Healthy Building, Healthy Bottom Line

Session 33C

2:00 - 3:30 PM

May 2, 2012

Speakers

- **Frank Muraca**
  - *Owner's Representative*
  - ARCH Consultants, ltd. (847.541.3220)
- **Susan King**
  - *Architect*
  - Harley Ellis Devereaux
- **Geoff Roehll**
  - *Landscape Architect*
  - Hitchcock Design Group

Benefits of Green Building

Environmental benefits

- **Reduce the impacts of natural resource consumption**

Economic benefits

- **Improve the bottom line**

Health and safety benefits

- **Enhance occupant comfort and health**

Community benefits

- **Minimize strain on local infrastructures and improve quality of life**

Benefits of Green Building

Competitive first costs

- **Integrated design allows high benefit at low cost by achieving synergies between disciplines and between technologies**

Reduce Operating Costs

- **Lower utility costs significantly**

Decrease vacancy, improve retention

- **Marketing Advantages**

Reduce liability

- **Improve risk management**

Agenda

- Architectural Factors
- Landscaping Factors
- Owner Considerations
- Summary

Sustainable Building

The United Nations World Commission on environment and development defines sustainable building as, "*The ability of humanity to ensure that development meets the needs of the present without compromising the ability of future generations to meet their own needs*."

Architectural Factors

HARLEY ELLIS DEVEREAUX

Discussion Points:

- **Practical & Operational Benefits for Seniors**
  - Health & Thermal Comfort
  - Lower Operating Costs
- **Case Studies / Examples – Benchmarking Tools**
  - Victory Centre South Chicago:
    Supportive Living Facility: LEED NC Silver
  - Lakefront Residences of Grayslake:
    Senior Apartments: National Green Building Standard: Bronze
  - Parkview Senior Apartments: Study
    LEED Platinum

Definition of Sustainable Housing:

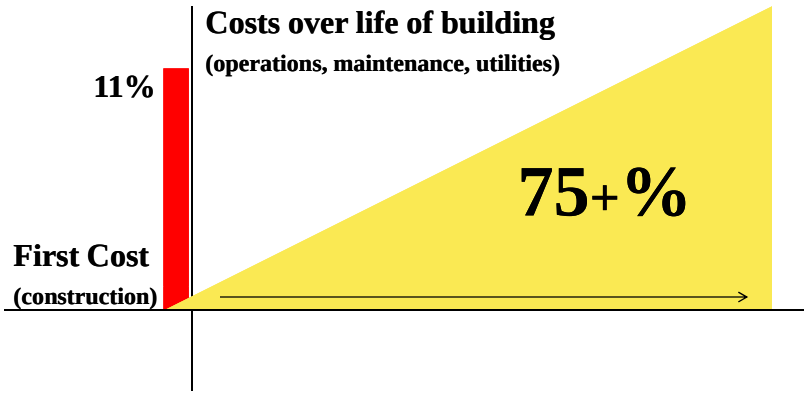
- Affordable to operate/maintain over time
- Long-lasting, Durable
- Producers rather than consumers: Natural Resources, energy, water, etc.
- Healthy: Products & Air Quality
- Location: Services, work near by? walk-able? Promote Active Living?

Challenges - Architect

- Money/Constr. Budget is Tight
- Professional Fees:
  - For integrated design - $$$ need to be repositioned
  - Additional Fee required for non traditional scopes:
    ie: energy modeling, certification documentation, commissioning
- Change is hard, takes time
  - Integrated Design Methodology is New
  - Consultants & Contractors resistant to change
  - Code Officials resistant to new technology/products
- Must Spend Time De-Bunking the "Maintenance Free" Myth

Why Integrated Design is Important:

First Cost vs. Life Cycle Costs



10% of design commits 90% of future costs

Sustainable Design:
A *Natural* for Senior Living

THE FUNDAMENTAL PREMISE:

- "GREEN" connotes something . . .
  - Living
  - Thriving
  - Healthy
  - Vibrant
- An Attitude of STEWARDSHIP toward . . .
  - Our Elders
  - Our Earth
- Parallel & Complementary Purposes & Challenges:
  - Defying "Conventional Wisdom"
  - Taking Responsibility
  - Instigating Cultural Transformation

Practical & Operational Benefits for Senior Living

TWO BASIC CATEGORIES

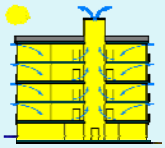
- **Health & Comfort**
  - Air Quality
  - Light & Views
  - Community & Nature
- **Lower Operating Costs**
  - Energy Efficiency
  - Durability /Low Maintenance

Health & Comfort

- **Goal:**
  - Indoor Air Quality
- **Challenges:**
  - Heightened Sensitivity to Environmental & Airborne Chemical Toxins & Pollutants
  - Prolonged Indoor Confinement
- **Solutions:**
  - Low-Emitting Building Materials with Limited or No:
    - Volatile Organic Compounds (VOCs)
    - Formaldehyde
    - Off-Gassing
  - Carefully Selected Maintenance & Cleaning Products
  - Ample Outside Make-up Air and Exhaust Systems: Utilizing Heat Exchange Technology to Minimize Heat Loss

Health & Comfort

- **Goal:**
  - Thermal Comfort
- **Challenges:**
  - Heightened Sensitivity to Temperature Extremes
  - Vulnerability to Drafts
  - Varying Individual Interior Climate Control Needs & Preferences
- **Solutions:**
  - Tight Building Envelope
  - Ample *Controlled* Natural Ventilation
  - Thoughtful HVAC Zoning
  - Deliver Heat & Cooling Where It's Needed
  - Flexible, User-Friendly, Programmable HVAC Controls



Stack Effect Building Ventilation

Radiant Floor Heating

Programmable Digital Thermostat

Health & Comfort

- **Goal:**
  - Visual Comfort
- **Challenges:**
  - Vision Impairments (e.g. Glaucoma, Cataracts, Macular Degeneration)
  - Heightened Sensitivity to Glare
  - Difficulty Adjusting to Changing Light Conditions
- **Solutions:**
  - Proper Orientation & Shading of Windows
  - Bright yet Diffuse and Uniform Lighting
    - Ample *Controlled* Daylight
    - Glare-Free Indirect Light Fixtures
  - Generous Task Lighting Where It's Needed
  - Flexible, User-Friendly, Programmable Lighting Controls

Window Orientation & Shading

Ample Controlled Daylight

Bright Indirect Light

Good Task Lighting

Light & Views / Community & Nature

- **Goal**:
  - Orientation
- **Challenges**:
  - Dementia & "Sundowning"
  - Prolonged Indoor Confinement
  - Lack of Positive Sensory Stimulation (e.g. Contact with Nature)
- **Solutions**:
  - Generous Well-Placed Windows
  - Visually (if not Physically) Accessible Plant & Animal Habitats
    - Minimal Site Disturbance & Native Planting Materials
    - Water Features
    - Promotion of Biodiversity & Habitat
  - Indoor Lighting Controls that Mimic Diurnal Cycles

