



Green Buildings

**Welcome to the Southeast Ohio
Community Clean Energy Workshop
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Why Green Buildings?

- Buildings in the US consume more than 30 percent of our total energy and 60 percent of our electricity annually.
- 5,000,000,000 (five billion!) gallons of potable water are used to flush toilets daily.
- Commercial construction wastes average between 2 and 2.5 pounds per square foot of floor space.

Why Green Buildings?

Pollution – Buildings account for:

49 percent of sulfur dioxide emissions

25 percent of nitrous oxide emissions

10 percent of particulate emissions

35 percent of carbon dioxide emissions

Why Green Buildings?

By the year 2010 over 30 million buildings are expected to be built.

Green Building Design can:

- Reduce negative environmental impacts

- Reduce operating costs

- Enhance building marketability

- Increase occupant productivity

- Help build a sustainable community

What is a Green Building?

What is a Green Building?

Design and construction practices that significantly reduce or eliminate the negative impacts of buildings on the environment and occupants that address:

- Sustainable site planning
- Safeguarding water and water efficiency
- Energy efficiency
- Conservation of materials and resources
- Indoor environmental quality

Who says so?



US Green Building Council

Formed in 1993

National, non-profit organization.

Purpose is to promote the design, construction and operation of buildings that are environmentally responsible, profitable, and healthy places to live and work.

Realized a priority for the sustainable building industry was to have a system to define and measure that which should qualify as “green building.”

Created the LEED green building rating system.



Leadership in Energy and Environmental Design

Currently LEED for New Construction Version 2.1

Under development by the USGBC:

LEED for Existing Buildings

LEED for Homes

LEED for Commercial Interiors

LEED for Core and Shell Buildings



What is the LEED Rating System all about?

Points are scored in five categories:

Sustainable Sites

Water Efficiency

Energy and Atmosphere

Materials and Resources

Indoor Environmental Quality

**Additional points awarded for Innovation and
LEED Accredited Professional**



63 Points Achieved

Possible Points: **69**

Certified 26 to 32 points Silver 33 to 38 points Gold 39 to 51 points Platinum 52 or more points

10 Sustainable Sites Possible Points: 14

Y	Prereq	Credit	Description	Points
Y	Prereq 1		Erosion & Sedimentation Control	
1	Credit 1		Site Selection	1
	Credit 2		Urban Redevelopment	1
	Credit 3		Brownfield Redevelopment	1
1	Credit 4.1		Alternative Transportation, Public Transportation Access	1
1	Credit 4.2		Alternative Transportation, Bicycle Storage & Changing Rooms	1
1	Credit 4.3		Alternative Transportation, Alternative Fuel Refueling Stations	1
1	Credit 4.4		Alternative Transportation, Parking Capacity	1
	Credit 5.1		Reduced Site Disturbance, Protect or Restore Open Space	1
1	Credit 5.2		Reduced Site Disturbance, Development Footprint	1
	Credit 6.1		Stormwater Management, Rate and Quantity	1
1	Credit 6.2		Stormwater Management, Treatment	1
1	Credit 7.1		Landscape & Exterior Design to Reduce Heat Islands, Non-Roof	1
	Credit 7.2		Landscape & Exterior Design to Reduce Heat Islands, Roof	1
1	Credit 8		Light Pollution Reduction	1

6 Materials & Resources Possible Points: 13

Y	Prereq	Credit	Description	Points
Y	Prereq 1		Storage & Collection of Recyclables	
	Credit 1.1		Building Reuse, Maintain 75% of Existing Shell	1
	Credit 1.2		Building Reuse, Maintain 100% of Existing Shell	1
	Credit 1.3		Building Reuse, Maintain 100% Shell & 50% Non-Shell	1
1	Credit 2.1		Construction Waste Management, Divert 50%	1
1	Credit 2.2		Construction Waste Management, Divert 75%	1
	Credit 3.1		Resource Reuse, Specify 5%	1
	Credit 3.2		Resource Reuse, Specify 10%	1
1	Credit 4.1		Recycled Content	1
	Credit 4.2		Recycled Content	1
1	Credit 5.1		Local/Regional Materials, 20% Manufactured Locally	1
1	Credit 5.2		Local/Regional Materials, of 20% Above, 50% Harvested Locally	1
	Credit 6		Rapidly Renewable Materials	1
1	Credit 7		Certified Wood	1

5 Water Efficiency Possible Points: 5

Y	Prereq	Credit	Description	Points
1	Credit 1.1		Water Efficient Landscaping, Reduce by 50%	1
1	Credit 1.2		Water Efficient Landscaping, No Potable Use or No Irrigation	1
1	Credit 2		Innovative Wastewater Technologies	1
1	Credit 3.1		Water Use Reduction, 20% Reduction	1
1	Credit 3.2		Water Use Reduction, 30% Reduction	1

