

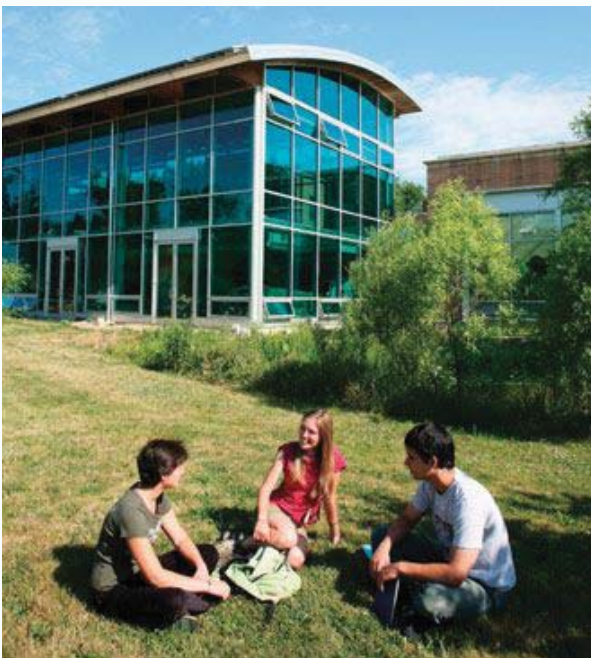
Case Study #3

“A Sustainable Site & Building”

Arch 464 - ECLS

Valerie Mitchell, Amanda Housh,
Allison Gray

Building/Site Description



Adam Joseph Lewis Center for Environmental Studies--Oberlin College

Location: Oberlin, OH

Building type(s): Campus, Higher education, Library, Assembly

New construction

Size: 13,600 ft. sq.

Completion date: January 2000

Rating: Green Building Challenge

Rating: Zero Energy Building

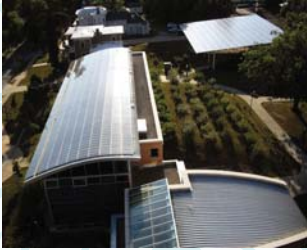
Program:

Interior Spaces: Public assembly, Lobby/reception, Classroom, Office, Restrooms, Mechanical systems, Electrical systems

Outdoor Spaces: Interpretive landscape, Restored landscape, Garden—productive, Wildlife habitat, Patio/hardscape, Garden—decorative, Parking, Drives/roadway, Pedestrian/non-motorized vehicle path

Sustainable Features-Energy

“An original goal for the building was that it be a net energy exporter within 10 years, operating only on current sunlight, as opposed to sunlight stored in the form of coal or oil.”



Photovoltaic (PV) System

- 4,000 sq. ft of 85 watt monocrystalline panels cover the south-facing roof
- 100 kW PV system were later installed over the adjacent parking lot
- Generates more than 110% of the building's electricity consumption
- Excess power is supplied to the Ohio power grid

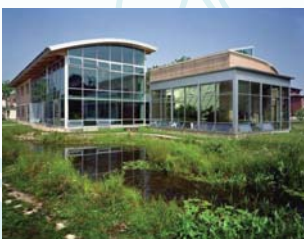
Daylighting Scheme

- Oriented on an east-west axis
- Large south-facing windows
- High ceilings
- Centrally located atrium space

Lighting Control Systems

- Daylight sensors
- Occupancy sensors
- Dimming switches

Sustainable Features-Wastewater & Greywater Reuse



Building - Living Machine

- Gathers and treats all wastewater from the bathrooms and kitchen
- Returns the purified water back to the toilets and urinals for reuse
- Enlarged in order to promote visual presence and education but through this action, the Living Machine actually consumes more energy

Site - Wetlands and Cistern System

- Arranged around the southeast corner of the building, the constructed wetland and meadow ecosystem treat stormwater runoff on-site
- Provides a habitat for 70 native plant species and countless animals
- Treated stormwater is then moved to a 7,500 gallon cistern for on-site storage

