

Green Roof Service LLC presents:

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**GREEN ROOF TECHNOLOGY**  
WE KNOW FORM AND FUNCTION

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**Green Roof Plant of the Month:**



Brush up on your green roof plant knowledge with a new plant every month! Only on our Green Roof Plant Blog!



### A Solar Garden Roof for Non-Profits

Renewable energy is an attractive tool that businesses can use to offset rising energy costs. So how does a non-taxable entity like a non-profit organization (NPO) take advantage of the plethora of incentives to produce energy for their own building?



### Green Roofs are Standard on Passive Houses

Many designers are striving to use the latest technologies to create more environmental friendly conscience structures. Some of the best examples of sustainable buildings are known as Passive Houses. Learn more about what makes these structures better for the environment!



### Energy Cost Savings Through Green Roofs: A Myth

Any man-made structure is nothing more than a body that requires consistent 'body temperature' to make it usable for the purposed design. A building without reliable all-season clothes is worthless or requires a tremendous effort (energy or operating costs) to make it useful. A common misconception, simply a green roof unfortunately is not enough to keep a building properly insulated.



### Swarthmore Performing Arts Center Green Roof Install

Swarthmore College gained yet another green roof this past week, adding an additional 31,000 square feet of green space to the campus.

## A Solar Green Roof for Non-Profits



Renewable energy is an attractive tool that businesses can use to offset rising energy costs. What makes renewable energy so attractive are the Federal and State incentives that cover over 30% of the costs to install the system. An investment today in a Solar Garden Roof creates a path of energy independence where your rooftop is producing the power necessary to run your building, instead of the local power plant.

So how does a non-taxable entity like a non-profit organization (NPO) take advantage of the plethora of incentives to produce energy for their own building? Fortunately there is an investment option tailored for NPO's called a Power Purchase Agreement (PPA). PPA's are used in situations where a site host does not desire to outlay the capital required to purchase a system, or is not able to take advantage of the tax benefits available due to being a non-tax paying entity. Through the PPA, the NPO will have no upfront investment nor carry any of the ongoing operations and maintenance obligations. The NPO will then enter into an agreement to purchase the energy produced at a rate below current energy rates.

With this setup, the NPO will make uniform, monthly payments at a reduced cost when compared to the current energy bill. After a set period of time, the NPO can decide to purchase the array from the investors at an agreed upon price. From there the system is paid off and the NPO is enjoying free energy, thanks to the SUN!

Green Roof Service/Green Roof Technology works with NPOs and investors to tailor the right PPA for an investment in a Solar Garden Roof.

## Green Roofs are Standard on Passive Houses

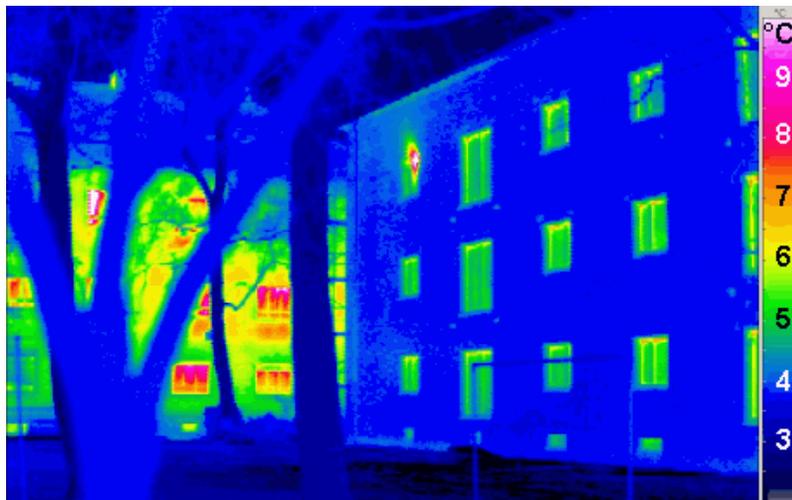


*Photo Source: Wikipedia*

In the past few decades sustainable building practices have come a long way. Many designers are striving to use the latest technologies to create more environmentally friendly conscience structures. Some of the best examples of sustainable buildings are considered Passive Houses. Germany is at the forefront of this trend, having been researching and developing specific environmental design principles since the early 1990s. These principles surpass LEED™ Certifications and are overall less expensive. Energy consumption of a Passive House is between five to ten times lower than an average (LEED™) building, decreasing the environmental footprint two to five times.