Desirable Views of Outdoors

Access to Natural Settings

Native Plantings & Water Feature

Community & Nature

- **Goal:**
  - Community
- **Challenges:**
  - Social Isolation
  - Loneliness
  - Depression
- **Solutions:**
  - Access to & Integration with Outside Community
    - Urban Infill & Redevelopment Sites
    - Walkable Communities
  - Improved Family, Caregiver, & Visitor Access
    - Proximity to Downtown/Community Core Areas
    - Provision for and Proximity to Alternate Transportation Modes

Integration with Outside Community

Family, Caregiver & Visitor Access

Lower Operating Cost

- **Goal:**
  - Efficient & Economical Operations
- **Challenges**:
  - Owner/Operator-Borne Utility Expense
  - Aging Physical Plants
  - High Staff Turnover Rates
  - Labor Intensive Operations
- **Solutions:**
  - Optimal Energy Efficiency
    - High-Efficiency Equipment
    - Well-Designed Building Envelope
  - Life-Cycle Cost Analysis
  - Efficient & Comfortable Working Environment

Case Study

Victory Centre of South Chicago

Developer: Pathway Senior Living
Community Partner: Neighborhood Housing Services

Phase One: Supportive Living Facility

Case Study

Victory Centre of South Chicago

Overview:

Phase One:
Supportive Living Facility,
5 Stories, 112 Studio Apartments
Supportive Services at Ground Floor

Green Benchmark:
LEED Certified Silver

Phase Two:
Independent Living,
Senior Center at the Ground Floor
5 Stories, 72 One Bedroom Apartments
City of Chicago Senior Center

Green Benchmark:
LEED Certification Pending, Silver Targeted

Case Study

Victory Centre of South Chicago

Phase Two: Senior Apartments

Victory Centre of South Chicago: Why is it Green?

Health

Materials

-Low emitting product specification

-Roof Terrace

Community

-Urban Infill, Brownfield Site,
-Near Mass Transit,
-Senior Community Center
-Urban Heat Island Reduction
-AGE Principles for exterior program

Lower Operating Costs

Water Efficiency

-StormWater Management through Rain Gardens & Bioswales

-Low Flow Plumbing Fixtures

Energy Efficiency

Building Envelope

High Efficiency Mechanical Systems,

Tight Envelope

Solar Thermal

Materials

Regional, Rapidly Renewable & Durable Materials

LEED NC *(Credit Categories)*	☆ ☆☆ ☆☆☆ Green Homes Chklist *(Point Categories)*
• Sustainable Sites	• Sustainable Sites
• Water Efficiency	• Energy Efficiency
• Energy Efficiency	• Materials
• Materials & Resources	• Health and Safety
• Indoor Environmental Quality	• Resource Conservation
• Innovation	• Homeowner Education
	• Innovation

Case Study

Lakefront Residences of Grayslake

Developer: Mercy Housing Lakefront

Overview:
Independent Living Facility,
3 - 4 Stories, 63 One Bedroom Apartments
Supportive Services at Ground Floor

Green Benchmark:
National Green Building Standard:
Bronze Level

Case Study

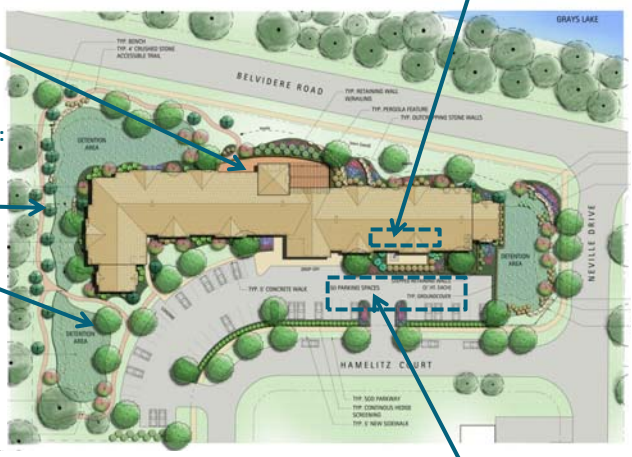
Lakefront Residences of Grayslake

Community:

North & South Porches

Active Living:

- Walking Trail
- Resident Garden Plots (Raised)



Site Plan

Lower Operating Costs

Solar thermal Array

Geothermal Field

Case Study

Lakefront Residences of Grayslake

South Elevation

Durability &
Low Maintenance:
Hardie Siding

Lakefront Residences of Grayslake — Why is it Green?

Health

Materials

-Low emitting product specification

-

Community

-Ground Floor Great Room open to Exterior Porch, Raised Beds for Community Beds for Gardening

