2013

Sophia Academy Roof Garden

Ryan Bonassar

Paul Clark

Robert Clarke

Lisa Fasciglione

April Gaddis

See next page for additional authors

Authors

Ryan Bonassar, Paul Clark, Robert Clarke, Lisa Fasciglione, April Gaddis, Heather Gillock, Cassidhe Griffiths, Leslie Hulbert, Aexandra Reilly, Chelsea Weibust, Ginna Johnson, Ellen Hasset, Meghan Spratt, and Arnold Robinson

cpc
Community Partnerships Center
at Roger Williams University

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.

Community Partnerships Center
Roger Williams University
One Old Ferry Road
Bristol, RI 02809
cpc@rwu.edu
http://cpc.rwu.edu

Proposed roof garden perspective.
Design by Leslie Hulbert.

Fall 2013
Team Members: Ryan Bonassar | Paul Clark | Robert Clarke | Lisa Fasciglione | April Gaddis | Heather Gillock | Cassidhe Griffiths | Leslie Hulbert | Alexandra Reilly | Chelsea Weibust
ARCH 413 - Advanced Architectural Design Studio | Ginna Johnson, ASLA
CPC Project Managers: Ellen Hassett | Meghan Spratt | Lisa Fasciglione

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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.

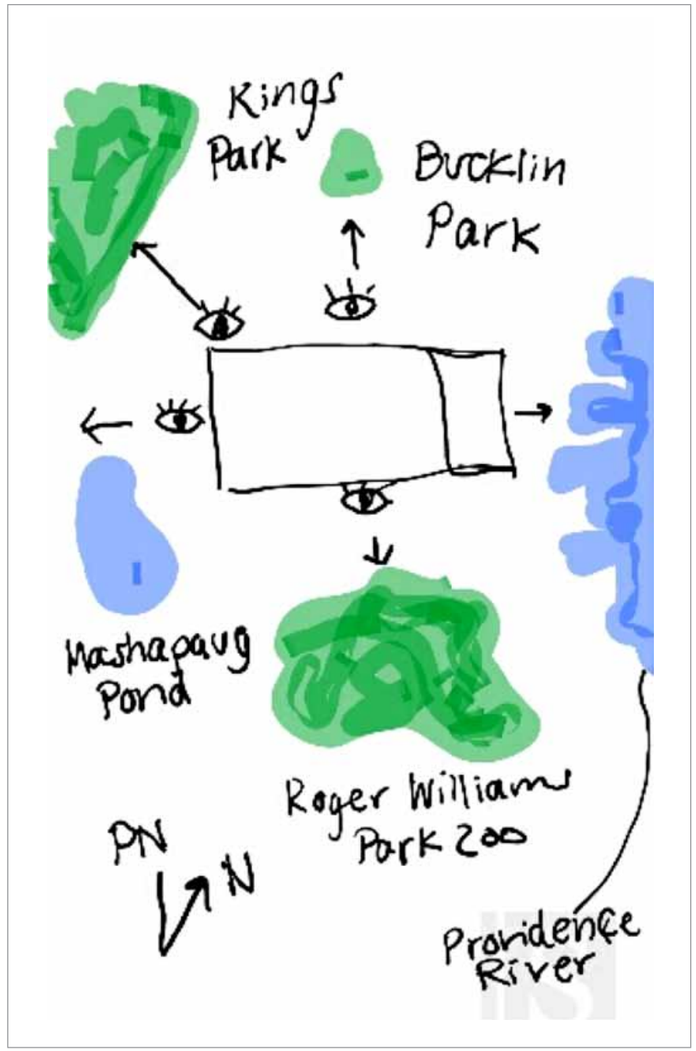

Diagram of city views from the future rooftop garden. Sketch by Chelsea Weibust.

Process

During the fall of 2013, landscape architect Ginna 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.

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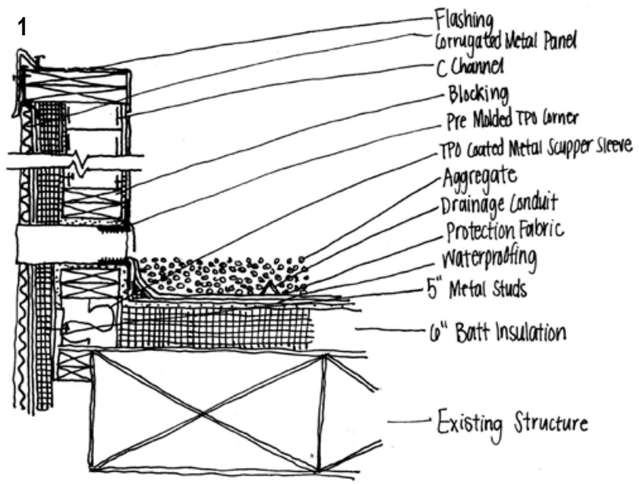

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1. Proposed roof parapet detail. Sketch by Cassidhe Griffiths.

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.

1. Founder Sister Mary Reilly in front of Sophia Academy at its Branch Avenue location.
2. A symbolic "ground breaking" ceremony held at the new Elmwood Avenue location.
3. Students of Sophia Academy.
4. The Sophia Academy logo in the floor of the new building.

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.

1. Aerial view of the new building.

2. Google Map image of the Elmwood Avenue location.

3. Front of the new school, a two-story, masonry structure, which was built in 1948 as a bank.

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 maintanence (extensive and brown roofs).
- Little to no artificial irrigation.
- Habitat for wildlife.
- Reduces environmental impact of the building within its surrounding.

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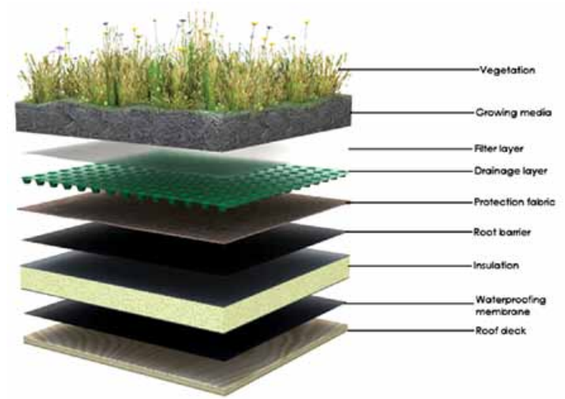