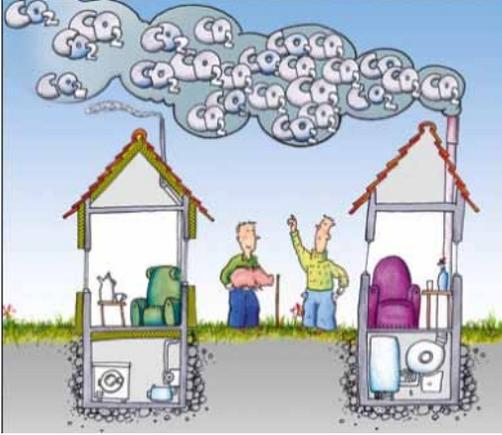
These houses are designed with many modifications. Exterior walls tend to be two to three times thicker when compared to conventional home. Natural and controlled ventilation systems are also prominent, helping to keep temperature balanced throughout the entire building. All these modifications make Passive Houses almost completely airtight and soundproof. Many of these houses are designed to include a green roof or solar powered system.

In 2010, there were over 25,000 Passive Houses in Germany and around 13 in the United States. In Urbana, Illinois, the first Passive house was erected in America, back in 2003.



*Photo Source: Wikipedia*

## Energy Cost Savings Through Green Roofs: A Myth



It is unavoidable and common sense that wearing wet clothes in winter will end up in hypothermia. Wearing the same wet clothes on a hot summer day, might actually help to feel cooler - not to be confused with feeling more comfortable. If we have only one set of clothes, for all four seasons, they would typically be made up of two layers. The first layer protects against direct environmental impacts such as sunlight, rain or wind and the second layer usually consists of a breathable layer for comfortable wearing and controlled air circulation.

I have learned on my travels all across different deserts on earth that these layers reduce temperature increase on hot, sunny days, but at the same time can reduce the loss of body heat during extremely cold nights. Indigenous people of extreme environments have learned this

lesson over centuries and were able to survive under these circumstances with this simple layer strategy. My father always used to say: "What is good for the cold is also good for the warm."

Any man-made structure is nothing more than a body that requires consistent 'body temperature' to make it usable for the purposed design. A building without reliable all-season clothes is worthless or requires a tremendous effort (energy or operating costs) to make it useful.

Helping to make a building useful for people, the 'coat' consists typically of an insulation layer covered with a layer to protect against the elements (waterproofing, roofing membrane). Since we all know that the protective sheet will deteriorate over time this sheet (waterproofing) has to eventually be renewed, a process experts call re-roofing, which usually happens every 18-25 years.

It is proven by my experience (since I have been designing and installing green roofs for 35 years) that a green roof can double the lifespan of the roof. The green roof acts like an additional all season two-layer system on top of the roof where healthy plants are the first layer, protecting against direct environmental impacts. The green roof growing media (green roof soil) is the breathable layer.

There is only one difference; the breathable layer (growing media) on a green roof is also the basis for the well-being of the plants and must be able to store water and air at the same time for a healthy growth. If this layer doesn't fully support the plants (and only the plants) the entire coat does not function and the plants tend to indicate this by suffering or a change in plant varieties present.



*Photo Source: Columbia*

Above we learned that a wet coat in winter causes problems because water is not a good insulator and so we have to consider heat loss in winter when speaking about green roofs. We also understand now that dry green roof soil in summer will store heat (in the aggregates) and increases the cooling needs.

