THE CIRCLE OF LIFE: PRACTICAL AND SUSTAINABLE DESIGN

The focus of the session is to inform park managers and maintenance personnel of ecologically responsive building designs. These buildings use Leadership in Energy and Environment Design (LEED), standards for the conservation of energy and resources, in the development of facility design.

1. Select suitable site for new building construction that will be cost effective and environmentally friendly.
   - Site selection is important; building in a flood plain will cost significantly more money due to hydrostatic pressure.
   - Do not disturb areas more than forty feet away from the building.
   - When landscaping the area be sure to use native species that compliment the ecosystem. Avoid nonnative flora that could potentially harm the ecosystem.

2. Integrated Design
   - Create wetlands from storm water runoff; reduces the amount of water that flows directly into a stream or river.
   - Use bioswells to filter water before it enters the aquifer.
   - The planting of trees will reduce the heat sinks and microclimates that adversely effect ecosystems.

3. Water Efficiency
   - Do not use potable to irrigate.
   - Plant species of grass that will need to be mowed once or twice a year.
   - Gray water: use of roof runoff in toilets and urinals.

4. Materials and Resources
   - Have recycling programs that accommodates 98% of all office products.
   - When remodeling contact people who will recycle discarded materials.
   - Use as many recycled materials as possible.
   - Use materials that are with a fifty mile radius.
   - Use rapidly renewable resources such as bamboo, linoleum, and quark.
   - Use durable products that will require little maintenance; such products will conserve vast amounts of resources over a long period of time. Use brick or stone in the construction of a facility.
   - Improve the air quality of a building by using materials that are low in toxins.
5. Energy and Atmosphere
   • Design the building in an “H” shape for more windows that will increase heat and light efficiency.
   • Use better insulation in roof and three pane windows.
   • Control different parts of the buildings climates to maximize energy efficiency. Some parts of the building will be used while others will not be used.
   • Use energy efficient fixtures and lights and occupancy sensors.
   • Use solar water systems that heat water with the heat of the sun.
   • Energy efficient products present substantial upfront cost; however, more money will be saved in the long run.
The Circle of Life: Practical Sustainable Design
Speakers

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Learning Objectives

- Better Understanding of LEED Goals and Objectives.
- Apply Practical Sustainable Design Practices
- Review the Impact of Sustainable Design on the operational cost of a facility.
- Benefits of Commissioning New and Existing Buildings
What is LEED?

LEED: Leadership in Energy and Environment Design

- Guidelines established by the US Green Building Council. 
  [www.usgbc.org](http://www.usgbc.org)

- Promote the design, construction and operation of buildings that are environmentally responsible, profitable and health places for people to work and live.

- Define green by providing a standard for measurement. Provide third party certification for buildings.

- Promote whole building, integrated design process.
What is “Green Design”?

Design and Construction Practices that significantly reduce or eliminate the negative impacts of buildings on the environment and the occupants in five areas:

- Sustainable Site Design
- Safeguarding Water and Water Efficiency
- Energy Efficiency and Renewable Energy
- Conservation of Material and Resources
- Indoor Environmental Quality
LEED Rating System

- Indoor Environmental Quality: 23%
- Sustainable Sites: 22%
- Water Efficiency: 8%
- Energy & Atmosphere: 27%
- Materials & Resources: 20%
Sustainable Site Design

Goals:

- Develop only appropriate sites.
- Reuse of Existing Buildings
- Protect natural and agricultural uses
- Reduce the need for Automobile Use.
- Protect and Restore Site.
Sustainable Site Design

Erosion Control Plan for any Site Development

- Control erosion to reduce the negative impacts on Water and Air Quality
- Common Accepted Practice in Construction
- EPA Requirement for Storm Water Management
Sustainable Site Design

Site Selection

- Sensitive to Floodplain Elevations and Wetlands
- Development on Public Parkland
- Reduced Site Disturbance, Limit Development with 40’ of building footprint.
Sustainable Site Design

Alternative Transportation

- Provide Bicycle Storage and Shower Facilities
- Promote carpooling by providing preferred parking
- Size parking capacity not to exceed minimum local zoning
- Purchase of Hybrid Cars in Fleet
- Promote use of Public Transportation
Sustainable Site Design

Storm Water Management

Limit the disruption of natural water flows by minimizing storm water run-off.

- Reducing the quantity and increasing the quality.
- Reduce impervious surfaces.
Sustainable Site Design

Green Roofs / Cool Roofs

- Reduction of Heat Island
- Reduction in Heating and Cooling Cost
- Clean Run-Off
- Reduce Quantity of Storm Water Run-off
Sustainable Site Design

Filtration Systems
- Bioswales
- Pervious Pavements
- Constructed Wetlands / Natural Water Treatment
- Natural Settings: Decrease in Maintenance and Care of Landscaping
Sustainable Site Design

Landscaping and Exterior Design to Reduce Heat Island Effect

- Minimize Impact on Microclimate, humans and wildlife habitat
- High albedo materials and Shading of Parking Lots.
Sustainable Site Design

Light Pollution Reduction

- Eliminate light trespass from Buildings and sky, improve night sky access.
  - Hidden Bulbs.
  - Parking Lot Light Levels Below Zoning Requirements
  - Time Clocks / Photocells

- Reduces Infrastructure Cost and Energy Usage
Water Efficiency

Goals

- Reduce the quantity of water needed for buildings and landscaping.
- Reduce Municipal Supply and Treatment Burden
Water Efficiency

Water Efficient Landscaping

- Natural Landscaping / Prairie Grasses / Perennial
- No irrigation systems
- Reduction in Maintenance, Operating, Infrastructure and Utility Cost
Water Efficiency

Rain Water Harvesting

- Rain Barrels / Cisterns / Rain Gardens
- Grey Water for landscaping or toilets.
Water Efficiency

Water Use Reduction

- Toilet Flush Valve
- Waterless Urinals
- Fixture Sensors
- Composting Toilets.
Material and Resources

Goals

- Reduce the amount of Materials Needed
- Use materials with less environmental impact
- Reduce and Manage Waste
Material and Resources

Storage and Collection of Recyclables

- Majority of the population is inclined to recycle if not inconvenient or costly
- Initiate a Recycling Program which is readily accessible.
  - Average Weight of Waste per employee: 2.9 pounds per day
  - 98% is recyclable.
Material and Resources

Building Re-Use and Construction Waste Management.

