Blending Green With Lean in Your Laboratory
Discover the most effective ways to achieve a step-by-step transition to Green and Lean capability

Presenters

Vassilios I. Nicolaou, AIA
Vice President, Chief Lab Designer

With 50 years of professional experience, Vassilios Nicolaou, AIA, is the Vice President, Senior Laboratory Architect at Karlsberger. In his 20 years with the firm, Vassilios has served as an expert for laboratory planning and design. Many accomplishments have added to his storied career, including Alabama Council of American Institute of Architects (AIA) two-time award winner, and first place team member award winner for the Milwaukee Waterfront Master Plan. Vassilios is also National Council of Architectural Registration Boards (NCARB) certified, a member of the Biotechnology Association of Alabama, and was an instructor at the University of Alabama at Birmingham School of Engineering.

Louis J. Pallay, AIA, LEED® AP
Senior Associate, Project Architect

Louis J. Pallay, AIA, LEED® AP is a Senior Associate, Project Architect with Karlsberger. With more than 20 years of professional experience, Lou specializes in design and document coordination for research facilities. His expertise includes complex laboratory and research spaces for leading academic medical centers. A LEED® accredited professional, Lou earned a bachelor of arts and sciences from the Knowlton School of Architecture at The Ohio State University and is a member of the American Institute of Architects.
The most effective ways to Green and Lean

- A Brief Overview of Lean Methodology
- Green Design Healthcare - Case Studies
- Specific LEED® approaches that work with Lean design

A Brief Overview of Lean Methodology
Trends of Lean Methodology

- Consolidations
- Flexibility/Adaptability
- Open/Interactive
- Automation/Robotics
- Labor Shortage
- Integration
- Green Design

Lean Objectives

- Reduce Turn-Around-Time (TAT).
- Eliminate waste.
- Reduce total cost.
- Improve quality.
- Improved productivity.
Forms of and Contributions of Waste

- Correction
- Unevenness
- Overproduction
- Waiting
- Transport
- Over processing
- Excess inventory
- Motion
- Correction of defects
- Underutilization

Existing Sixth Floor Travel Distances
Flow Process

Current Flow of Front End Process

Flow Process

Ideal Flow of Front End Process

Proximity Matrix

FRONT END 1
OUTREACH 2
CHEMISTRY 3
HEMATOLOGY 4
SPECIAL CHEMISTRY 5
MORPHOLOGY 6
Virology 7
IMMUNOLOGY 8
MOLECULAR DIAGNOSTICS 9
FLOW CYTOMETRY 10
BLOOD BANK 11
PRE-MATERNITY 12
RESIDENTS 13
LAB SUPPORT 14
INFORMATION SYSTEMS 15
ADMINISTRATION 16

ADJACENT
PROXIMITY
POSSIBLE PROXIMITY
SEPARATED
Bubble Diagram

Benchmark and Comparative Analysis

<table>
<thead>
<tr>
<th>FACILITY LOCATION</th>
<th>TEST VOLUME</th>
<th>STAFF / FTE's</th>
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<th>SQUARE FOOT COST ORIGINAL</th>
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## Area Analysis

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### Summary

- Area Analysis
- Test Volume

#### Test Volume

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#### Notes

- Area Analysis
- Test Volume

### Notes

- Area Analysis
- Test Volume
### Storage Analysis
(Flow Cytometry Supplies)

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### Equipment Schedule

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### Notes
1.bold text indicates new equipment.
2.italics indicate equipment under repair.
3.italicized text indicates equipment that is temporarily on loan.
4.withdrawn equipment is denoted with "Viewed as."
Area Analysis

- EXISTING
  - NSF: 32,629
  - DGSF: 45,225
  - Efficiency: 0.72

- PROGRAM
  - NSF: 53,064
  - DGSF: 62,959
  - Efficiency: 0.90

- FINAL
  - NSF: 66,431
  - DGSF: 68,417
  - Efficiency: 0.90

Green Design Healthcare - Case Studies
A Highly Complex Research Environment

Rationale to Achieve LEED® Certification

- Lowering the operating and maintenance costs
- Improved productivity
- Using green design and sustainability in the recruitment and retention of staff
- Enhanced health and well being
- Environmental stewardship

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<th>PERCEIVED ADVANTAGES OF BUILDING GREEN</th>
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<td>8.9% decrease in operating costs</td>
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<tr>
<td>7.5% increase in building values</td>
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<tr>
<td>6.6% improvement in ROI</td>
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<tr>
<td>3.5% increase in occupancy</td>
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<tr>
<td>3% rent increase</td>
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* According to the U.S. Green Build Council

The Positive Outcomes

Multiple benefits of a LEED project include:

- Substantial future energy and maintenance cost savings
- The creation of a standard of excellence for buildings
- The support and advancement of our professional responsibilities for environmental stewardship
- Expedited permitting (verify with local building authority)

LEED® Corporate Commitment

- Karlisberger now requires all staff to become LEED® Accredited Professionals
- Currently “greening” Karlisberger base specifications
A Platinum-level LEED® hospital

**Dell Children’s Medical Center of Central Texas**

- First hospital in the world to achieve Platinum-level certification
- Construction Cost - $137,000,000
- Size - 473,000 sf
- Unique On-site Combined Cooling Heating Power Plant that produces energy more efficiently and reuses its by-products.