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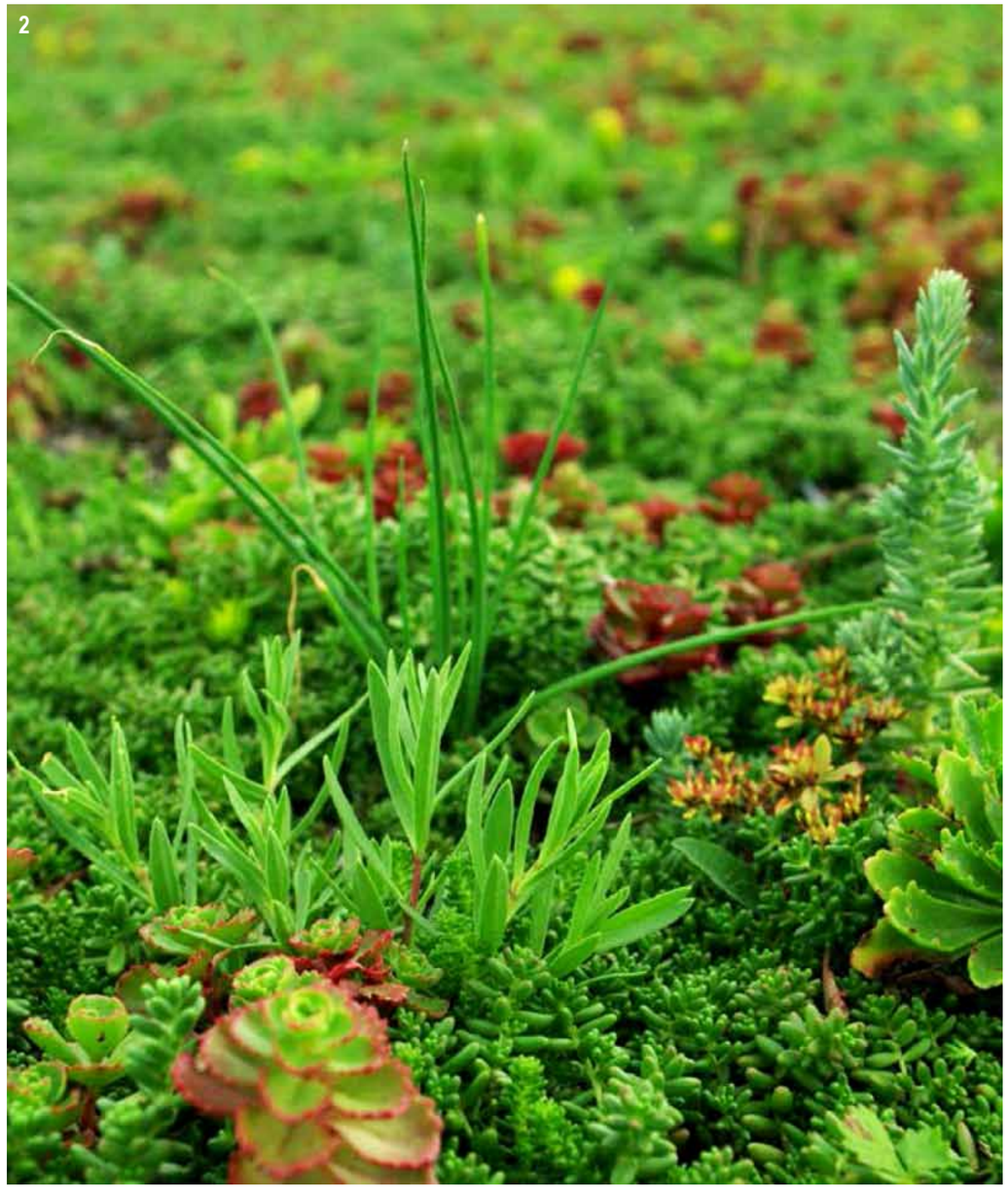

1. Diagram of basic green roof requirements: Image source: www.barr architects.net/landscape

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.

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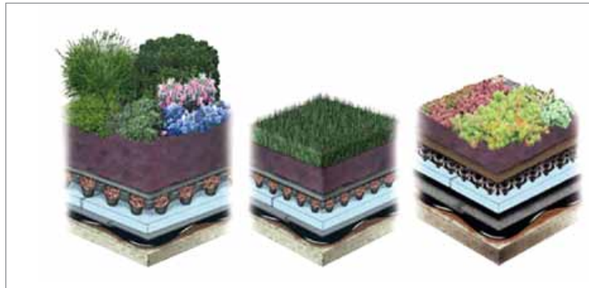


	INTENSIVE	SEMI-INTENSIVE	EXTENSIVE
Plant Options	sedum, moss, grass, large shrubs, trees	sedum, moss, grass, herbs, flowers, shrubs	sedum, moss, grass
Soil Depth	8" to 30"+ Deep	5" to 8" Deep	2" to 5" Deep
Dry Weight	40 to 100+ pounds dry weight	25 to 40 pounds dry weight	10 to 25 pounds dry weight
System Types	Built-up	Tray, Built-Up	Tray, Built-Up
Maintenance	Routine	Occasional / Routine	Minimal
First Cost	High	Medium	Low

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

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.

3

1. Example of an intensive roof.

2. Types of green roofs. Image source: www.barrarchitects.net/landscape

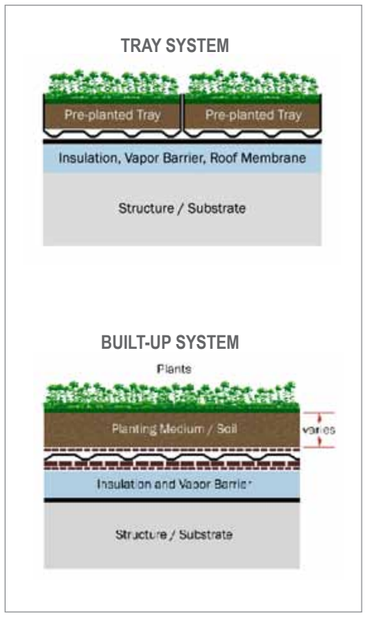
3. Example of a brown roof. Image source: dustygedge.co.uk

Green Roof Systems

1

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

2



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, Scrofido + Renfro
Green Roof System: Apex Green Roof

Peerless Building

Providence, Rhode Island
Project Year: 2005
Building Type: mixed use, residential
Durkee Brown Viveiros Werenfels 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.


2


1

Wheeler School

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


3


4

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.

