LEED Certification

What does LEED characterize?
• Leadership in
• Energy and
• Environmental
• Development

How was it created?
• Created by United States Green Building Council (USGBC) in 1998
• Developed by
  – architects
  – Realtors
  – building owners
  – Lawyer
  – Environmentalist
  – industry reps
How was it created?

• Needed to define and measure a green building.
• Continuously updated and improved

What does it take to be a LEED Accredited Professional?

• 2 hour exam with 80 questions
  – $300 for USGBC members
  – $400 for USGBC nonmembers
• Tutorials available
  – Online - www.greenbuild365.org
  – Full day course
• More information at www.gbc.org
Starting Projects

• Determine design team
  – Need team leader
• Determine design rating system
• Register at www.usgbc.org
• Registration fee
  – $450 members
  – $600 non members

Project Certification

• Online project list
• Documentation!!!
• Design Review
• Construction Review

Design Review

• Design submitted and reviewed
  – Design team can see which credits will be accepted
• Improve design to increase LEED certification
• 2/3 of certification fee due at this time
Construction Review

• Conducted at completion of construction
• Can be submitted at the same time as the Design Review
• Each design phase credit will be reviewed and determined completed successfully

Areas addressed

• Sustainable Sites
• Water Efficiency
• Energy & Atmosphere
• Materials & Resources
• Indoor Environmental Quality
• Innovation in Design

LEED Green Building Ratings

<table>
<thead>
<tr>
<th>Ratings</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certified</td>
<td>26-32</td>
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<tr>
<td>Silver</td>
<td>33-38</td>
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<tr>
<td>Gold</td>
<td>39-51</td>
</tr>
<tr>
<td>Platinum</td>
<td>52-69</td>
</tr>
</tbody>
</table>
LEED Ratings

• Each Area has Prerequisites
• All Areas have Credits to build LEED rating
• Find rating at www.usgbc.org

Sustainable Sites

• To develop construction site as not to make an environmentally adverse impact on the construction site and surrounding area.

Sustainable Sites

• Prerequisite
  – Reduce soil erosion and dirt leaving construction site via water and air by developing a ESC Plan
  – NPDES permit – mandatory for site over 1 acre
What does a ESC include?

- Site Plan
- Controls
  - Storm Water Pollution Prevention Plan (SWPPP)
  - Best Management Practices (BMPs)
- Maintenance
- Inspections
- Non-Storm Water Discharges
- Construction Contractors must sign permit

Site Selection Credits

- Site Selection
- Development Density & Community Connectivity
- Stormwater Design
- Heat Island Effect
- Site Development
- Light Pollution Reduction
- Brownfield Redevelopment
- Alternative Transportation

Pictures from US EPA website

Pictures from Stuart Jennings at Montana State University, Land and Water magazine and University of Vermont websites
Site Selection – Credit 1

- Pick an appropriate site
- Reduce environmental impact of building on site
- Cannot develop on:
  - Prime farmland
  - Below 5’ above 100 year floodplain
  - Habitat of threatened or endangered animals
  - 100’ from wetlands
  - 50 ft from surface water
  - Public parkland

Development Density & Community Connectivity – Credit 2

- Develop Urban areas.
- Protect greenfields
- Preserve habitat and natural resources
- 2 options

Development Density & Community Connectivity – Credit 2

- Construct or renovate building on previous developed site
- In a community with a minimum density of 60,000 SF/ac net
- Construct or renovate building on previous developed site
- Within ½ mi of a residential zone or neighborhood with an average density of 10 units/ac
- Within ½ mi of at least 10 basic services
- Pedestrian access between the building and services
Basic Services

- Bank
- Place of Worship
- Convenience Grocery
- Day Care
- Cleaners
- Fire Station
- Beauty
- Hardware
- Laundry
- Library
- Medical/Dental

- Senior Care Facility
- Park
- Pharmacy
- Post Office
- Restaurant
- School
- Supermarket
- Theater
- Community Center
- Fitness Center
- Museum

Brownfield Development – Credit 3

- What is a Brownfield Site?
  - Contaminated w/ hazardous substance or pollutant
- Rehabilitate damaged sites
- Land prices cheaper
- Remediation costs could be high
Alternative Transportation – Credit 4.1

• Public Transportation Access
• Reduce pollution from automobile use
• Locate project within ½ mi of existing or future commuter rail, light rail or subway station
• Locate project within ¼ mi of one or more public or campus bus lines usable by occupants

Alternative Transportation – Credit 4.2

• Bicycle Storage & Changing Rooms
• Commercial or institutional blgs
  – Provide secure bicycle racks and/or storage for at least 5% of all blg users
  – Provide shower and changing facilities in blg for 0.5% of FTE occupants
• Residential
  – Covered storage for bicycles for 15% of blg occupants

Alternative Transportation – Credit 4.3

• Low emitting & Fuel Efficient Vehicles
• 3 options
  – Provide low-emitting & fuel-efficient vehicles for 3% of FTE occupants AND preferred parking
  – Provide preferred parking for low-emitting & fuel-efficient vehicles for 5% of the total vehicle parking capacity
  – Install alternative fuel refueling stations for 3% of the total vehicle parking capacity
Alternative Transportation – Credit 4.4

• Parking Capacity
  • 4 options
    – Nonresidential - Size parking capacity to meet, but not exceed, minimum local zoning requirements AND provide preferred parking for carpools or vanpools for 5% of the total parking spaces
    – Nonresidential – provide parking for less than 5% of FTE blg occupants AND provide preferred parking for carpools or vanpools for 5% of the total parking spaces

– Residential - Size parking capacity to meet, but not exceed, minimum local zoning requirements AND provide infrastructure and support programs to facilitate shared vehicle usage.
  – All – Provide no new parking

Site Development – Credit 5.1

• Protect or Restore Habitat
  • 2 options
    – Greenfield sites limit all site disturbances
      • 40’ beyond blg perimeter
      • 10’ beyond walkways, patios, surface parking & utilities less than 12” in diameter
      • 15’ beyond primary roadway curbs & main utility trenches
      • 25’ beyond constructed areas with permeable surfaces
Site Development – Credit 5.1

• Protect or Restore Habitat
• 2 options
  – Previously developed or graded sites, restore or protect at least 50% of the site area with native or adapted vegetation.