Sustainable Features - Heating and Cooling



Components with Efficient Insulating Properties

- Walls (R value of 15 or greater)
- Roof (R value of 25 or greater)
- Windows (R value of 7)
- Building Envelope (R value of 13)

Satisfaction of Heating/Cooling Demands

- Closed-loop geothermal wells
- Operable windows
- Carbon dioxide sensors



Elements that Provide Thermal Mass

- Earth berm on north wall
- Concrete floors and exposed masonry walls

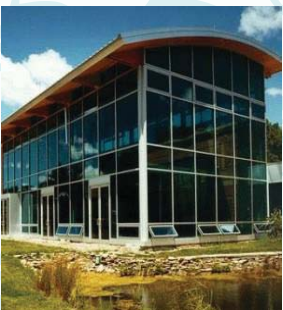


Sustainable Features - Building Elements



Sustainable Materials

- Used low VOC acrylic latex interior paint, compostable synthetic fiber fabrics and other nonhazardous materials that would prevent against indoor air pollution
- Used wood certified by the Forest Stewardship Council (FSC)
- Used recycled structural steel, brick, aluminum, ceramic tile, plastics and fabrics. Some materials were even salvaged from the campus.



Sustainable Features - Site Elements

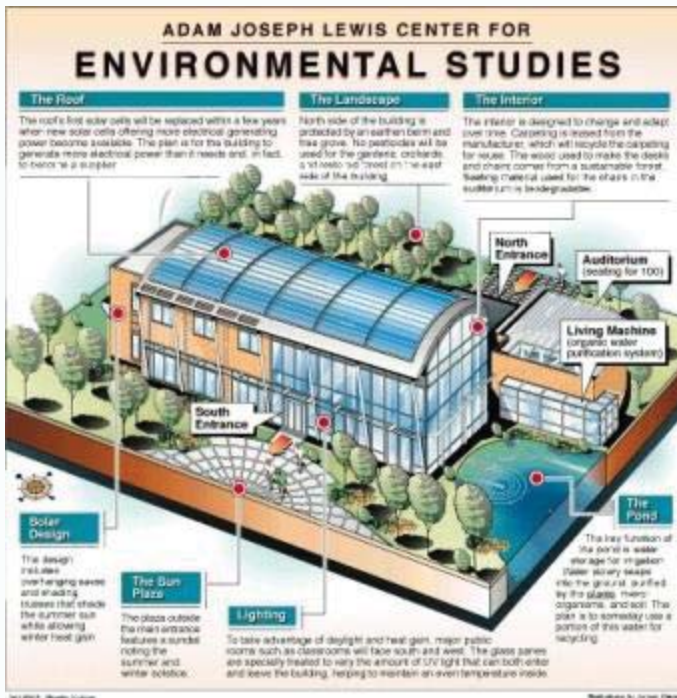


- Dwarf apple and pear trees grow on an earthen berm built up against the north side of the building
- Vegetable and flower gardens grow on the northwest side of the building
- Strawberries, blueberries and raspberries also grow in patches throughout the site

On-Site Food Production

- Grassy spaces on site are comprised of native species that don't rely on constant mowing or chemical intake
- "It is estimated that over a 20 year period, the maintenance of the native species will cost only 1/7th as much as maintaining conventional turf."