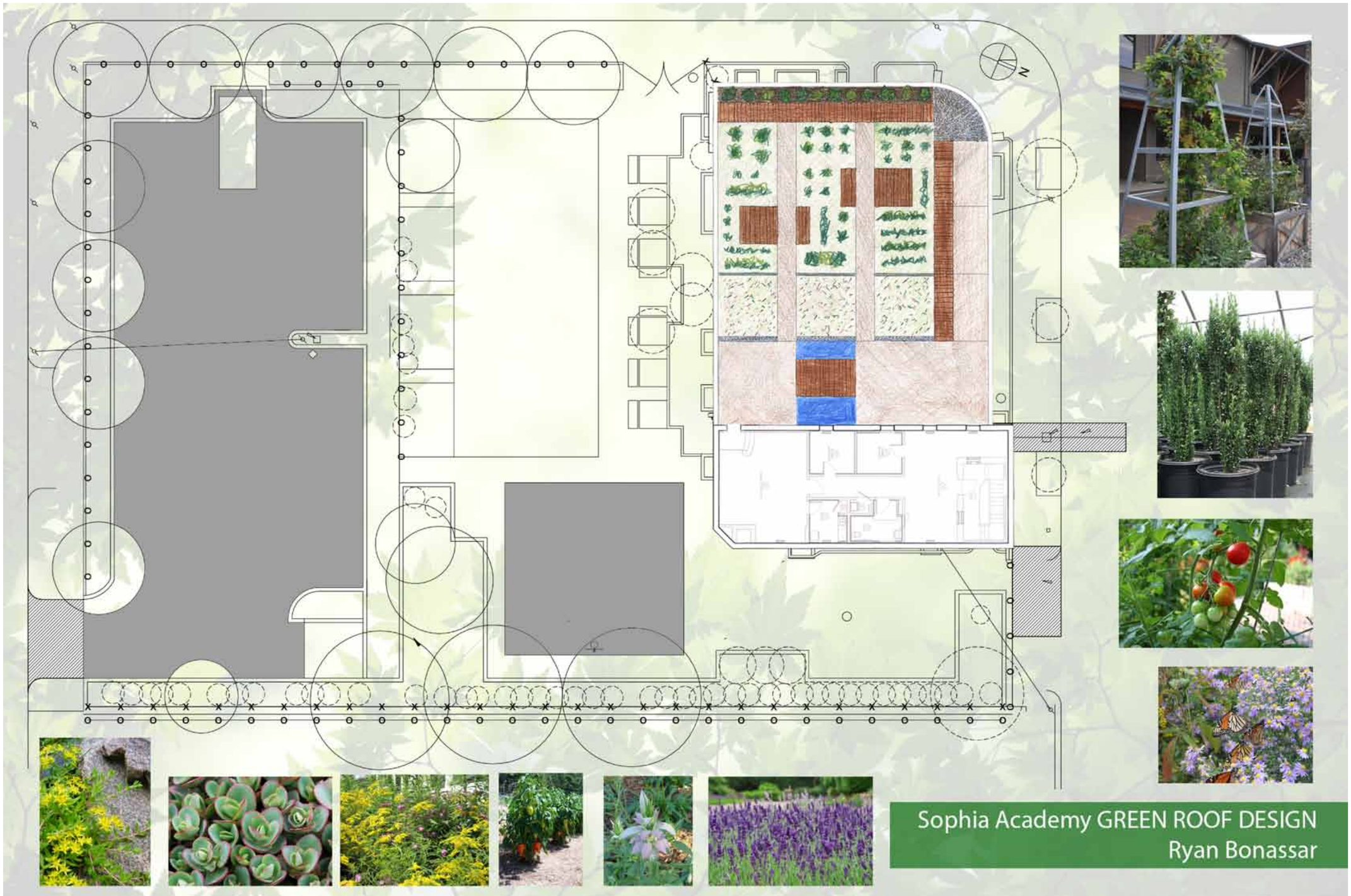
Design Options

Ryan Bonassar

Concept: Gardening

Geometric pathways divide the roof into smaller garden zones. Plants include both vegetables and flowers. Includes pergola and seating.

1-2. Models of proposed rooftop garden containing vegetable and flower plants.


N
Sophia Academy GREEN ROOF DESIGN
Ryan Bonassar

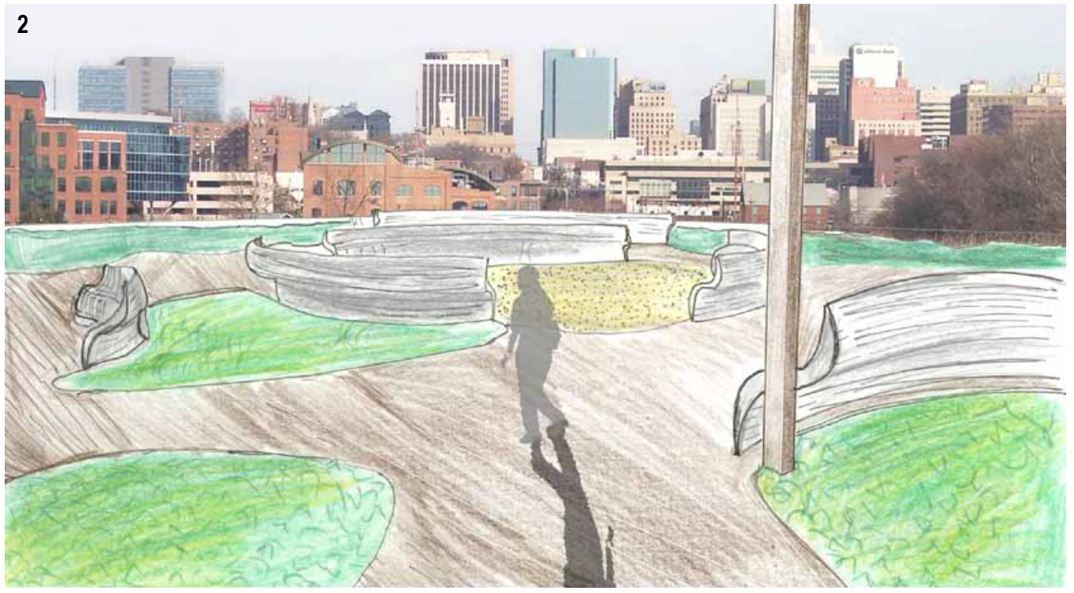
Design Options

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.

2



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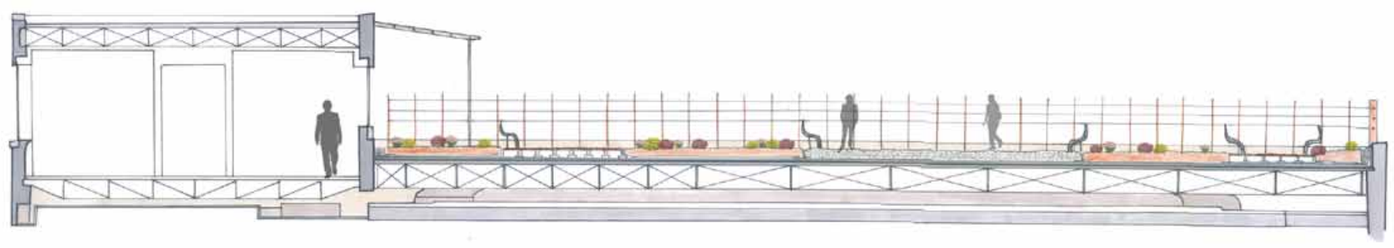
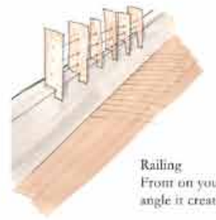


1. Section.

2. Perspective with rooftop view of the Providence skyline.

The Site 1/16" Scale

Sketch Perspective



Railing
From on you can see out but on an angle it creates enclosure

Beench
Built out of curved steel the bench matches the curves of the ground and conforms well to the body.

