Agenda

1. Green Building in California
2. The Economic Case for Greening Existing Buildings
3. Assessing Building Opportunities
   • Building Exterior and Site
   • Water Efficiency
   • Energy & Atmosphere
   • Materials & Resources
   • Indoor Environmental Quality
3. LEED-EB OM
4. Case Studies

Global Warming Solutions Act of 2006 (AB32)

- First carbon cap law in the country
- Still too soon to understand effects on city
- AEP guidance for CEQA (3/5/07) Future development will need to mitigate carbon dioxide emissions
- City emissions:
  - Government: 80,000 tons/year
  - Citywide limits: 5-6 million tons/year

Leading the Nation in CO2 Emissions Reduction


Converging Forces

- Global Warming Task Force (“Green Team”)
- State of California Green Building Executive Order
- Global Warming Solutions Act of 2006 (AB32)
- Pending CA legislation
- U.S. Mayor’s Climate Protection Agreement
- U.S. Supreme Court decision: EPA has authority & duty to act upon CO2 emissions per Clean Air Act
- Pending federal legislation
Where do California emissions come from?

Source: CEC

U.S Carbon Emissions

What is “Green Building”?

» Implementation of “Best Practices” in design and construction for new construction and major renovation projects

» Utilizes an integrated process for design and construction

What is Green Building?

» Green buildings may incorporate:
  • Sensitive site selection
  • Access to alternative transportation
  • Stormwater quality and quantity
  • Water conservation
  • Energy conservation
  • Renewable energy
  • Green materials
  • Daylighting
  • Indoor air quality
  • And many others...

The U.S. Green Building Council and LEADERSHIP in ENERGY and ENVIRONMENTAL DESIGN

A voluntary, consensus-based national standard for developing high-performance, sustainable buildings and interiors
U.S. Green Building Council

- National nonprofit organization based in Washington, DC
- Diverse membership of organizations
- Consensus-driven
- Committee-based product development
- Developer and administrator of the LEED Green Building Rating System

Developing Means to Measure Performance

Certified Projects

LEED Programs

Making the Most of Existing Buildings

40% view facilities as a capital asset
60% view facilities as a strategic tool

- Increase productivity and process efficiency
- Reduce operations and maintenance costs
- Reduce energy and water use
- Reflecting and changing culture
- Adapt to future needs

Third-party-certified buildings outperform their conventional counterparts in:

- energy savings
- occupancy rates
- sale price
- rental rates

LEED Gold and Platinum projects exhibit energy cost reduction approaching 50%.

**2008 CoStar Study**

LEED buildings:
- Rent premiums of $11.24/sf over non-LEED
- 3.8% higher occupancy
- Selling for $171/sf more

Energy Star buildings:
- Rental rates $2.38/sf over non-Energy Star
- 3.6% higher occupancy
- Selling for an average of $61/sf more

**2008 CoStar Study**

**Green Building Cost: Perception**

- Buildings’ contribution to total emissions:
  - Perception: 19%
  - Reality: 40%

- Certified green buildings cost premium:
  - Perception: 17%
  - Reality: 0-7%

**World Business Council for Sustainable Development**

Energy Efficiency in Buildings: Business realities and opportunities, Summary Report

**Additional construction costs**

- LEED-certified buildings:
  - Conventional building cost (19%): Additional cost
  - Platinum: 6.8%
  - Gold: 2.2%
  - Silver: 1.9%
  - Certified: 0.66%

**“Change is not easy. But to all the developers, investors, owners, lenders, appraisers, valuers, agents and especially, occupants, the conclusion is that you ignore green buildings at your cost. Green buildings can provide financial benefit.”**

Chris Corps BSc MRICS
2005 RICS Green Value Report

**Your building:**
How efficient is it?
Why a Building Audit?

» Establishes building baseline
» Defines capital expenditures
» Incentives potential
» Marketing to potential tenants
» Anticipates legislation and regulation

Process of Greening Existing Buildings

I: Assessment
II: Corporate Planning
III: Implementation
IV: Project Closeout

Audit Process

» Building Walk-through
» Energy Star Benchmarking
» ASHRAE Level I Audit
» Environmental Comfort Analysis
» Gap Analysis-Building Benchmark
» Baseline to LEED
» Comprehensive Report with Cost Analysis

