The Mechanics: Design, Construction and Operations

Presented by
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Project Manager
Integrating LEED into Your New Project

- Terminology
- Rating System Risk Management
- Certification Process
- Schedule Milestones
- Deliverables Due
- Project Case Examples
LEED Integration – ‘The Basics’

• LEED vs. LEEDS?
• Certified Buildings vs. Accredited Professionals
• LEED Products?
• LEED AP = or ≠ Qualified LEED Consultant?
• LEED Consultant = or ≠ Energy Modeler?
• LEED Consultant = or ≠ Commissioning Agent?

LEED Rating Categories

- Indoor Environmental Quality
- Innovation and Design Process
- Sustainable Sites
- Energy and Atmosphere
- Water Efficiency
- Materials and Resources
LEED Certification Levels

LEED Scorecard

1. Credit 6.2 Stormwater Design, Quality Control
2. Credit 7.1 Heat Island Effect, Non-Roof
3. Credit 7.2 Heat Island Effect, Roof
4. Credit 8 Light Pollution Reduction

Water Efficiency

1. Credit 1.1 Water Efficient Landscaping, Reduce by 50%
2. Credit 1.2 Water Efficient Landscaping, No Potable Use or No Irrigation
3. Credit 2 Innovative Wastewater Technologies
4. Credit 3.1 Water Use Reduction, 20% Reduction
5. Credit 3.2 Water Use Reduction, 30% Reduction

Energy & Atmosphere

1. Prereq 1 Fundamental Commissioning of the Building Energy Systems
2. Prereq 2 Minimum Energy Performance
3. Prereq 3 Fundamental Refrigerant Management

4. Credit 1 Optimize Energy Performance (*rqd to achieve min. 2pts now) 1 to 10
5. Credit 2.1 On-Site Renewable Energy 1 to 3
6. Credit 3 Enhanced Commissioning 1
LEED Design & Construction Schedule

**Register the Project**
- SD Design Phase
- DD Design Phase
- CD Design Phase
- Construction Phase

**Design Phase submittal to the USGBC**
- Design Point Evaluation
- Incorporating LEED points and associated requirements into the Contract Documents
- Completing LEED submittal documentation and submitting to LEED AP for review
- Remaining LEED submittals by General Contractor
- Construction Phase submittal to the USGBC

**Owner Occupy**

Design and Construction LEED Milestone Schedule Integration

- LEED Baseline Scorecard Established
- LEED Project Registration
- LEED Design Phase Kick-off
- Schematic Design Phase LEED Review
- Design Development Phase LEED Review
- DD Commissioning Review (by the Cx Agent)
- Construction Document Phase LEED Review
- LEED Design Phase Submittal (USGBC review approx. 1 month)
- Commissioning Phase Kick-off (construction)
- LEED Construction Kick-off
- LEED IAQ Flush-out or IAQ Testing (@ TCO, prior to occupancy)
- LEED Construction Phase Submittal (USGBC review approx. 1 month)
- Project LEED Certification Award
- Re-commissioning (1yr after occupancy)
## Owner & Developer Strategies

### Sustainable Sites

<table>
<thead>
<tr>
<th>Credit</th>
<th>Description</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Construction Activity Pollution Prevention</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Development Density &amp; Community Connectivity</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Brownfield Redevelopment</td>
<td>1</td>
</tr>
<tr>
<td>4.1</td>
<td>Construction, Public Transportation Access</td>
<td>1</td>
</tr>
<tr>
<td>4.2</td>
<td>Bicycle Storage &amp; Changing Rooms</td>
<td>1</td>
</tr>
<tr>
<td>4.3</td>
<td>Low-Emitting and Fuel-Efficient Vehicles</td>
<td>1</td>
</tr>
<tr>
<td>4.4</td>
<td>Parking Capacity</td>
<td>1</td>
</tr>
<tr>
<td>5.1</td>
<td>Site Development, Protect of Restore Habitat</td>
<td>1</td>
</tr>
<tr>
<td>5.2</td>
<td>Site Development, Maximize Open Space</td>
<td>1</td>
</tr>
<tr>
<td>6.1</td>
<td>Stormwater Design, Quantity Control</td>
<td>1</td>
</tr>
<tr>
<td>6.2</td>
<td>Stormwater Design, Quality Control</td>
<td>1</td>
</tr>
<tr>
<td>6.3</td>
<td>Stormwater Design, Quantity Control, Low-Emitting and Fuel-Efficient Vehicles</td>
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</tr>
<tr>
<td>6.4</td>
<td>Parking Capacity</td>
<td>1</td>
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### Energy & Atmosphere

<table>
<thead>
<tr>
<th>Credit</th>
<th>Description</th>
<th>Points</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Fundamental Commissioning of the Building Energy Systems</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Minimum Energy Performance</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Fundamental Refrigerant Management</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Optimize Energy Performance</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Enhanced Commissioning</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Enhanced Refrigerant Management</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Measurement &amp; Verification</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Green Power</td>
<td></td>
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</table>