Efficient Landscaping Elements

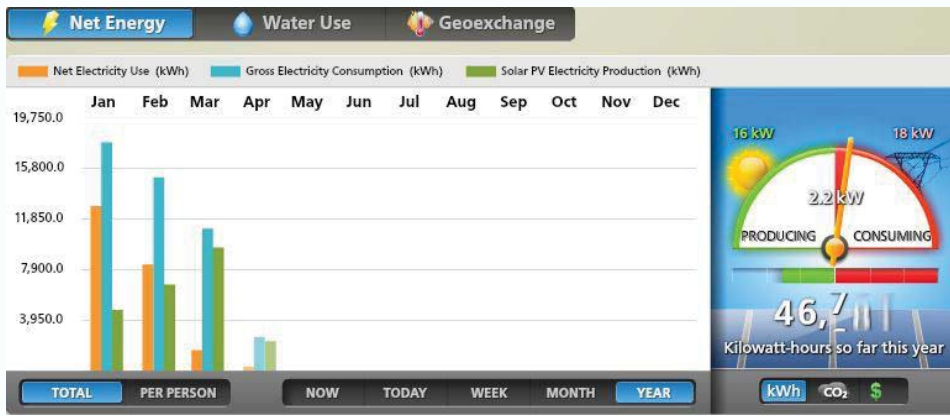


Sustainable Features Summary

"The **building** operates on three fundamental principles of nature - eliminate the concept of waste, rely on natural energy flows, and honor diversity."

"The **site** focuses on 3 broad ecological functions - natural habitat, food production and water management."

In 2006, the site became a net energy exporter, producing 30 percent more energy than it needs to operate and sharing this excess energy with the community.



Adam Lewis Center Energy and Water Performance Graph

Regeneration-Based Checklist for Design and Construction

© SBSE @ Tadoussac 1999

Project: _____

	degeneration		sustainability			regeneration			
	-100 always	-75 usually	-50 sometimes	-25 a bit	0 balances	25 a bit	50 sometimes	75 usually	100 always
the site									
pollutes air									
pollutes water									
wastes rainwater									
consumes food									
destroys rich soil									
dumps wastes unused									
destroys wildlife habitat									
imports energy									
requires fuel-powered transportation									
intensifies local weather									
excludes daylight									
uses mechanical heating									
uses mechanical cooling									
needs cleaning and repair									
produces human discomfort									
uses fuel-powered circulation									
pollutes indoor air									
is built of virgin materials									
cannot be recycled									
serves as an icon for the apocalypse									
is a bad neighbor									
is ugly									
cleans air									
cleans water									
stores rainwater									
produces food									
creates rich soil									
consumes wastes									
provides wildlife habitat									
exports energy									
requires human-powered transportation									
moderates local weather									
uses daylight									
uses passive heating									
uses passive cooling									
maintains itself									
provides human comfort									
uses human-powered circulation									
creates pure indoor air									
is built of recycled materials									
can be recycled									
serves as an icon for regeneration									
is a good neighbor									
is beautiful									