Categories of Concern

- Building Exterior and Site
- Water Efficiency
- Energy and Atmosphere
- Materials and Resources
- Indoor Environmental Quality

Applied case study: Insurance Building
**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

**FACT:** One quarter of all car journeys are less than two miles.

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**Sustainable Sites: Issues**

- Low-impact Site Management
- Stormwater Management
- Transportation Management
- Heat Island Reduction
- Landscaping and Water Conservation
- Light Pollution

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**Low-impact Site Management**

**Intent:**
Environmentally-sensitive building exterior maintenance

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**Low-impact Site Management**

**Review Current Practices**
- Monitor exterior chemical use?
- Healthy cleaning substances and equipment?
- Pest management procedures?
- Erosion monitoring?
Low-impact Site Management

**Implementation:**
Building Exterior and Hardscape Management Plan
- Maintenance equipment
- Snow and ice removal
- Cleaning of building exterior
- Lights and sealants used on building exterior
- Cleaning of sidewalks, pavement and other hardscape

Low-impact Site Management

**Implementation:**
Integrated Pest Management, Erosion Control and Landscape Management Plan
- Outdoor integrated pest management
- Erosion and sedimentation control
- Landscape waste management
- Chemical fertilizer use
- Plant health care management

Transportation Management Plan

**Intent:**
- Reduce conventional automobile use
- Educate building occupants on their climate impact
- Understand issues regarding land development

Transportation Management Plan

**Review Current Practices**
- Develop and administer a transportation management survey
  - Monday – Friday
  - Mode of transit
  - Distance Traveled
- Develop strategies for improvement

Transportation Management Plan: Baseline

<table>
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<tr>
<th>Mode of Transportation</th>
<th>Jeff Blosse</th>
<th>Karen Totaro</th>
<th>Mike Brown</th>
<th>Mark Hunter</th>
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<td>0</td>
<td>0</td>
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</table>

Instructions:
Please enter the miles per week travelled by each staff member under the respective mode of transportation.

Transportation Management: Implementation

**Strategies**
- Alternative transportation commuting plan
- Bicycle racks for employees and visitors
- Changing and shower facilities
- Preferred parking for employee carpooling, access to mass transit or alternative-fuel refueling stations

**Survey**
- Re-issue the survey
- Report success!
Landscaping and Water Conservation

Considerations

- Site Selection and Management
- Irrigation

Benefits

- Less maintenance
- Less water use
- Lower chemical use
- Helps prevent stormwater runoff

Landscaping and Water Conservation

Review Current Practices

- Ratio of hardscape to landscape
- Ratio of turf to plantings
- Native and adapted plants
- Current Irrigation Practices

Synergies

- Stormwater Management

Landscaping and Water Conservation: Implementation

Sensor Controls

- Program automatic controllers with adjustable watering schedules
- Install moisture sensors to account for seasonal variations, and calibrate during commissioning

Stormwater Management

Concerns:

- In urban environments, ~95% of stormwater is channeled away.
- A typical city block creates 9 times as much runoff as a wooded area of the same size.

In a sustainable model, the majority of stormwater should be retained on site.

Stormwater Management

Review Current Practices

- Ratio of hardscape to landscape
- Natural detention features
- Monitoring and maintenance of stormwater

Natural Hydrology Cycle
Stormwater Management

The whole building site
- Flow Control
- Pollutant Removal
- Sedimentation
- Flotation
- Filtration
- Infiltration

Site constraints and opportunities:
Balfour Guthrie

Heat Island Reduction

Concerns:
- Urban/suburban temperatures can be 2-10° warmer than surrounding undeveloped areas
- On a sunny 90° day a conventional roof can be 140-190° when a green roof is only 85°
Heat Island Reduction

Non-roof area
- Hardscape shading
- Tree canopy
- Covered parking
- Open grid pavement
- Underground parking

Roof Area
- Establish feasible roof area
  - Green roof
  - Reflective roofing

Heat Island Reduction: Implementation

Green roof options
- Intensive: Over 6" of soil, looks more like a natural landscape, larger plants
- Extensive: Up to 6" of soil, low maintenance plants selected for durability, ground cover, water retention

Synergy: Stormwater runoff

Light Pollution Reduction

Considerations
- Light Trespass
- Light to the night sky

Consequences
- Disrupts nocturnal species
- Human health and psychology
- Excessive energy use

Light Pollution Reduction: Baseline

Review Current Practices
- Interior Lighting
  - Does interior lighting emit from building at night?
- Exterior Lighting
  - Site lighting past the property line?
  - Unnecessary fixtures installed?
  - Occupant safety?

