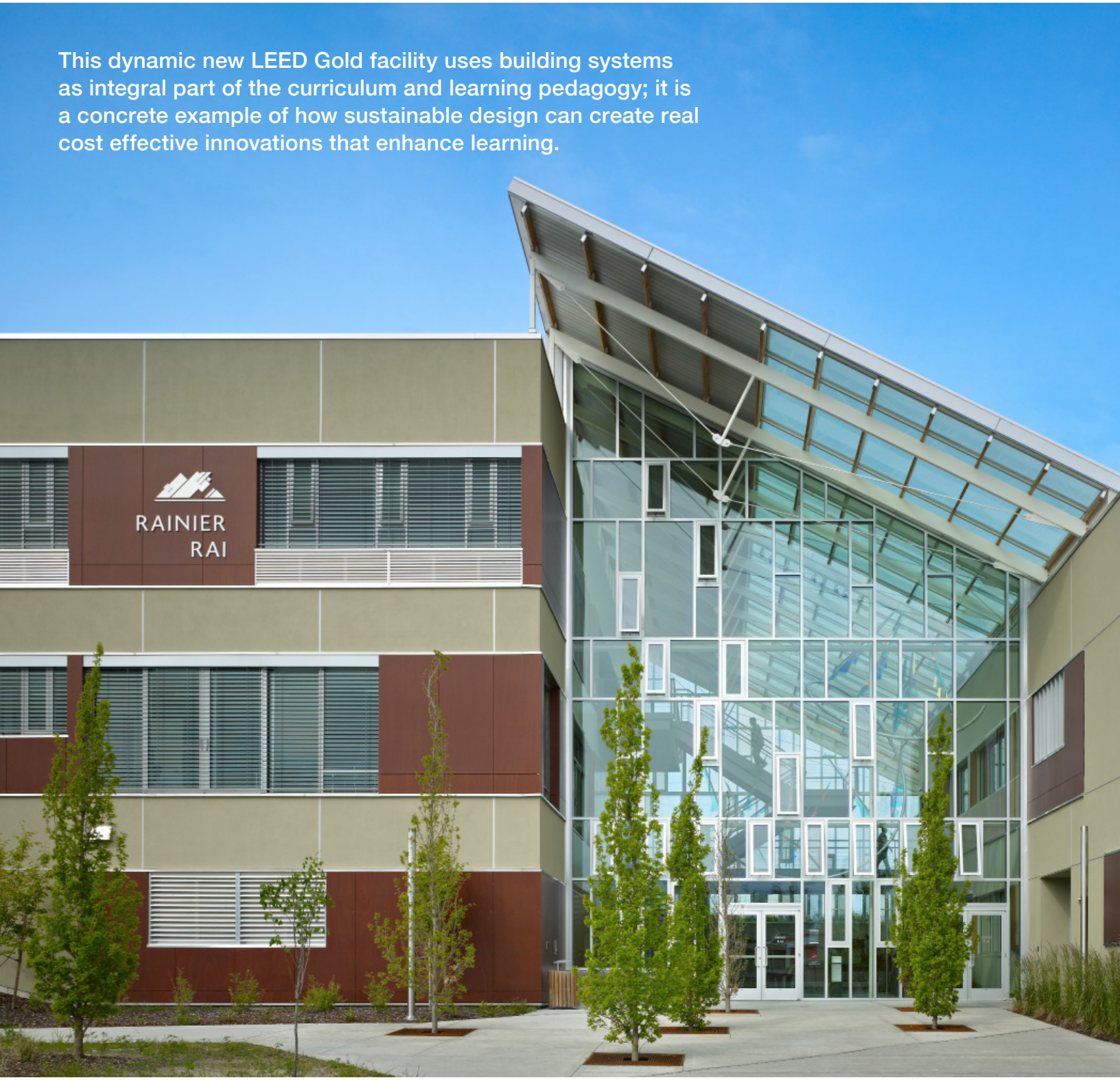
Rainier Science and Technology Building

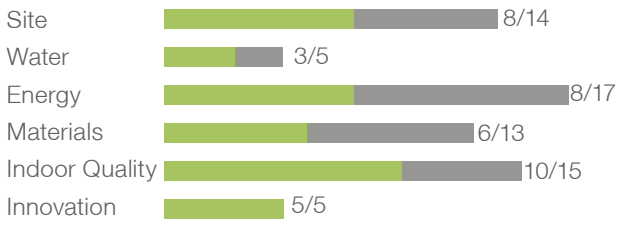
Pierce College | Lakewood, Washington

Opsis Architecture & MSGS Architects

This dynamic new LEED Gold facility uses building systems as integral part of the curriculum and learning pedagogy; it is a concrete example of how sustainable design can create real cost effective innovations that enhance learning.