Site Development – Credit 5.2

• Maximize Open Space
• 3 options
  – Provide vegetated open space that exceeds local zoning open space requirement for the site by 25%
  – No local zoning requirements, vegetated open space area = building footprint
  – Zoning ordinance w/ no requirement for open space, vegetated open space = 20% of site area

Site Development – Credit 5.2

• Maximize Open Space
• All options
  – If earn SS Credit 2, vegetated roof areas can contribute to credit compliance
  – If earn SS Credit 2, pedestrian oriented hardscape areas can contribute to credit compliance but 25% of open space must be vegetated
  – Wetlands or naturally designed ponds may count as open space if the side slope 1:4 or less and vegetated
Stormwater Design – Credit 6.1

• Quality Control
• Limit disruption of natural water hydrology
  – Reduce impervious cover
  – Increasing on site infiltration
  – Reducing or eliminating pollution from stormwater runoff
  – Eliminating contaminants

• Case 1 – existing imperviousness < 50%
  – Discharge rate not exceed 1 or 2 yr 24 hr storm
  – Implement stormwater management plan protect receiving streams from excessive erosion

• Case 2 – existing imperviousness > 50%
  – Decrease stormwater runoff of 2 yr, 24 hr storm by 25%

Stormwater Design – Credit 6.2

• Quality Control
• Limit disruption and pollution of natural water flow by managing stormwater runoff
  – Reduce impervious cover
  – Promotes infiltration
  – Capture and treat 90% of average annual rainfall using BMP
Stormwater Design – Credit 6.2

• BMPs
  – Remove 80% average annual post development TSS
  – Designed in accordance with standards and specs from state or local program that has adopted these performance standards
  – In field performance monitoring data demonstrating compliance

Stormwater Design – Credit 6.2

• Alternative surfaces
  – Vegetated roofs
  – Pervious pavements
  – Grid pavers

• Nonstructural techniques
  – Rain gardens
  – Vegetated swales
  – Disconnection of imperviousness
  – Rainwater recycling

Stormwater Design – Credit 6.2

• Sustainable Design Strategies
  – Constructed wetlands
  – Vegetated filters
  – Open channels treating stormwater runoff
Heat Island Effect – Credit 7.1

- Non-roof
- Reduce heat islands w/ 2 options
  - Any combination of following for 50% of site hardscape
    - Shade within 5 yr of occupancy
    - Paving materials with SRI at least 29
    - Open grid pavement system
  - Place minimum of 50% of parking spaces under cover w/ roof of SRI at least 29

SRI for paving materials

- Which materials can be used?

<table>
<thead>
<tr>
<th>Material</th>
<th>Emittance</th>
<th>Reflectance</th>
<th>SRI</th>
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<tbody>
<tr>
<td>Typical Light Gray Concrete</td>
<td>0.9</td>
<td>0.26</td>
<td>47</td>
</tr>
<tr>
<td>Typical Medium Gray Concrete</td>
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<td>0.26</td>
<td>47</td>
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<tr>
<td>Typical White Concrete</td>
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<tr>
<td>Low Reflective White Concrete</td>
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<td>85</td>
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<tr>
<td>High Reflective White Concrete</td>
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<td>0.44</td>
<td>85</td>
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<tr>
<td>Marble</td>
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<td>0.8</td>
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<tr>
<td>Asphalt</td>
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<td>0.10</td>
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</tbody>
</table>

Heat Island Effect – Credit 7.2

- Roof
- Reduce heat islands w/ 3 options
  - Roof materials w/ SRI ≥ listed for a minimum of 75% of roof surface
  - Vegetated roof for at least 50% of the roof area
  - Install high albedo and vegetated roof surfaces that meet
    - \( \frac{\text{Area of SRI roof}}{0.75} + \frac{\text{Area of vegetated roof}}{0.5} \geq \text{total roof area} \)
Heat Island Effect – Credit 7.2

- www.coolroofs.org

<table>
<thead>
<tr>
<th>Roof Type</th>
<th>Slope</th>
<th>SRI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-sloped roof</td>
<td>≤ 2:12</td>
<td>78</td>
</tr>
<tr>
<td>Steep-sloped roof</td>
<td>&gt; 2:12</td>
<td>29</td>
</tr>
</tbody>
</table>

SRI for roofing materials

- Which materials can be used for a typical residential house with a ?
- Which materials can be used for an apartment building?

Light Pollution Reduction – Credit 8

- Minimize light from building and site
- Interior lighting
  - Interior lights cannot shine directly thru windows to outside OR
  - Non-emergency lights shall be automatically controlled to turn off during non-business hours
Light Pollution Reduction – Credit 8

• Exterior lighting
  – Only light areas for safety & comfort
  – Use ASHRAE standard
    • Not to exceed 80% of lighting power densities for exterior areas & 50% for blg facades and landscape
    • All projects have to be classified under a zone

• Zones
  – Dark – park & rural setting
  – Low – residential area
  – Medium – commercial/industrial, high density residential
  – High – major city centers, entertainment districts