* excludes emergency lighting

Light Pollution Reduction: Implementation

Interior lighting
- Controls
- Lighting design from building envelope

Exterior Lighting
- Full or partial shielding
- Site light meter measurements
Water Efficiency

Goals
- Reduce the quantity of water needed for the building
- Reduce municipal water supply and treatment burden

FACT: Global water consumption has almost doubled in the last 50 years.

Plumbing Fixtures & Fittings

Considerations
- Reduce potable water use
- Fixture selection

Establish building water use baseline
- Define strategies for water conservation improvements
- Water conservation cost savings

Waterless urinals can save 43,000 gallons of water every year.

Plumbing Fixtures & Fittings

Water Efficiency: Issues

Plumbing Fixtures & Fittings

Water Use Measurement

Cooling Tower Management

Typical Office Building Water Use

- Mechanical (22%)
- Intake (22%)
- Sanitary (40%)
- Cooling/Heating (24%)
- Single Pass Cooling (14%)
- Miscellaneous (9%)
Plumbing Fixtures & Fittings: Baseline

- Provide the following information for each fixture type
  - Urinals
  - Water Closets
  - Lavatories
  - Hand Wash Fountains
  - Kitchen Sinks Showers
  - Janitors Sinks
  - Self Closing Faucets

<table>
<thead>
<tr>
<th>Location</th>
<th>Description</th>
<th>Fixture</th>
<th>Model</th>
<th>Flow/Flush Rate (gpm or gpf)</th>
<th>Quantity of Fixtures</th>
<th>Number of Users</th>
</tr>
</thead>
</table>

Plumbing Fixtures & Fittings: Baseline

Toilets... how much Water?

<table>
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<tr>
<th>Time Period</th>
<th>Gallons / Flush</th>
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<tr>
<td>Best Current</td>
<td>1.0 / 1.28</td>
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<tr>
<td>1992 - Current</td>
<td>1.6</td>
</tr>
<tr>
<td>1980s</td>
<td>3.5</td>
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<tr>
<td>1930s- 80s</td>
<td>5.0 – 7.0</td>
</tr>
<tr>
<td>1920s</td>
<td>2.0</td>
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</table>

Plumbing Fixtures & Fittings: Implementation

- Uniform Plumbing Code (UPC)
- International Plumbing Code (IPC)

Economic assessment of plumbing upgrades
- Water supply
- Disposal
- Maintenance

Plumbing Fixtures & Fittings

Water Efficiency Economic Assessment Policy
- Management Support
- Assign a “champion”
- Integrate into existing plans

Payback acceptable?
Identify / implement projects
Report success!

Plumbing Fixtures & Fittings

Implementation:
- Toilet selection
  - Dual flush options
- Urinal selection
  - Waterless options
- Faucet selection
  - .5 gpm standard

EPA Water Sense

Modeled after Energy Star, the EPA’s new WaterSense program promotes water-efficient products and practices.

www.epa.gov/watersense
**Site and Water Landscaping and Water Conservation**

**Water Use Measurement**

**Intent:**
- Understand consumption patterns
- Identify water and monetary saving opportunities

**Measure Current Practices**
- Are meters owned by third parties?
- Are they calibrated?
- How often are meter readings taken?

**Implementation:**
- Designated whole building meter
- Submeters
  - Irrigation
  - Indoor Plumbing Fixtures and Fittings
  - Cooling Towers
  - Domestic Hot Water
  - Other Process Water

**Cooling Tower Management**

**Chemical Management**
- Chemical Management Plan
- Conductivity meter
- Trend of bleed rate & concentration

**Non-potable water source**
- Harvested rainwater
- Condensate
Energy & Atmosphere

Performance is paramount

Energy & Atmosphere

Goals
- Establish energy efficiency and system performance
- Optimize energy efficiency
- Encourage renewable and alternative energy sources
- Support ozone protection protocols

FACT: Only 10% of the energy used by an incandescent light bulb provides light. The other 90% is released as heat, which uses 30% of a building’s cooling energy.

