Sophia Academy
Roof Garden

Academic Partner:
School of Architecture, Art
and Historic Preservation

Community Partner:
Sophia Academy

Fall 2013
The Roger Williams University Community Partnerships Center

The Roger Williams University (RWU) Community Partnerships Center (CPC) provides project-based assistance to non-profit organizations, government agencies and low- and moderate-income communities in Rhode Island and Southeastern Massachusetts. Our mission is to undertake and complete projects that will benefit the local community while providing RWU students with experience in real-world projects that deepen their academic experiences.

CPC projects draw upon the skills and experience of students and faculty from RWU programs in areas such as:

- American Studies
- Architecture and Urban Design
- Business
- Community Development
- Education
- Engineering and Construction Management
- Environmental Science and Sustainability
- Finance
- Graphic Design
- Historic Preservation
- History
- Justice Studies
- Law
- Marketing and Communications
- Political Science
- Psychology
- Public Administration
- Public Relations
- Sustainable Studies
- Visual Arts and Digital Media
- Writing Studies

Community partnerships broaden and deepen the academic experiences of RWU students by allowing them to work on real-world projects, through curriculum-based and service-learning opportunities collaborating with non-profit and community leaders as they seek to achieve their missions. The services provided by the CPC would normally not be available to these organizations due to their cost and/or diverse needs.

CPC Project Disclaimer: The reader shall understand the following in regards to this project report:

1. The Project is being undertaken in the public interest.

2. The deliverables generated hereunder are intended to provide conceptual information only to assist design and planning and such are not intended, nor should they be used, for construction or other project implementation. Furthermore, professional and/or other services may be needed to ultimately implement the desired goals of the public in ownership of the project served.

3. The parties understand, agree and acknowledge that the deliverables being provided hereunder are being performed by students who are not licensed and/or otherwise certified as professionals. Neither RWU nor the CPC makes any warranties or guarantees expressed or implied, regarding the deliverables provided pursuant to this Agreement and the quality thereof, and Sponsor should not rely on the assistance as constituting professional advice. RWU, the CPC, the faculty mentor, and the students involved are not covered by professional liability insurance.

4. Neither RWU, the CPC, the faculty mentor, nor the students involved assume responsibility or liability for the deliverables provided hereunder or for any subsequent use by sponsor or other party and Sponsor agrees to indemnify and hold harmless RWU, the Center, the Faculty Mentor, and the Center’s student against any and all claims arising out of Sponsor’s utilization, sale, or transfer of deliverables provided under this Agreement.
Table of Contents

Introduction ...................................4
Process ...........................................5
History ...........................................6
Site Context ...................................7
Green Roof Study ...........................9
Green Roof Precedents .................12
Design Options ............................14

Proposed roof garden perspective.
Design by Leslie Hulbert.
Introduction

In October 2012, Sophia Academy purchased a former City School building that will be the school’s first permanent home. Currently located at the former St. Edward’s Grammar School on Branch Avenue in Providence, the new building (located on Elmwood Avenue) would allow for the school to invest in a rooftop garden — something that was once part of the structure.

The addition of a roof garden to the new site would give Sophia Academy science faculty members the opportunity to provide hands-on learning experiences for the students. The garden would serve as a backdrop to the top-floor meeting area, which looks out onto the roof. Additionally, the rooftop garden would serve as a living and vibrant tribute to Sophia Academy’s Founder, Mary Reilly, RSM.

In the spring of 2013, Sophia Academy applied to the Community Partnerships Center at Roger Williams University for support in creating potential designs for the rooftop garden. Students enrolled in ARCH 413 — Advanced Architectural Design Studio — in the fall of 2013 were tasked with creating potential design options for the rooftop garden at the new Sophia Academy site. Students looked at possible programmatic uses for the roof garden and explored potential materiality and vegetation options for the site. Students visited other green roofs and roof gardens in the Providence area as part of the precedent analysis for this project.

The work included in this book showcases the results of a semester’s worth of work for the students in the design studio.