Light & Views

Views To Lake, Daylighting in Corridors

Lower Operating Costs

Water Efficiency

-StormWater Management through Rain Gardens & Bioswales

-Low Flow Plumbing Fixtures

Energy Efficiency

Building Envelope

High Efficiency Mechanical Systems,

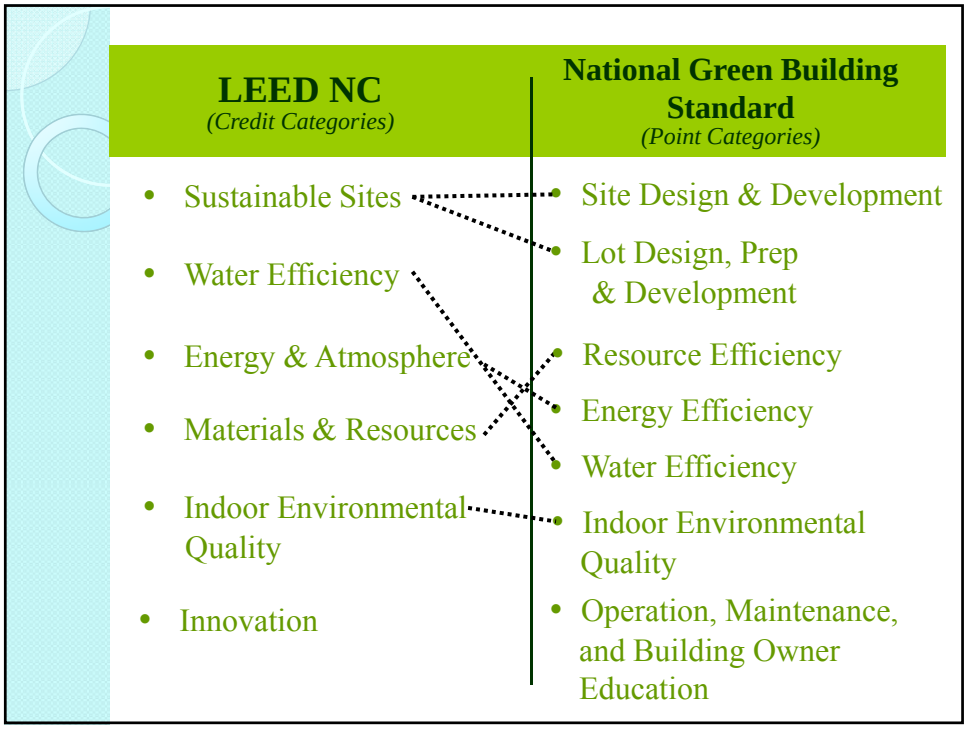
Tight Envelope

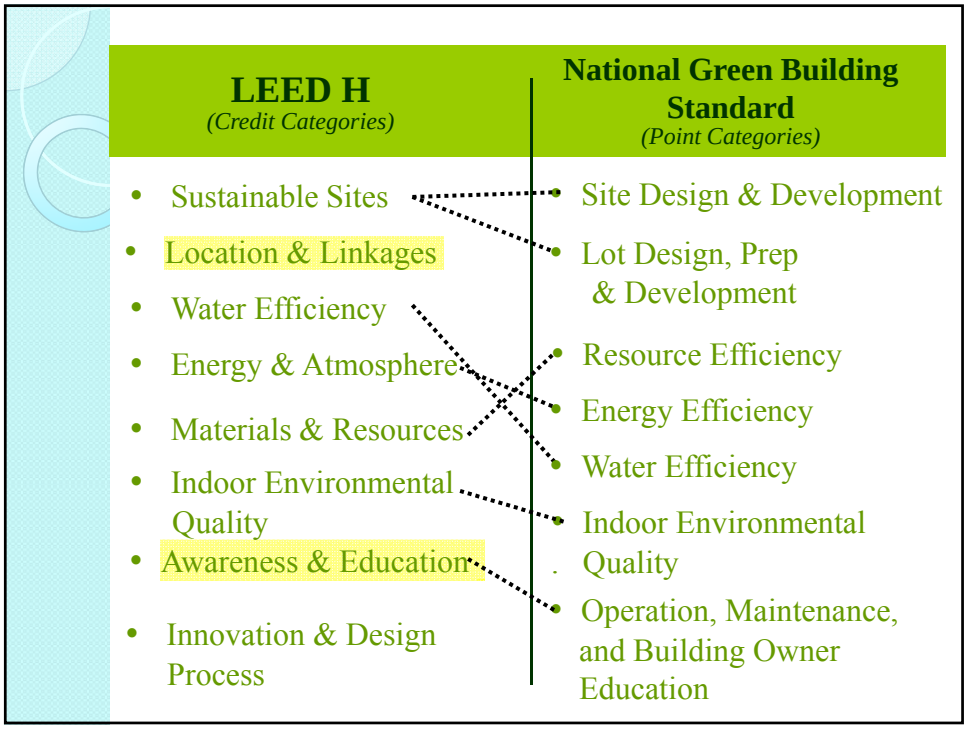
Geothermal

Solar Thermal

Materials

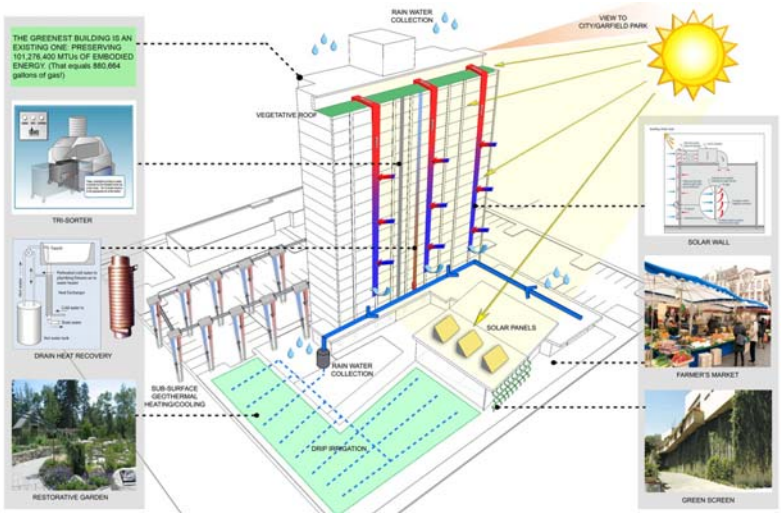
-Regional, &
-Durable Materials: Exterior Hardie Siding,
-Hard Surfaces & Carpet Tiles


LEED NC
(Credit Categories)
National Green Building Standard
(Point Categories)
Sustainable Sites
Water Efficiency
Energy & Atmosphere
Materials & Resources
Indoor Environmental Quality
Innovation
Site Design & Development
Lot Design, Prep & Development
Resource Efficiency
Energy Efficiency
Water Efficiency
Indoor Environmental Quality
Operation, Maintenance, and Building Owner Education


LEED H
(Credit Categories)
National Green Building Standard
(Point Categories)
Sustainable Sites
Location & Linkages
Water Efficiency
Energy & Atmosphere
Materials & Resources
Indoor Environmental Quality
Awareness & Education
Innovation & Design Process
Site Design & Development
Lot Design, Prep & Development
Resource Efficiency
Energy Efficiency
Water Efficiency
Indoor Environmental Quality
Operation, Maintenance, and Building Owner Education

Case Study

Parkview Senior Apartments



Sustainable Design Diagram

Case Study

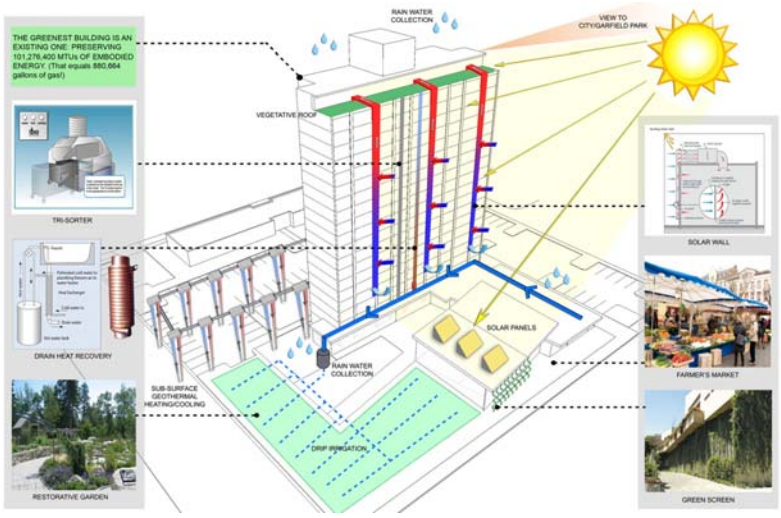
Parkview Senior Apartments

Overview:
Independent Living & Senior Center
180 One Bedroom Apartments,
Highrise Modernization Study

Ground Floor Plan

Case Study

Parkview Senior Apartments



Sustainable Design Diagram

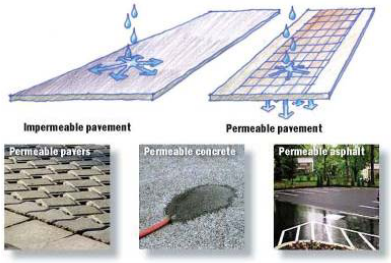
Landscape Factors

HITCHCOCK DESIGN GROUP
creating better places


Green
Creating Better Places®
for Senior Living
Hitchcock Design Group


Shop Better.
Dine Better.
Play Better.
Learn Better.
Live Better.
Heal Better.