Selected Plants

Sedum spathulifolium

Sedum showy stonecrop

Sedum dendroideum

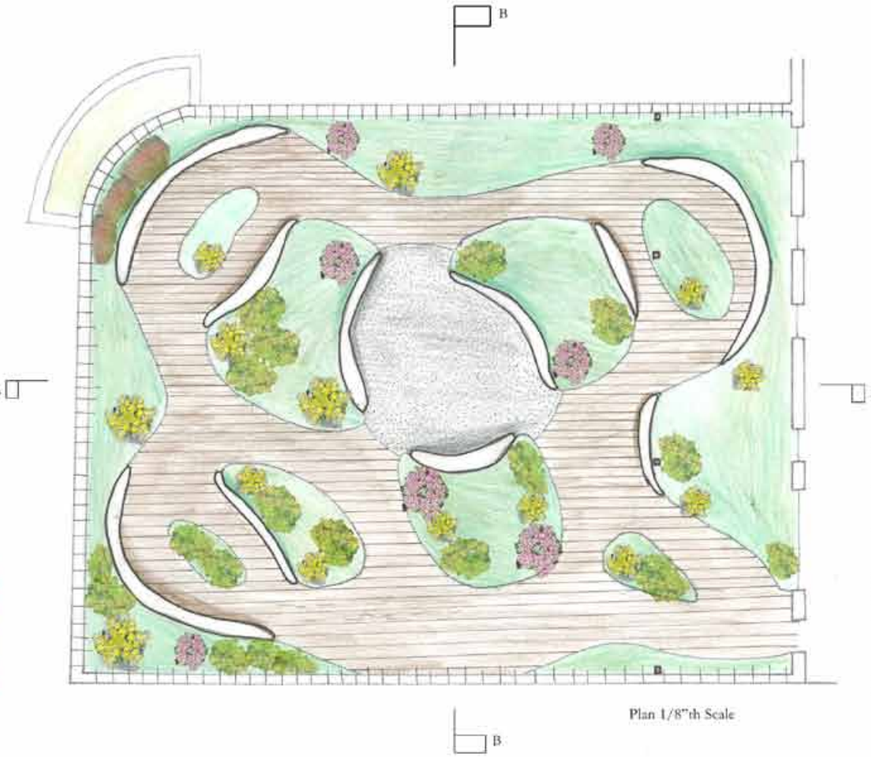
Thyme

Sedum grisebachii

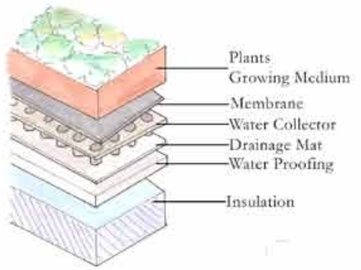
Sedum spurium

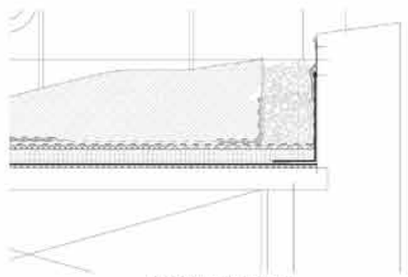
Panicum virgatum

Artemisia frigida



Plan 1/8"th Scale





Roof Assembely Detail

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.

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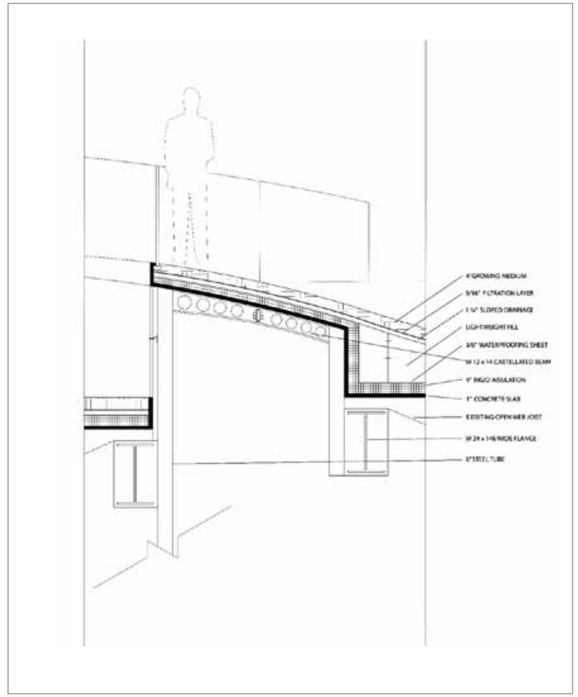

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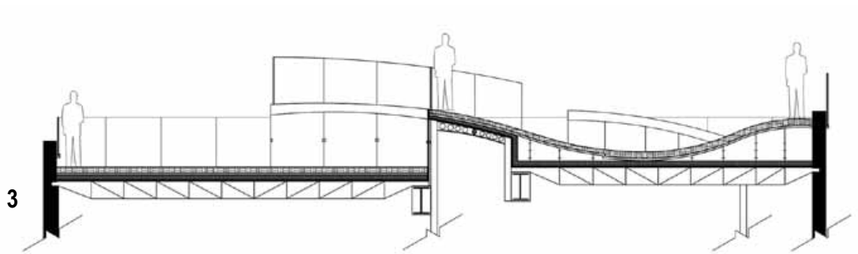
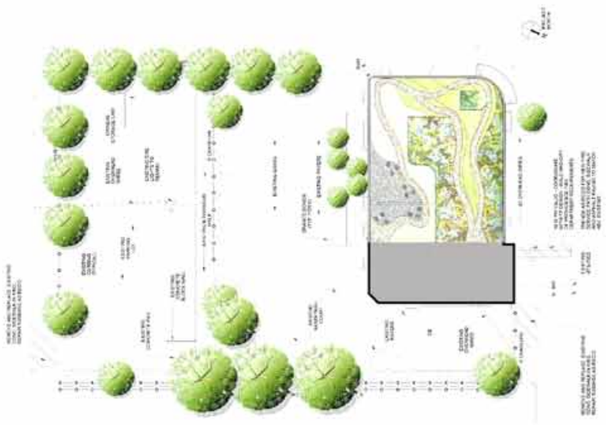
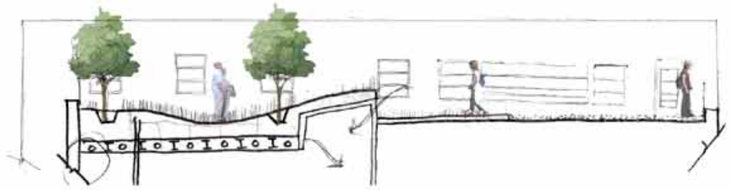
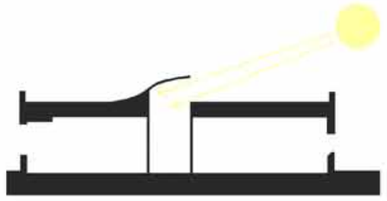
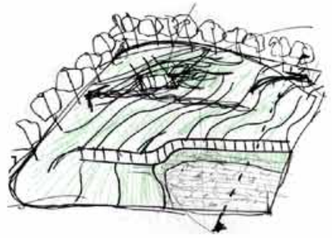