**Dell Children’s Medical Center of Central Texas Clinical Laboratory**

- Construction Cost - $3,035,433
- Size - 10,480 sf
- Surrounded by inviting courtyard spaces (1), the clinical laboratory (3) infuses natural light into the lab spaces.
- Courtyards also provide natural air circulation throughout the lab spaces.
A Highly Complex Research Environment

University of Miami Biomedical Research Building

- 10-stories, 183,000 square foot
- $72,000,000
- Seven floors of research space
- Two floors of vivarium with imaging suites
- A penthouse for mechanical systems
- Two separate HVAC zones and duct systems for energy savings
  - Office and administrative areas recirculate a portion of the HVAC.
  - The laboratory areas exhaust 100-percent of the HVAC.
  - Flexible zone (office or laboratory space)
Sustainable and LEED® certification design features

- Dedicated air handling units with reduced air exchanges for the office area
- Daylight harvesting reduced unnecessary artificial lighting requirements
- To eliminate redundant systems the future “sister” building will be supported by M/E/P systems in the annex attached to the Biomedical Research Building

Sustainable and LEED® certification design features continued

- Purchase green power from local utility
- Recirculation animal watering system
- External egress stairs (reduced HVAC load/eliminate smoke EVAC)
- Low flow plumbing fixtures
- High efficiency lighting fixtures
- Cut-off light fixtures
- Lighting control system
- Heat recovery system

Inventive reclamation system for the HVAC condensate that flushes half of the toilets and urinals
- Fully commissioned building systems to ensure efficient operations and maximum energy savings
- Shower facilities for bicyclers

Options Not Pursued
- Waterless Urinals
A Green Clinical Laboratory

Yale-New Haven Hospital Laboratory Relocation

- Construction Cost - $21,000,000
- Size - 80,000 sf
- Designed to achieve Silver-level LEED® Certification.
- Increased ventilation.
- Recycled and reused materials.

Yale-New Haven Hospital Laboratory Relocation

- Low heat island effect using light colored roof membrane and light-colored paving.
- Interior and exterior lighting that reduces nighttime light pollution.
- Water use reduction of 40% including Laboratory process water.
- Optimized energy performance of 17% improvement over baseline design.
Specific LEED® approaches that work with Lean design

Aspects of LEED® Scoring

- Sustainable Sites
- Water Efficiency
- Energy & Atmosphere
- Materials & Resources
- Indoor Environment Quality
- Innovation & Design Process
Environmental/sustainability artwork?
Aspects of LEED® Scoring

- Sustainable sites
  - These elements belong to the building not to the department
  - Potentially Lean design is departmental and does not effect the overall building except for –
    - Monitoring construction waste
    - Even if it is an infill, they can’t trash all of their garbage
    - Bicycle use but you don’t get value for Lean because you spend money to create those areas.
    - Outdoor environment/relaxation locations, again you are paying for it, is a healthy employee worth it?
Aspects of LEED® Scoring

- Water efficiency
  - Items that are applicable to a lab
  - Low flow fixtures and automatic controls
  - A point-of-use polishing / De-Ionized water as you need them
  - Not wasting money on a system that you are not going to use. Not installing a building wide system.

Aspects of LEED® Scoring

- Energy and atmosphere
  - Relies heavily on pre-requisites.
  - Building related
Aspects of LEED® Scoring

- Materials and Resources
  - Building/materials re-use and recycled
  - Regional materials
  - Certified wood
  - Whether materials is adding value to be Lean
    - Chemical resistant?
    - Lower costs?
    - Less maintenance?
    - Reparability and ease of replacement?

Aspects of LEED® Scoring

- Indoor Environmental Quality
  - Low-emitting materials
    - Adhesives, paints, carpet, composite wood
  - Indoor chemical and pollution source control
    - Separate copy rooms
  - Controllability of systems
    - Lighting and thermal
    - Lighting sensors
    - Office areas
  - Thermal comfort
  - Daylighting and natural images – adds to the psyche of staff
Aspects of LEED® Scoring

- Innovation and design
  - Can be implemented without affecting the Lean design
  - Anything completed over and above what is requested
    - Hand sanitizers as opposed to hand sinks?
    - At BRB – condensate water collection
    - University’s green purchasing program – only buying green cleaning materials and recycled materials.
- Water-less urinals
- Clinical laboratory / LEED® education program / Wellness Initiatives

Building and Architectural Design Features

Design Features

- To enhance sustainability and achieve LEED®:
  - Finishes can include low VOC paints and adhesives, carpet tile and linoleum tile
  - Recycled aluminum can be utilized wherever possible (curtain wall)
  - An Energy Star® roof (reducing heat gain) at the upper floors
  - Enclosed copy areas
  - Sunshades and building orientation reducing solar heat gain into the building
  - Encouraging stair use hopefully reducing elevator operations, while fostering collaboration.
  - Establishing an educational program
j12

Art that flows with text on right.

jdeleon, 09/09/2008
**Flexibility – Flexibility – Flexibility**

- Flexible design of laboratory spaces
  - Central core laboratory support space
  - Perimeter laboratories
  - Effective use of ghost corridors
  - Floor plate efficiency
  - Inherent flexibility is consistent and supportive of the LEED® philosophy and the creation of a sustainable environment.
  - A flexible design greatly reduces future retrofit construction waste.

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**Thank you!**
j38 Environmental/sustainability artwork>?
jdeleon, 09/09/2008
Karlsberger has been in continuous operation since 1928 providing full spectrum professional planning and architecture services. Headquartered in Columbus, Ohio, the firm also has offices in New York City, Birmingham, Alabama, and Karlsberger Healthcare Consulting, an independent, woman-owned business in Ann Arbor, Michigan.

Karlsberger is an internationally recognized leader in the programming, planning, design and architecture of contemporary, innovative laboratory environments. Design experience includes laboratory projects for healthcare, academic teaching/research, biomedical, production, public health, forensic and specialty laboratory clients.