Technique 2:
Permeable Pavement

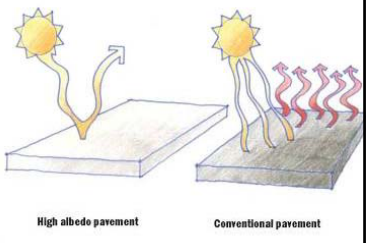


Permeable pavement has pores or openings that allow water to pass through the surface and percolate through the existing subsoil. Permeable pavement comes in the form of permeable asphalt, permeable concrete, and permeable pavers. In areas where soils do not drain freely, permeable pavement can be used in combination with subsurface drainage systems, like pipe underdrains or stormwater infiltration trenches to slow runoff and reduce stress on the combined sewer system.

Potential Benefits

- Reduces the rate and quantity of stormwater runoff
- Reduces stress on the sewer system
- Recharges ground water
- Filters silt, pollutants and debris

Technique 3:
High Albedo Pavement

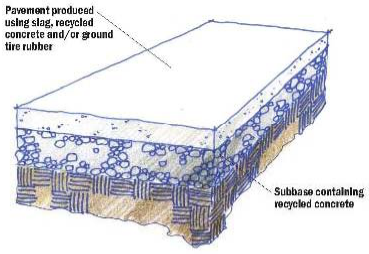


High albedo pavement material is light in color and reflects sunlight away from the surface. With less sunlight absorbed by pavement, less heat is radiated by the pavement. High albedo pavement therefore reduces the urban heat island effect. This reduces cooling costs, helps the survival of urban vegetation, and improves air quality, which can help reduce the symptoms of som respiratory diseases.

Potential Benefits

- Reduces the urban heat island effect
- Can be used under a wide variety of site conditions
- Conserves energy by reducing cooling costs
- Improves air quality

Technique 4:
Recycled Construction Materials

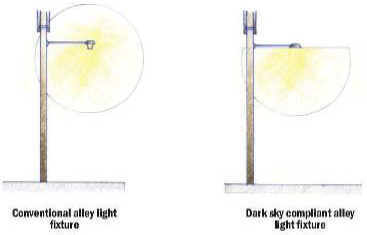


Recycled construction materials can be incorporated in a variety of ways in green alleys. Recycled concrete aggregate can be used in the concrete mix and as a base beneath surface paving. Also, slag, a by-product of steel production, can be used as a component of the concrete mix, reducing industrial waste. Ground tire rubber can be used in porous asphalt and reclaimed asphalt pavement in non-porous asphalt.

Potential Benefits

- Reduces waste hauled to landfills
- Reduces the need to extract virgin natural resources
- Develops new technologies and saves money

Technique 5:
Dark Sky Compliant Light Fixtures

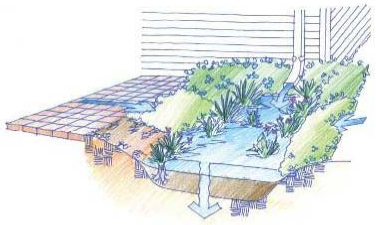


Energy efficient, dark sky compliant light fixtures are specially designed to direct light downward, focusing light where it's needed. These fixtures can also incorporate the latest technologies in energy efficiency while maintaining adequate light levels. New alley fixtures will also use metal halide lamps, which produce white light, instead of the yellow light produced by the existing high-pressure sodium fixtures. This will help people to be able to distinguish color at night.

Potential Benefits

- Reduces light pollution from site
- Reduces glare and provides better light uniformity
- White light produced by metal halide fixtures has a high "color rendition index" and therefore allows people to perceive color more accurately

Technique 5	Rain Garden		
$2-16 per square foot	✓ Residential	✓ Commercial	✓ Industrial

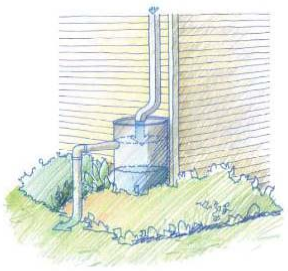


A rain garden is a landscape feature that is planted with native perennial plants used to slow down the stormwater runoff from impervious surfaces (such as roofs, sidewalks and parking lots) and allow it to infiltrate back into the soil.

Potential Benefits

- Provides attractive garden area to receive discharge from down spouts
- Filters silt, pollutants and debris
- Reduces rate and quantity of stormwater entering the sewer system
- Recharges ground water
- Provides habitat for birds and wildlife
- Can help reduce localized flooding

Technique 6	Rain Barrel / Cistern		
$50-$5,000	✓ Residential	✓ Commercial	✓ Industrial



A rain barrel or cistern is a container used to collect and store rainwater from a building roof for various uses including irrigating plants.

Potential Benefits

- Recycles rain water
- Conserves water
- Reduces the quantity of stormwater runoff
- Can provide water for plant irrigation

Bioswale / Vegetative Swale

Benefit

☐ Air ☑ Water ☑ Land ☐ Recycling ☐ Energy

Cost

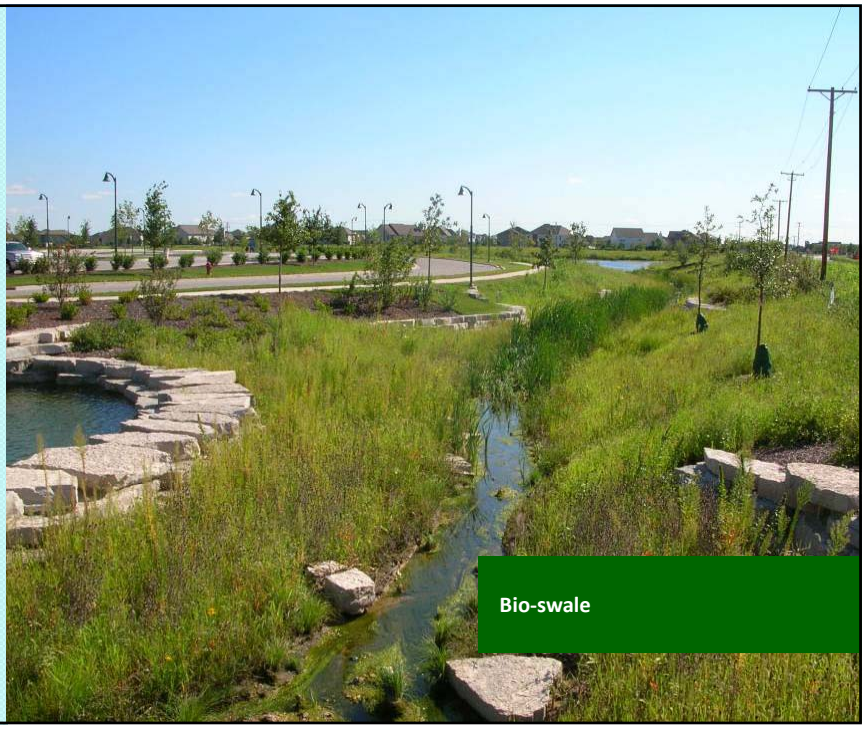
$8 - $30 per linear foot

Description

A bioswale, or a vegetated swale, is a shallow trench or shoulder area planted with native plants that is used to slow the speed of surface stormwater runoff and allow water to infiltrate back into the ground instead of flowing directly into storm sewers.