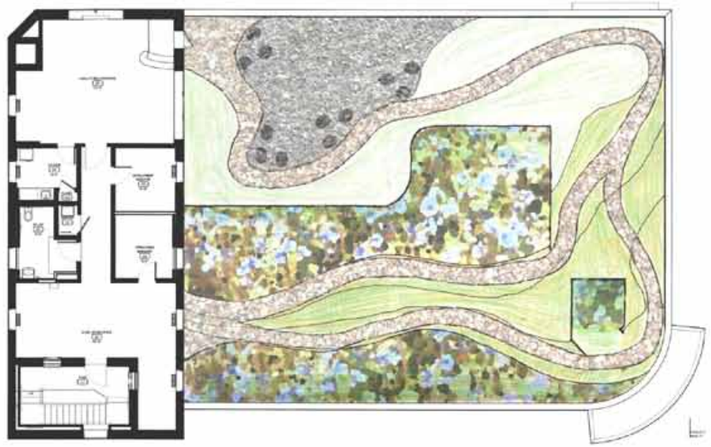
1. Detail of skylight.
2. Perspective.
3. Section.

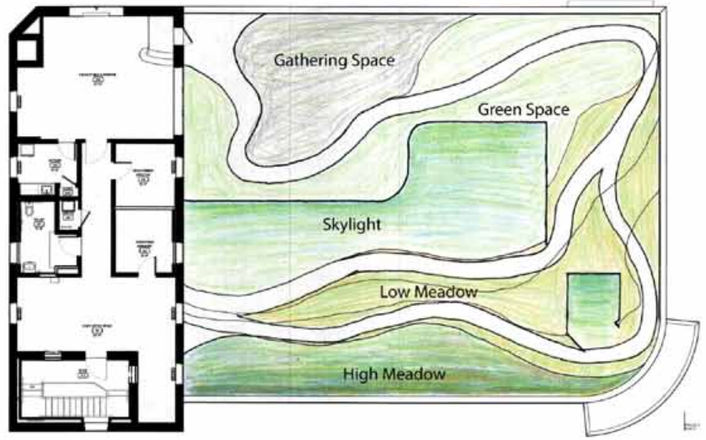












ROOF PLAN

ROBERT CLARKE

SIDEOATS GRAMA

DWARF LADY'S MANTLE

DESERT BELLS

VIPER BUGLOSS

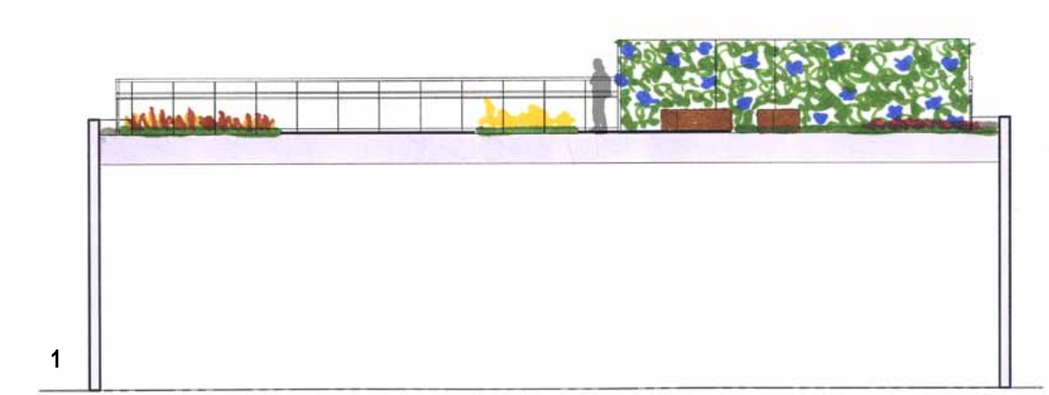
CORAL REEF

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.



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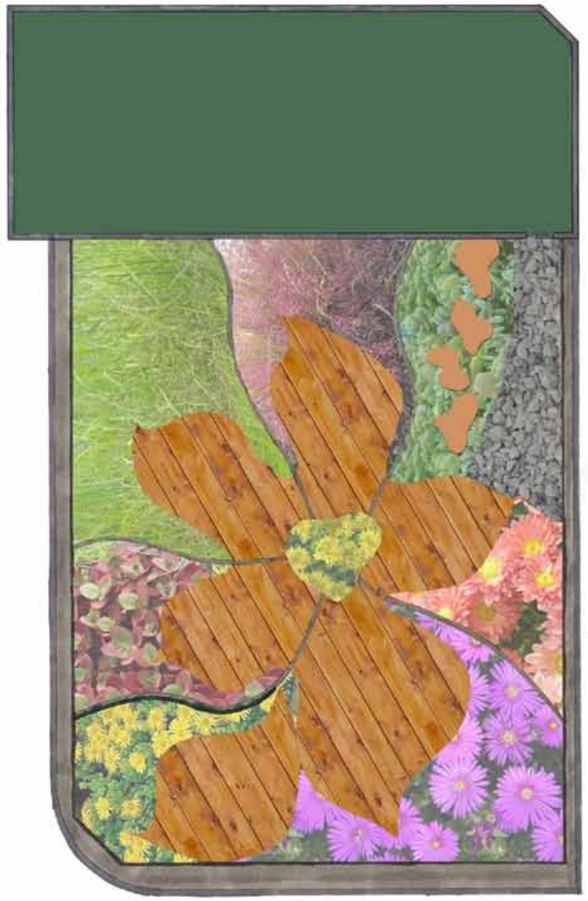
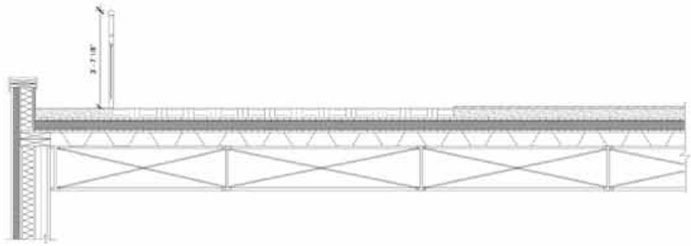
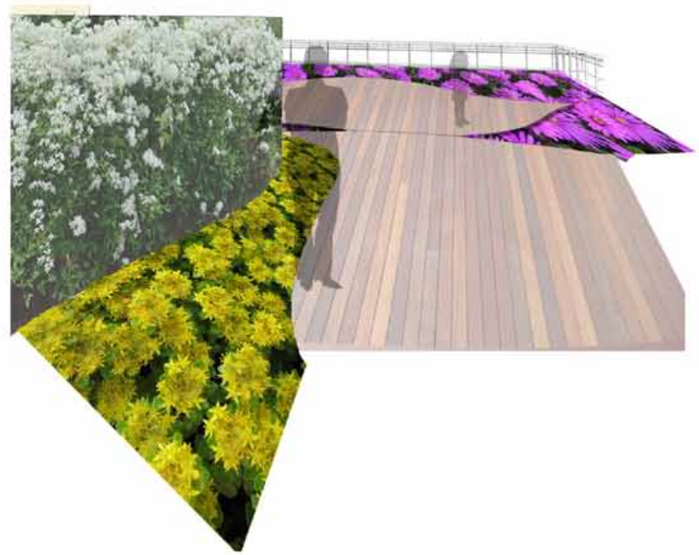
1. Section.