Energy & Atmosphere: Issues

Energy Best Management Practices

Metering, Monitoring and Management

Commissioning and Auditing

Green Power

Energy Performance Measurement

Energy Best Management Practices

Intent
- Understand energy flows in the building
- Reduce energy inputs without negatively affecting outputs

Benefits
- Maintain/improve human comfort, health and safety
- Understand consumption patterns
- Energy use and cost savings

Assess current practices:
- Sequence of Operations?
- Building Operating Plan?
- Preventative Maintenance Plan?
- Systems narrative?

Implementation:
- Develop and/or update:
  - System descriptive narratives
  - System sequence of operations
  - Building operations plan
  - Preventive maintenance plan
- Conduct ASHRAE Level 1 energy audit

Energy Best Management Practices

Figure 2 - Total Energy Consumption by End-Use

Figure 3 - Total Energy Consumption by Building Type

http://www.epa.gov/cleanenergy/documents/sector-meeting/4bi_officebuilding.pdf

http://www.epa.gov/cleanenergy/documents/sector-meeting/4bi_officebuilding.pdf
Energy Best Management Practices

1. Collect and analyze historical energy usage data
2. Energy breakdown framework for potential energy savings
3. Review building documentation
4. Assess equipment
5. Estimate cost/savings for each Energy Efficiency Measure
6. Rank measures based on potential payback
7. Collect more precise data
8. Benchmark existing vs. proposed equipment performance

Commissioning & Auditing

What exactly is commissioning?
Verification that the building’s energy related systems are installed, calibrated, and perform according to the intended design and based on construction documents.

Commissioning & Auditing

Intent:
To investigate building systems and find further reductions in energy consumption while maintaining a healthy indoor environment

Commissioning vs. Auditing:
Which is better for your building?

Investigation & Analysis
- Retro-Commissioning OR ASHRAE Level II Audit
- Implementation
  - No/low-cost measures
  - Capital improvements
- Ongoing Commissioning
  - Incorporate into Preventative Maintenance Plan
  - No Audit Option
- Incentives

Energy Performance Measurement

» Energy performance rating system
» Ratings (1-100) benchmark buildings against the energy performance of similar facilities
» Comparison, improvement, savings
Energy Performance Measurement

- Percentile of total energy use
- Simple, need to know:
  - Square feet
  - Age
  - Use
  - Number of computers
  - Utility data
- Must be validated by an engineer
- Large database

Energy Performance Measurement

- Continue to record energy monthly
- Track improvement
- Re-certify

Metering, Monitoring & Management

Concerns
- Tracking energy and water use consumption
- Chemical management

Benefits
- Understand consumption patterns
- Identify energy, water and monetary savings

Metering, Monitoring & Management

Measure current practices:
- Metering?
  - Designation building meter
  - Energy end-use sub-metering
- Building Automation System?
  - Permanent
  - Tracks heating, cooling, ventilation & lighting
  - Responsive

Metering, Monitoring & Management

Energy meters
- Whole building meters
- Submeters
- Calibration

Benefits
- You can manage what you can measure!
- Identify problems early
- Tenant accountability

Computerized building automation system (BAS)
- Heating
- Cooling
- Ventilation
- Lighting
- Other systems

Benefits
- Communicates back to the user
- Used to inform decisions
Metering, Monitoring & Management

Refrigerant Management
- Identify halons, CFC and HCFC refrigerants used
  - HVAC&R
  - Fire suppression

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Refrigerant Used</th>
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</thead>
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<tr>
<td></td>
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</tr>
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</table>

Green Power

Intent
- To support emerging clean energy production technologies
- To work toward energy independence
- To remove strain from the national grid
- To reduce greenhouse gas emissions

Green Power

Assess current practices:
- Current annual energy use?
- Onsite renewable energy production capacity?
- Incentives available?

