Synergies

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Synergies

Architects have to become designers of eco-systems. Not just the designers of beautiful facades or beautiful sculptures, but systems of economy and ecology, where we channel the flow not only of people, but also the flow of resources through our cities and buildings.

- Bjarke Ingels

https://big.dk/#projects

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Synergies

Two important components forming the basis for any design, in particular net-zero building design, are the metrics and ethics of project decisions.

Metrics

The scientific and quantifiable components of sustainability. Anything that requires calculation of values to understand performance impact can be considered a metric.

- Primary energy consumption
- Building performance

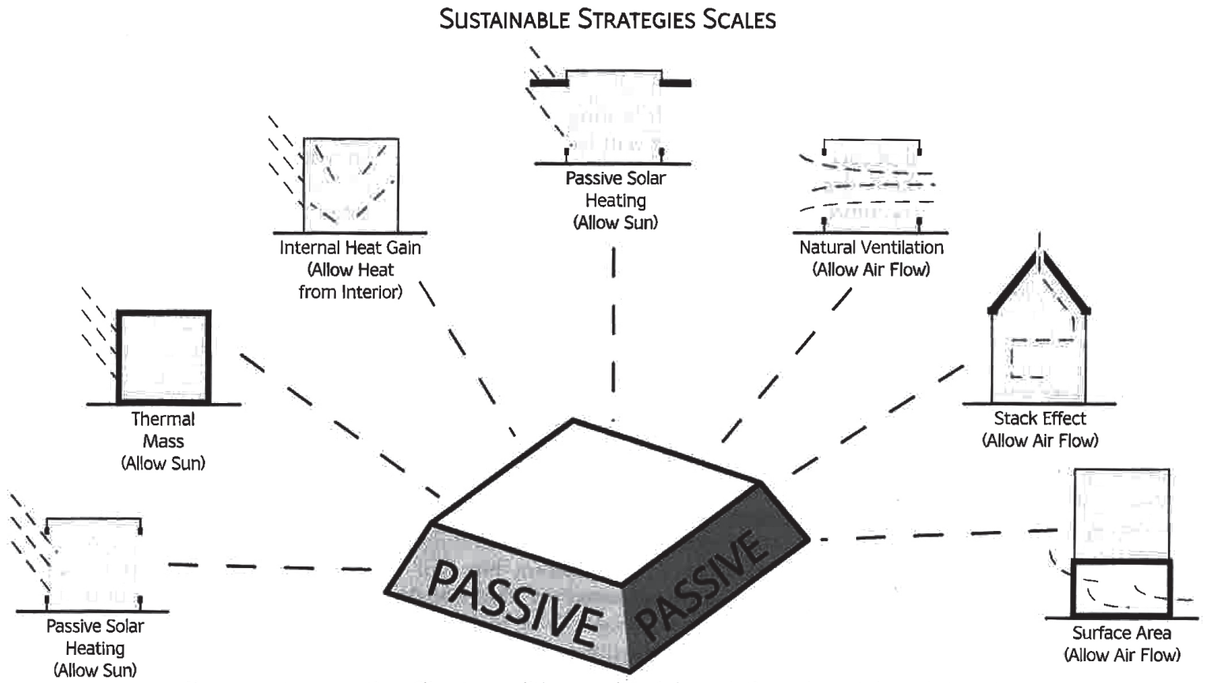
Ethics

Sets of values we hold important to make decisions as architects / builders. They consider the earthly stewardship we are obliged to maintain as authors of the built environment.

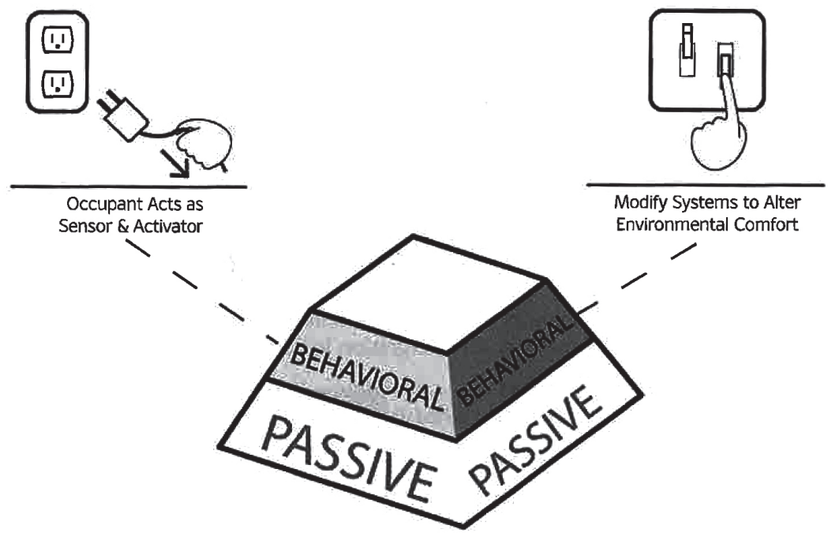
Scales

Passive design strategies
Occupant behavioral strategies

(Source: Heating, Cooling, Lighting by Lechner)



No energy consumption. Climate conditions analyzed through the architect's knowledge of environmental controls determines which strategies should be applied. Building orientation, heat rejection or admission, and other critical determinants of fundamental environmental analysis described in earlier chapters inform which specific passive strategies to pursue.