A green roof (and green walls that grow on growing substrates on vertical surfaces with consistent irrigation) are only thermal masses with hardly any insulating values. Considering these facts, building owners should be cautious when someone tells them that green roofs are good insulators. This is just not the case, especially if the building envelope is not insulated correctly in the beginning. Fixing heating and cooling loss simply through green roofs and/or green walls is impossible or a short-term solution.

*Photo DM Products: Penn State's futuristic Millennium Science Complex earns LEED Gold for this space-wasting empty over hang. The 'water head' of the campus (or of their bureaucracy). Pants can not even grow underneath - how can people survive?*



With all the current research in this field, it's surprising to me that people still claim green roofs are good insulators. Additional insulation below the original coat is necessary (waterproofing or walls) to make the most effective roof (cost wise and physically) compared to any vegetated layer combined with growing media of growing substrate.

However, the thermal mass "green roof" certainly has lifespan extending properties for the waterproofing (and again, I can confirm this with projects spanning over 35 years). This is the key to start thinking in long terms (50+ years) in the building industry and is the most sustainable approach. Longevity is hardly considered in LEED™

certifications and with less emphasis on longevity, many awarded LEED™ buildings might fail for a certification because they can't be upgraded easily when the costs of energy increase. I am not referring to how wasteful the footprints of many of these 'innovative' building designs are.

In the last 35 years, energy costs increased eight to ten times (!) and are expected to grow accordingly over the next three to five decades (or the lifespan of a green roof). Knowing this, selling a green roof for insulation purposes will unavoidably end up in a costly disaster for the building owner. Removing a fully functioning green roof in less than 25 years after installation, simply to add to more insulation, meet future requirements or to keep heating and cooling costs low.

Green roofs do not extend the life span of selected, important building components dramatically. Increasing the lifespan of any building is the best environmentally friendly approach in the building industry and the most efficient way to reduce costs for the owner over decades. Although, if scientist and green roof professionals often do not understand this unique property of green roofs and don't design underplaying components accordingly, the building owner won't be very happy in the future. In 20-25 years when parts start needing to be replaced, a second green roof will be the last choice of the building owner because it will simply be additional costs with few benefits as originally promoted. He might not understand why he should disassemble a perfectly functioning and well established green roof, precisely when certain individuals led him in the wrong direction in the past.

Conclusions:

- As a building owner be careful when people try to sell you green roofs as a good insulator without mentioning that additional insulation is necessary for the building for future energy needs.
- Building owners have to understand that any available research about the insulation value of green roofs reflect only a current snap shot and potential savings in a very short time period (less than half life time of a green roof) and they are worthless when the intention is to build for half a century.
- There are no energy studies completed over a 50+ year time span comparing a green roof (plus additional insulation) and a conventional roof that will be re-roofed with additional insulation 20 years from now (typical re-roofing practice)

Trust only experts that recommend additional insulation under the green roof because then they expect that your investment will last a human lifetime, which will be profitable but also affordable during this time. Designing the roof (or wall) to last for five decades or more requires a lot of responsibility and expertise of the designers - if they value their customers.

## Swarthmore Performing Arts Center Green Roof Install



Our relationship with Swarthmore College began nearly a decade ago. We have had the privilege of working with the college on several other green roofs, a few of which appear on the front cover of popular green roof books.

This past Friday, Andrew went to Swarthmore College to oversee the install of the college's newest green roof. The Furbish Company was awarded the contract to install the 31,000 square foot green roof.

On a beautiful afternoon, the Furbish installers added the final touches on one of the lower roofs. The custom designed green roof is a hybrid single-course system that utilizes heavy-weight drainage and retention fabrics (provided by Resource Conservation Technology), a 100% pumice growing media layer (provided by Stancills Inc.) and sedum mats (by Sedum Master). This system was utilized due to the roof's weight capacity limitation.