LEED NC v.2.1 Credits Achieved

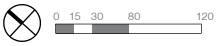


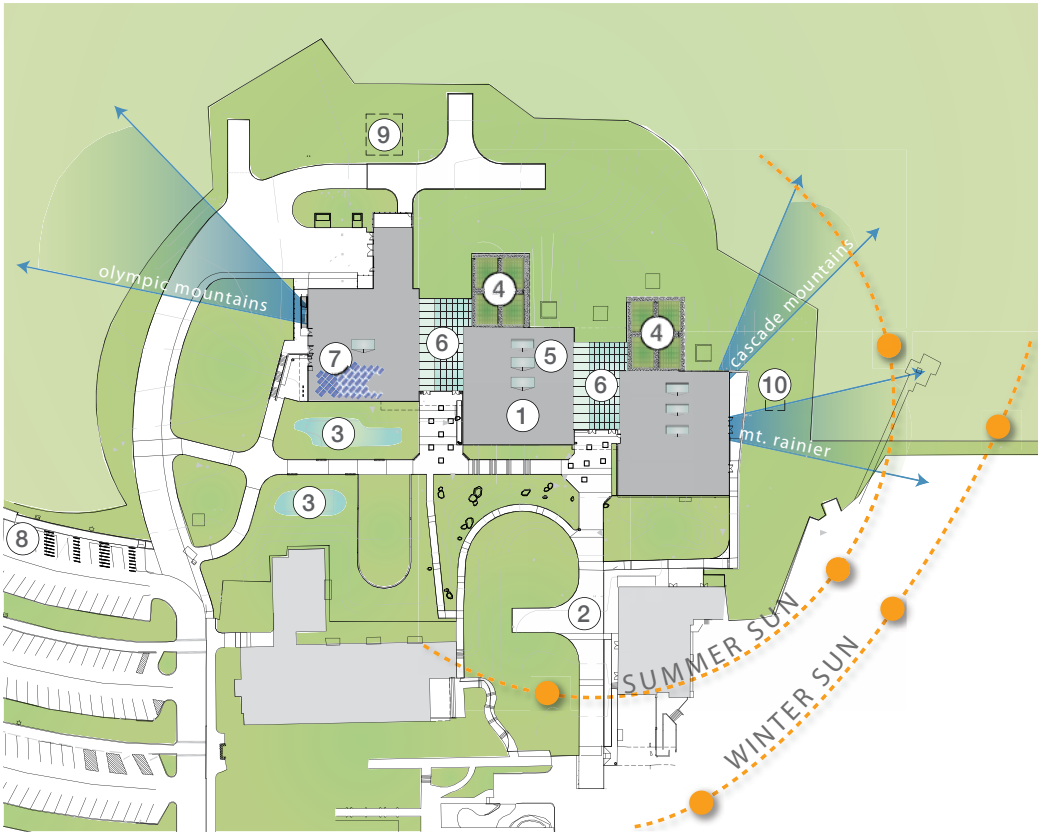
SITE ECOLOGY & LAND USE

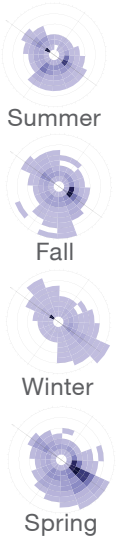
The Rainier Science and Technology Building is sited to take advantage of sun angles, wind direction and a variety of passive solar techniques. Building massing also made the most of the natural slope of the site; the program is split into three distinct laboratory “pods” that step down the site from the northwest at its highest point down towards the southeast. Filling the ‘voids’ between the pods are two winter gardens that utilize the adjacent walls for two sides of their enclosure with glass walls facing northeast to the natural landscape and southwest towards the campus buildings. These spaces are capped by skylights that slope with the natural grade of the site.