2. Axonometric of the proposed flower petal design.







ROOF PLAN

LISA FASCIGLIONE

DELOSPERMA DYERI

DELOSPERMA ECKLONIS

PANICUM VIRGATUM

DELOSPERMA CONGESTUM

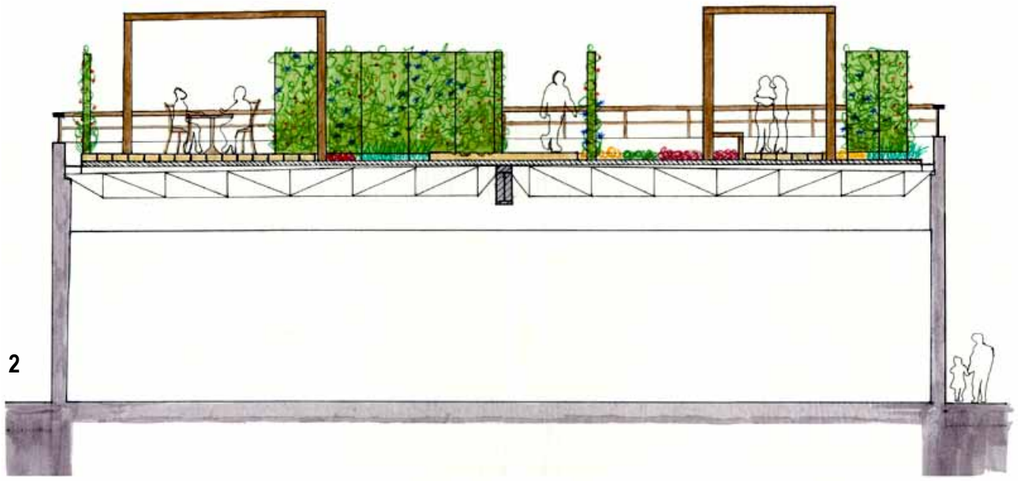
OSBERG

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.



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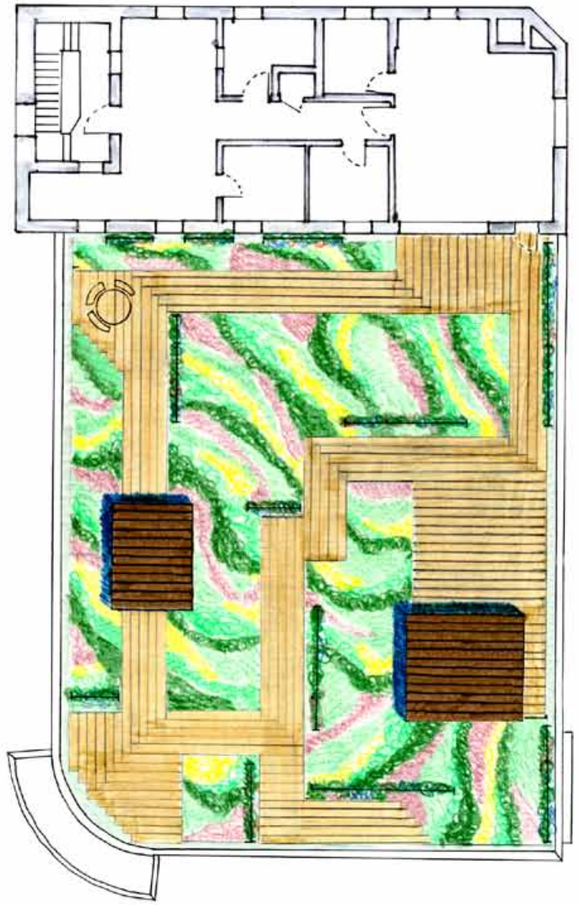
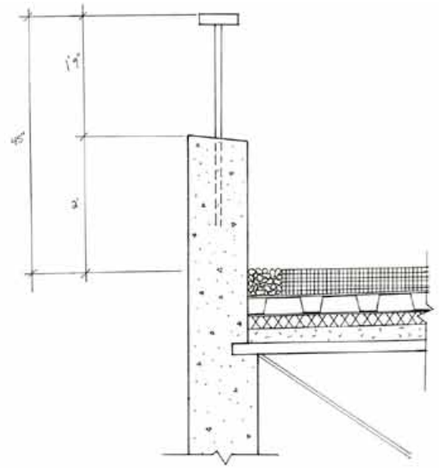
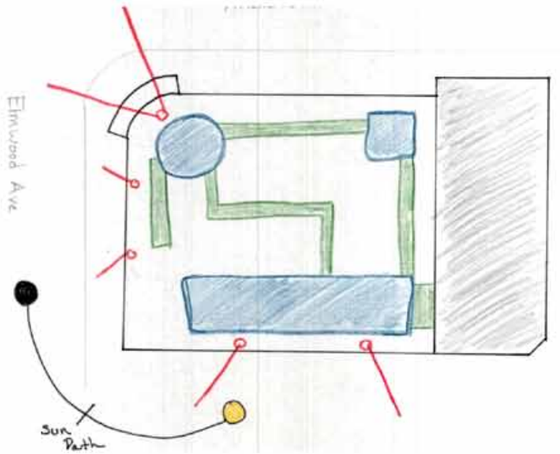
1. Perspective.