No energy consumption. Human effort drives a reduction of energy through minimized use and conservation.

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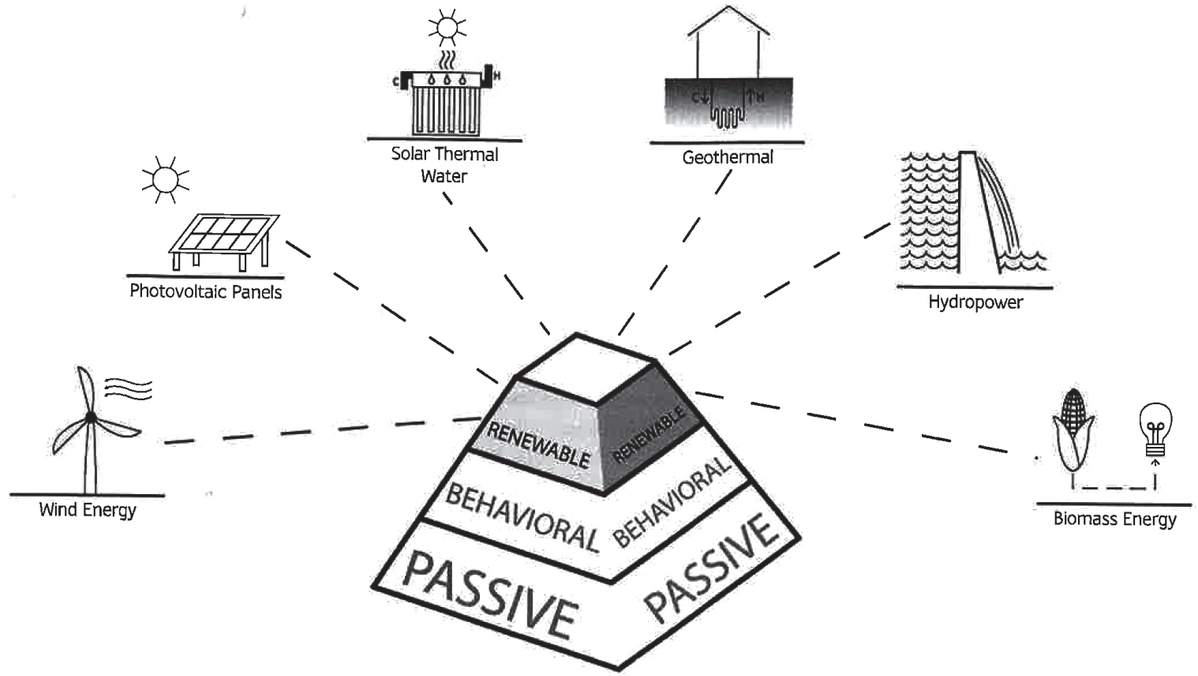
Synergies

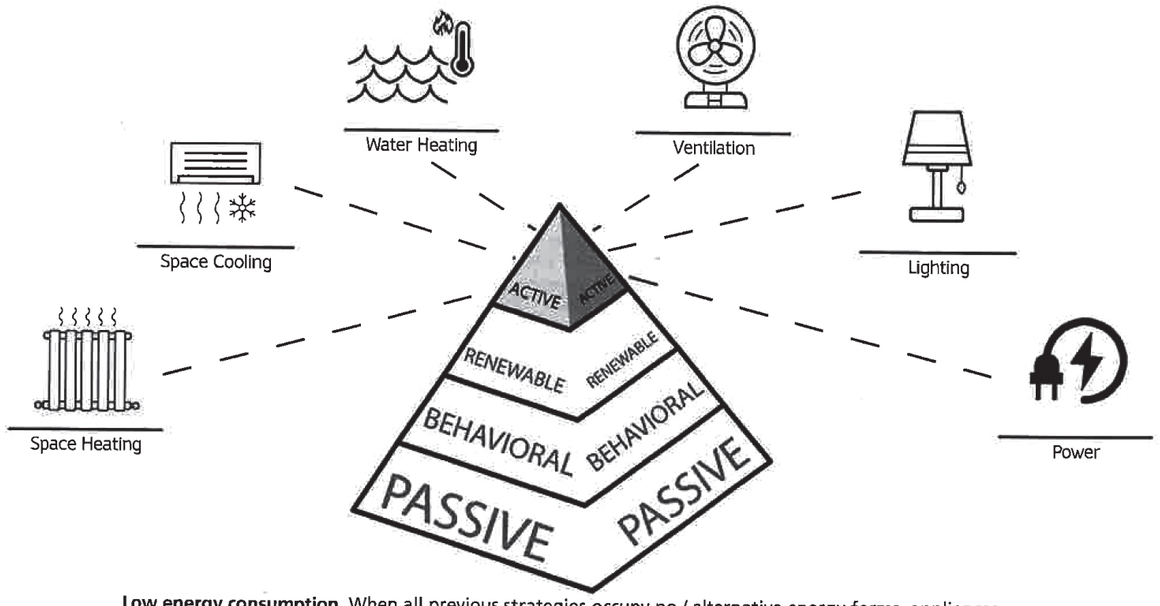
Scales

Renewable technology strategies
Active (low energy) design strategies

(Source: Heating, Cooling, Lighting by Lechner)



Renewable energy consumption. Energy from natural resources that can be easily replenished is converted to power for building systems.



