

## **Project Profile**

PECO Energy, PECO Green Roof  
2301 Market Street, Philadelphia, PA 19101

## **Project Overview**

*Please provide a complete and accurate overview of the project. Describe its purpose and scope. Provide specific statistics / details as you like.*

In January of 2009, Exelon subsidiary PECO Energy unveiled a new Green Roof atop its corporate headquarters at 23rd and Market Streets in Philadelphia. With C. Erickson & Sons, Inc. at the helm as Construction Manager, the project became the city's largest installed vegetated roof on an existing building, as well as a shining example of PECO's commitment to a cleaner, greener, future. A long-time partner of PECO Energy, C. Erickson & Sons is proud of its key leadership role in the project, and hopes it will lead other clients and builders on the road to a more sustainable future.

The project had its roots in more than just flowering sedum, however. A cornerstone of PECO's extensive fifteen million dollar Environmental Initiative, the work called upon the vision and skill of many different players, from C. Erickson & Sons through key architecture, engineering and design firms, including Re:Vision Architecture, AKF Engineers, and Robert E. Lamb, Inc., among others. From ensuring structural roof integrity, to coordinating growing seasons -- literally from state to state -- the creation of a true, living roof atop a Philadelphia office building required care and attention not just to the physical structure of the rooftop, but the very environment it was intended to benefit.

Purely from an economical standpoint, the new roof represents a savings in heating and cooling costs for PECO, reducing peak summertime roof temperature by as much as 60 to 80 degrees, as well as indoor temperature extremes. Additionally, it will help reduce storm water runoff (absorbing 60 to 70 percent of the approximately 1.5 million gallons of rain that falls on PECO's Main Office Building annually) and outlast a new conventional roof installation by two to three times.

Beyond just these "at home" rewards, the new green roof absorbs air pollution, provides a welcome habitat for birds and other small wildlife, and -- through a partnership with the Pennsylvania Horticultural Society -- enables the education of schoolchildren on the importance of thinking, living, and building "green." Its visibility from surrounding high-rise buildings also provides a sublime focal point in an otherwise strictly urban landscape.

Built overtop PECO's Emergency Response Control Room, power and data center substations, as well as employee office and cafeteria space, support of the existing roof structure was critical. To reinforce the underlying structural steel joists, 650 6" diameter holes were cored through the existing concrete roof deck, an innovation which allowed the reinforcement to actually take place from above. This portion of the job was complicated not only by HVAC and Electrical utilities attached to the joists, but by frequently unpredictable summer and fall weather. Careful coordination was required to avoid flooding and damage by rain and the elements.

After the structural reinforcement work and original roof drain replacement was complete, Erickson oversaw the installation of a 50,000 square foot EFVM (Electric Field Vector Mapping), manufactured by International Leak Detection. Underlying the verdant roof areas, this tested barrier is sensitive enough to detect even tiny moisture leaks or penetrations in the rubber membrane with pinpoint accuracy.

45,000 square foot of the overall roof project was reserved for the vegetated surface, divided into both Extensive and Intensive environments. The Extensive environment comprises the largest section of green roof, covering 43,000 square feet, and yields more practical environmental benefits, including low cost, low maintenance, and no irrigation requirements. Ten different

species of sedum -- a hardy succulent with water-storing leaves -- were planted throughout this area.

Within this section, six distinct layers separate the underlying roof deck from the topmost Roofmeadow Growth Media and Pre-Vegetated Sedum Mat: Insulation, Electrical Grounding, Felt, Primary Membrane, 100% recycled Roofrug Drainage Mat, and Separation Fabric. Roofscape's Growth Media, an engineered soil-like material, helped to retain both moisture and plant nutrients, as well as supporting vigorous growth of the foliage ovetop for years to come.

The remaining 2,000 square feet is allotted to Intensive planting, and in addition to providing a natural habitat for birds, improves the aesthetic appeal of the roofscape for its human visitors. Fourteen different varieties of perennial plant species, including aster and Echinacea, thrive in this irrigated portion of the roof.

In this section, a total of seven layers stand between the roof deck and RoofMeadow Growth Media: Insulation, Electrical Grounding, Felt, Primary Membrane, Protection Layer, Granular Drainage Media, and Separation Fabric.

Finishing the vegetated portions of the roof was not as simple as tossing out handfuls of seed. Careful pre-planning required an intimate knowledge of the local climate, roof environment, as well as the plant varieties that would be put into use. The decision was made to use Pre-Grown Vegetated Mats, sod-like rolls of Sedum plants already in the early stages of growth, to establish the topmost foliage cover in the Extensive areas. Planted, cultivated, harvested and shipped out of more temperate climates from Sempergreen's Virginia location, the Pre-Grown Sedum Mats could be rolled out over the Growth Media, and allowed to naturally take root in their new environment. Only a limited number of Sedum varieties are adapted to this method, but plant species were carefully selected to ensure phased blooming throughout the year.

Once again, inclement weather offered its own challenges to the teams responsible for installing the sedum mats, as well as a closure of JFK Boulevard just north of the PECO Building. Though hardy, the sedum rolls were still vulnerable in their sod state, and Erickson faced a limited timeframe in which to safely situate them in their new environment.

When seeing the Green Roof project for its technical complexities, it's important not to overlook its similarly impressive functional aesthetics. More than just a field of green on a city high-rise, the roof was designed and crafted to be as experientially pleasing as it is environmentally responsible. Paved walking paths invite visitors through the roofscape, lit by energy-conscious LED lighting, and hemmed by smooth riverstone perimeters. Handicapped-accessible via a Forest Council Certified IPE Wood Deck, the way is decorated by raised planting beds, benches, and a variety of ornamental flowering plants. As an added benefit to visitors, free-standing informational platforms guide visitors on an information tour across the roof, providing details on its construction, growth, and green roofing concepts.