### Materials & Resources

<table>
<thead>
<tr>
<th>Credit</th>
<th>Description</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Storage &amp; Collection of Recyclables</td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>Building Reuse, Maintain 75% of Existing Walls, Floors &amp; Roof</td>
<td>1</td>
</tr>
<tr>
<td>1.2</td>
<td>Building Reuse, Maintain 100% of Existing Walls, Floors &amp; Roof</td>
<td>1</td>
</tr>
<tr>
<td>1.3</td>
<td>Building Reuse, Maintain 50% of Interior Non-Structural Elements</td>
<td>1</td>
</tr>
<tr>
<td>2.1</td>
<td>Construction Waste Management, Divert 50% from Disposal</td>
<td>1</td>
</tr>
<tr>
<td>2.2</td>
<td>Construction Waste Management, Divert 75% from Disposal</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Materials Reuse, 5%</td>
<td></td>
</tr>
<tr>
<td>3.1</td>
<td>Materials Reuse, 10%</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Recycled Content, 10% (post-consumer + ½ pre-consumer)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Regional Materials, 10% (extracted, processed &amp; manufactured regional)</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Regional Materials, 20% (extracted, processed &amp; manufactured regional)</td>
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</tr>
<tr>
<td>7</td>
<td>Rapidly Rentible</td>
<td></td>
</tr>
<tr>
<td>7.1</td>
<td>Certified Wood</td>
<td></td>
</tr>
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</table>

### Indoor Environmental Quality

<table>
<thead>
<tr>
<th>Credit</th>
<th>Description</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Minimum IAP Performance</td>
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</tr>
<tr>
<td>2</td>
<td>Environmental Tobacco Smoke (ETS) Control</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Construction IAQ Management Plan, During Construction</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Construction IAQ Management Plan, Before Occupancy</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Low-Emitting Materials, Adhesives &amp; Sealants</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Low-Emitting Materials, Paints &amp; Coatings</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Low-Emitting Materials, Carpet Systems</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Low-Emitting Materials, Composite Wood &amp; Agrifiber Products</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Indoor Chemical &amp; Pollutant Source Control</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Controllability of Systems, Lighting</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Controllability of Systems, Thermal Comfort</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Controllability of Systems, Thermal Comfort, Design</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Controllability of Systems, Thermal Comfort, Verification</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Daylight &amp; Views, Daylight 75% of Spaces</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Daylight &amp; Views, Views for 90% of Spaces</td>
<td></td>
</tr>
</tbody>
</table>
Integrating LEED into Your *Existing* Building

- LEED EB O&M Basics
- Functional Group Approach
- LEED EB Certification Schedule
- LEED EB Myths
- LEED EB and CI Synergies
- Opportunities

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**LEED for Existing Buildings: Operations & Maintenance**

- Focuses on building performance
- Helps building owners reduce the environmental impacts of their facilities
- LEED EB v2 → LEED EBOM
- LEED Consistencies: Categories, Certification Levels, and Scorecard
- Building must be continually occupied for 12 months
- Performance period (3 months – 2 years)
- Recertification every 5 years
- Prerequisites include Energy Star and Policy implementation
LEED EBOM: Functional Groups

- 5 Rating System Categories
  - Sustainable Sites (SS)
  - Water Efficiency (WE)
  - Energy and Atmosphere (EA)
  - Materials and Resources (MR)
  - Indoor Environmental Quality (EQ)

Reconfigured for Alignment With Functional Areas
- High Performance Operations
- Green Cleaning
- Site Management
- Materials Accounting
- LEED Program Administration

LEED EBOM Project Schedule
LEED EBOM Myths

- Building must undergo major construction
- Commissioning is required
- Implementing a policy = documenting performance
- There is no Green Police

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**LEED addresses the complete lifecycle of buildings:**

<table>
<thead>
<tr>
<th>HOMES</th>
<th>4 of 6 LEED CI Prerequisites Documented in LEED EB</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEW CONSTRUCTION</td>
<td>Up to 21 LEED CI Points Documented in LEED EB</td>
</tr>
<tr>
<td>EXISTING BUILDINGS</td>
<td></td>
</tr>
<tr>
<td>SCHOOLS, RETAIL, LEED FOR HEALTHCARE</td>
<td></td>
</tr>
</tbody>
</table>

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8/18/2008
LEED EB Opportunity: Building Energy End Use

- Lighting: 15%
- Fans: 13%
- Space Heating: 35%
- DHW: 6%
- Office Equipment: 9%
- Cooling: 8%
- Computer: 6%
- Other: 3%
- Kitchen: 3%

LEED EB Opportunity: Ongoing Commissioning

- Initial Cx Investment: Analysis & Implementation
- Building Tune-up
- Continuous Commissioning
- Lost Savings
LEED EB Opportunity: Calculating Carbon Footprint

Tenant Guidelines

- Recommendations vs. Requirements for future tenants
- Leasing Agent/Brokers/Real Estate Agents/etc. MUST have buy-in and knowledge of green
- Attracts & Rewards LEED-CI Tenants
- Maintains sustainable practices in the facility
- Communicated clearly and early – may not add cost
Operational Strategies

- Green Housekeeping:
  - Cleaning Chemicals & Products (prohibited vs. permitted)
  - Cleaning Procedures & Schedules
  - Cleaning Equipment

Cleaning Equipment

The State and the occupants are working to adopt the following requirements for equipment in a cost-effective manner:

- Vacuum cleaners must meet the requirements of the Carpet & Rug Institute Green Program and are capable of capturing 99% of particulates 0.3 microns in size with a sound level less than 76dB.
- Hot water extraction equipment for deep cleaning carpets is capable of removing sufficient moisture such that carpets can dry in less than 24 hours.
- Prevent maintenance equipment including floor buffers, burnishers, and vacuums.