Low energy consumption. When all previous strategies occupy no / alternative energy forms, appliances and systems with low energy production are specified. Currently, most are already engineered to have a reduced load than in previous years, yet the architect may research specific systems with the engineer to confirm the reduction since technology is daily evolving to higher sustainable standards.

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Synergies

Synergies

An integration of sustainable strategies that have a positive symbiotic performance to reduce the environmental impact of a building.

Multiple sustainable strategies come together to form symbiotic components of a sustainable system to inform a synergy; if one strategy were to be removed, the strength of the design would to some capacity be compromised.

(Source: Heating, Cooling, Lighting by Lechner)

Overview - Street View a

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Synergies

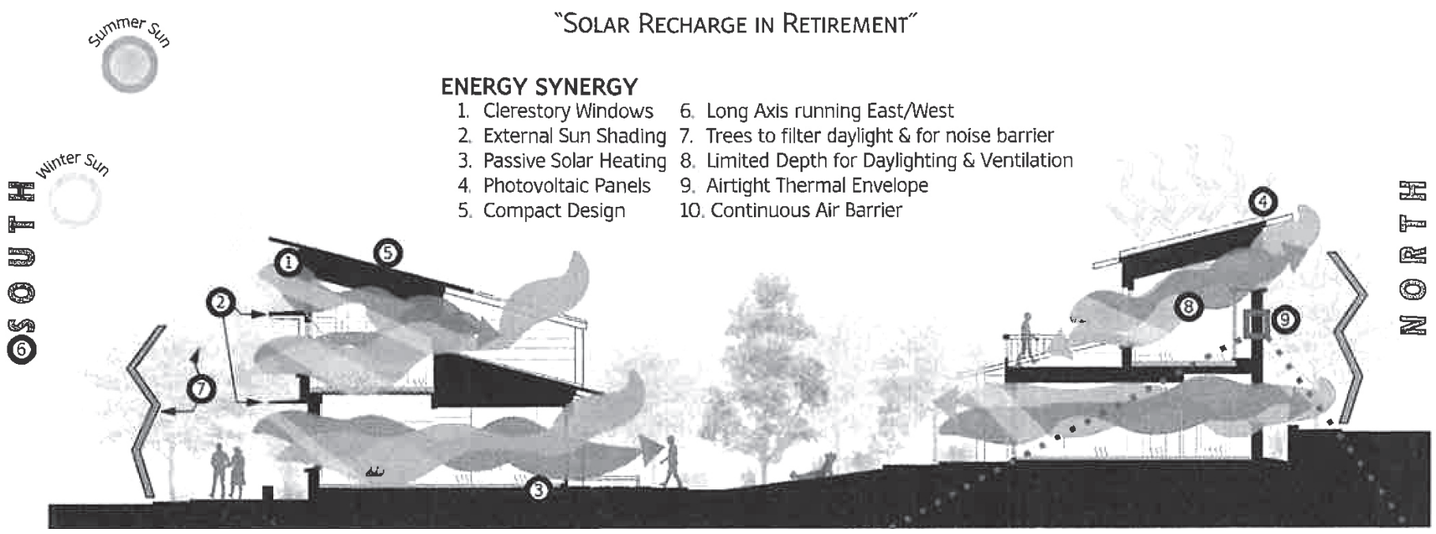
Ankeny Row Townhomes: Green Hammer

The net-zero design for this retirement housing community was successful in its integrated design process (IDP) namely due to the diverse team composition of Green Hammer Design/Build, which directly employs architects, carpenters, and energy consultants among its regular full-time staff.

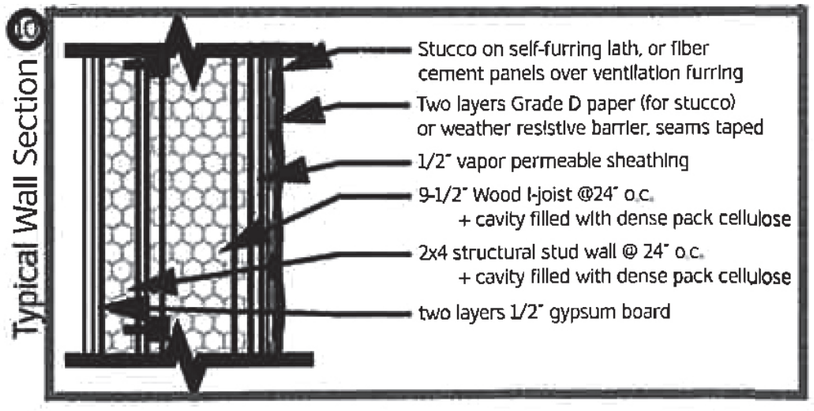
Green certifications

- Passive House
- Net-Zero Energy
- Universal Design
- WaterSense

(Source: Heating, Cooling, Lighting by Lechner)



Project:	Ankeny Row Townhomes
Type:	Residential
Location:	Portland, Oregon
Year:	2012
Architect:	Green Hammer