Potential Benefits

- Filters silt, pollutants, and debris
- Reduces rate and quantity of stormwater entering sewer systems
- Recharges ground water
- Reduces storm sewer piping and structures
- Can reduce detention requirements
- Provides locations for wildlife habitat



Bio-swale

Benefits of Native Plants

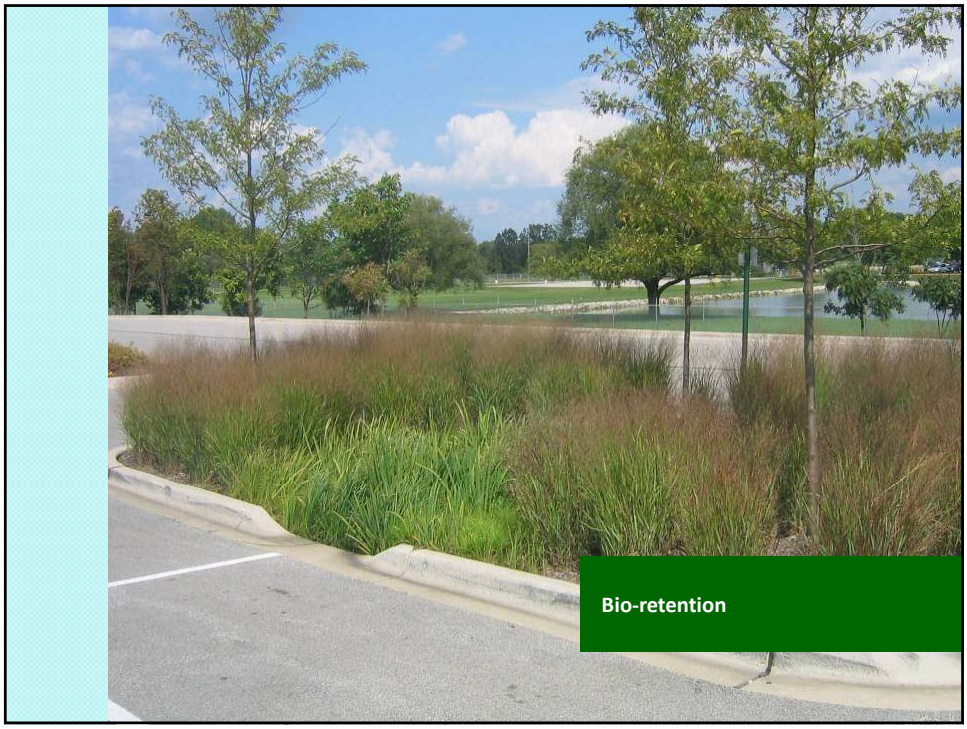
- Less irrigation
- Less mowing (reduce fossil fuel use)
- Less fertilizers
- Create broader bio-diversity
- Attracts wildlife
- Can act as a bio-filter and buffer to waters


But why aren't you mowing the weeds!

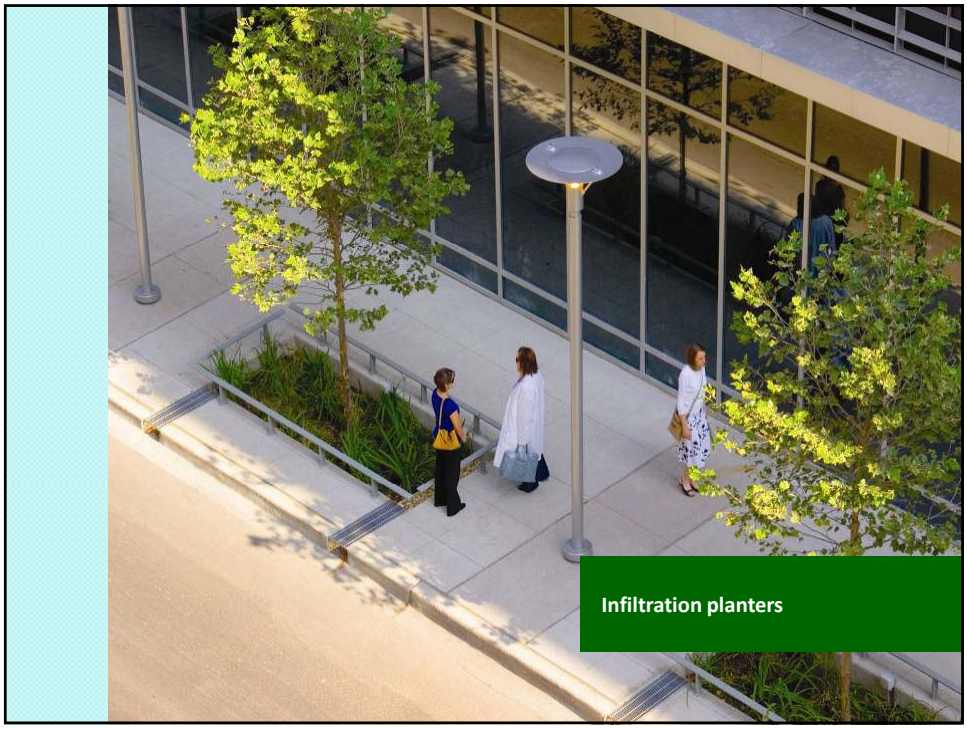

Grow in period 3 years!


Naturalized “defined” edges


Dramatic results!


Bio-retention


Permeable paving


Infiltration planters

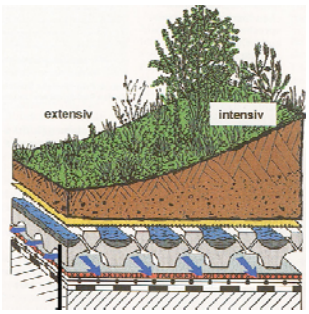

Infiltration planters

Cisterns for irrigation

- Reduced heating and cooling costs
- Increased life expectancy of roofing membrane
- Reduces exterior noises
- Improves air quality
- Reduces stormwater runoff
- Reduces the "Urban Heat Island" effect
- Creates habitat for animals and plants
- Increased property value
- Aesthetic value