Diagram of city views from the future rooftop garden. Sketch by Chelsea Weibust.
Process

During the fall of 2013, landscape architect Ginnna Johnson, ASLA, Principal at Esker Company Landscape Architecture in Lexington, MA, served as the faculty mentor for students in the Advanced Architectural Studio, which studied the principles of landscape architecture. As part of one project during the studio, students worked on designing an engaging roof garden for the new Sophia Academy building. Students were tasked with developing possible programmatic uses of the green roof for students and staff, maximizing the services the green roof could provide.

At the beginning of the process, students were asked to conduct an analysis of the building, which once had a green roof as part of its structure, and the surrounding community to help inform their design. Students gained inspiration for their designs from site visits conducted locally at the Granoff Center at Brown University, the Peerless Building and the Save The Bay Education Center. Students studied various types of green roofs and planting systems that could be used on the site in order to inform their designs.

The desired goal for the project was for the staff at Sophia Academy to have a vision of what the transformed roof space could look like on the site and a program for how the space could be utilized. This vision would allow the leaders of Sophia Academy to seek the appropriate funds needed to transform the roof space.


2. A sample green roof.
History

“Sophia Academy is a school of abundant opportunity where middle-school girls discover and develop their potential and become confident and compassionate young women prepared to meet the challenges of their world.”

- All-girls middle school (5th-8th grade).
- Founded in 2001 by Sister Mary Reilly.
- Fosters intellectual, moral, cultural and social growth for its students.
- Its 60 students are city residents (specifically those facing economic inequities).
- School is supported through private donations, corporate and foundation grants and special events.
- Annual tuition is $12,500.
Site Context

Current Location:
979 Branch Ave, Providence, RI (leasing building)

New Location:
582 Elmwood Ave, Providence RI (move in 2014)

New building:
• Originally built as a branch of Industrial National Bank in 1948.
• Used as a high school and by a construction company as an office.
• Size: 14,000 square feet.
• Site size: 28,000 square feet.
• Two-story building (and basement) masonry building.
Renderings of new building and site. Adaptive reuse project by Durkee Brown Architects.
Green Roof Study

Environmental Benefits

• Use of roof area as additional space.
• Improves rainwater management.
• Improves thermal performance.
• Reduces sound transmission through roof.
• Visually attractive with a variety of plants and foliage.
• Low maintenance (extensive and brown roofs).
• Little to no artificial irrigation.
• Habitat for wildlife.
• Reduces environmental impact of the building within its surrounding.

1. Diagram of basic green roof requirements:
Image source: www.barrarchitects.net/landscape

2. Green roof HYDROPACK® field in Batavia, NY.
Image source: “Green Roof Design Guide” from Vegetal i.D.
Types of Green Roofs

Intensive Roofs
- Similar management as ground-level gardens.
- Can accommodate virtually any type of plant including grass, moss, shrubs and trees.
- Require artificial irrigation, higher nutrient application and focused maintenance.
- Soil depth ranges from 8” - 30” or more.
- Has greatest impact on structural design.
- Weighs 35-100 pounds per square foot (dry).
- Must pay close attention to waterproofing and roof barrier details.

Extensive Roofs
- Low management requirements.
- Cheap to install and maintain.
- Generally made up of a thin layer of soil or other planting medium with shallow-root plants such as sedums, small grasses, herbs and flowers.
- Soil depth ranges from 2” - 5”.
- Weighs 10-25 pounds per square foot (dry).
- Tray systems are a viable option.
- Do not require artificial irrigation.

Brown Roofs
- Same benefits and construction methods as intensive/extensive.
- Encourage plant and wildlife biodiversity.
- Utilize local soil and spoil.
- Recycled building rubble and materials (usually 40% or more).
- Range of low-fertility substrate (rubble, sand, rotting timber, etc.).
- Plants tend to establish themselves over a period of time.