Operational Strategies

- Green Housekeeping:
  - Collaborate and coordinate with vendor, occupants and waste hauler
  - No cost increase except...
  - Appropriate training is crucial
Owner or Tenant Recycling

- Tenant Recycling location and process defined by Developer or Building Owner
- Janitorial Service or Tenant Responsibility?
- Can building serve recycling for Glass, Metal, Paper, Cardboard, & Plastics?

Design Program Around Tenants

- Recycling and waste at every desk
- Recycling at every desk, central waste
- Waste at every desk, central recycling
Owner or Tenant Recycling
A Tale of Two Buildings

- Tenant: Bank, Law firms, Financial Institutions
- 40% recycling rate
- Exchanged trash bins for recycling bins $0
- Cleaners dump 1 bin
- No liner used – $saved

- Tenant: Bank, Government, Union
- Boycotted program
- Purchased $5k in recycling bins
- Cleaners dump 2 bins - $$
- Using liners 1 bin – no savings

Measurement & Verification

- BAS, EMS, DDC...you’re almost there
- Triple-Net Lease Structure
- Responsible Party? – Cx Agent, M&V Agent, Controls Contractor, etc.
Measurement & Verification

- Metering electricity – HVAC power vs. lighting power?

<table>
<thead>
<tr>
<th>System</th>
<th>Data Points</th>
<th>Type of Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terminal PPV, VAV boxes</td>
<td>Discharge air temperature</td>
<td>Analog Input (A)</td>
</tr>
<tr>
<td>Terminal PPV, VAV boxes</td>
<td>Terminal Reheat Valve Positions</td>
<td>Analog Input (A)</td>
</tr>
<tr>
<td>Space (Common &amp; Tenant)</td>
<td>Temperatures</td>
<td>Analog Input (A)</td>
</tr>
<tr>
<td>Parking garage</td>
<td>Carbon monoxide (CO)</td>
<td>Analog Input (A)</td>
</tr>
<tr>
<td>Parking Garage Exhaust Fans</td>
<td>Fan VFD command</td>
<td>Analog Output (AO)</td>
</tr>
<tr>
<td>Parking Garage Exhaust Fans</td>
<td>Fan Start/Stop</td>
<td>Digital Output (DO)</td>
</tr>
</tbody>
</table>

Note that during the M&V period, the base building will have tenants moving in, which will result in the relocation of VAV boxes and space sensors etc. Building controls will keep an updated log of tenant changes, and will revise controls plan accordingly and in a timely manner.

### 2.3.3 Base Building Sub-Meters

Table 2.2 provides a complete sub-metering control points list.

<table>
<thead>
<tr>
<th>System</th>
<th>Metering Points</th>
<th>Type of Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>RTU-1 &amp; 2</td>
<td>Fan motor circuit pulse meters feeding to DDC system. (1 sensor for each fan)</td>
<td>Analog Input (A)</td>
</tr>
<tr>
<td>Building Exhaust Fan</td>
<td>Fan motor circuit pulse meters feeding to DDC system. (1 sensor for each fan)</td>
<td>Analog Input (A)</td>
</tr>
<tr>
<td>Domestic Hot Water Heaters and Common Areas 3-20V Loads</td>
<td>Circuit Pulse meter feeding to DDC system.</td>
<td>Analog Input (A)</td>
</tr>
<tr>
<td>Base building interior lighting</td>
<td>Circuit Pulse meter feeding to DDC system.</td>
<td>Analog Input (A)</td>
</tr>
<tr>
<td>Defries lighting</td>
<td>Circuit Pulse meter feeding to DDC system.</td>
<td>Analog Input (A)</td>
</tr>
</tbody>
</table>

### LEED EB Opportunity: Energy Savings Potential

- Data Analysis; On-going Cx
- Tune-up
- Cost allocation
- Install meters only

Top 10 Final Recommendations

1. Education & Training
2. Determine Rating System or other Metric to measure success
3. Prioritize Environmental Goals
4. Integrate Key Consultants (& pre-qualify them!), dedicate Champions
5. Risk Management for Sustainability

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Top 10 Final Recommendations

6. Use your vendors
7. Integrate reports with current reporting structure
8. Understand the relationship with tenants
9. Create high level understanding of building operations
10. LEED EB is a part of the journey
Questions?
Thank you for your time!