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Synergies

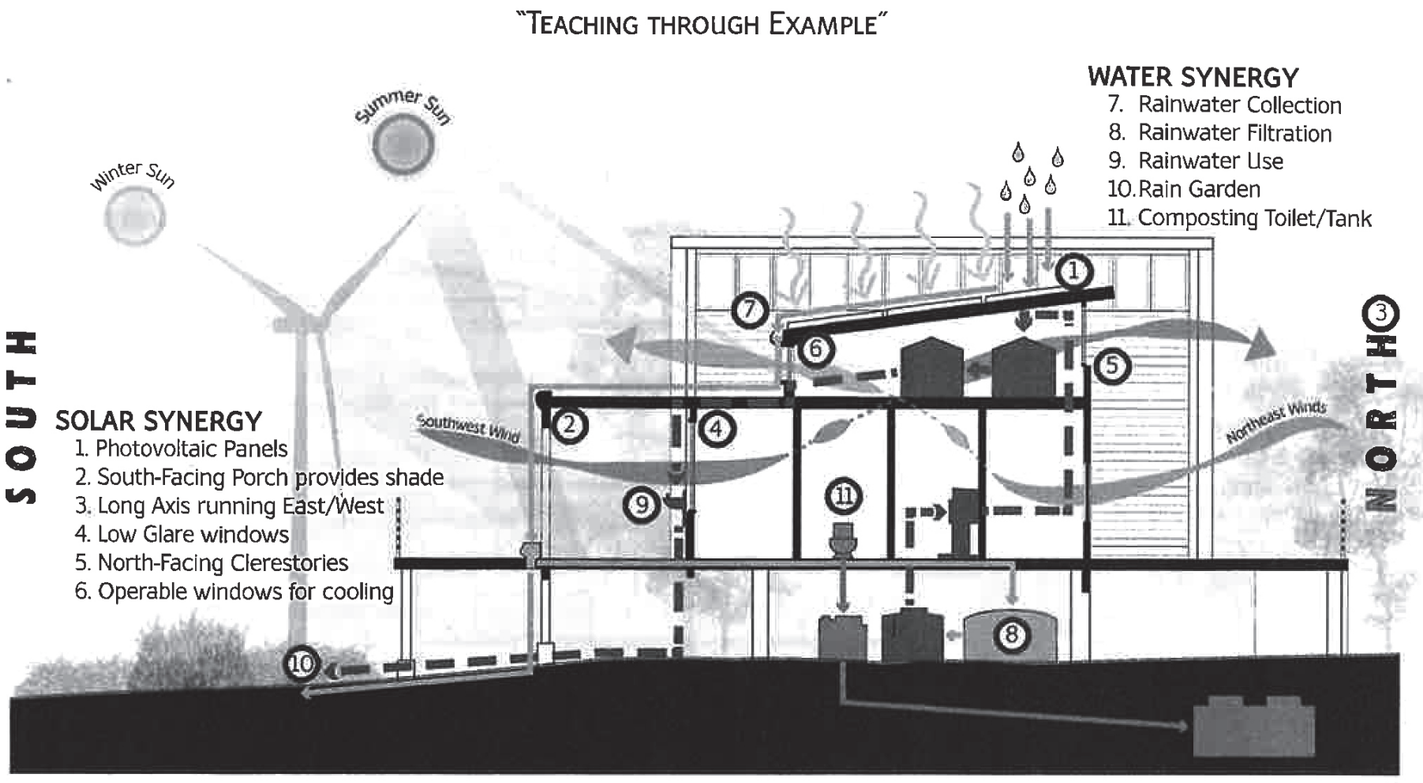
Brock Environmental Center - SmithGroup

Early charettes with the Chesapeake Bay Foundation (owner) and neighbors of the site led to a shared project vision during the IDP. A strong partnership between experts and the use of digital/building performance analytics (BPA) simulations through iterative feedback loops allowed the team to validate and maximize each design decision to find optimal strategies and synergies.

Certifications

- Net-Zero Carbon and Water
- LEED Platinum
- ILFI Living Building Challenge

(Source: Heating, Cooling, Lighting by Lechner)



Project:	Brock Environmental Center
Type:	Community, Education
Location:	Chesapeake Bay, Maryland
Year:	2015
Architect:	Smith Group JJR
Net EUI:	15.5 kBtu/sf/yr