Green Power

Renewable Energy
- Purchase Green-e certified energy from utility or third party
- Generate on-site
  - Photovoltaics
  - Wind power
  - Geothermal
  - Biomass

Checklist!

FACT: Making recycled paper instead of new paper uses 64% less energy and uses 58% less water.

Materials & Resources
Raw materials, Source practices
Materials & Resources

Goals
- Reduce the amount of materials needed
- Use materials with less environmental impact
- Reduce and manage waste

FACT: Making recycled paper uses 64% less energy and uses 58% less water.

Materials Flow Policies

INPUTS
- Consumables
- Durable goods
- Facilities Alterations

OUTPUTS
- Solid waste
- Food waste
- Recycling

Purchasing Policies
Waste Management Policies

How do we select green materials?

Certified Products: Eco-labels
- SCS: Recycled Content
- FSC: Certified Wood
- Green Seal: Paints
- Green Guard: VOC Emissions
- CRI Green Plus Label: Carpet
- Floorscore: Hard Flooring

Energy Star covers over 50 different product types
- appliances
- heating and cooling equipment
- Lighting
- home electronics
- office equipment

www.energystar.gov
Materials Flow Policies

**INPUTS**
- Purchasing Policies

**OUTPUTS**
- Waste Management Policies

Materials & Resources: Issues

**Purchasing**

**Solid Waste**

Sustainable Purchasing

**Concerns:**
- Overuse of resources
- Pollutant source reduction
- Responsible purchasing & supporting industries

**Benefits:**
- Decreased impact on material production
- Decreased waste impacts
- Decreased purchasing redundancies
- Healthier indoor environment

Sustainable Purchasing

Assess current practices:
- Environmental Preferable Purchasing (EPP) Policy?
- Purchasing specifications?
- Centralized purchasing and reporting?

→ TENANTS!

Sustainable Purchasing

**Purchasing inventory:**
- Consumables (paper, notebooks, envelopes, toners, batteries, etc.)
- Durable goods (computers, printers, scanners, water coolers, refrigerators, etc.)
- Facility renovations and additions
Sustainable Purchasing

Intent:
To reduce the environmental impacts from materials acquired for use in the operations, maintenance, and upgrades of buildings.

- Ongoing consumables
- Durable goods
- Facility alterations/additions
- Toxic source reduction
- Food

Sustainable Purchasing

Environmentally Preferably Purchasing Policy - Requirements

Purchasing: Ongoing Consumables

Office Products Purchasing Program

- Frequently used materials (paper, notebooks, envelopes, toners, batteries, etc.)
- Program should include materials that have green attributes:
  - Recycled content
  - Rapidly renewable
  - Locally harvested
  - FSC certified
  - Rechargeable (batteries)

Purchasing: Durable Goods

Equipment Purchasing Program

- Infrequently purchased materials
  (computers, printers, scanners, water coolers, refrigerators, etc.)
- Meet criteria for Electric Powered Equipment
  - Energy Star labeled
  - Replaces conventional gas-powered equipment

Purchasing: Facility Alterations and Additions

Purchasing Programs & Specifications

- Address facility renovations, refits, and additions:
  - Wall studs
  - Insulation
  - Windows
  - Carpet
  - Sealants
  - Paints
  - Attached finishes
Purchasing: Reduced Mercury in Light Bulbs

- Light bulbs
- Look for:
  - High efficiency
  - Low mercury content

Solid Waste Management

Intent:
Reduce waste and toxins generated from the use of consumable products.

Solid Waste Management

Assess current practices:
- Conduct solid waste audit
- Waste Reduction and Recycling Program
  - Ongoing Materials
  - Durable Goods
  - Facility Alterations and Additions

Solid Waste Management Policy

- Ongoing Consumables
- Durable Goods
- Facility Alterations and Additions

Solid Waste Management

Tracking

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<tr>
<th>Waste Type</th>
<th>Weight of Volume in Waste Stream</th>
<th>Percentage of Total Waste Stream</th>
<th>Weight of Volume of Waste Type Diverted</th>
<th>Percentage of Waste Type Diverted from Waste Stream</th>
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<td>9.04%</td>
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The Economics of Green Waste Mgmt

