The Greener Facility: Going Beyond LEED

Thursday, October 27, 2011
Introductions

- Matt Welander, Theatre Projects Consultants
- Katie Oman, LEED AP, Fisher–Dachs Associates
- John Shorb, LEED AP, AIA, Opsis Architecture
- Denis Blount, ARUP
The Greener Facility

What’s LEED got to do with it?
LEED, follow, or ...
Pros and cons of LEED
LEED Brain
The bike rack argument
LEED and theaters
Do we really need a LEED rating?
I may wear a size 7 shoe, but I leave a size 14 carbon footprint.
LEED EBOM

Existing Buildings: Operations & Maintenance
LEED EBOM

Sustainable Sites
Water Efficiency
Energy and Atmosphere
Materials and Resources
Indoor Environmental Quality
Innovation in Operations
Regional Priority
LEED EBOM

Measurement & Reporting
- Water and Energy Performance Measurement
- Emissions reduction reporting
- Energy sub-metering
- Waste auditing

Policy and Planning
- Landscape, Hardscape, Pest Management plans
- Purchasing and Waste Policies
- Green Cleaning Policies
- Alternative Commuting Policy
- Planning for building upgrades & expansion

Best Practices
- Commissioning
- Energy- and water-efficient equipment & practices
- IAQ best practices
- Systems control
- Sustainable site management and design
- Renewable Energy
- People-friendly design
Case Study: Seattle Rep
Case Study: Seattle Rep

1) Document Baseline
   What’s being done now?
   How does this affect the bottom line (to ID savings)
   How are we communicating to our patrons about sustainability?

2) Identify Areas for Improvement
   What can we do to improve?
   How much will it cost?
   What impact will it have?
   Can we leverage any partnerships?

3) Implement
   Develop Environmental Action Plan
   Harvest Low-hanging Fruit
   Report on progress
Case Study: Seattle Rep
Case Study: Seattle Rep

Image courtesy Gustafson Guthrie Nichol ltd

Donnelly Gardens
Theater Commons at Seattle Center
Groundbreaking, September 2009
Opening, Spring 2010
Case Study: Stephen Sondheim Theatre
Case Study: Stephen Sondheim Theatre

Priority: Indoor Environmental Quality
Case Study: Stephen Sondheim Theatre

Indoor Environmental Quality
• HVAC system filters out 95% of particulate matter
• CO2 sensors help deliver 30% more fresh air than code requires
• Paints, sealants, and adhesives are low VOC
• Green Label Plus certified carpeting
• Wood products are low VOC and contain no added urea-formaldehyde
• All furniture is Greenguard Indoor Air Quality Certified
• Strict construction procedures prevented dust and debris from entering the theatre’s ductwork system
Case Study: Stephen Sondheim Theatre

Materials
- Over 75% of project waste diverted from landfill
- Blast furnace slag replaces 45% of cement in the structural concrete
- Wood products FSC certified
- Sheetrock with high recycled content and mineral fiber acoustic ceiling tile is used throughout
- Lobby Carpeting is 100% wool
- Seating upholstery is 100% recycled polyester, and is fully recyclable.
- Drapery fabric is over 50% wool
Case Study: Stephen Sondheim Theatre

Water Conservation
• Waterless urinals reduce potable water consumption by 1/3
• Wastewater is reused for flushing toilets

Energy Efficiency
• Energy Star equipment and appliances
• Equipment and systems commissioning
Case Study: Gerding Theatre
Case Study: Gerding Theatre
Case Study: Gerding Theatre
Sustainable Design:
Reaching LEED Platinum for The Gerding Theater at the Armory

The Gerding Theater at the Armory is the first building on the National Register of Historic Places and the first building in Portland to achieve the highest benchmark in the U.S. Green Building Council Leadership in Energy and Environmental Design (LEED) Rating System. This rating system addresses the environmental and human impacts of a building in six categories:

Energy

Using an energy model to estimate energy usage and test energy efficiency measures, the building is projected to achieve 30% energy cost savings over a similar code-compliant building.

Indoor Environment

Displacement and underfloor ventilation is used in the theater and the main lobby. This system will deliver fresh air directly under seats to improve comfort and improve air quality, thermal comfort, and user experience.

Water

A rainwater harvesting system captures rainfall to flush toilets and urinals.

Materials & Resources

The architect and interior designers specified as many materials as possible that have a high percentage of recycled content and were locally manufactured or harvested. As a result, 20% of materials have recycled content and 45% were manufactured within 500 miles.

Site Strategies

Space-saving 13,000 SF of interior programming is housed in a 20,000 SF footprint.

Innovation and Design Process

The Natural Step Principles were throughout the design and construction of the building.

More than 45% of building materials were locally manufactured or harvested, more than double the LEED requirement.

The project provided tours of the building during construction and has continued to do so after the project was completed. The goal is to share the knowledge learned from the project and educate the general public, staff, and schoolchildren about the principles of sustainable building through interactive activities and articles written, tours, and using this project as a case study.
Case Study: Wolf Trap
Case Study: Wolf Trap
Case Study: Wolf Trap

How Green Is This Tour?
Guster and Jack’s Mannequin have teamed up with Reverb for green Your 2011 Summer Tour.