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Synergies

Bullit Center - Miller Hull Partnership

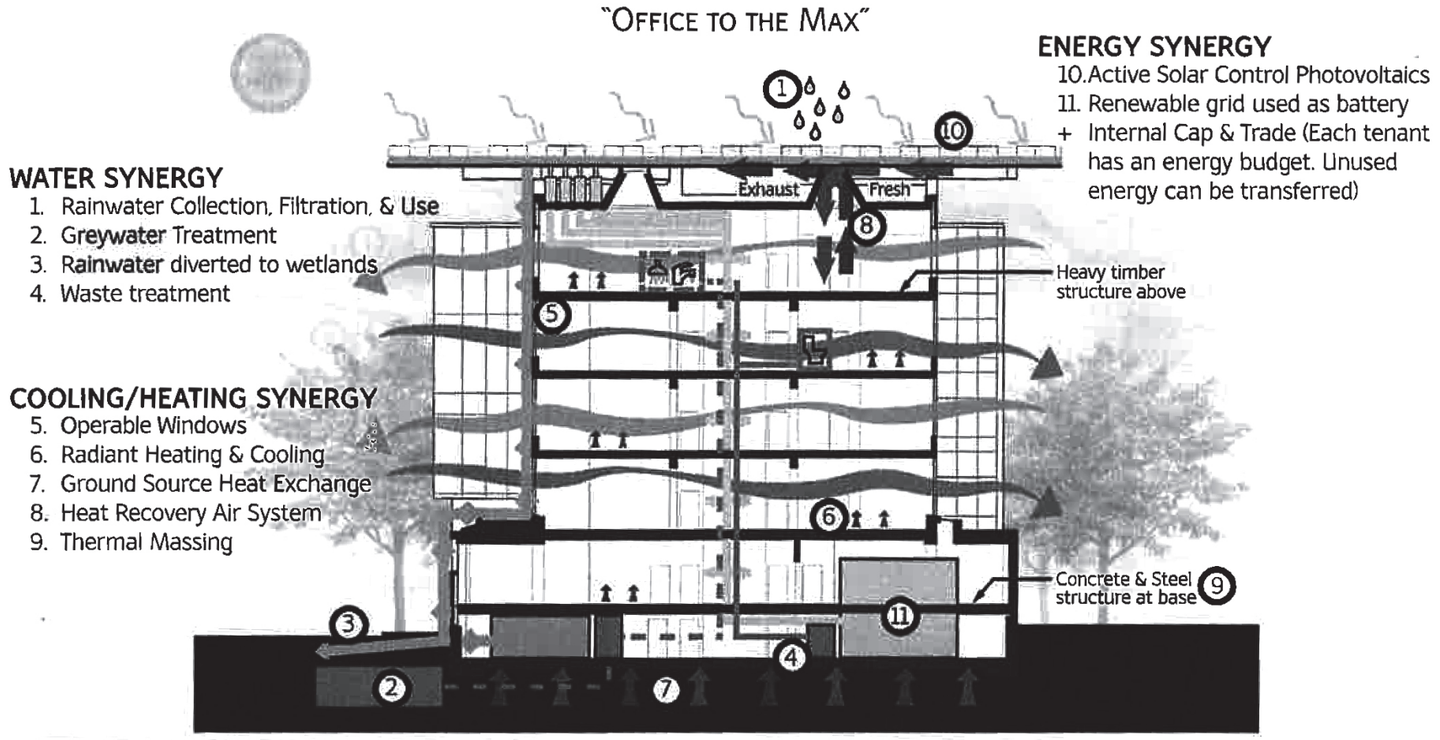
This building is perhaps the icon of the IDP, where performance metrics most significantly informed building design and collaboration between the integrated design team was ingrained from its inception. The iterative process involving balancing the solar-energy potential of the site with the building's power needs.

Certifications

- Net-Zero
- "Greenest Office Building in America"
- ILFI Living Building Challenge

https://bullittcenter.org/

(Source: Heating, Cooling, Lighting by Lechner)



Project:	Bullitt Center
Type:	Commercial
Location:	Seattle, WA
Year:	2013
Architect:	Miller Hull Partnership
Net EUI:	9.4 kBtu/sf/year

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Synergies

Discovery School - VMDO

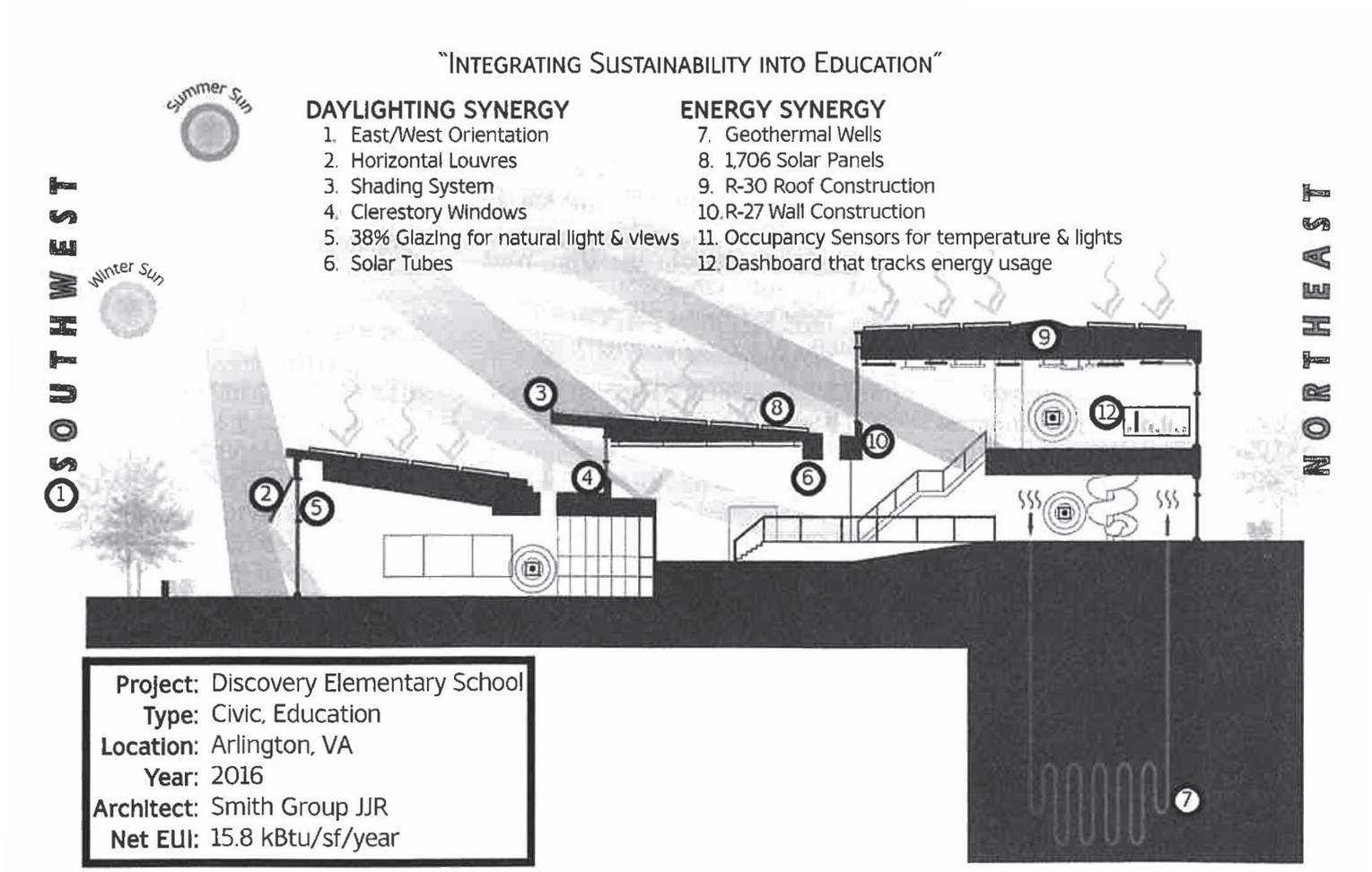
This net-zero elementary school's project team was ambitious from the project's inception, pushing for maximum building performance and carbon neutrality from the start of design to post-occupancy.