Joe Serna Jr. Cal/EPA HQ
Managed by Thomas Properties
Sacramento, California
- LEED-certified Platinum, November 2003
- First building certified Platinum under LEED-EB
Solid Waste Management

» Vermicomposting and other measures have diverted 202.7 tons of material from landfill, saving $10,135
» Elimination of garbage can liners save $60,000 annually
» Reusable cloth bags in recycling bins saves $20,000 annually

Indoor Environmental Quality

Indoor Environmental Quality: Issues

Outdoor Air Delivery & Monitoring

Occupant Comfort

IAQ Best Management Practices

Green Cleaning

Indoor Environmental Quality

Goals
» Establish good indoor air quality
» Eliminate, reduce, manage the sources of indoor pollutants
» Ensure thermal comfort and system controllability
» Provide for occupant connection to the outdoor environment

FACT: Americans spend 90% of their lives indoors.

Outdoor Air Delivery & Monitoring

Intent:
To ensure that ventilation systems sustain occupants’ comfort and well-being.
Outdoor Air Delivery & Monitoring

ASHRAE 62.1
Standard that defines minimum ventilation rates for commercial and institutional buildings.

Implementation:
- Establish outdoor air ventilation rate
- Take measurements at system level
- Implement HVAC systems maintenance program
- Test and maintain building exhaust systems

Outdoor Air Delivery & Monitoring

Implementation:
- Outdoor airflow measurement devices
- CO₂ sensors
- MERV 13+ air filters
  - Outside air intakes
  - Inside air recirculation returns

IAQ Best Management Practices

Intent:
- Prevent indoor air quality problems
- Promote well-being of the occupants
- Address any moisture or mold accumulation

IAQ Management Program
- Optimize practices to prevent indoor air quality problems and maintain the well-being of the occupants
- Survey and evaluate building systems to identify potential IAQ Problems
- Address any moisture or mold accumulation

IAQ Best Management Practices

IAQ Management Program: Facility Alterations & Additions
- HVAC protection
- Controlling Pollutant Sources
- Pathway Interruption
- Housekeeping
- Scheduling to minimize contamination
- Construction sequencing
IAQ Best Management Practices

Environmental Tobacco Smoke Policy
» Prevent and minimize exposure to Environmental Tobacco Smoke (ETS)
» Prohibit all smoking in the building
» Locate exterior designated smoking areas at least 25 feet away from all building entries, outdoor air intakes, and operable windows

Occupant Comfort

Occupant comfort
» Temperature
» Humidity
» Air Velocity
» Air Quality
» Building cleanliness
» Acoustics
» OCCUPANT PERCEPTION

Occupant Comfort

Implementation:
» Survey occupants
• Thermal comfort
• Acoustics
• Indoor Air Quality
• Lighting Levels
• Building Cleanliness

Occupant Comfort

Implementation:
» Controllability of Systems
• Task lighting
• Proper zoning
» Access to daylight and views
• Space churn
• Systems furniture panel height
Synergies:
» Lighting controls
» Temperature controls
» Energy savings! $$

Daylight Simulation Model (AGI-32)

Green Cleaning

Concerns:
One-third of cleaning chemicals are harmful to your health
» Eye/skin irritation
» Respiratory problems
» Allergies
» Brain toxins
» Reproductive problems
» Carcinogens
Green Cleaning

Concerns:
- Janitorial staff
  - Direct exposure
  - 6% injured every year
- Building occupants
  - Distribution of chemicals via HVAC system
  - VOC levels up to 36x higher than acceptable two hours after cleaning

Green Cleaning - Intent

Concerns:
- Mold
  - Health effects
  - Liability issues

Green Cleaning

Concerns:
- Pollution issues
  - Air pollution/smog
  - Ozone depletion
  - Eutrophication of waterways
  - Interference with sewage treatment
  - Bioaccumulation of toxins in plants and animals
  - Endocrine disruption in wildlife

Green Cleaning

Assess current practices:
- Green Cleaning Policy?
- High Performance Cleaning Program?
- Custodial Effectiveness?
- Green Purchasing?
- Green Cleaning Equipment?
- Entryway Systems?
- Indoor Integrated Pest Management?