The building footprint for the Rainier Science and Technology Building was limited to 40,758 sf, while 135,260 sf of surrounding vegetated open space was preserved as part of the project, to be restored and maintained by the campus for at least the life of the building. To encourage building users to use alternative transportation methods in their commutes to the project, no new parking was added to service the building, and three parking stalls in the existing lot were designated preferred parking for alternative fuel vehicles. Additionally, the building is serviced by two bus lines.

1 Rainier Building
2 Future Plaza
3 Raingarden
4 Green Roof
5 Roof Monitor Skylights
6 Daylit Wintergarden
7 Photovoltaic Panels
8 Alternative Fuel Vehicle Parking
9 Future Observatory
10 Future Greenhouse







Wind Roses
(colored areas indicate wind direction and speed; darker colors indicate higher wind frequency)

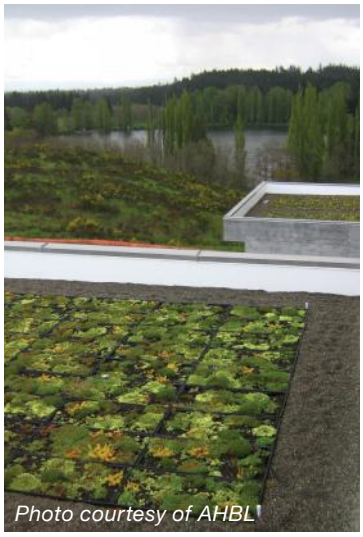


Photo courtesy of AHBL


Photo courtesy of AHBL

Project Summary

Location: Lakewood, Washington
Gross sf: 80,645Sf
Building Footprint: 40,758Sf
Cost: $23M
Completed: June 2010

Planted green roofs comprise 5,520 sf of the building's roof area. These green roofs help to mitigate stormwater runoff, reduce heat island effect and reduce the building's energy loads by reducing unwanted heat gain. To further reduce heat island effect and unwanted heat gain in the building, the remaining roof area is a TPO white membrane.

WATER CYCLE

Lakewood receives an average of 39 inches of rain every year, making stormwater runoff a considerable issue for the Pierce College campus and the Rainier Science and Technology project. The facility has been designed to retain, treat and infiltrate 100% of the stormwater on the site through a combination of raingardens and infiltration trenches. Water is funneled to the raingardens first where 18 inches of soil is designed to treat stormwater, and runoff slowly percolates into the ground. If the rain event exceeds the size manageable by the rain gardens, infiltration trenches downstream of the raingardens have been designed to manage 100-year, 24-hour peak storm events.

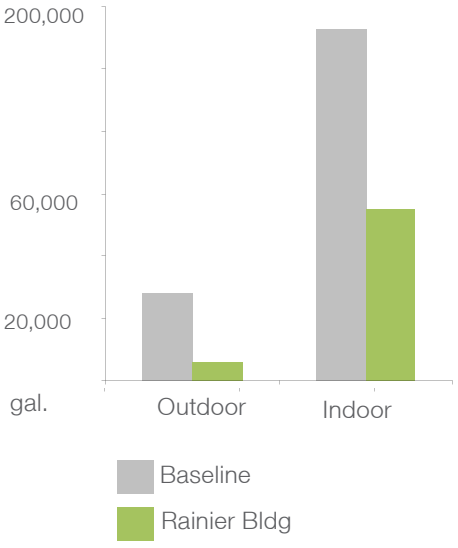
Outdoor water savings for the Rainier Building come from two key components: the amount of irrigated landscape was dramatically reduced through the restoration of a native White Oak prairie ecosystem, and areas that do require some irrigation have been clustered nearer to the buildings and planted with low-water plants. The total water usage required for irrigation has been reduced by 79%, saving an estimated 220,480 gallons of water annually.

Water saving measures have also been implemented indoors. Low flow faucets and urinals, along with dual flush toilets, save an estimated 576,504 gallons of water per year, a 51% reduction over conventional fixtures.