- Building Re-Use reduces initial upfront cost to a New Facility
- Re-use and recycling of construction waste is not economically feasible.
- Rule of Thumb: If landfill tipping fees exceed $50.00 per ton. Recycling becomes cost effective.
- Other Resources:
  - Recycling program for Acoustic Tile. www.armstrong.com/environmental
  - Recycling program for Electronic http://www.illinoisrecycles.org/byteback_list.html
Material and Resources

Material Selection

- Recycled Content and Post Consumer Recyclable.
- Regional Materials- 500 mile Radius
- Rapidly Renewable Materials Resources
- Embodied Energy
Material and Resources

Material Selection / Durable and Easily Maintained

- Carpeting
- Linoleum/ Cork / Bamboo
- Stained Concrete Floors
- Terrazzo
Material and Resources

Material Selection / Durable and Easily Maintained
- Low- VOC emissions from paints, adhesive and building materials
- Integrally colored block/ brick stone.
- Wheatgrass cabinetry
Energy & Atmosphere

Goal:

- Establish Energy Efficiency and System Performance
- Optimize Energy Efficiency
- Encourage Renewable and Alternative Energy Sources
Energy and Atmosphere

The 12 – Step Integrated Design Process

- Issues
- Goals
- Charette
- Alternatives
- Client
- Matrix
- Analysis
- Design Development
- Documentation
- Bid
- Construction
- Commissioning

- Involve all the Players from the Beginning
- Approach Design Issues as a group
- Good solutions often affect multiple disciplines
- Holistic, Team-based Design
Energy and Atmosphere

Commissioning & Building Envelope

Commissioning is the systematic process of ensuring that all building systems perform interactively according to the design intent and the owner’s operational needs.

- Maximizes the effective use of energy while providing good indoor air quality
- Improved occupant comfort and productivity
- Commissioning of building envelope ensures that architectural design and mechanical systems are appropriate for each other
Energy and Atmosphere

HVAC Systems Controllability

HVAC Systems can be designed to control important atmospheric conditions such as:

- Carbon Dioxide Levels
- Ventilation
- Temperature
- Humidity
Energy and Atmosphere

Lighting & Lighting Controls

Photometrics – Why do we need them?
- Measures how much light is needed
- Ensures that there is enough but not an excess of light
- Can reduce construction costs and energy costs as well as provide eye-health benefits to occupants

Energy Efficient Fixtures
- Use less energy, last longer

Multi – level switching
- Allows occupants to choose lighting levels based on specific needs

Occupancy Sensors
- Reduces energy costs by automatically turning off lights not in use
Energy and Atmosphere

Ventilation Effectiveness & Indoor Air Quality

- Problem sources
  - Polluted Outdoor Air
  - Building Equipment
  - Carpeting & Furnishings
  - Indoor Sources

- Poor IAQ can cause headaches, fatigue, coughing, sneezing, or dizziness
Energy and Atmosphere

Renewable Energy

- Solar Hot Water
  - Roof mounted
  - Solar Wall
- Photovoltaics
  - Roof mounted
  - Building Integrated
- Wind Energy
  - Low Speed Vertical
  - Building Mounted Horizontal
- Geothermal
  - Horizontal
  - Vertical Wells
Energy and Atmosphere

Day-lighting and Views

If controlled properly…

- Decreases time spent on tasks
- Increases mental function and memory recall
- Increases overall “well-being,” less fatigue
- Increases learning progression in educational settings
- People are generally happier, more satisfied, and content when daylight is used
Indoor Environmental Quality

What are the economic benefits of increasing the quality of your indoor environment?

What are the potential economic costs of a building with poor indoor environment quality?
Benefits of Green Design

- Environmental Benefits
  - Reduce the impact on the environment

- Economic Benefits
  - Improve the bottom line by optimizing life cycle economic and reduce operating cost.

- Health and Safety Benefits
  - Enhance Occupant Comfort

- Personal Satisfaction: Environmental Stewardship
Question and Answer

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THANK YOU
Resources

Roofing
www.coolroofs.org
www.greenroofs.com

Light Pollution
www.darksky.org

Water Efficiency
American Rainwater Catchment Systems Association
www.arcsa-usa.org

American Water Works Association
www.waterwise.org

Composting Toilet Review
www.Buildinggreen.com/features/mr/waste.html
Resources

Recycling at Work
www.usmayors.org/USCM/recycle

Construction Materials Recycling Association
www.cdrecycling.org

Grants
Illinois Clean Energy Community Foundation
http://www.illinoiscleanenergy.org/grants.asp
Illinois Solar Thermal Grant Program
Ohio Energy Loan Fund (ELF) Grants
http://www.odod.state.oh.us/cdd/oee/elfgrant.htm
Wisconsin Focus on Energy Rebate Program
http://www.focusonenergy.com/page.jsp?pageld=905
Michigan Energy Efficiency Grants
http://www.michigan.gov/lieefund
Resources

Building Commissioning Association
www.bcxa.org