Actual performance relies on each occupant, including the youngest students, to invest in managing their impacts on the building. They have all shown stewardship and have helped maintain their building as a net positive school.

Certifications

- LEED 2009 Schools Gold
- LEED Zero School
- ILFI Zero Energy

(Source: Heating, Cooling, Lighting by Lechner)



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Synergies

West Berkeley Public Library - Harley Ellis Devereaux

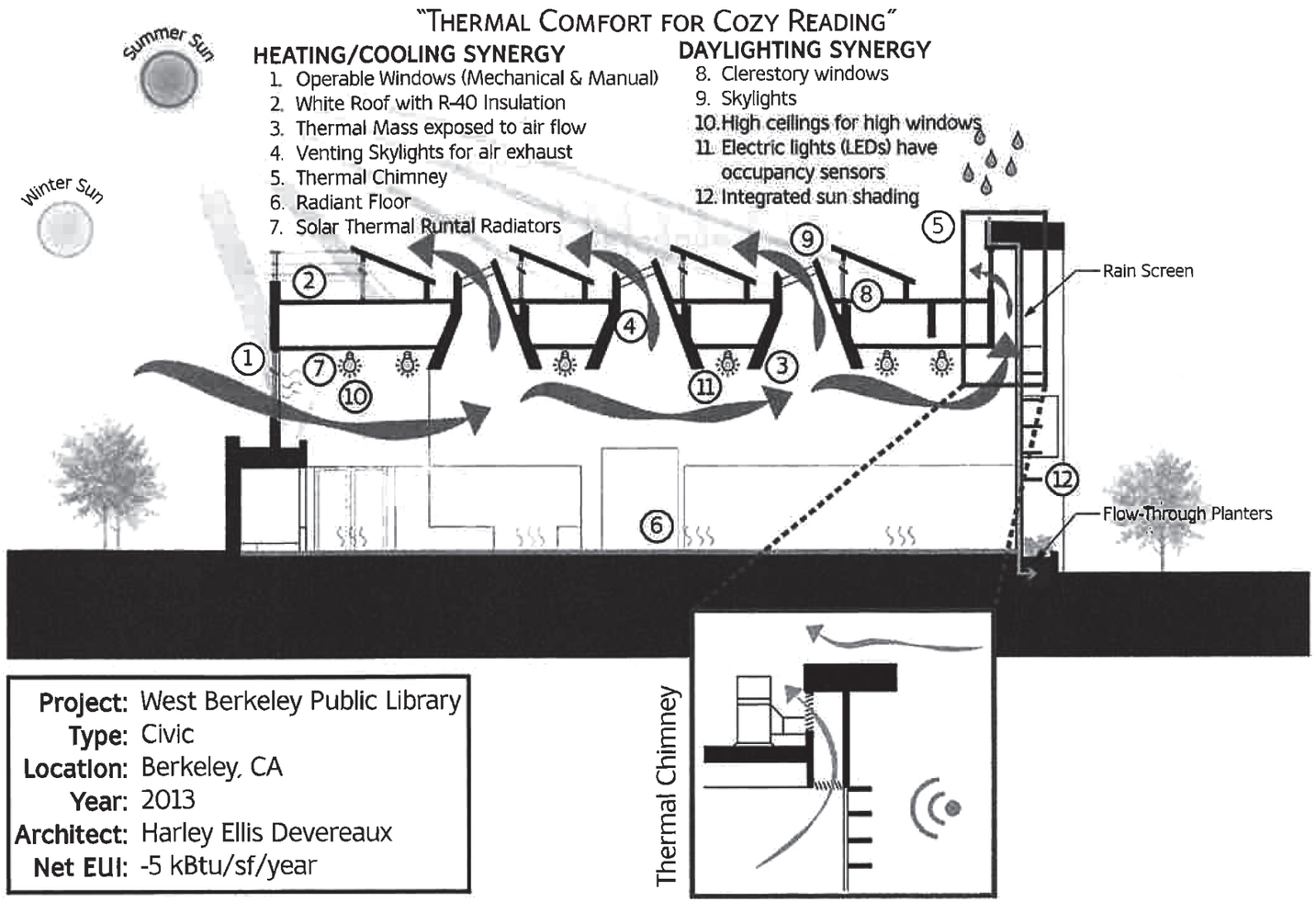
The IDP was used for all building design phases in this community library, including a diverse design team and iterative feedback loop fo all simulations.