Monthly Precipitation

796,984 gal/yr
Water Use Reduction

Water Use Reduction



ENERGY FLOWS

The Rainier Science and Technology Building is a high performance facility designed to reduce its energy use by 28.9% and its CO^2 emissions by 34%. The resulting energy savings are not only good for the environment, but they also yield an annual energy cost savings of 28.6%. This efficiency is achieved through a number of integrated systems. The building pairs a high performance envelope with radiant flooring systems, natural ventilation and renewable energy systems.

Heating for the classroom and office spaces is provided through a radiant floor system, pumping hot water through tubes installed in the concrete floor slabs. These spaces also have operable windows to allow for natural ventilation, aided by automatically controlled roof dampers that create a stack effect to pull through the building. Automated roof dampers and exterior blinds are controlled by the buildings Direct Digital Control (DDC) system which monitors the building temperature and CO^2 levels to coordinate the opening/closing of windows, shades, and dampers. When outdoor air exceeds the comfort zone, chilled water is circulated through the concrete slab to provide radiant cooling. A 50-panel Photovoltaic array has been mounted on the building's largest roof area, oriented for maximum solar exposure.

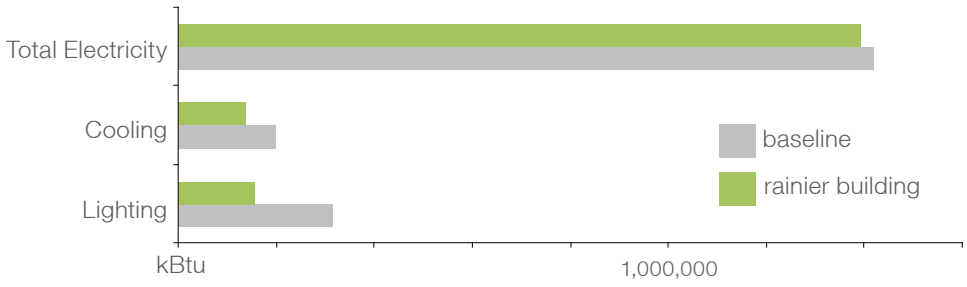
Laboratories employ Aircuity lab monitoring equipment This equipment monitors the lab air on a constant basis and turns the fans on for exhaust only when required versus a typical lab that operates with constant volume exhaust. Life cycle cost analysis shows that this system will pay itself back in three years.