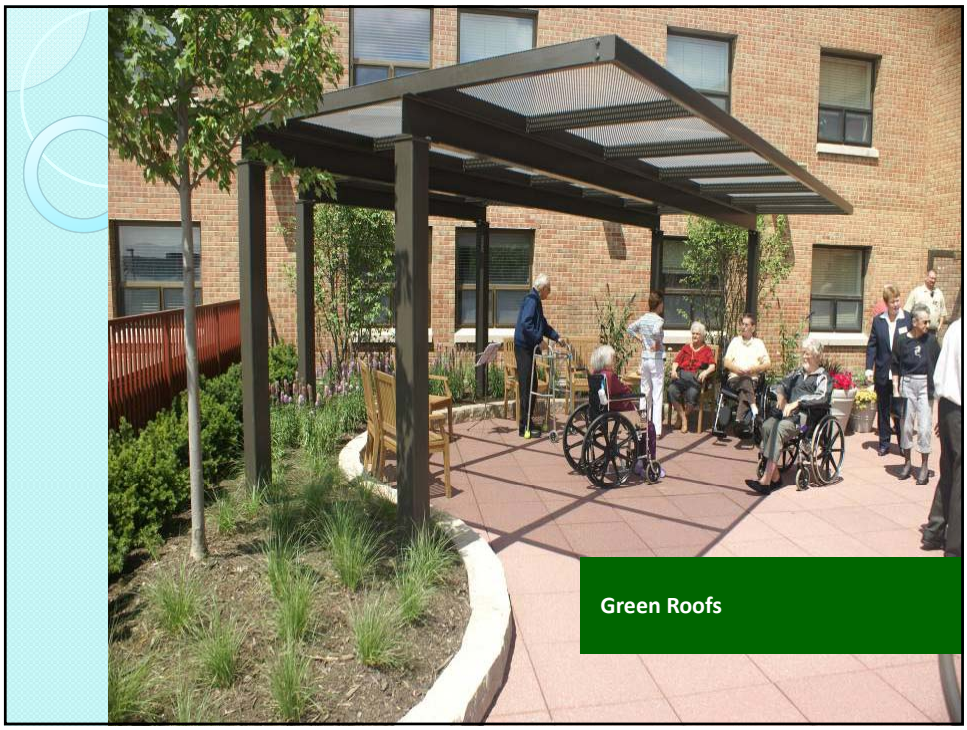
Green Roofs

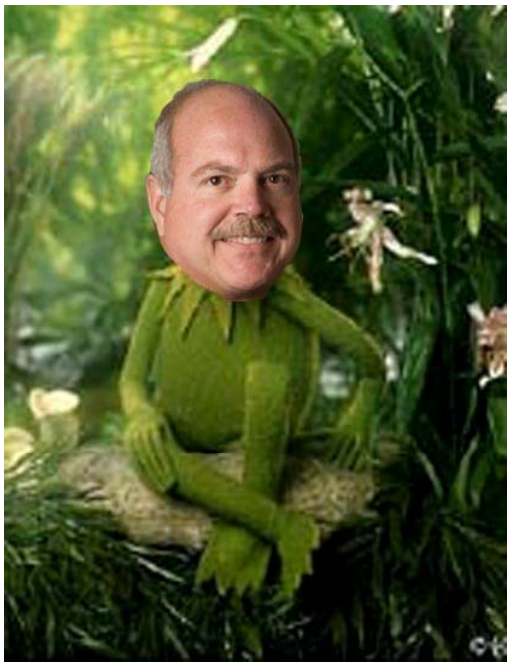
Green Roof Components



Filter Fabric


Roof Gardens
(accessible green roofs)


Green Roofs



It can be FUN being Green

Thank You!

Owner Considerations

ARCH

Healthy Building

- Use non-toxic materials.
- Allow for abundant fresh air.
- Allow for abundant natural light.
- Conserve natural resources.
- Reduce energy consumption.
- Reduce greenhouse gas emissions.

Healthy Bottom Line

- Greater productivity.
- Lower employee – turnover rates.
- Less absenteeism.
- Reduce employee health costs.
- Lower energy usage.
- Lower water consumption.

Roadblocks To Owners

- Pioneering Green buildings are more expensive to construct
- Learning curve to create Green buildings
- Materials, systems and equipment may be hard to find
- No standards to measure performance

USGBC

- The LEED (Leadership in Energy & Environmental Design) Green Building Rating System TM.
- LEED Certification and Green Building Rating System.

USGBC

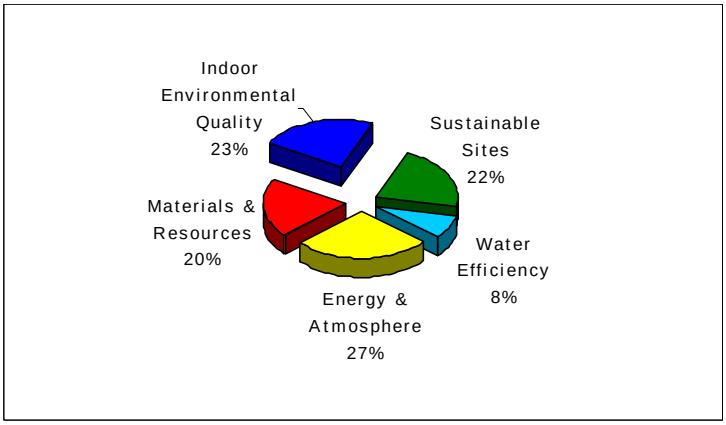
Green is design and construction practices that significantly reduce the negative impact of buildings on the environment and occupants.

<u>5 broad LEED areas:</u>

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

LEED-NC® Point Distribution

Five LEED credit categories



Technical Overview of LEED®

Four levels of LEED-NC certification:

Certified Level	26 - 32 points
Silver Level	33 - 38 points
Gold Level	39 - 51 points
Platinum Level	52+ points (69 possible)

USGBC

- Project Checklist
- Energy & Atmosphere – Prerequisite includes fundamental building systems commissioning.
- Commissioning Team and/or Agent – minimum level of energy efficiency for base building design to comply with ASHRAE/IESNA or local energy code.
- Innovation & Design Process – Leed Accredited Professional.
- Additional Commissioning – Owner's Representative or independent agent shall conduct a review of the design prior to the CD phase (1 PT).

LEED-NC® Certification Process

- A three step process:
  - Step 1: Project Registration
    - LEED Letter Templates and on-line project listing
  - Step 2: Technical Support
    - Reference Package
    - Credit Inquiries and Rulings (CIR)
  - Step 3: Building Certification
    - Upon documentation submittal and USGBC review

LEED® Certification Benefits

Recognition of Quality Buildings and Environmental Stewardship

- Third party validation of achievement (Owner's Representative or independent agent)
- Qualify for growing array of state and local government incentives
- Contribute to growing knowledge base
- LEED certification plaque to mount on building
- Official certificate
- Receive marketing exposure through USGBC Web site, case studies, media announcements

Fundamental Building Commissioning

- Energy & Atmosphere intent: to verify and ensure that fundamental building elements and systems are designed, installed and calibrated to operate as intended.
- Requirements include engaging a commissioning team not directly involved in project design.
- Develop and utilize a commissioning plan including a operation and maintenance (O&M) documentation.
- Expect a 20% increase in efficiency with building commissioning.
- Optimize life-cycle economic performance.

Green Globes Checklist

Green Globes™ for New Construction
Pre-Assessment and Assessment Checklist for Project Managers

What is Stage I assessment?

As the design phase draws to a close, and your Green Globes construction document questionnaire is completed, it is time for a GBI authorized Green Globes Assessor to compare the answers you supplied in the questionnaire with the construction documents that you provide. The assessor then responds with a brief letter describing his initial findings and notifying you of additional documentation you will need to provide during the on-site visits. From this letter, you will know whether or not you are on track to receive a rating of one, two, three or four Green Globes.

What is Stage II assessment?

As the construction phase approaches substantial completion, it is time to contact the GBI to schedule the Stage II assessment. The GBI will arrange for a third-party assessor to perform an on-site assessment. An ideal timeframe would be two months before final (punchlist) completion and/or beneficial occupancy. The optimal time for the visit is toward the end of the punchlist completion period and before occupancy, although it is recognized that circumstances vary by project. The assessor will call to schedule a visit no later than 30 days before your estimated construction completion date. .

How long will it take?