Digital modeling/BPA included climate studies, solar and energy simulations, and computational fluid dynamics modeling for thermal stack strategies.

Certifications

- LEED Platinum
- ILFI Zero Energy

(Source: Heating, Cooling, Lighting by Lechner)



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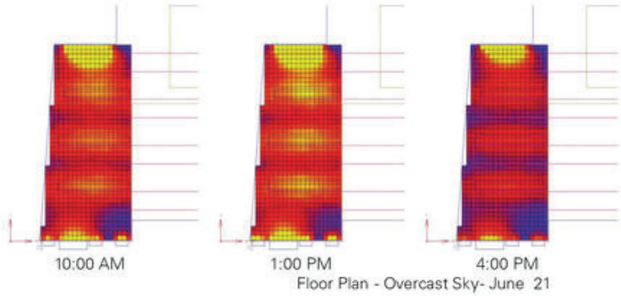
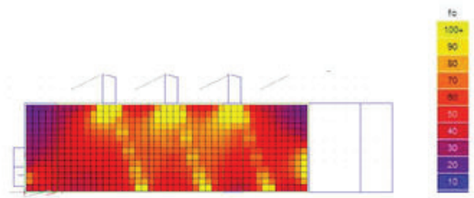
Synergies

West Berkley Public Library - Harley Ellis Devereaux

Digital modeling/BPA included climate studies, solar and energy simulations, and computational fluid dynamics modeling for thermal stack strategies.

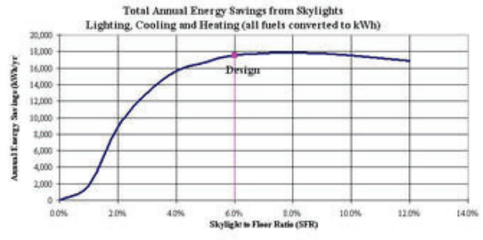
(Source: Heating, Cooling, Lighting by Lechner)





Daylighting Modeling in Daysim and Radiance

Access to Views



Skycalc Analysis

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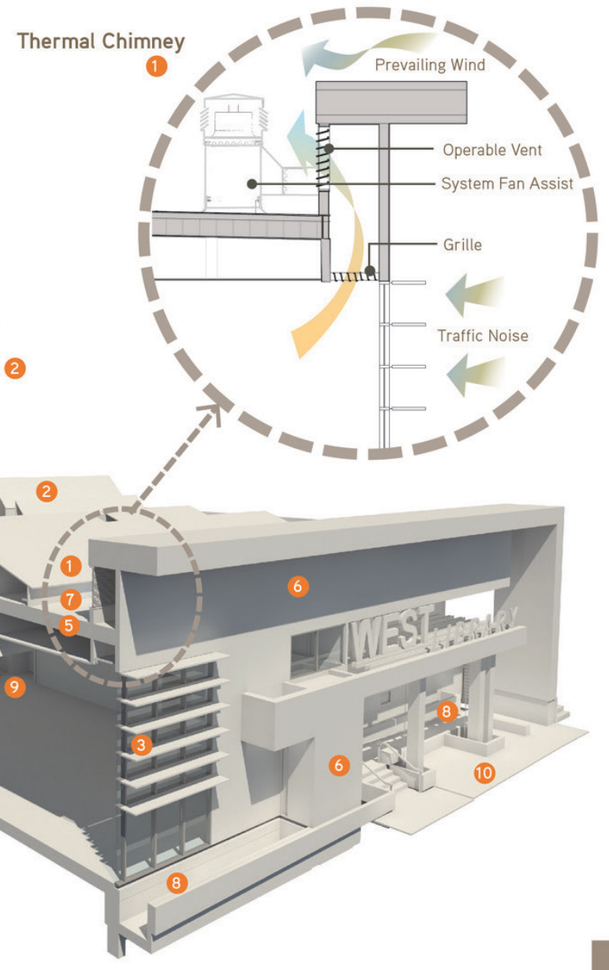
Synergies

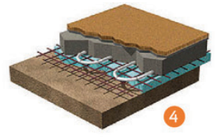
West Berkley Public Library - Harley Ellis Devereaux

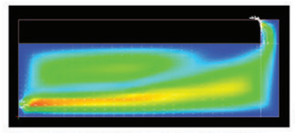
Digital modeling/BPA included climate studies, solar and energy simulations, and computational fluid dynamics modeling for thermal stack strategies.