- Plantings are naturalistic and self-sustaining.
- Sedums or hardy wildflower mixtures.
- Habitat for native flora and fauna.
### Green Roof Systems

<table>
<thead>
<tr>
<th>TOPIC</th>
<th>TRAY SYSTEMS</th>
<th>BUILT IN PLACE SYSTEMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEAD TIME</td>
<td>Minimum of 3 months (plants are pre-grown in nurseries)</td>
<td>2 week lead time (typical extensive systems are planted with cuttings or plugs)</td>
</tr>
<tr>
<td>MAINTENANCE</td>
<td>Can be initially less maintenance than built-in-place systems. Coverage will</td>
<td>Initially more maintenance when established with plugs and cuttings, though similar</td>
</tr>
<tr>
<td></td>
<td>decline after installation as conditions are less</td>
<td>when established with plugs and cuttings, though similar when established with</td>
</tr>
<tr>
<td></td>
<td>ideal than in a nursery environment.</td>
<td>pre-treated mats.</td>
</tr>
<tr>
<td>COST FOR TYPICAL 4&quot; EXTENSIVE SYSTEM</td>
<td>$13-20 per sq. ft. tray</td>
<td>$9-15 per sq. ft. (which includes 8 maintenance visits $13-20 per sq. ft. tray over 2 years)</td>
</tr>
<tr>
<td>WATERPROOFING</td>
<td>Covering all areas of the waterproofing material can be more challenging,</td>
<td>Built-in-place systems cover the entire surface of the waterproofing membrane,</td>
</tr>
<tr>
<td></td>
<td>depending on the dimensions of a roof. In many cases, gaps expose areas of</td>
<td>therefore preserving it and extending the life of the roof.</td>
</tr>
<tr>
<td></td>
<td>the membrane to the sun/weather which will shorten the life of the roof.</td>
<td></td>
</tr>
<tr>
<td>DESIGN</td>
<td>Less design flexibility (ex. Curves, irregular angles, pitches)</td>
<td>Complete design flexibility</td>
</tr>
<tr>
<td>LEAK DETECTION</td>
<td>Same requirements</td>
<td>Same requirements</td>
</tr>
<tr>
<td>RETRO-FIT ROOFS</td>
<td>Plastic (non-biodegradable) tray systems are good for those who wish to</td>
<td>Ideally, a built-in-place system would last 40+ years by protecting the waterproofing</td>
</tr>
<tr>
<td></td>
<td>have a green roof and will be retro-fitting existing roofs with older</td>
<td>membrane from UV and temperature fluctuations. Typically recommend this type of</td>
</tr>
<tr>
<td></td>
<td>waterproofing membranes. Trays have the ability to be moved more easily than</td>
<td>installation on a waterproofing membrane that is less than 3 years old to</td>
</tr>
<tr>
<td></td>
<td>a built-in-place system. They are also more convenient for DIY homeowners</td>
<td>maximize the life of the roof.</td>
</tr>
<tr>
<td></td>
<td>looking to build their own residential green roof system</td>
<td></td>
</tr>
<tr>
<td>AESTHETICS</td>
<td>Trays almost always visible, edges do not conform to curved edges or sharp</td>
<td>Continuous vegetation; edges of the roof are continuous, limitless design options</td>
</tr>
<tr>
<td></td>
<td>angles.</td>
<td>with curved spaces, angles, and pitch.</td>
</tr>
<tr>
<td>PLANT HEALTH</td>
<td>Depending on the type of tray, plant health can be compromised as plants</td>
<td>Time proven complete eco-systems where plants adapt to the microclimate conditions</td>
</tr>
<tr>
<td></td>
<td>cannot share the resources of water and nutrients as easily.</td>
<td>of the roof surface.</td>
</tr>
<tr>
<td>PRODUCT QUALITY</td>
<td>Many manufacturers will not warranty anything but the module and soil.</td>
<td>40-70 years experience in Europe and USA. Fully warranted plants and components as</td>
</tr>
<tr>
<td></td>
<td>Modules exposed to the sun on the edges are typically not warranted.</td>
<td>well as single source options.</td>
</tr>
<tr>
<td>PITCHED ROOFS</td>
<td>Not recommended - tray systems are likely to lose their shape or break</td>
<td>Can be installed on almost any pitch.</td>
</tr>
<tr>
<td></td>
<td>apart on pitched roofs.</td>
<td></td>
</tr>
</tbody>
</table>