12 Indoor Environmental Quality Possible Points: 15

Y	Prereq	Credit	Description	Points
Y	Prereq 1		Minimum IAQ Performance	
Y	Prereq 2		Environmental Tobacco Smoke (ETS) Control	
1	Credit 1		Carbon Dioxide (CO₂) Monitoring	1
	Credit 2		Increase Ventilation Effectiveness	1
1	Credit 3.1		Construction IAQ Management Plan, During Construction	1
1	Credit 3.2		Construction IAQ Management Plan, Before Occupancy	1
1	Credit 4.1		Low-Emitting Materials, Adhesives & Sealants	1
1	Credit 4.2		Low-Emitting Materials, Paints	1
1	Credit 4.3		Low-Emitting Materials, Carpet	1
	Credit 4.4		Low-Emitting Materials, Composite Wood	1
1	Credit 5		Indoor Chemical & Pollutant Source Control	1
1	Credit 6.1		Controllability of Systems, Perimeter	1
	Credit 6.2		Controllability of Systems, Non-Perimeter	1
1	Credit 7.1		Thermal Comfort, Comply with ASHRAE 55-1992	1
1	Credit 7.2		Thermal Comfort, Permanent Monitoring System	1
1	Credit 8.1		Daylight & Views, Daylight 75% of Spaces	1
1	Credit 8.2		Daylight & Views, Views for 90% of Spaces	1

15 Energy & Atmosphere Possible Points: 17

Y	Prereq	Credit	Description	Points
Y	Prereq 1		Fundamental Building Systems Commissioning	
Y	Prereq 2		Minimum Energy Performance	
Y	Prereq 3		CFC Reduction in HVAC&R Equipment	
2	Credit 1.1		Optimize Energy Performance, 20% New / 10% Existing	2
2	Credit 1.2		Optimize Energy Performance, 30% New / 20% Existing	2
2	Credit 1.3		Optimize Energy Performance, 40% New / 30% Existing	2
2	Credit 1.4		Optimize Energy Performance, 50% New / 40% Existing	2
2	Credit 1.5		Optimize Energy Performance, 60% New / 50% Existing	2
1	Credit 2.1		Renewable Energy, 5%	1
1	Credit 2.2		Renewable Energy, 10%	1
1	Credit 2.3		Renewable Energy, 20%	1
1	Credit 3		Additional Commissioning	1
1	Credit 4		Ozone Depletion	1
	Credit 5		Measurement & Verification	1
	Credit 6		Green Power	1

5 Innovation & Design Process Possible Points: 5

Y	Prereq	Credit	Description	Points
1	Credit 1.1		Innovation in Design: Sustainability Education	1
1	Credit 1.2		Innovation in Design: 100% On-Site Renewable Energy	1
1	Credit 1.3		Innovation in Design: 100% Energy Cost Budget Reduction	1
1	Credit 1.4		Innovation in Design: Exemplary Performance MPR2	1
1	Credit 2		LEED™ Accredited Professional	1



Levels of Certification

LEED Certified	26-32 points
Silver Level	33-38 points
Gold Level	39-51 points
Platinum Level	52+ points

A total of 69 points are possible



Current LEED Certified Buildings in the US:

LEED Certified	50 projects
Silver Level	27 projects
Gold Level	26 projects
Platinum Level	2 projects (both in CA)

(One project in Ohio – Federal Courthouse in Youngstown is LEED Certified)



LEED Rating System

Sustainable Sites

Goals:

Develop only appropriate sites

Reuse existing buildings and/or sites

Protect natural and agricultural areas

Reduce need for automobile use

Protect and/or restore sites



LEED Rating System

Sustainable Sites:

One Prerequisite – Erosion and Sedimentation Control

14 Total Possible Points

Example of Typical Credit

Sustainable Sites Credit 1:

Site Selection – Do NOT develop building, roads or parking on:

Prime farm land

Land that is less than 5 feet above 100 year flood elevation

Habitat for threatened or endangered species

Within 100 feet of any wetland

Land that was previously public parkland



LEED Rating System

Other Sustainable Site Credits Available for:

Urban Redevelopment

Brownfield Redevelopment

Alternative Transportation – Access to Public Transit

Alternative Transportation – Bicycle Storage/Changing

Alternative Transportation – Alternative Fuel Stations

Alternative Transportation – Minimum or No New Parking

Reduced Site Disturbance – Protect/Restore Open Space

Reduced Site Disturbance – Reduce Footprint/Increase Open Space

Stormwater Management – No Net Increase or 25% Decrease

Stormwater Management – Treatment Systems

Reduce Heat Island – Site Surfaces

Reduce Heat Island – Roof Surfaces

Light Pollution Reduction



LEED Rating System

Example of Heat Island Reduction utilizing Green Roof



Example of Interior Graywater Treatment



LEED Rating System

Water Efficiency

Goals:

Reduce the quantity of water needed for the building

Reduce municipal water supply and treatment burden



LEED Rating System

Water Efficiency:

No Prerequisites

5 Total Possible Points

Sample Credit:

Water Efficiency Credit 2 – Innovative Wastewater Technologies

Reduce the use of municipally provided potable water for building sewage conveyance by a minimum of 50%, OR treat 100% of wastewater on site to tertiary standards.