Green Cleaning

Implementation:
- Green Cleaning Policy
  - Cleaning products
  - Cleaning equipment
  - Standard Operating Procedures (SOPs)
  - Hand hygiene
  - Handling and storage of hazardous substances
  - Feedback mechanisms

Green Cleaning

Implementation:
- Purchasing
  - Look for:
    - EcoLogo
    - Green Seal
    - CA Code of Regulations
    - Ergonomic design
    - High efficiency, low emissions
Green Cleaning

Custodial Effectiveness Assessment
» Perform audit meeting requirements of APPA Leadership in Educational Facilities "Custodial Staffing Guidelines"

APPA Audit

Level 1 – Orderly Spotlessness
Level 2 – Orderly Tidiness
Level 3 – Casual Inattention
Level 4 – Moderate Dinginess
Level 5 – Unkempt Neglect

Indoor Integrated Pest Management

Intent:
» Integrated methods
» Site or pest inspections
» Pest population monitoring
» Emergency application of pesticides
» Communication strategies

Indoor Integrated Pest Management

IPM applies to all employees and contractors at the facility
» Site or pest inspections
» Pest population monitoring
» Integrated and non-chemical methods
» Least-toxic pesticide as last resort
» Communication strategy for universal notification of pesticide use

Indoor Integrated Pest Management

Implementation:
» IPM Policy
» Prescriptive Strategies
» Integrated Methods

Indoor Integrated Pest Management

Indoor Integrated Pest Management Policy
» Education
» General rules
» Monitoring and record keeping
» Universal Notification
Indoor Integrated Pest Management

Strategies:
» Eliminate cracks and
» Boric acid
» Physical barriers
» Monitor chemical use
» Alter the pest’s environment
» Use of alternative methods to catch pests
» Minimal use of herbicides and pesticides

Other Considerations

Emissions Reduction Reporting

» Track and record emissions reductions
» Third-party voluntary reporting or certification programs
  • EPA Climate Leaders
  • Energy Star
  • WRI/WBCSD Protocols

<table>
<thead>
<tr>
<th>CO₂ Avoided (metric tons per year)</th>
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</thead>
<tbody>
<tr>
<td>Waste Reduction</td>
<td>128</td>
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<tr>
<td>Energy Reduction (electricity)</td>
<td>1,381</td>
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<tr>
<td>Energy Reduction (natural gas)</td>
<td>188</td>
</tr>
<tr>
<td>Water Reduction</td>
<td>40</td>
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Sustainable Operations Accounting

» Documenting Sustainable Building Cost
  • 5 years of historical data on operating costs
  • Operating costs once LEED-EB Implementation has begun
  • IPC & UPC
  • Off-site Renewable Energy
  • As an alternative to on-site renewable energy
  • Facility expenses account categories
LEED Programs

Toward a more elegant rating system

LEED v. 3

Harmonization: The 100 (+10) point system

Overall Weighting Shift
LEED-EB OM

For building owners and service providers that address building operation and ongoing upgrades and performance improvements.

LEED Participants

EB Certified projects: 120
Registered projects (since 2003): 2272
Registered in 2008: 1368
As of 1/2009

LEED for Existing Buildings Project Registrations and Certifications (12/2008)

Rating system analysis: LEED-EB OM 2009

LEED-EB OM & 2009 Point Breakdown

Existing Building Certification Process
## Existing Building Certification Process

### I: Assessment
- Building Walk-through
- Energy Star Benchmarking
- ASHRAE Level I Audit
- Environmental Comfort Analysis
- Gap Analysis-Building Benchmark
- Baseline to LEED
- Comprehensive Report with Cost Analysis

### II: Corporate Planning
- Corporate Planning Session
- Performance and Certification Goals
- Establish Capital Improvements
- Budget and Schedule

### III: Implementation
- Provide O&M Training
- (Staff, Contractors & Tenants)
- Policies and Programs
- Capital Improvements
- Track Energy Performance
- Commissioning
- Waste Audit

### IV: Project Closeout
- In-depth Review of Assessment
- Corporate Planning Session
- Performance and Certification Goals
- Establish Capital Improvements
- Budget and Schedule

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## LEED-EB OM Cost Implications