negative score: 2200 possible | -175

positive score: 2200 possible | 1200

final score: 1025

SBSE's Updated Malcolm Well's Checklist

Original Design - Highly Regenerative

LEED 2009 for New Construction and Major Renovations		Project Checklist		Project Name _____		Date _____	
14 Sustainable Sites Possible Points: 24				Materials and Resources, Continued			
Y	Prereq 1	Construction Activity Pollution Prevention		Y	Credit 4	Recycled Content	1 to 2
	Credit 1	Site Selection	1		Credit 5	Regional Materials	1 to 2
	Credit 2	Development Density and Community Connectivity	5		Credit 6	Rapidly Renewable Materials	1
	Credit 2	Brownfield Redevelopment	1		Credit 7	Certified Wood	1
	Credit 4.1	Alternative Transportation—Public Transportation Access	4	9 Indoor Environmental Quality Possible Points: 15			
	Credit 4.2	Alternative Transportation—Bicycle Storage and Changing Rooms	1	Y	Prereq 1	Minimum Indoor Air Quality Performance	
	Credit 4.3	Alternative Transportation—Low-Emitting and Fuel-Efficient Vehicles	3		Prereq 2	Environmental Tobacco Smoke (ETS) Control	
	Credit 4.4	Alternative Transportation—Parking Capacity	2		Credit 1	Outdoor Air Delivery Monitoring	1
	Credit 5.1	Site Development—Protect or Restore Habitat	1		Credit 2	Increased Ventilation	1
	Credit 5.2	Site Development—Maximize Open Space	1		Credit 3.1	Construction IAQ Management Plan—During Construction	1
	Credit 6.1	Stormwater Design—Quantity Control	1		Credit 3.2	Construction IAQ Management Plan—Before Occupancy	1
	Credit 6.2	Stormwater Design—Quality Control	1		Credit 4.1	Low-Emitting Materials—Adhesives and Sealants	1
	Credit 7.1	Heat Island Effect—Non-roof	1		Credit 4.2	Low-Emitting Materials—Paints and Coatings	1
	Credit 7.2	Heat Island Effect—Roof	1		Credit 4.3	Low-Emitting Materials—Flooring Systems	1
	Credit 8	Light Pollution Reduction	1		Credit 4.4	Low-Emitting Materials—Composite Wood and Agrifiber Products	1
9 Water Efficiency Possible Points: 10					Credit 5	Indoor Chemical and Pollutant Source Control	1
Y	Prereq 1	Water Use Reduction—20% Reduction			Credit 4.1	Controllability of Systems—Lighting	1
	Credit 1	Water Efficient Landscaping	2 to 4		Credit 4.2	Controllability of Systems—Thermal Comfort	1
	Credit 2	Innovative Waterwaster Technologies	2		Credit 7.1	Thermal Comfort—Design	1
	Credit 3	Water Use Reduction	2 to 4		Credit 7.2	Thermal Comfort—Verification	1
20 Energy and Atmosphere Possible Points: 35					Credit 8.1	Daylight and Views—Daylight	1
Y	Prereq 1	Fundamental Commissioning of Building Energy Systems			Credit 8.2	Daylight and Views—Views	1
Y	Prereq 2	Minimum Energy Performance		5 Innovation and Design Process Possible Points: 6			
	Prereq 3	Fundamental Refrigerant Management			Credit 1.1	Innovation in Design: Specific Title	1
	Credit 1	Optimize Energy Performance	1 to 19		Credit 1.2	Innovation in Design: Specific Title	1
	Credit 2	On-Site Renewable Energy	1 to 7		Credit 1.3	Innovation in Design: Specific Title	1
	Credit 3	Enhanced Commissioning	2		Credit 1.4	Innovation in Design: Specific Title	1
	Credit 4	Enhanced Refrigerant Management	2		Credit 1.5	Innovation in Design: Specific Title	1
	Credit 5	Measurement and Verification	3		Credit 2	LEED Accredited Professional	1
	Credit 6	Green Power	2	2 Regional Priority Credits Possible Points: 4			
10 Materials and Resources Possible Points: 14					Credit 1.1	Regional Priority: Specific Credit	1
Y	Prereq 1	Storage and Collection of Recyclables			Credit 1.2	Regional Priority: Specific Credit	1
	Credit 1.1	Building Reuse—Maintain Existing Walls, Floors, and Roof	1 to 3		Credit 1.3	Regional Priority: Specific Credit	1
	Credit 1.2	Building Reuse—Maintain 50% of Interior Non-Structural Elements	1		Credit 1.4	Regional Priority: Specific Credit	1
	Credit 2	Construction Waste Management	1 to 2	69 Total Possible Points: 110			
	Credit 3	Materials Reuse	1 to 2	<small>Certified 40 to 49 points Silver 50 to 59 points Gold 60 to 79 points Platinum 80 to 110</small>			

LEED Checklist



Redesign Strategies



1. Reduce the need for fuel-powered transportation for the occupants by offering cheap public transit and bike routes.
2. Decrease the size of the living machine to most efficient size.
3. Create pure indoor air by adding natural ventilation.
4. Connect to Cleveland's wind farm chain for energy back up when PV panels are insufficient.

