



INTERNATIONAL HARVESTER BUILDING SOLAR ECO ROOF

79 SE Taylor Street Portland, OR 97214



PROJECT SUMMARY

Building Owner: Mr. Michael Kauth

**Green Roof + Solar
Design / Install:**



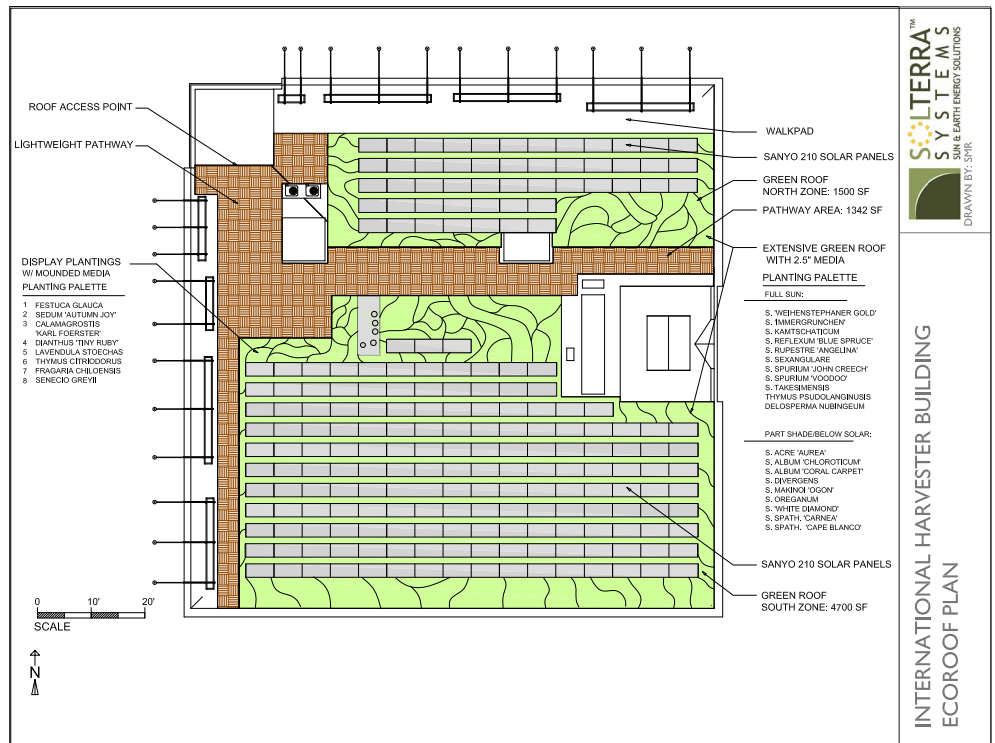
Completion Date: July 2010
Project Type: Commercial
Technologies: 6,200 SF Green Roof with
45.6 kW Solar PV array
Eco roof construction cost: \$91,000
Total cost without membrane: \$42,400

INTRODUCTION

The International Harvester Building of 79 SE Taylor Street in the Central Eastside Industrial District of Portland, OR showcases 6,200 square feet of eco roof with a 45.6kW solar photovoltaic system integrated into the green roof. The International Harvester Building is listed on the National Register of Historic Places for the Eastside Industrial District of Portland, and necessary structural upgrades were completed to accommodate additional loading from the solar panels and green roof. The IHB Solar Eco Roof features extensive plantings (within 2.5" of growth media) of a variety of sedums throughout the green roof, both in full sun locations and in shade conditions below the raised 216 Sanyo solar photovoltaic panel system. Plantings for the eco roof were carefully selected and arranged in a dynamic planting plan that also features a mounded planting area to support taller plantings such as *Calamagrostis*, *Sedum 'Autumn Joy'*, and *Lavandula stoechas*.

SolTerra Systems, designer and installer of the eco roof and solar PV system, worked closely with the building owner, Mr. Michael Kauth, to create a model eco roof that promotes sustainable

practices. The major benefits from the roof include increasing stormwater management (research indicates that eco roofs can capture and absorb up to 50% of rainwater runoff), extending the roof life of the building, habitat creation for biodiversity, and provide an educational model for combined eco roof systems.



RESEARCH

Portland State University is conducting research on the synergistic effects between green roofs and solar panels on the International Harvester Building eco roof. Dr. David Sailor, Director of the Green Building Research Laboratory at Portland State University, is studying the potential positive effects of cooler roof temperatures due to increased shading from the 216 solar PV panel array.



Additional environmental benefits may include improved green roof growing conditions from shade-providing solar panels. Dr. Sailor is measuring the temperatures at four distinct locations on the roof surface: on a white roof surface, on a black roof surface, within the growth media in full sun, and within the growth media under the shade of solar panels. Dr. Sailor is also conducting temperature testing on the interior of the building directly below the roof to support his research.



SYSTEM COMPONENTS

- Structural Roof Support- building upgrades to support solar panels and green roof systems
- Root Barrier - HDPE 30 Mil
- Membrane- 9,500 square feet of 80 Mil TPO by Carlisle-Syntec
- Columbia Green Loose-laid system including 1/2" Drainage layer, Filtration Layer, 1/2" Water Retention Layer
- 2.5" Growing media throughout- from Phillips Soil Products (50 cu.yds)
- Edging- 270 LF of Permaloc metal edging
- Irrigation by Ewing with variable jet emitters and timer system

BUDGET

Design: \$5,000

Permitting: \$2,500

Eco Roof components and labor: \$91,000

Total cost without membrane: \$42,400



International Harvester Building Eco Roof- Before



International Harvester Building Eco Roof- After - upon construction completion date July 2010

PLANTINGS/VEGETATION:

Plantings were carefully specified for full sun conditions on edge locations, and part-shade conditions below the 216 solar panels. Both sedum cuttings and 4" pots of vegetation were used throughout the roof.

Full sun plantings include: *Sedum kamtschaticum*, *Sedum pachyclados* 'White Diamond', *Sedum* 'Blue Spruce', *Sedum spathulifolium* 'Carnea', *Sedum album* 'Coral Carpet', *Sedum* 'Weihenstephaner Gold', and *Delosperma nubigeum*. **Part shade plantings** below the solar panels include: *Sedum makinoi* 'Ogon', *Sedum makinoi* 'Limelight', *Sedum album* 'Chloroticum', and *Sedum spathulifolium* 'Cape Blanco'. Ferns including *Polystichum neolobatum* were planted under the full shade areas below solar panels.

Display plantings in small mounded areas include: *Lavendula stoechas*, *Sedum spectabile* 'Autumn Joy', *Dianthus* 'Tiny Ruby', *Calamagrostis acutiflora*, and *Festuca glauca*. Maintenance includes weeding 2 x per year, and the in-line irrigation system has been used initially in summer months during the vegetation rooting process, and will be used in the hottest summer months as necessary.

LESSONS LEARNED + SUCCESSES:

No unexpected issues were encountered during the construction of this project, and the International Harvester Building's Solar Eco Roof will continue to be studied by Portland State University's Green Building Research Laboratory. The IHB Solar Eco roof will play a key role in furthering eco roof research to support public education and implementation of beneficial environmental technologies. The project has been a model for the integration of solar photovoltaic



systems with living eco roofs, and viewings are encouraged and can be arranged through SolTerra Systems of 79 SE Taylor Street, Portland, contact: info@solterrasystems.com. SolTerra Systems and International Harvester Building owner Mr. Michael Kauth are proud to have completed this eco roof with funding from the Portland BES eco roof grant, and are pleased to contribute to environmental health and sustainable technology awareness in the Central Eastside Industrial District of Portland.