Founded by Guster’s Adam Gardner and his wife, Lauren Sullivan, Reverb is a 501(c)(3) environmental non-profit organization that creates and executes comprehensive greening programs for music tours while also using the tour itself as a platform to engage fans in a fun and positive atmosphere.

Greening actions on this tour include:
- Carbon offsets to account for CO2 emissions from internal energy use, ground transportation, generators, trucks and buses
- Extensive waste reduction and recycling bootlegs and front of house
- Sustainable supplies such as biodegradable and reusable serving utensils
- Green cleaning supplies for buses
- Reusable water bottles & soyfree hugs for band and crew with backpack water stations
- Using sustainability endorsed K Loves Sustainable Fair Trade certified products
- Educational outreach opportunities for local environmental non-profits
Case Study: Wolf Trap
Approach to Sustainability is influenced by:

<table>
<thead>
<tr>
<th>Who</th>
<th>Client, Campus Culture, Program User Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Where</td>
<td>Climate, Specific Site, Slope, Views, Response to Existing Buildings, Native Vegetation</td>
</tr>
<tr>
<td>What</td>
<td>Program Requirements, Acoustics, Air Quality, Light, Public Access Needs, Local Resources &amp; Programs</td>
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# Program Related Sustainability Drivers

<table>
<thead>
<tr>
<th>Arts &amp; Allied Health</th>
<th>Natural Ventilation &amp; Tempered Air</th>
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<tbody>
<tr>
<td>Offices</td>
<td>Displacement Ventilation</td>
</tr>
<tr>
<td>Lobby</td>
<td>Mechanical Air</td>
</tr>
<tr>
<td>Art Studios</td>
<td>Radiant Heating &amp; Cooling</td>
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</tbody>
</table>

- Offices
- Lobby
- Art Studios

- Theatre
- Vocal Recital Hall

- Recording Studio
- Practice Studio
- Computer Labs
- Classrooms

- Offices, Lobby
- Project Rooms, Art Studios

- Offices
- Lobby
- Project Rooms
- Art Studios

[Image of people in a room with papers on walls]
SMALL FOOTPRINT
Tucked into the site, a more compact building uses less materials and saves forest.

SITE FEATURES
1. Green Roof
2. Stormwater Runoff Garden
3. Existing Tree Preservation
4. Outdoor Seating
5. Bike Parking
6. Reflective/Open Grid Paving
7. Stormwater Infiltration Basin

FLOOR ONE PLAN
8. Theatre
9. Scene Shop
10. Costume Shop
11. Rehearsal/Drama Classroom
12. Vocal/Instrumental Recital Hall
13. Tiered Classroom
14. Computer Classroom
15. Medical Office
16. Multi-Media Lab
17. Nursing Skills Lab
18. Classroom

RESOURCE SAVINGS
Efficient, sustainable systems save water and energy compared to a baseline building.

Project Summary
Location: Puyallup, Washington
Gross Sf: 61,500 Sf
Building Footprint: 38,969 Sf
Cost: $17M
Completed: September 2010
Natural Ventilation Modeling

Step 0: Plan modeling strategy
How is the building best simulated?
Identify objectives
Establish comfort parameters
Determine acceptable levels of comfort

<table>
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<tr>
<th>Temperature</th>
<th>Acceptable Hours Annually</th>
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<tbody>
<tr>
<td>75-80 ºF</td>
<td>150 Hours</td>
</tr>
<tr>
<td>80-85 ºF</td>
<td>50 Hours</td>
</tr>
<tr>
<td>&gt;85 ºF</td>
<td>20 Hours</td>
</tr>
</tbody>
</table>
Natural Ventilation Modeling

Lobby Analysis

No Shading

E façade Top

Shading Sliding doors open

Sliding Doors closed

<table>
<thead>
<tr>
<th></th>
<th>Hours in Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Shading</td>
<td></td>
</tr>
<tr>
<td>Preliminary</td>
<td></td>
</tr>
<tr>
<td>Revised</td>
<td></td>
</tr>
</tbody>
</table>

- No Shading: 101, 17
- E façade Top Shading: 445, 14
- Sliding doors open: 294, 24
- Sliding Doors closed: 485, 29

- > 85
- 80-85
- 75-80

Arts
Theater Arts
Music
Touch and Feel
Recital Hall
Green Roof

plant pallette

- sedum spirium 'foldaglut'
bloom color: red
mature height: 5-7"
drought tolerance: v. high

- sedum cauticola 'bertram anderson'
bloom color: purple
mature height: 6-8"
drought tolerance: v. high

- sedum kamtschaticum
bloom color: yellow
mature height: 4-6"
drought tolerance: v. high

- sedum album 'coral carpet'
bloom color: white
mature height: 4"
drought tolerance: v. high