1. Chart comparing tray systems to built-up systems.
2. Diagrams of green roof systems. Image source: archtoolbox.com
Green Roof Precedents

**Granoff Center, Brown University**

*Providence, Rhode Island*

**Project Year:** 2011  
**Building Type:** education, visual arts center  
**Architect:** Diller, Scofidio + Renfro  
**Green Roof System:** Apex Green Roof

**Peerless Building**

*Providence, Rhode Island*

**Project Year:** 2005  
**Building Type:** mixed use, residential  
**Architect:** Durkee Brown Viveiros Wernefels Architects

1-3. Building exterior and self-sustaining rooftop garden of the Granoff Center. This roof is not accessible to the public.

4-5. Building exterior and rooftop garden of the Peerless Building. This roof is accessible for use by residents.
Save The Bay

Providence, Rhode Island
Project Year: 2004
Building Type: education
Croxton Collaborative Architects
Green Roof System: Sika Sarnafil, Inc.

Wheeler School

Providence, Rhode Island
Project Year: 2009
Building Type: education, visual arts center
Ann Beha Architects

1-2. Semi-intensive exterior rooftop garden of the Save The Bay Center. This roof is not accessible to the public.

3-4. Building exterior and tray system rooftop garden at the Wheeler School. This roof is not accessible to the public.
Design Options
Ryan Bonassar

Concept: Gardening
Geometric pathways divide the roof into smaller garden zones. Plants include both vegetables and flowers. Includes pergola and seating.
Design Options
Paul Clark

Concept: Quiet Space
Organic pathway branches off to create multiple intimate gathering zones. Zones have custom steel benches that focus attention inward. Includes pergola, custom railing and addition of windows.
Design Options
Robert Clarke

Concept: Interaction with Skylights
Skylight addition to roof creates change in elevations and improves light in rooms below. Stone pathway leads up to higher sections of roof. Includes gathering space, stone furniture and green space.

1. Detail of skylight.
2. Perspective.
3. Section.
Design Options
Lisa Fasciglione

Concept: Feminine Flower
As a girls’ school, a feminine feel is emphasized through flower petal-shaped decking and plants of many colors. Includes gathering spaces, privacy screen trellis and an outdoor classroom.
Design Options
April Gaddis

Concept: Hide and Reveal
Geometric pathways of teak decking contrast with plants in organic patterns. Green wall screens and wooden elements create privacy and shading. Includes seating and gathering spaces.
Design Options
Cassidhe Griffiths

Concept: Natural vs. Built
Geometric design with wood and stone pathways that lead in straight lines. Half of the garden is manicured while half naturally thrives. Includes benches along the pathway for seating.
ROOF PLAN

CASSIDHE GRIFFITH

ASTER NOVAEANGLIAE
SEDUM CAUTICOLA
ALLIUM SCHOENOPRASUM
ACHILLEA MILLEFOLIUM
RUDBECKIA HIRTA
Design Options
Leslie Hulbert

Concept: The Bay
Taking inspiration from the water around Rhode Island, washed wood decking appears as water with the surrounding plants as the shore. Includes pergola, gathering spaces and vegetable garden.
ROOF PLAN

LESLE HULBERT

CAMPsis RADICS
AMMOPHILA BREVIARULTA
OCIMUM BASILCUM
ALLIUM SATIVUM
LONICERA SEMPREVIRENS
Design Options
Chelsea Weibust

Concept: Urban Nest
Design based off imagery of eggs in a birds nest. Includes outdoor classroom, gathering spaces and custom log benches. Crushed concrete “brown roof” occupies a large portion of the rooftop.
ROOF PLAN

CHELSEA WEIBUST

AQUILEGIA CANADENSIS

FOAM FLOWER

YUCCA ALOIFOLIA

OENOTHERA MACROCARPA

PANICUM VIRGATUM