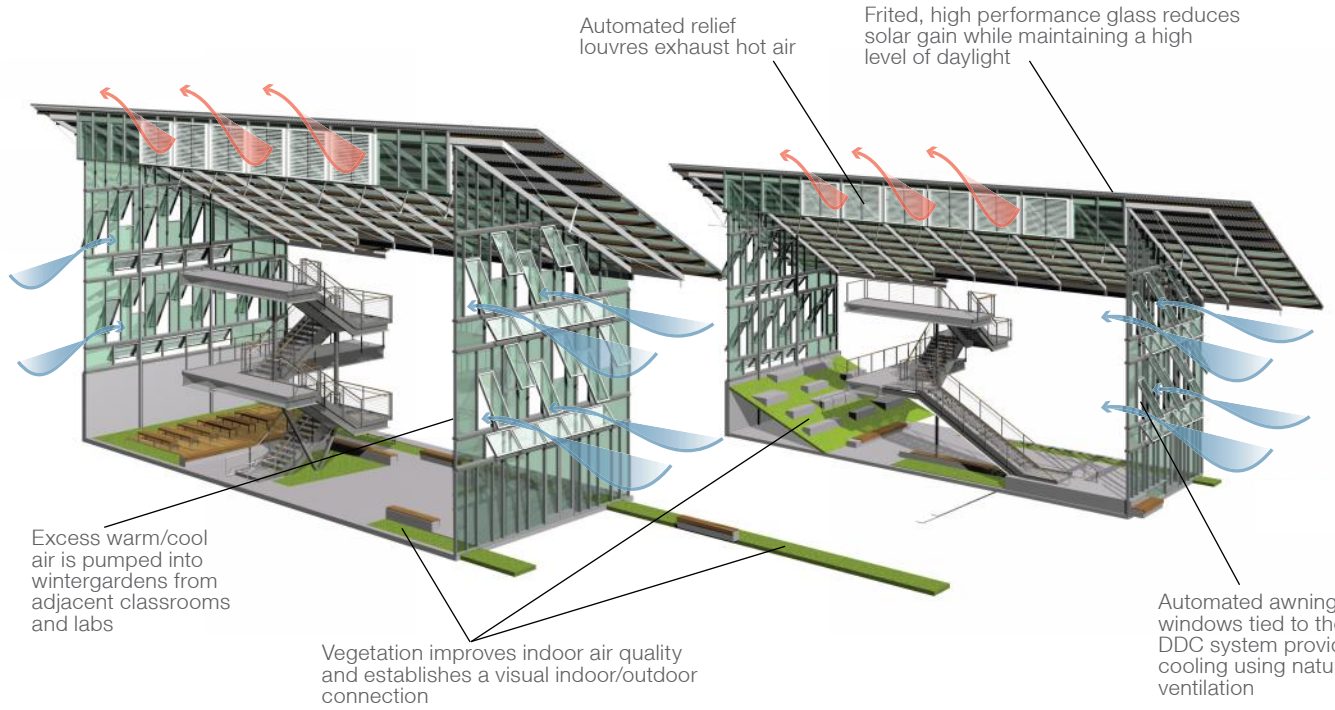
PROJECT HIGHLIGHT: WINTERGARDENS

The winter gardens are an integral component of the building. Conceived as a living/learning space, they provide a sheltered environment for informal gathering and interaction, a place to foster enrichment of the learning experience and create a partially naturally-tempered space that takes advantage of the building's orientation to forces such as sunlight, wind, and natural convection/stratification. This space will serve as a