Regeneration-Based Checklist for Design and Construction

© SBSE @ Tadoussac 1999

Project:		degeneration						sustainability			regeneration		
		-100 always	-75 usually	-50 sometimes	-25 a bit	0 balances	25 a bit	50 sometimes	75 usually	100 always			
the site	pollutes air											cleans air	
	pollutes water											cleans water	
	wastes rainwater											stores rainwater	
	consumes food											produces food	
	destroys rich soil											creates rich soil	
	dumps wastes unused											consumes wastes	
	destroys wildlife habitat											provides wildlife habitat	
	imports energy											exports energy	
	requires fuel-powered transportation											requires human-powered transportation	
	intensifies local weather											moderates local weather	
the building	excludes daylight											uses daylight	
	uses mechanical heating											uses passive heating	
	uses mechanical cooling											uses passive cooling	
	needs cleaning and repair											maintains itself	
	produces human discomfort											provides human comfort	
	uses fuel-powered circulation											uses human-powered circulation	
	pollutes indoor air											creates pure indoor air	
	is built of virgin materials											is built of recycled materials	
	cannot be recycled											can be recycled	
	serves as an icon for the apocalypse											serves as an icon for regeneration	
is a bad neighbor											is a good neighbor		
is ugly											is beautiful		

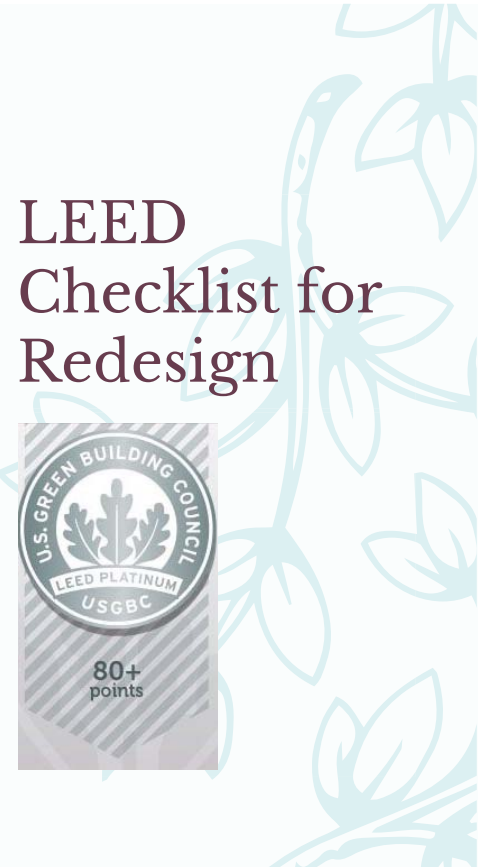
negative score: 2200 possible
-50

positive score: 2200 possible
1300

final score:
1250

Malcolm Well's Checklist Redesign

Improved score of 125



LEED 2009 for New Construction and Major Renovations

Project Checklist

Project Name
Date

23	Sustainable Sites	Possible Points: 26	Materials and Resources, Continued	
Y	Prereq 1 Construction Activity Pollution Prevention		Y	Credit 4 Recycled Content 1 to 2
Y	Credit 1 Site Selection 1		Y	Credit 5 Regional Materials 1 to 2
Y	Credit 2 Development Density and Community Connectivity 5		Y	Credit 6 Rapidly Renewable Materials 1
Y	Credit 3 Brownfield Redevelopment 1		Y	Credit 7 Certified Wood 1
Y	Credit 4.1 Alternative Transportation—Public Transportation Access 1			
Y	Credit 4.2 Alternative Transportation—Bicycle Storage and Changing Rooms 1		11	Indoor Environmental Quality Possible Points: 15
Y	Credit 4.3 Alternative Transportation—Low-Emitting and Fuel-Efficient Vehicles 3		Y	Prereq 1 Minimum Indoor Air Quality Performance
Y	Credit 4.4 Alternative Transportation—Parking Capacity 2		Y	Prereq 2 Environmental Tobacco Smoke (ETS) Control
Y	Credit 5.1 Site Development—Protect or Restore Habitat 1		Y	Credit 1 Outdoor Air Delivery Monitoring 1
Y	Credit 5.2 Site Development—Maximize Open Space 1		Y	Credit 2 Increased Ventilation 1