2. Section.







ROOF PLAN

APRIL GADDIS

SPURIUM FULDAGLUT

FESTUCA IDAHOENSIS

WEIHENSTEPHANER GOLD

CARDINAL CLIMBER

BOUGAINVILLEA

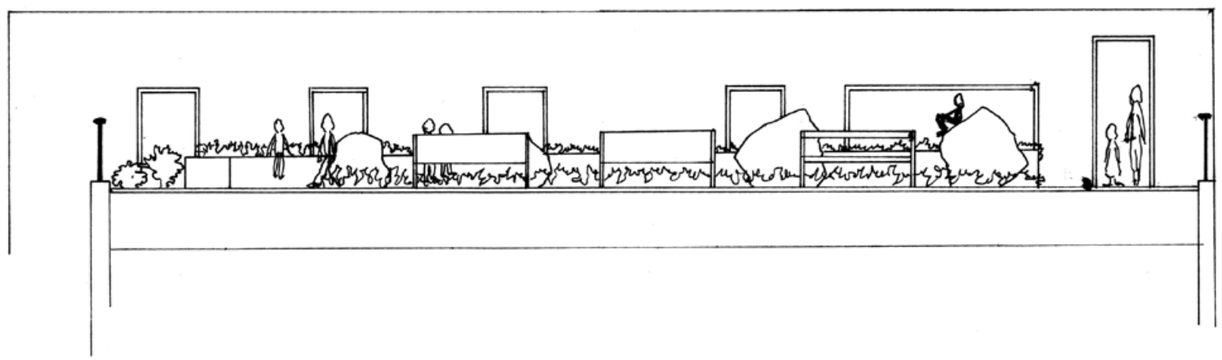
Design Options

Cassidhe Griffiths

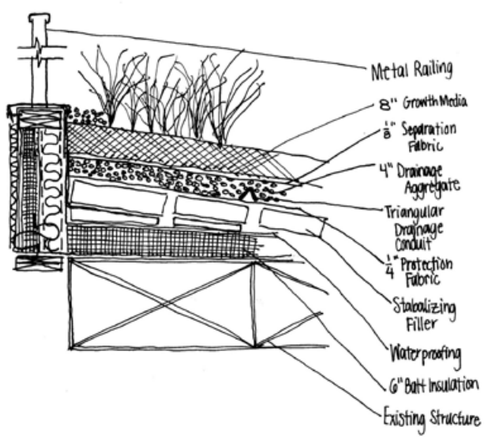
Concept: Natural vs. Built

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.

2



1



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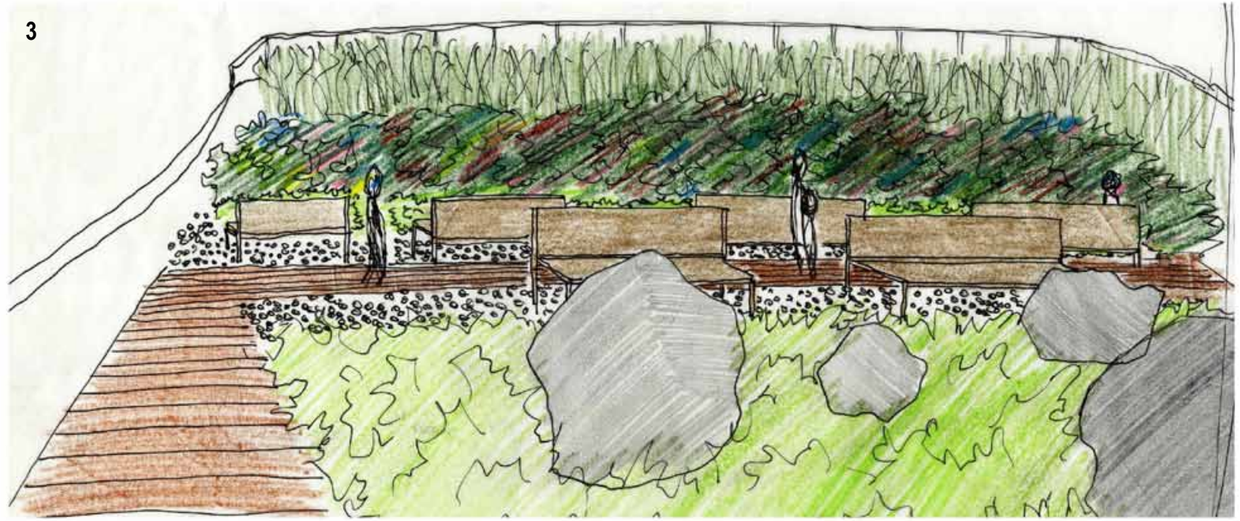
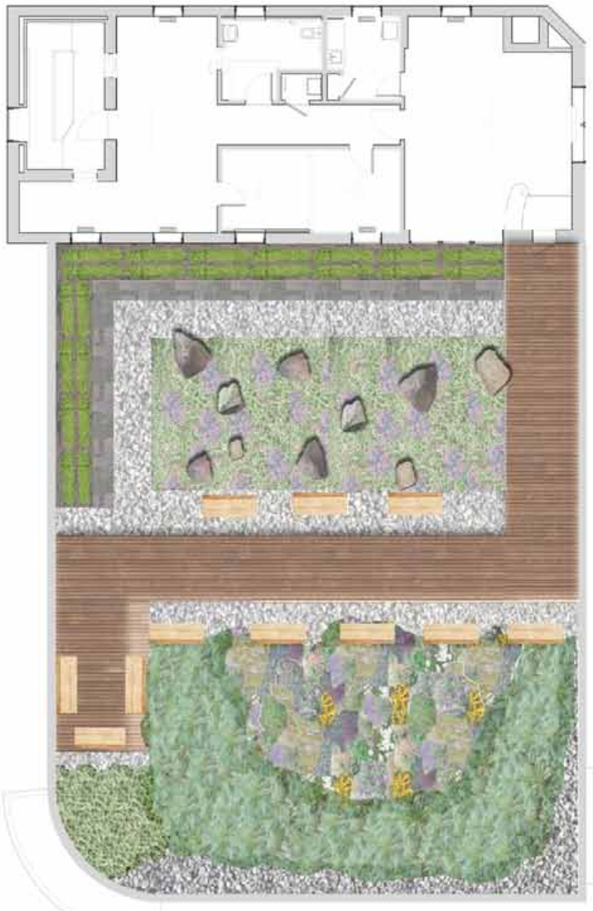
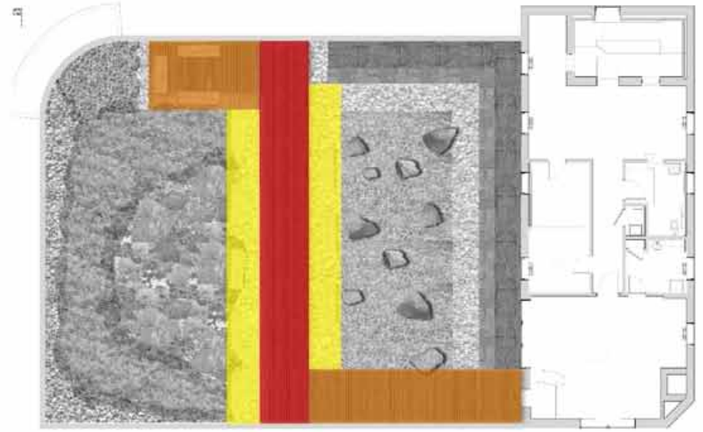


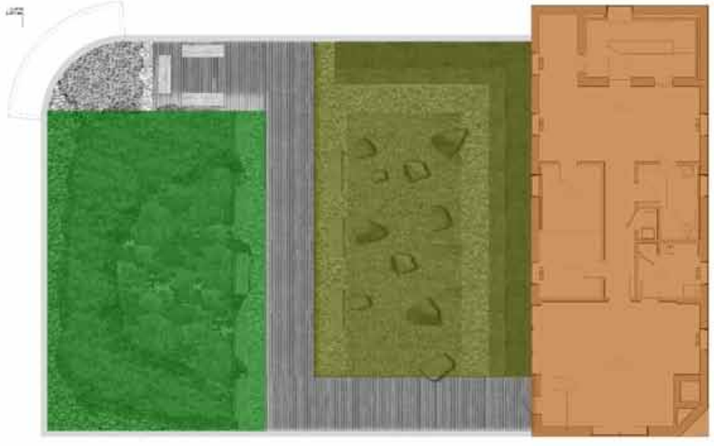
1. Slope detail.