34%
CO^2 Emissions Reduction

28.6%
Annual Energy Cost Savings

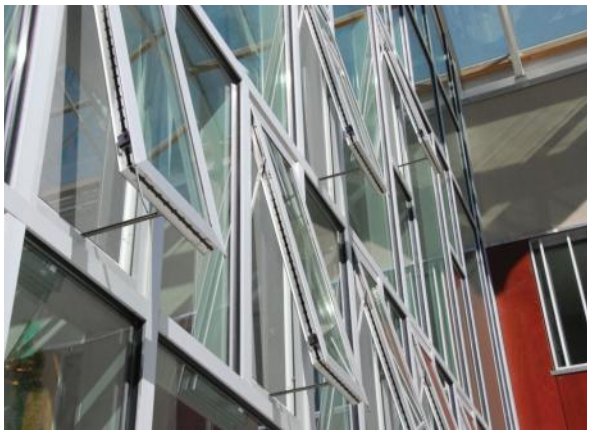


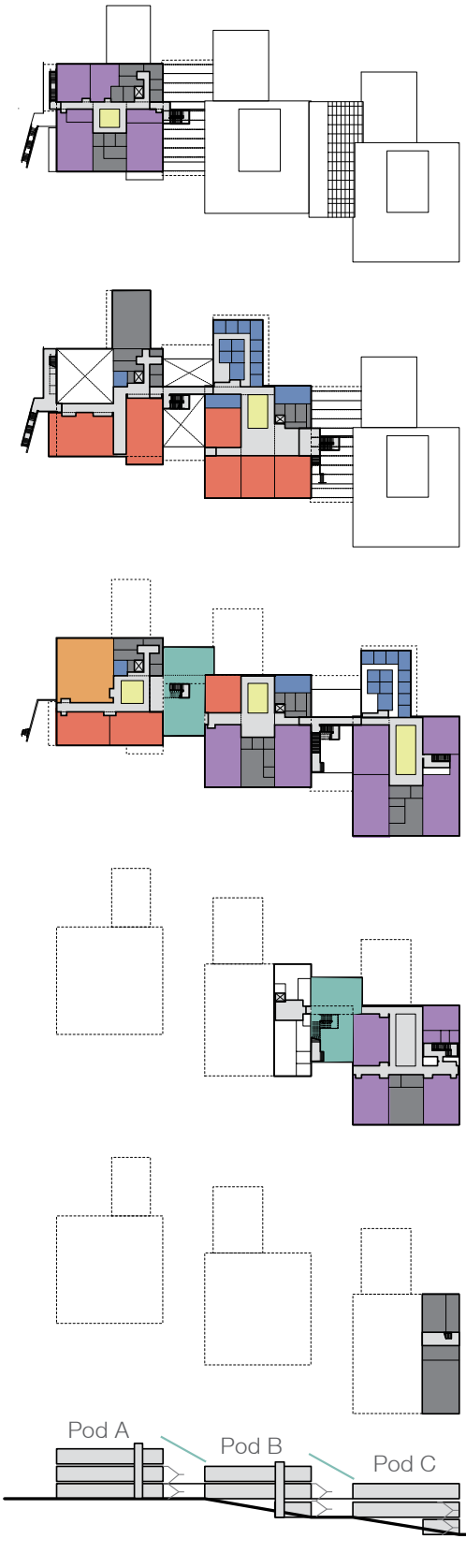


tempering environment to the mechanically conditioned program spaces at the perimeter. A portion of the return air ordinarily exhausted to the exterior is harnessed to provide the space with partially conditioned air without consuming additional energy. Wintergardens roofs are equipped with fritted glass to filter out unwanted solar gain, while still allowing ample daylight to enter the spaces.

Partially carved into the site grade as a result of the stepped massing of the pods and the natural slope of the site, these spaces are the main common area of the building. Taking advantage of natural daylight and views to the sky through the light and airy skylight structure above, these space are a welcoming environment to persons entering the building, as well as comfortable places for students hanging out in between classes.

In evaluating design strategies and technologies, emphasis was placed on systems that perform more than one task. The winter gardens buffer the academic pods, but also provide student gathering space throughout the year. Operable windows provide an opportunity for natural ventilation and also will be used as lab access for the collection of air samples for investigation.





MATERIALS & CONSTRUCTION

During the construction of the Rainier Science and Technology Building, construction waste was tightly managed. Nearly 246 tons, or 98.4%, of the waste generated during the construction process was diverted from landfills, and after careful sorting was delivered to a local recycling facility. Careful waste management practices will continue at the Rainier Building; designated areas for recycling have been provided in each pod in order to promote recycling on campus.

Materials were selected based on their recycled and regional attributes. From the steel decking to the door frames, the Rainier Building incorporates a number of recycled materials totalling 21% of the total materials used on the project. Fast growing laminated bamboo paneling is used throughout the winter gardens.

Regional materials not only support the local economy, they also reduce the environmental impacts that result from transporting materials long distances. A remarkable 52% of the materials used for the Rainier Building was manufactured within 500 miles of the project.

- Science Lab
- Classroom
- Planetarium
- Office/Conference Room
- Wintergardens
- Student Lounge
- Support
- Circulation

98.4%
Construction Waste Recycled

52%
Materials Regionally Sourced

LIGHT & AIR

Appropriate lighting and fresh air are two of the most important factors in providing a healthy indoor environment. The Rainier Building has been designed to maximize the daylight and views available to occupants, provide optimum user control over room temperature and lighting, and offer the highest degree of indoor air quality. Window openings were selectively located to improve day lighting, increase views throughout the spaces, and provide effective natural ventilation. Exterior operable shades eliminate unwanted solar heat gain during the cooling season and control glare for critical tasks in the lab and classroom.

In coordination with the automated controls, the project uses simple passive means to achieve comfort year round while affording the occupants a direct connection to their microclimate. Significant thermal mass through exposed concrete floor slabs (and ceilings in the office pods) moderates the indoor temperature within a very narrow range, even during extreme swings in outdoor temperature. Manually controlled operable windows distributed throughout the space allow the users to fine tune the building to optimize comfort. Exterior operable shades on the west facade lower automatically when signaled by sun sensors controlling unwanted heat gain and glare. High efficiency dimmable T-5 fluorescent lighting is zoned with photocell sensors to provide constant dimming to take full advantage of the windows and skylights.

All clear wood finishes, paints, and adhesives used are very low and non-toxic, contributing to a clean and healthy indoor environment.

92%
Building Areas with Ample Daylight

93%
Building Areas with Views to the Outdoors

DESIGN & CONSTRUCTION TEAM

Opsis Architecture, Design Architect
MSGS Architects, Architect of Record
PCS, Structural Engineer
Stantec, Mechanical Engineer
BCE, Electrical Engineer
AHBL, Civil Engineer and Landscape Architect
Yantis, Inc., Acoustician
Brightworks, LEED Consultant
Aldrich & Associates, Contractor

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