success and let the plants grow where they grow best.
- Mix all the plant varieties you what to establish – no fancy patterns, let nature do this job on extensive green roofs.
- Use a growing media according the FLL guideline.
- Check for unwanted plants – sometimes “weeds” are wanted plants.
- Fertilize with very low amounts and more often. Not all slow release fertilizers are slow release on green roofs.

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“Extensive Green Roofs don’t need irrigation.”

Irrigated

Un-irrigated

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“Farming on roofs to feed the poor.”

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“Farming on roofs to feed the poor.”

There is a big difference between herbs and vegetables. Extensive green roofs are able to support
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Urban agriculture is a recreational or educational occupation in every sense.

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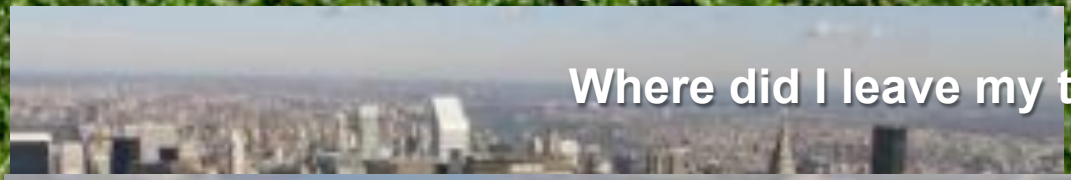

Where did I leave my tractor?

Where is my little farm?

Abb. 12. Dachgarten mit Gemüsebeeten auf dem Landhauerhaus in München, Baujahr um 1850 (Harberz 1937, S. 106)

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“Only native plants on green roofs.”

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“Only native plants on green roofs.”

As long as the plants’ environmental requirements are met--moisture, nutrient availability, aeration, drainage, wind, temperature and light exposure--native plants can be easily incorporate in modern green roof technology.

Attempting to replicate natural ecosystems on a roofs (local ground-level based nature) will increase construction costs dramatically. A replicated natural ecosystem can cost 10 times or more than a standardized extensive green roof system and probably over 100 times more than a few efficient efforts on the ground.

Wasting land and wasting money is not environmentally friendly.

All extensive green roofs can be easily optimized for more biological diversity or as a stepping-stone environment for native micro or macro organisms.

??Any responsible and environmental conscious person helps to protect the environment on the ground??

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What are the advantages of Modular Green Roof Systems?

Are they less expensive than in-place or monolithic systems?

Modular, or tray systems, involve supplemental labor costs associated with double-handling of the materials. Shipping and on-site handling can be more difficult.

Tray systems do not offer the same high protection for the water proofing as in-place or monolithic systems because they never cover the entire roof area or critical roof areas such as penetrations, drains and parapets.

Removal of modules for whatever reason is just as difficult and costly as removal of in-place systems. Leak detection, isolation or other procedures are identical. A 2'x 2' module filled with 4" of mineral media could weigh about 80 lbs. when saturated. Selectively moving modules of such weight can be challenging or might destroy the roofing when just dragged along.

Tray systems are like planters and cannot consider various drainage situations on one roof

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What are the advantages of Modular Green Roof Systems?

Are they less expensive than in-place or monolithic systems?

Open gaps cause many problems.

Transportation on the roofs cause many problems like weight issues, gravel spills and damage to the waterproofing.

Irritating, misleading advertising shows the real understanding of suppliers….quick bucks seems the goal.

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What are the advantages of Modular Green Roof Systems?

Are they less expensive than in-place or monolithic systems?

Modular systems are not new!

Germany, 1981

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What are the advantages of Modular Green Roof Systems?

Are they less expensive than in-place or monolithic systems?

Modular or tray systems do not allow custom design solutions or different plant varieties in a short time.

Individual drainage (holes) in trays are a potential risk of failure.

Defeat EFVL leak detection.

Cost of labor is much cheaper in nurseries because they often operate only seasonally, mainly without benefits/healthcare and hardly any safety requirements (machines, chemicals etc.)

No long-term experience (10+ years) with all the plastics – especially with recycled plastics

Sustainability?

“Grow to Go” versus “Grow to Stay”

Conflict of interests: Nursery vs. Owner

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Maintenance

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Sustainable progress is the smart combination of old ideas with new technologies.

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