

Demystifying the Green Roof

Presented by:

W. Blake Talbott, NCARB, CSI
BBH Design

Tim Pennigar
Duke University Health System

AIA/CES Credits

Hanley Wood is a Registered Provider with The American Institute of Architects Continuing Education Systems. Credit earned on completion of this program will be reported to CES Records for AIA members. Certificates of Completion for non-AIA members are available on request.

This program is registered with the AIA/CES for continuing professional education. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the AIA of any material of construction or any method or manner of handling, using, distributing, or dealing in any material or product. Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

Learning Objectives:

Upon completing this program, the participant should know:

- The classic definition of “Green Roofing” and why it may be changing.
- Which benefits you can “bank on.”
- Good design and construction process and how to avoid a big green mess.
- Why green roofing and building design may be the FM's best friend.

What is your Attendance Objective?

Acknowledgement and Commendations for Professional Representatives.

THE ARCHITECT'S OBJECTIVES

The last five years have been exciting times for designers. There are a lot of new products. We have seen building science and its testing developed enough to allow practical application of some old and new human aspirations, i.e. solar collecting, vegetative roofs, etc.

Sod roofs developed into better vegetative roofs and have been further developed more over the last 25 years in Europe. Historically, the free plentiful vegetative or sod roof had benefits for the North American plains settlers and others. These temporary dwellings were replaced as the user's prosperity improved and the ability to purchase more environmentally adaptable materials. Why after all these centuries are we revisiting this type of roof again? THERE ARE BENEFITS, IF one uses good building science, quantifiable standards, which have been field tested. Do we have all the necessary building science and are we using it properly?

Human Aspirations vs. Licensed Professional Responsibilities

Everyone has memories of past premature, impractical, or unacceptable ideas and products foisted upon the profession and public:

- Automobiles:
- Consumer Foods:
- Housing:
- Roofs:

The Licensed Professional's (Architects and Engineers) Responsibilities:

- Required to provide for the public's life, safety and welfare.
- Due diligence.
- Communicate and implement reasonable owner expectations.

Due Diligence

What is the Professional Approach?

Can it be specified?

Let's examine all building products
through the three part process.

Green Roofs Challenges Yesterday and Today

Steven Peck, Founder and President of GRHC, 2005:

“Since our first conference in Chicago in 2003 when 425 researchers, entrepreneurs, policy makers, gathered to talk about challenges to the industries development; we have all been working to overcome them. These challenges still exist but we are making significant progress in overcoming them. The challenges require the participation of Researchers, Policy Makers and a wide range of Industry Professionals (Manufacturers and Designers).

- *Lack of technical information on green roof infrastructure and its performance – at different scales – product, building and community-wide.*
- *Lack of information on biophysical and economic benefits of widespread green roof implementation for policy makers in areas such as air quality, storm water, urban heat island, biodiversity, green space etc.*
- *Lack of performance standards for products re: drainage, saturated weights etc.*
- *Lack of a formal training and certification process for design professionals.*
- *No data on the industry itself – size, composition, location, growth rate.”*

BENEFITS: Yes, No, Maybe

- **Can extend membrane Life...**
- **Can enable sustainability...**
- **Can reduce heat island effect and glare...**
- **Can save energy...**
- **Can provide human visual comfort & health...**
- **Can reduce storm water runoff...**
- **Can reduce noise transmission...**
- **Can maintain quickly and efficiently...**

What is the Roof's Future?

- General: Energy Collection and Efficiency:
- Vegetative Roofs: Standards and Tests for materials and assemblies:
- Vegetative Roof Products:

Facilities Manager's Objectives CASE STUDY

Tim Pennigar
Duke University Medical Center

Introduction

- The Pledge
- The Turn
- The Prestige

Every great magic trick consists of three acts. The first act is called “The Pledge”; the magician shows you something ordinary, but of course... it probably isn’t. The second act is called “The Turn”; the magician makes his ordinary something do something extraordinary. Now if you’re looking for the secret... you won’t find it, that’s why there’s a third act called, “The Prestige”; this is the part with the twists and turns, where lives hang in the balance, and you see something shocking you’ve never seen before.

Credit: The Prestige, Walt Disney Pictures

But First... A word about the green roofing movement and the current economic climate.