(Source: Heating, Cooling, Lighting by Lechner)

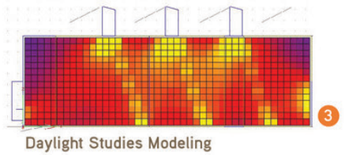


1 Natural Ventilation / Mix Mode
2 On Site Energy Generation- PV & Solar Thermal
3 Daylighting- 90% of Spaces is Daylit
4 Radiant Floor for Heating & Cooling
5 FSC Certified Wood
6 High Performance Exterior Rain Screen (R30)
7 Cool Roof (R40)
8 Low Flow Planters- On Site Storm Water Technology
9 High Recycled Content
10 Dense Urban Site / Site Selection





Computer Fluid Dynamics Modeling



Daylight Studies Modeling

Zero Net Energy Features

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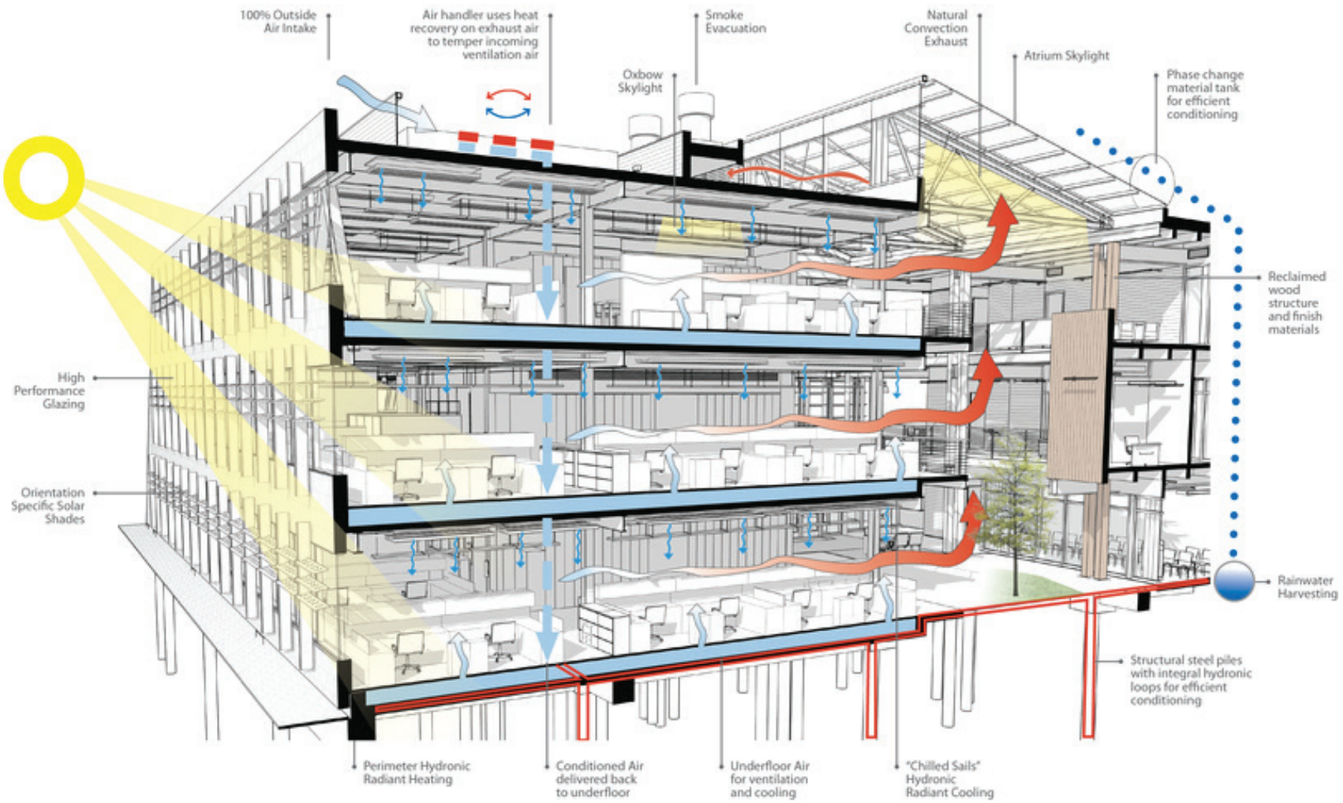
Synergies

Federal Center South Building 1202 / ZGF Architects

Energy strategies:

- High performance glazing
- Perimeter hydronic heating
- Hydronic radiant cooling
- Phase change material tank for efficient cooling
- Natural convection exhaust

https://www.archdaily.com/447019/federal-center-south-building-1202-zgf-architects?ad_medium=gallery



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Synergies

Manitoba Hydro Place, Winnipeg, MB, Canada, KPMB Architects, 2009

Optimizing the orientation to use passive solar gains to condition the interior space; high ceilings to increase natural daylighting: creating envelope buffer zones as winter gardens and double facades for passive solar pre-conditioning of fresh air. Operable windows and solar chimney allow natural ventilation. Thermo-active slab heating and cooling is supported by geothermal heat exchangers.

Occupants can control their individual environment according to their own personal preference using operable windows, lighting and shading devices.

The building consumes 140 kWh/m²/year of primary energy for building operation, establishing it as the most energy efficient office tower in North America, 60% below a typical office tower. Beyond energy efficiency the building provides a new level of thermal and visual comfort, with all workstations having access to the facade.

https://transsolar.com/projects/manitoba-hydro

https://www.archdaily.com/44596/manitoba-hydro-kpmb-architects?ad_medium=gallery