2. Section.

3. Perspective.







ROOF PLAN

CASSIDHE GRIFFITHS

ASTER NOVAEANGLIAE

SEDUM CAUTICOLA

ALLIUM SCHOENOPRASUM

ACHILLEA MILLEFOLIUM

RUDBECKIA HIRTA

Design Options

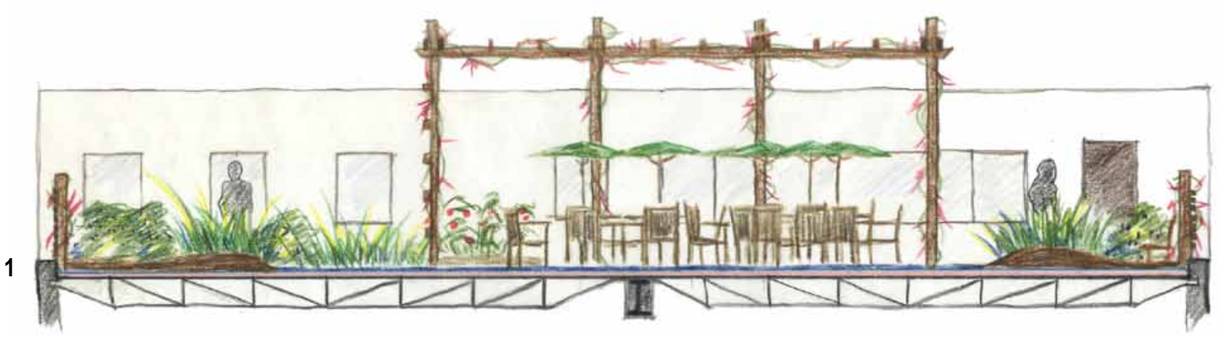
Leslie Hulbert

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.

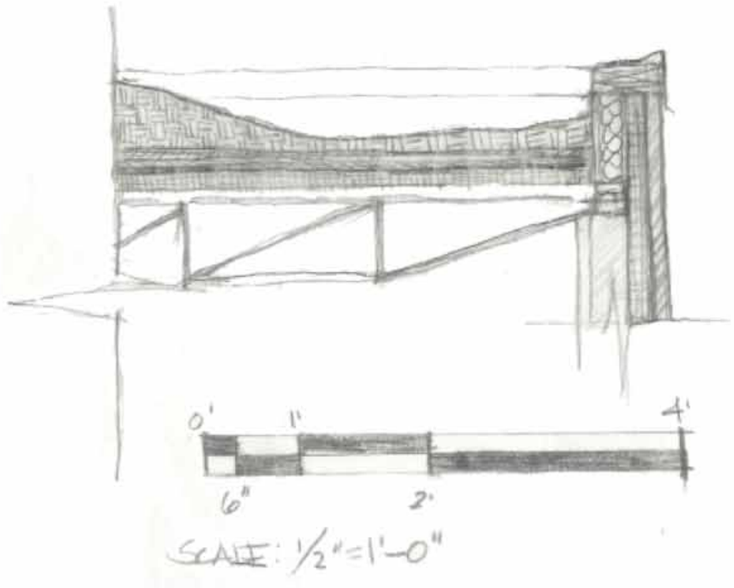
2

1



1. Section.

2. Perspective.



ROOF PLAN

LESLIE HULBERT

CAMPSIS RADICANS

AMMOPHILA BREVILIGULTA

OCIMUM BASILCUM

ALLIUM SATIVUM

LONICERA SEMPERVIRENS

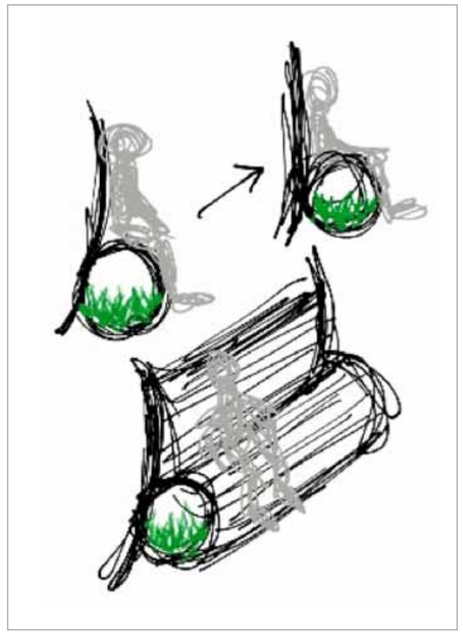
Design Options

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.

1

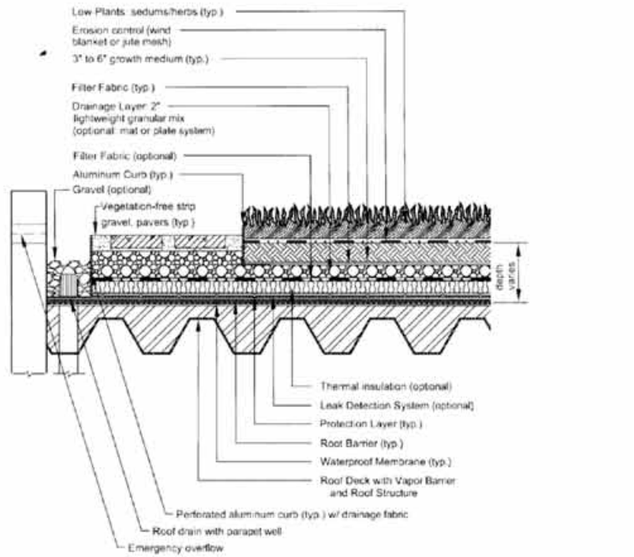


2

1. Sketch of log-like bench.

2. Axonometric facing south.

ROOF PLAN



CHELSEA WEIBUST

AQUILEGIA CANADENSIS

FOAM FLOWER

YUCCA ALOIFOLIA

OENOTHERA MACROCARPA

PANICUM VIRGATUM

Roger Williams University
One Old Ferry Road
Bristol, Rhode Island 02809

cpc@rwu.edu
http://cpc.rwu.edu