Example:

Change 50% of toilets and urinals to composting toilets and waterless urinals.



LEED Rating System

Other Water Efficiency Credits Available for:

Water Efficient Landscaping – Reduce Potable Water Consumption for Landscape Irrigation by 50%.

Water Efficient Landscaping – No Potable Water Use for Irrigation

Innovative Wastewater Technologies – Reduce by 50% or Treat 100% on Site (example at previous slide)

Water Use Reduction – 20% Reduction

Water Use Reduction – 30% Reduction



LEED Rating System

Example of Rain Water Capture for Irrigation

Example of Waterless Urinals





LEED Rating System

Energy and Atmosphere

Goals:

Establish energy efficiency and system performance

Optimize energy efficiency

Encourage renewable and alternative energy sources

Support ozone protection protocols



LEED Rating System

Energy and Atmosphere:

3 Prerequisites

Fundamental Building Systems Commissioning

Minimum Energy Performance

CFC Reduction in HVAC Equipment

17 Total Possible Points

Sample Credit:

Energy and Atmosphere Credit 2 – Renewable Energy (3 points available): Use on-site renewable energy for a percentage of total energy consumption:

5% - one point

10% - two points

20% - three points



LEED Rating System

Other Energy and Atmosphere Credits Available for:

Optimize Energy Performance by:

15% to 60% - New Construction **1-10 points**

5% to 50% -Existing Buildings **1-10 points**

Renewable Energy – 5% - 20% (example) **1-3 points**

Additional Commissioning

Ozone Depletion (Meet Montreal Protocol – no HCFC or halons)

Measurement and Verification (meet DOE protocol)

Green Power (purchase “Green-e” electric via 2 year contract)



LEED Rating System

Example of Photovoltaic Panel System





LEED Rating System

Materials and Resources

Goals:

Reduce the amount of materials needed

Use materials with less environmental impact

Reduce and manage waste



LEED Rating System

Materials and Resources:

1 Prerequisite

Storage and Collection of Recyclables

13 Total Possible Points

Sample Credit:

Local/Regional Materials:

Level 1: Use a minimum of 20% of building materials and products that are manufactured regionally within a radius of 500 miles – 1 point

Level 2: Of the regionally manufactured building materials in Level 1, use a minimum of 50% of building materials and products that are extracted, harvested or recovered (as well as manufactured) within a radius of 500 miles – 1 additional point



LEED Rating System

Other Material and Resource Credits Available for:

Building Reuse – Maintain 75% of Existing Shell

Building Reuse – Maintain 100% of Existing Shell

Building Reuse – Maintain 100% of Existing Shell and 50% Non-Shell

Construction Waste Management – Divert 50%

Construction Waste Management – Divert 75%

Resource Reuse – 5% Salvaged, Refurbished, Reused

Resource Reuse – 10% Salvaged, Refurbished, Reused

Recycled Content – Materials w/5% Recycled content

Recycled Content – Materials w/10% Recycled content

Local Regional Materials – 20% within 500 miles (example)

Local Regional Materials – 50% extracted within 500 miles (example)

Rapidly Renewable Materials – 5% of total value

Certified Wood – 50% of wood-based materials



LEED Rating System

Example of Strawboard-Core Cabinets



Certified Wood Doors





LEED Rating System

Indoor Environmental Quality

Goals:

Establish good indoor air quality

Eliminate, reduce, and manage the sources of indoor pollutants

Ensure thermal comfort and system controllability

Provide for occupant connection to the outdoor environment



LEED Rating System

Indoor Environmental Quality:

2 Prerequisites

Minimum IAQ Performance

Environmental Tobacco Smoke Control

15 Total Possible Points

Sample Credit:

Daylight and Views:

Achieve a minimum Daylight Factor of 2% in 75% of all spaces – 1 point

Achieve a direct line of sight to vision glazing for 90% of all regularly occupied spaces – 1 point



LEED Rating System

Other Indoor Environmental Quality Credits Available for:

Carbon Dioxide Monitoring

Increase Ventilation Effectiveness

Construction IAQ management Plan

Low-Emitting Materials (4 points available)

Indoor Chemical and Pollutant Source Control

Controllability of Systems (by occupants – 2 points)

Thermal Comfort (2 points available)

Daylight and Views (2 points available – Example)



LEED Rating System

Line-of-sight views



Daylighting





LEED Rating System

Innovation and Design

Provide the design team the opportunity to be awarded points for exceptional performance above requirements set by the LEED Rating System and/or innovation performance in Green Building categories not specifically addressed by the LEED Rating System – 4 points available

LEED Accredited Professional – 1 point

LINKS

Green Energy Ohio

www.greenenergyohio.org

US Green Building Council

www.usgbc.org

Cleveland Green Building Coalition

www.clevelandgbc.org

Whole Building Design Guide

www.wbdg.org

Rocky Mountain Institute

www.rmi.com

Smart Communities Network

www.sustainable.doe.gov

Environmental Design + Construction

www.edgmag.com

Green Matrix

www.grenmatrix.net

Congress of the New Urbanism

www.cnu.org



Questions