The duration of the site visit varies considerably with the scope and size of the completed building project. For smaller buildings less than 50,000 square feet, please allow approximately 3-5 hours for the assessor to review new documentation onsite, conduct a thorough walk-through audit of your facility, and interview you and/or other designated representatives.

What documentation is required?
Below is a sample of documents that will be helpful to have on hand prior to the completion of the survey and that assessors will likely request to review as part of the Stage I and/or Stage II assessment. Close coordination with your assessor, once assigned, can help ensure that you will have all documentation required prior to both the Stage I and Stage II review processes.
The following list is the suggested documentation for a Green Globes assessment:

Section 1
Project Management:

- List of written performance goals.
- Progress meeting agendas and meeting minutes.
- EMS plan to be used by the general contractor.
- Description of supplemental clean diesel practices.
- Construction documents.*
- Manufacturer's specifications, cut sheets and performance documentation.
- Photographs of protected building materials.
- Baseline indoor air quality test.
- Commissioning reports.
- Operations and maintenance manual (including all plans, protocols, strategies and contracts).

Section 2
Site

- Site civil plans and existing site civil plans.
- Site plans that show the building, parking, street access, etc. and civil engineering plans that show topography, drainage and infrastructure.
- Documentation by EPA, municipal, or other governmental authority of Superfund and Brownfield site.

Greener Hospitals

Green Guide for Health Care

Improving environmental performance supported by: Bristol-Myers Squibb Co.

www.gghc.org

Environmental checklist for healthcare facilities.

6. Environmental Checklist for Healthcare Facilities

This following checklist includes a number of elements of an environmental management system. By answering YES or NO to the various elements of the checklist, it is expected that you will become more knowledgeable about the current status of your environmental management system. A "YES" answer signifies that your facility's environmental management system already includes that particular element. A "NO" answer indicates that the element is not currently part of your environmental management system. The latter elements should be reviewed for applicability to your healthcare facility and incorporated into your environmental management system as appropriate.

Environmental Management System	
1. Does your healthcare facility have a set of principles or guidelines?	☐ Yes ☐ No
2. If yes, do these guidelines include environmental protection?	☐ Yes ☐ No
3. Are these guidelines communicated not only internally to staff but also externally to the public?	☐ Yes ☐ No
4. Are tasks and responsibilities relating to environmental protection clearly defined and assigned to medical staff, nursing staff, engineering staff and the hospital administration?	☐ Yes ☐ No
5. Has your healthcare facility appointed a person with special responsibility for: waste, hazardous substances, effluent, energy, pollutants and harmful emissions, radiation safety, hygiene, others?	☐ Yes ☐ No
6. Are all members of the staff aware of their specific responsibilities relating to environmental protection?	☐ Yes ☐ No
7. Do you have working groups concerned with special topics such as energy, water, pollution prevention, and environmentally responsible purchasing?	☐ Yes ☐ No
8. Does your organization have a program to routinely leverage the value of new building design or major renovations to incorporate green principles (for example, energy, and water conservation) into design, construction, and operations?	☐ Yes ☐ No
9. Have you implemented an environmental management system?	☐ Yes ☐ No
10. Has your organization developed measurable annual environmental objectives / goals?	☐ Yes ☐ No
11. Does your organization have a system in place to periodically evaluate your continued compliance with pertinent national, state or provincial and local environmental regulations?	☐ Yes ☐ No
12. Is appropriate training offered?	☐ Yes ☐ No
13. Are your contractors informed about your environmental requirements?	☐ Yes ☐ No
14. Are neighbourhood and community environmental questions and complaints documented and subsequently addressed?	☐ Yes ☐ No

ASHE Sustainable Design Guide

- Green Building Committee of the American
- Society of Healthcare Engineering

ASHE

Green Healthcare Construction Guidance Statement

Developed in January 2002, revised October 2004
by the Green Building Committee of the American Society of Healthcare Engineering (ASHE)
for use in conjunction with the ASHE Sustainable Design Awards Program.

Problem Statement

The construction and use of buildings in all sectors consumes 3 billion tons of raw materials annually (40% of raw stone, gravel, sand, and steel, 25% of virgin wood, 40% of energy resources, 75% of PVC, 17% of freshwater flows) and generates significant waste (25-40% of municipal solid waste from construction and demolition alone), 50% of CFCs, about 30% of US CO2 production, and substantial toxic emissions.

Given this, the opportunities are significant to improve environmental quality through green planning, design, construction and operations and maintenance practices. Improving the environment through green construction practices is consistent with the American Hospital Association's recent voluntary agreement with the United States Environmental Protection Agency to reduce waste volume and toxicity.

Building design and construction practice can be shaped to protect health at three scales:

Energy Star

EPA report that buildings participating in the Energy Star program can operate with annual savings of 30% under the US average.

Four Principles for Planning of a Healthy Building

- Design to provide for Wellness rather than to prevent Illness
- Design to achieve Functional Requirements rather than just to meet codes and standards
- Design for the Last Day of Occupancy rather than for Initial Occupancy
- Verify with Building Diagnostic Methods for virtual and actual buildings

Sustainable Benefits

- Environmental benefits include protecting air quality within the building
- Potential economic benefits are experienced in building operations and asset value
- Occupants benefit from health and safety features which relate to risk management
- Community benefits include lessened demand for water supply, storm water sewers and their related operational costs

First Costs

- Comparable to conventional structures if key elements are identified during initial planning stages
- Integrated design and implementation strategies are essential to managing and controlling costs
- Assessing lifecycle and energy costs are critical for Owners to decide upon various systems
- Managing budgets that balance capital costs and construction escalation

Cost of Building Green

- *California's sustainable building task-force –*

"For initial cost of 2% of total construction, the benefits accrue at a level over $50 per square foot; higher costs recaptured through energy savings alone, before accounting for other cost savings."

The Cost of Building Green: Is it Worth It? Yes, Says California

The question nearly everyone asks about building green is, "Are the additional costs worth it?" California's Sustainable Building Task Force, a group of more than 40 state agencies, commissioned a study to provide an answer.

The report, The Costs and Financial Benefits of Green Buildings, concludes that the financial benefits of building green far outweigh the initial costs. For a minimal initial investment of about two percent of the total cost of construction, the benefits accrue at a level of between $50 and $70 per square foot, greater than 10 times the initial cost of building green. In fact, the study finds that the higher costs associated with building green are recaptured through energy savings alone, before even accounting for other cost savings.

According to the study, cost savings are realized in several areas, including energy value, emissions, water, waste, commissioning, operations and maintenance, and productivity and health. As the report notes, "Despite data limitations and the need for additional research in various areas, the findings of this report point to a clear conclusion: building green is cost-effective and makes financial sense today."

The U.S. Conference of Mayors reference this study as "the most definitive analysis of green buildings ever conducted" in their proposed "2030 Challenge" resolution.