<table>
<thead>
<tr>
<th>Capital Expenses</th>
<th>Operating Expenses</th>
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<tbody>
<tr>
<td>Energy Efficiency Measures $-$ $$</td>
<td>Energy audits $$</td>
</tr>
<tr>
<td>On-site renewable energy $$ $$</td>
<td>Professional sustainability support $$</td>
</tr>
<tr>
<td>Major equipment upgrades $$ $$</td>
<td>Waste stream audit $</td>
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<tr>
<td>Plumbing upgrades $$</td>
<td>Implementation of Best Practices $$ $$</td>
</tr>
<tr>
<td>Stormwater retention systems $$</td>
<td>Commuting incentives $</td>
</tr>
<tr>
<td>Retro-Commissioning $$</td>
<td>Mechanical systems test and balance $$</td>
</tr>
</tbody>
</table>

- Surveys $ |
- Emissions reporting $
Vernier Software & Technology: Employees

- "100 Best Companies to Work For"
- Bike storage and changing rooms
- Free transit passes
- Building monitoring system for thermal comfort

Vernier Software & Technology: Materials

- 100% Purchased IAQ Compliant Products
- 95% Green Cleaning Products
- 74.5% Recycling of Solid Waste Stream
- 58% Purchased Alternative Materials

Vernier Software & Technology: Energy

- Energy Star Roof
- Photo Voltaic System
- 5 New High Efficiency Rooftop Units
- Achieved Energy Star Rating of 86
- 30% Green Power

Ashforth Pacific Liberty Centre: Energy

- Energy Star rating: 83
- Real-time building systems monitoring
- 30% renewable energy through Blue Sky
- "Green tags" purchased to offset energy use during performance period

Ashforth Pacific Liberty Centre: Water

- Total potable water use reduced by 30%
- Landscaping water use reduced by 50%
- Stormwater managed with bioswales installed by city
Ashforth Pacific Liberty Centre: Occupant Health

- Integrated green cleaning practices
- MERV 16 filters for outdoor air circulation
- Bike parking and changing rooms provided

Oregon Convention Center

- Major chiller retrofit
- Plumbing upgrades
- Rain garden
- Salmon Safe Certification
- Monthly team coordination

Oregon Convention Center

- Solid waste audit including food waste
- Extensive tracking of purchases
- 44% recycling rate

Standard Plaza: Operations

- Solid Waste Management Policy results in 92% landfill diversion rate
- Comprehensive Green Cleaning Program
- Aggressive Environmentally Preferable Purchasing Policy
- Strong “Green Team” presence
Standard Plaza: Occupant Comfort

- Meets ASHRAE 62.1-2007 ventilation requirements
- Bike storage, MAX access and transit incentives
- Underground parking reduces urban heat island effect

40% view facilities as a capital asset
60% view facilities as a strategic tool

- Increase productivity and process efficiency
- Reduce operations and maintenance costs
- Reduce energy and water use
- Reflecting and changing culture
- Adapt to future needs

National Resources

- Betterbricks, www.betterbricks.com
- BOMA, www.boma.org
- IFMA, www.ifma.org

California Resources

- Savings by Design, www.savingsbydesign.com
- Flex Your Power, www.fypower.com
- CaCx, www.caCx.org

Your building: How efficient can it be?

Thank you.

Elaine Aye, IIDA, LEED AP Faculty
Principal
elaine@greenbuildingservices.com

Brian Schaefer, AIA, LEED AP
Principal
Brian@greenbuildingservices.com

Richard Manning, AIA, LEED AP
Principal
Richard@greenbuildingservices.com
Questions?

Thank you.

Elaine Aye, IIDA, LEED AP
Principal
503-467-4715
elaine@greenbuildingservices.com

Richard Manning
Brian Sehnert

PORTLAND
133 SW Second Avenue
Suite 201
Portland, OR 97204
MAIN: 503-467-4710
FAX: 503-467-4711

SACRAMENTO
1721 2nd Street
Suite 200
Sacramento, CA, 95814
MAIN: 916-448-3072

ORLANDO
112 Lake Avenue
Orlando, FL 32801
MAIN: 407-367-2901

HOUSTON
5116 Bissonett #408
Bellaire, TX 77401
TOLL FREE: 888-743-4277