Y	Credit 6.1 Stormwater Design—Quantity Control 1		Y	Credit 3.1 Construction IAQ Management Plan—During Construction 1
Y	Credit 6.2 Stormwater Design—Quality Control 1		Y	Credit 3.2 Construction IAQ Management Plan—Before Occupancy 1
Y	Credit 7.1 Heat Island Effect—Non-roof 1		Y	Credit 4.1 Low-Emitting Materials—Adhesives and Sealants 1
Y	Credit 7.2 Heat Island Effect—Roof 1		Y	Credit 4.2 Low-Emitting Materials—Paints and Coatings 1
Y	Credit 8 Light Pollution Reduction 1		Y	Credit 4.3 Low-Emitting Materials—Flooring Systems 1
			Y	Credit 4.4 Low-Emitting Materials—Composite Wood and Agrifiber Products 1
			Y	Credit 5 Indoor Chemical and Pollutant Source Control 1
9	Water Efficiency	Possible Points: 10	Y	Credit 4.1 Controllability of Systems—Lighting 1
Y	Prereq 1 Water Use Reduction—20% Reduction		Y	Credit 4.2 Controllability of Systems—Thermal Comfort 1
Y	Credit 1 Water Efficient Landscaping 2 to 4		Y	Credit 5.1 Thermal Comfort—Design 1
Y	Credit 2 Innovative Wastewater Technologies 2		Y	Credit 6.1 Daylight and Views—Daylight 1
Y	Credit 3 Water Use Reduction 2 to 4		Y	Credit 6.2 Daylight and Views—Views 1
27	Energy and Atmosphere	Possible Points: 35		
Y	Prereq 1 Fundamental Commissioning of Building Energy Systems		5	Innovation and Design Process Possible Points: 6
Y	Prereq 2 Minimum Energy Performance		Y	Credit 1.1 Innovation in Design: Specific Title 1
Y	Prereq 3 Fundamental Refrigerant Management		Y	Credit 1.2 Innovation in Design: Specific Title 1
Y	Credit 1 Optimize Energy Performance 1 to 19		Y	Credit 1.3 Innovation in Design: Specific Title 1
Y	Credit 2 On-Site Renewable Energy 1 to 7		Y	Credit 1.4 Innovation in Design: Specific Title 1
Y	Credit 3 Enhanced Commissioning 2		Y	Credit 1.5 Innovation in Design: Specific Title 1
Y	Credit 4 Enhanced Refrigerant Management 2		Y	Credit 2 LEED Accredited Professional 1
Y	Credit 5 Measurement and Verification 3			
Y	Credit 6 Green Power 2		2	Regional Priority Credits Possible Points: 4
			Y	Credit 1.1 Regional Priority: Specific Credit 1
10	Materials and Resources	Possible Points: 14	Y	Credit 1.2 Regional Priority: Specific Credit 1
Y	Prereq 1 Storage and Collection of Recyclables		Y	Credit 1.3 Regional Priority: Specific Credit 1
Y	Credit 1.1 Building Reuse—Maintain Existing Walls, Floors, and Roof 1 to 3		Y	Credit 1.4 Regional Priority: Specific Credit 1
Y	Credit 1.2 Building Reuse—Maintain 50% of Interior Non-Structural Elements 1			
Y	Credit 2 Construction Waste Management 1 to 2		Total	Possible Points: 110
Y	Credit 3 Materials Reuse 1 to 2			

Certified 40 to 49 points Silver 50 to 59 points Gold 60 to 79 points Platinum 80 to 110

LEED Checklist for Redesign



Conclusion

The Adam Lewis Center was already a icon of sustainability. But with a few modifications, we were able to take it from LEED Gold to LEED Platinum.