- sedum fabaria
bloom color: purple
mature height: 12-16"
drought tolerance: v. high
The AAH Building creates something greater than the sum of the individual pieces.
Lasting outcomes…

• Began “sustainable” campus identity discussion

• Users played an active role in sustainability decisions

• Enhanced recycling program in the City of Puyallup

• Sustainable landscaping plan campus-wide at Ft. Steilacoom

• Development of sustainable curriculum in conjunction with other area colleges.
LEGEND

1. Planted Stormwater Infiltration Basin
2. Hardy Native Landscaping
3. Existing Tree Preservation
4. Covered Outdoor Plazas
5. Solar Array
6. Green Roof
7. Skylights
001  PREFACE
Introduction to EA and the EA Commercial Program

005  CATEGORY 1: ENERGY
Save Energy, Systems Performance, Measure & Manage Energy

039  CATEGORY 2: WATER
People, Plants and Stormwater

057  CATEGORY 3: HEALTH
Pollution Source Control, Toxic Reduction and Occupant Comfort

077  CATEGORY 4: MATERIALS
Environmental, Minimization, Durability & Waste Reduction

105  CATEGORY 5: LAND
Site Ecology, Transportation and Connectivity & Placemaking

127  RESOURCES
Under Development
east perspective
LEGEND

1. Extensive Green Roof
2. Roof Terrace
3. Automated Windows – controlled by mechanical DDC system
4. Cooling Through Natural Ventilation
5. Thermal Mass Regulates Temperature Swings
6. Heated and Chilled Radiant Floor
7. Louvers at Natural Ventilation Exhaust
8. Skylights Provide Daylight Throughout Wintergarden
9. Cantilevered Canopies Shade East/West Sun
Daylight Analysis

Daylight Factor Averages
1st Floor: 5%
2nd Floor: 7.3%
3rd Floor: 15%

SOUTH WALL
studio theater
Daylight Analysis
DANCE STUDIO

JUNE 21
SUMMER SOLSTICE
CLEAR SKY
RGB
blackbox theatre
level 3
music/choral rehearsal
LEGEND

1. Daylighting
2. Displacement Ventilation
3. Acoustic Clouds
4. Diffusive Acoustic Wood Panels
5. Floating Floor
Going Beyond LEED

Denis Blount, Arup
Sir Ove Arup founded his practice in London in 1946 based on a belief in ‘total design’ — the integration of the design process and the interdependence of all the professions involved, the creative nature of engineering, the value of innovation and the social purpose of design.

Today we understand this as a commitment to sustainability.
My Perspective
Technical Disciplines

- **Acoustics**
- **Audiovisual Design**
- Bridges
- CAD/Drafting
- Civil Engineering
- Controls
- Commissioning
- Electrical Engineering
- Environmental Engineering
- Façade Engineering
- Fire Engineering
- Geotechnical/Tunnel Engineering
- Information Technology

- Lighting Design
- Logistics
- **Mechanical Engineering**
- Plumbing and Fire Protection Engineering
- Project Management
- Risk
- Security Design
- Structural Engineering
- **Sustainability**
- Transport Planning
- **Theatre Planning and Design**
- Urban Planning
- Visualization
Loads per Building Type

Museum
- Windows
- Walls
- Infiltration
- People
- Lights
- Equipment
- Ventilation

Residential
- Windows
- Walls
- Infiltration
- People
- Lights
- Equipment
- Ventilation

Office
- Windows
- Walls
- Infiltration
- People
- Lights
- Equipment
- Ventilation

Lab
- Windows
- Walls
- Infiltration
- People
- Lights
- Equipment
- Ventilation
Concert for Diana: Carbon Footprint

Sustainable Design for Venues?
Additional Resources

BS 8901 – Sustainable Event Management
www.greentheatres.org
Project Examples

...for discussion...
Brooklyn College Performing Arts Center

- **Program:** Performing Arts Center
- **Location:** Brooklyn, NY
- **Client:** City University of New York (CUNY)
Theatrical lighting loads at +18’ in space

Occupied zone with 80 people sitting in rafters
Theatre Rehearsal Room

- **Design challenges:**
  - Reduce airflow by 50%
  - Minimize ductwork size
    - Reduces architectural impact
    - Reduces cost
    - Minimize energy consumption
  - Meet air velocity requirements
  - No draft on occupants
Solution: downward deflection angle of 15°
Volumetric average temperature of occupied zone – 74.5 F; meets temperature criteria

Sweep Surface: Contours of Static Temperature

Jan 21, 2010

FLUENT 6.3 (3d, pbns, S-A)
Takeaways:

- Temperature stratification: design approach that is simultaneously practical and energy-efficient
- CFD as a design validation tool
Case study: Load driven design

- **Design challenges:**
  - 800 amp equipment electrical load and 400 amps for mechanical equipment allocated for performance space
  - Equipment specification and system design to meet loads

- **Solutions**
  - Distributed dimming
  - LED fixtures

Strand S21 Dimmer Strip  
Elation LED Par Zoom MM  
‘Mighty Output’ LED Batten
Going Beyond LEED

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