The study is available at: http://www.usgbc.org/Docs/Resources/CA_report_GBbenefits.pdf

Figure ES-1. Financial Benefits of Green Buildings Summary of Findings (per ft2)

Category	20-year NPV
Energy Value	$5.79
Emissions Value	$1.18
Water Value	$0.51
Waste Value (construction only) – 1 year	$0.03
Commissioning O&M Value	$8.47
Productivity and Health Value (Certified and Silver)	$36.89
Productivity and Health Value (Gold and Platinum)	$55.33
Less Green Cost Premium	($4.00)
Total 20-year NPV (Certified and Silver)	$48.87
Total 20-year NPV (Gold and Platinum)	$67.31

Source: Capital E Analysis

Increase Employee Performance

- NYC Dept. Design & Construction states a 1% increase in productivity could be worth $2-5/sqft in savings per year.
- Reduced absenteeism and employee turnover – range of savings: $.87-1.15/sqft. (9 to 7 sick days & increase retention by 1%).

Business Case

- Energy and resource savings
- Initial construction cost accounts for under 10% of total cost of owning a building over its useful life span
- Operating costs account for approximately 80% over 30 year useful life
- Attempt in a more efficient staffing plan by reducing FTEs as a result of design

Cost of Green (USGBC)

- 1% to 3% increase in 'hard' costs to achieve a certification level (26 points) depending upon the construction type and what best practices in sustainable design were contemplated in the concept plans
- In terms of overall project cost, the median 'soft' costs associated with LEED certification may increase as follows:
  - * Design fees = $0.56/sf
  - * LEED documentation = $0.30/sf
  - * Commissioning = $1.55/sf
- Range in LEED fees can be considerable; for example, design fees in case studies went from minimal increase to as high as $6.62/sf.

Cost of Green (USGBC)

- Average hard cost increase 2%
- Median soft cost increase of $2.40/sf
- There is a very large variation in costs of buildings for LEED-seeking versus non-LEED seeking projects
- Cost differences between buildings are due primarily to program type
- There are low cost and high cost 'green' buildings depending on the project and criteria used to define 'green'
- Third-party analysis of criteria and cost can assist in defining objectives

Case Study

The Village at Orchard Ridge

Owner: National Lutheran Communities & Services

Location: Winchester, VA

Budgeting Methodology

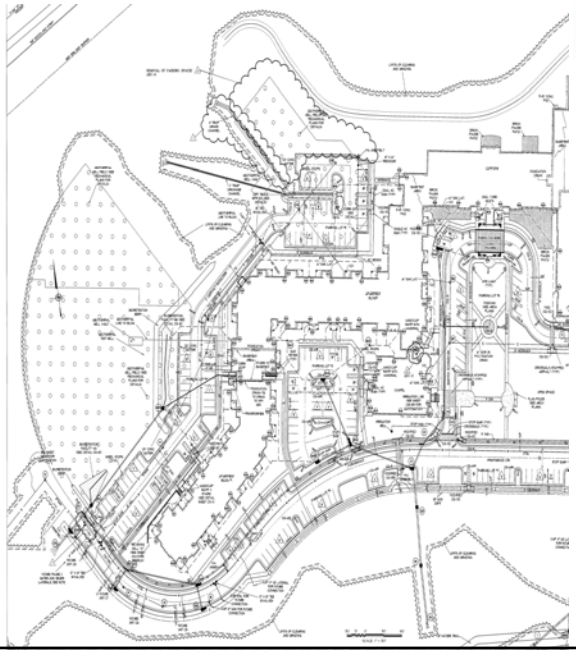
- Establishing team goals, expectations and expertise
- Include specific goals in the project program
- Align budget with program
- Consider sustainability as a priority, how you reach that goal depends on how you define green
- Generate a cost model for the project
- Identify funds necessary for green initiatives
- Address limitations in the budget at the programming stage

Site Plan

THE VILLAGE AT ORCHARD RIDGE
A National Lutheran Community

Geothermal Well Field

THE VILLAGE AT ORCHARD RIDGE
A National Lutheran Community



Site Concepts

- Implement measures to control soil erosion, waterway sedimentation and dust during construction
- Re-utilize blasted rock for crushed stone in road beds.
- Automatic controls for outdoor lighting to reduce light levels after certain hours.
- Three and four-story apartments to help limit site disturbance/maintain habit
- Implement stormwater management measures to limit runoff and disruption and pollution to natural waterways
- Non-toxic pest control measures

Water Efficiency

- Utilize low flow plumbing fixtures.
- Tankless / instantaneous hot water heating system in cottage homes.
- Specify indigenous plantings to minimize need for watering.
- Utilize irrigation well (non-treated) for outdoor fountain use.

Energy & Atmosphere

- Energy-efficient HVAC systems (geo-thermal heat pump system, high efficiency gas furnaces).
- High efficiency domestic water heating with condensing water heaters.
- Higher "R" value and overall building envelope efficiency
- Variable frequency drives to minimize pump and fan energy consumption.
- Energy recovery unit for outside air/exhaust for the Small House.
- Demand-controlled ventilation for the Chapel.
- Occupancy sensors and time clocks for lighting control in common areas.
- LED exit signs and night lights.
- Low E, Argon filled insulated glass in windows.
- Utilization of non-HCFC refrigerants in mechanical refrigeration equipment (using R-410A instead of R-22) for lower ozone depletion potential.
- Building Automation Systems to optimize equipment operation and energy use.
- High efficiency motors.

Materials & Resources

- Implement construction waste management program.
- Recycling areas incorporated into trash collection spaces.
- Specify products with recycled content (ceiling panels and flooring materials).
- Specify regional materials. (Concrete and concrete masonry units).

Indoor Environmental Quality

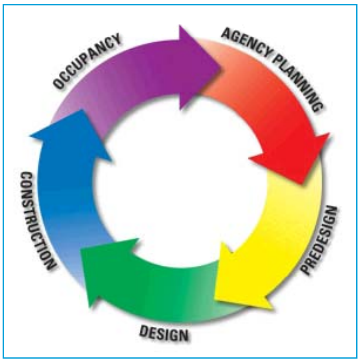
- Specify low-emitting materials (paint, adhesives/sealants, flooring systems, carpets and composite wood).
- Design features to maximize day lighting and views (skylights in small house design).
- Specify debris-catching mats at entrances.
- Provide individual lighting controls.
- Carbon monoxide monitors and other basic combustion venting measures in cottages homes.
- Continuous ventilation, reduced air distribution losses and better air filtration measures for cottage homes.
- Radon protection in cottage homes.
- Garage pollutant protection in cottage homes.

Owner Awareness

- Goal Setting
- Program definition
- Site planning
- Budget planning
- Respond to mission as good stewards of the environment
- *Risks associated with supporting outcomes of building performance*
- Integrated approach to design

Multi-Disciplined Process

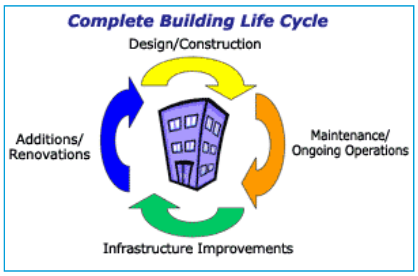
- Site
- Strategy & Planning
- Operations
- Finance
- Marketing
- Regulations & Codes
- Design & Engineering
- Construction
- Management
- Sustainable Design



Question & Answer

Sustainable Objectives

- The changing needs for environmental control in buildings for normal and extraordinary conditions
- The changing demands for reduced energy consumption
- The impact of these changes on the design, construction and operations of buildings



Thank You