- There clearly is some market pull back
 - 1.Total elimination through Value Engineering
(Response: Ensure that new roofing is designed to support future vegetated retrofit.)
 2. Substantially reduced project scale
(Response: Preserve some areas for green roof demonstration plots.)
- Can there be a “silver lining”?
 1. More intelligent and sustainable growth for the green roof industry
 - 2.Time for building science to catch up to marketing
 - 3.Broader education and involvement of facility professionals

I. The Pledge (The Ordinary)

A. Understand Your Building

1. **Enough structure to support saturated loads?**
 - a. Margin of safety
 - b. Professional assessment
2. **Where does my building leak?**
 - a. Roofs and typical sources
 - b. Exterior walls and typical sources
3. **Where might my building *tend* to leak?**
 - a. Professional review of as-built drawings
 - b. Anticipatory maintenance

I. The Pledge (The Ordinary)

B. Follow design principles for sustainable roofing

- 1. Favor insulations or insulating assemblies that are highly resistant to water and physical damage.**
- 2. Favor roof assemblies that position the roofing membrane directly over a permanent or semi-permanent substrate.**
- 3. Favor roof designs that prohibit or highly discourage the entrapment of water within the roof assembly.**
- 4. Favor membrane and insulation designs that are capable of in-place reuse or recycle in future roof iterations.**

I. The Pledge (the ordinary)

C. Improved Processes for Improved Outcomes

- 1. Professional const specs and detailed drawings**
 - a. project specific
 - b. buildable – no RFOs
- 2. Prequalification is vital**
 - a. experience with Protected Membrane Roofing
 - b. construction crew skill matched to the task
- 3. Preconstruction conference and agreements**
 - a. must include actual crew members
 - b. must produce a binding set of meeting minutes
- 4. On-site inspection during construction**
 - a. must be competent
 - b. must be timely

II. The Turn (the *extraordinary*)

A. Understand your green roof performance goals

1. **For Show**
 - a. Positive public perception
 - b. Building esthetics
2. **For Go**
 - a. Stormwater management
 - b. Urban heat-island effect
 - c. Increased roof service life
 - d. Business incentives

II. The Turn (the *extraordinary*)

B. Understand your green roof vegetation choices

1. The vegetation
 - a. Sedums, et al
 - b. Ornamental grasses
 - c. Ornamental mosses
2. The vegetation delivery system
 - a. Build up in place
 - b. Modular trays
 - c. Pre-cultivated mats

III. The Prestige (really shocking stuff)

A. Duke Lessons Learned

- 1. Understanding your Green Team dynamics**
 - a. Unbridled zeal can lead to blindness**
 - b. Roles and Goals often overlap or conflict.**
 - c. Read and comprehend your contracts**
 - d. Become highly informed on pricing strategies**

III. The Prestige (really shocking stuff)

A. Duke Lessons Learned

2. Expect the Best. Prepare for the Worst

(Avoiding the avoidable during construction.)

- a. **Require a full-sized mock up of roof assembly and vegetation.**
- b. **Inspect and certify the roof site with all invested parties prior to vegetation delivery.**
- c. **Don't be an idiot with your structure – know your limitations**
- d. **Fiercely monitor roof protection and damage**

III. The Prestige (really shocking stuff)

A. Duke Lessons Learned

3. Care and Maintenance is not optional

- a. You will need supplemental irrigation.
- b. You will need to do occasional weed control.
- c. You will need to monitor for signs of plant distress.
- d. You will need to maintain contact with your vegetation warranty provider.

III. The Prestige (really shocking stuff)

B. Emerging Trends

- 1. Faster, cheaper, better materials**
 - a. More pre-vegetated options
 - b. Native plant species and specialty blends more broadly available
 - c. More composite assemblies to lower installed costs
- 2. Better building (and building code) science. Better education of facility professionals**

III. The Prestige (really REALLY shocking stuff)

B. Emerging Trends

3. **Progressive transformation of the building design and construction industry**
 - a. ***Durable* and *high-performance* becoming normative (The "New" Green)**
 - b. **Integrated design processes**
 - c. **The Return of a Practical Art
(real-world design for real-world challenges)**

Thank You for Attending!

Questions?

W. Blake Talbott, NCARB



919.460.6700
btalbott@bbh-design.com

Tim Pennigar

Duke University Health System

919.684.4004
tim.pennigar@duke.edu