PECO Energy's Green Roof project was intended to serve as a symbol for all sustainability strategies that the company has undertaken. In committing itself to a greener way of business -- and life -- it has added another leaf to Philadelphia's growing laurel of environmentally-conscious improvements, and beautified its own personal corner of the city.

### **Project Management & Timeliness**

*Please describe how the project was managed. If applicable, explain what best practices were used to manage the project. In addition, tell us how your team (i.e., in-house personnel, engineers, architects, sub-contractors, owners) worked together to get the job done. How were you sensitive to the environment and the community surrounding this project?*

The complex nature of the project called for varied skill sets from a wide variety of consultants, designers, subcontractors and builders. Key team members on the project included:

Roofscapes, Inc. | Green Roof System Design and Installation  
Re:Vision Architecture | Architectural Design  
AKF Engineers | Mechanical and Electrical Engineers  
IEI Group, Ltd. | Project Management  
Robert E. Lamb Engineers | Structural Engineers  
Systems Design & Analysis, Inc. | Roof Consultant  
U.S. Roofing | Primary Roof Installer  
Furbish Company | Green Roof Installer  
Sempergreen | Vegetated Mat Grower  
Sarnafil | Product, "Sika Sarnafil", Plastic Membrane Manufacturer

The project required close coordination between the different roofing systems and subcontractors involved in the project. C. Erickson & Son released and imported the custom-manufactured Growth Media from Sempergreen's headquarters in Germany, allowing them to coordinate the Pre-Vegetated Sedum Mats with the appropriate growing seasons along its journey (first in Virginia, and later in its final home in Philadelphia.)

Team coordination spanned everything from old roof removal and replacement to reinforcement of the structural steel joists with their HVAC and electrical tie-ins. Troubling weather throughout the project required careful timing, both to avoid damage to the underlying roof, and to protect the freshly-laid sedum from unkind winter elements.

Coring work done through the existing concrete roof deck was coordinated with the re-roofing operation, and the closure of JFK Boulevard required careful rescheduling of dumpster removal and crane lifts around the outside construction.

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C. Erickson & Sons project team performed beyond expectation, skillfully facing the complex challenges inherent in a project of such scale, and coordinating with consultants and subcontractors from many different disciplines, and regions, to complete the project on-time, and on-budget.

### **Quality of Workmanship**

Explain the level of workmanship / craftsmanship that went into this project.

### **SCHEDULE**

With an enormous cast of players, from consultants and subcontractors to technicians and laborers, and hindered by extremes of seasonal wind, cold and precipitation, the project was still completed within the allotted timeframe of only thirty weeks.

### **ROOF DECK CORING**

A veteran C. Erickson & Sons employee suggested the process by which the roof steel joists could be reinforced with Nelson Studs from above: by coring holes, 6" in diameter -- a process which also required coordination with the other, simultaneous re-roofing work underway. The process saved the project team a tremendous amount of time and money.

The beauty of the completed Green Roof environment is that its true complexity is not the first thing a visitor will notice. With its Zen-like landscaping, it instead encourages PECO employees and visitors to explore, walk, learn and enjoy, not to plumb the technical depths that went into its making. Like any living thing, its continued growth, and its ability to thrive with a minimum of human influence or interference, is the greatest testament to its success.

## **Innovation in Construction Techniques or Materials**

*Explain special construction techniques, methods, and/or materials that were used on this project. If specific challenges arose as a result, how were they handled?*

Although the construction of living roofs, in their most basic form, have been in practice since the ancient times, the technology and design behind their more modern, urban cousins still puts them at the cutting edge of both new and rehabilitative construction. C. Erickson & Sons had the pleasure of working with companies at the forefront of this movement, including Roofscapes, Inc., and Sempergreen, whose very business is built upon bringing life, in the most literal sense, back into building.

Some of the more noteworthy innovations in this area include:

### **EVFM ELECTRIC LEAK DETECTION SYSTEM**

Although not frequently seen in the United States, EVFM ( Electric Field Vector Mapping) has a long history of success in Europe. Ideal for applications where the waterproofing is concealed or buried, The technique uses water as the conductive material, and an upper and lower electrical plate. When a leak occurs - even as tiny as a pinhead -- the invading water completes the circuit between the two plates, allowing a technician to simply follow the direction of the electric field to the precise location of the tear or penetration.

The EFVM technique uses water as the electrically conductive medium. The survey technician installs a wire loop around the perimeter of the area to be tested and introduces an electrical potential. The area within the loop is dampened to form an upper electrical 'plate'. The structural deck is the lower electrical plate, while the membrane separating the two plates acts as the insulator. If moisture enters a defect in the membrane, an electrical contact is established between the two plates (i.e., an electrical ground). The survey technician can then follow the direction of the electric field to the membrane defect. This can all be achieved *above* the growth overburden, as well as walkways, as long as water can pass through and meet with the primary roof.

### **PRE-VEGETATED SEDUM MATS**

Another method employed was the use of the sod-like, roll-out Pre-Vegetated Sedum Mats. The dominant method of Green Roof installations in Germany, they are a proven rapid and reliable method of establishing Sedum foliage cover. Although careful timing was required, not only to coordinate the growing seasons between Virginia and Pennsylvania, but in making certain that the rolled mats could be transported, and implemented, without compromising the living Sedum.

### **GREEN ROOF WEIGHT**

As a final note, although the structural roof joints were reinforced, there was a finite amount of weight that the new roof would be able to hold. The materials that went into the Green Roof, including each of the constituent layers, are not only durable, self-sustaining, efficient at water retention and drainage, but light in weight as well.