

# The Economics of LEED for Existing Buildings

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THE SUSTAINABILITY EXPERTS®

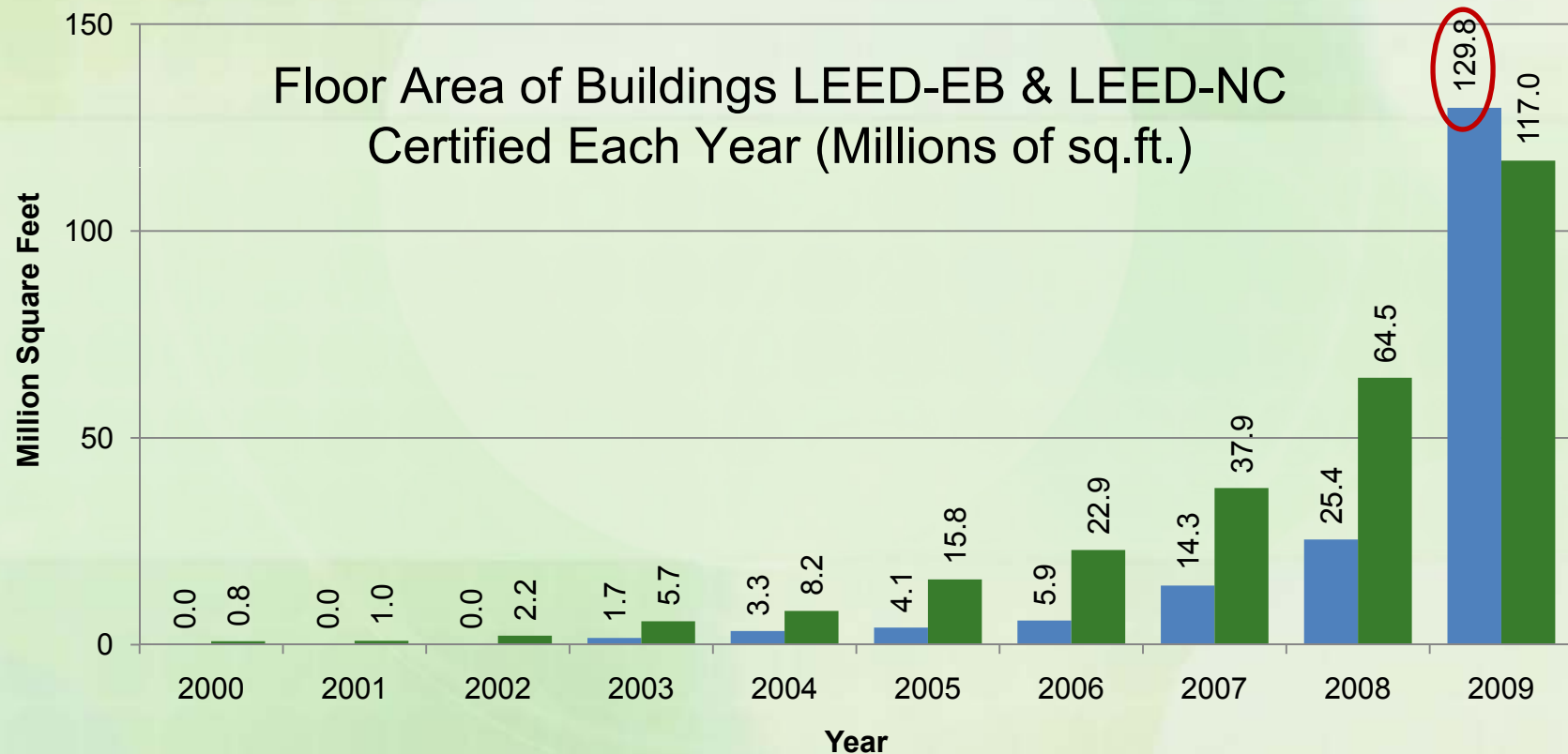
# Introduction to Leonardo Academy

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- A Charitable (501c3) nonprofit organization
- Mission: advancing sustainability
- Approach:
  - Develops new approaches and methods for sustainability
  - Supports implementation of new approaches and methods
- Areas of Work
  - Organizational Sustainability
  - LEED® implementation and certification support
  - Emissions footprints, reduction strategies and offsets
    - Cleaner and Greener Program certifies achievements
  - ANSI Sustainability Standards Development
    - Emissions, Sustainable Organizations, Sustainable Vehicles, Sustainable Agriculture, Sustainable Gaming



# Growing Importance of LEED for Existing Buildings



# LEED for Existing Buildings Economics

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- LEED-EB is a relatively new standard
  - It is expected that LEED-EB (based on experience with LEED-NC) will:
    - Reduce operating and maintenance costs
    - Optimize life cycle economic performance
    - Enhance asset value and increase profits
- Leonardo Academy conducted a survey to explore the costs & benefits of LEED-EB



# LEED-EB Economics:

Leonardo Academy Study, 2008

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## – The Study:

- “The Economics of LEED for Existing Buildings, 2008 Edition” – Leonardo Academy

## – About the Study:

- All building owners/managers of LEED-EB certified buildings were sent a cost survey
- 23 LEED-EB building owners/managers responded to the survey
- Response rate of 43%
- Report can be found at: [www.leonardoacademy.org](http://www.leonardoacademy.org)



# Certification Costs per Square Foot for All Buildings

	Mean	Median	Minimum	Maximum
<b>Staff Hours</b>	0.013 hr	0.008 hr	0.001 hr	0.041 hr
Consulting Costs	\$0.237	\$0.04	0.000* (*pilot program )	\$1.49
Registration Fee	\$0.018	\$0.01	0.000*	\$0.10
Application Fee	\$0.010	\$0.01	0.000*	\$0.04
Other	\$0.005	\$0.00	0.005	\$0.06
<b>Total Soft Costs</b>	<b>\$0.27</b>	<b>\$0.10</b>	<b>\$0.005</b>	<b>\$1.54</b>
<b>Total Hard Costs</b>	<b>\$0.73</b>	<b>\$0.11</b>	<b>\$0.00</b>	<b>\$3.14</b>
<b>All Costs</b>	<b>\$1.00</b>	<b>\$0.33</b>	<b>\$0.01</b>	<b>\$4.68</b>

# Definitions of Hard & Soft Costs

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## – Soft Costs

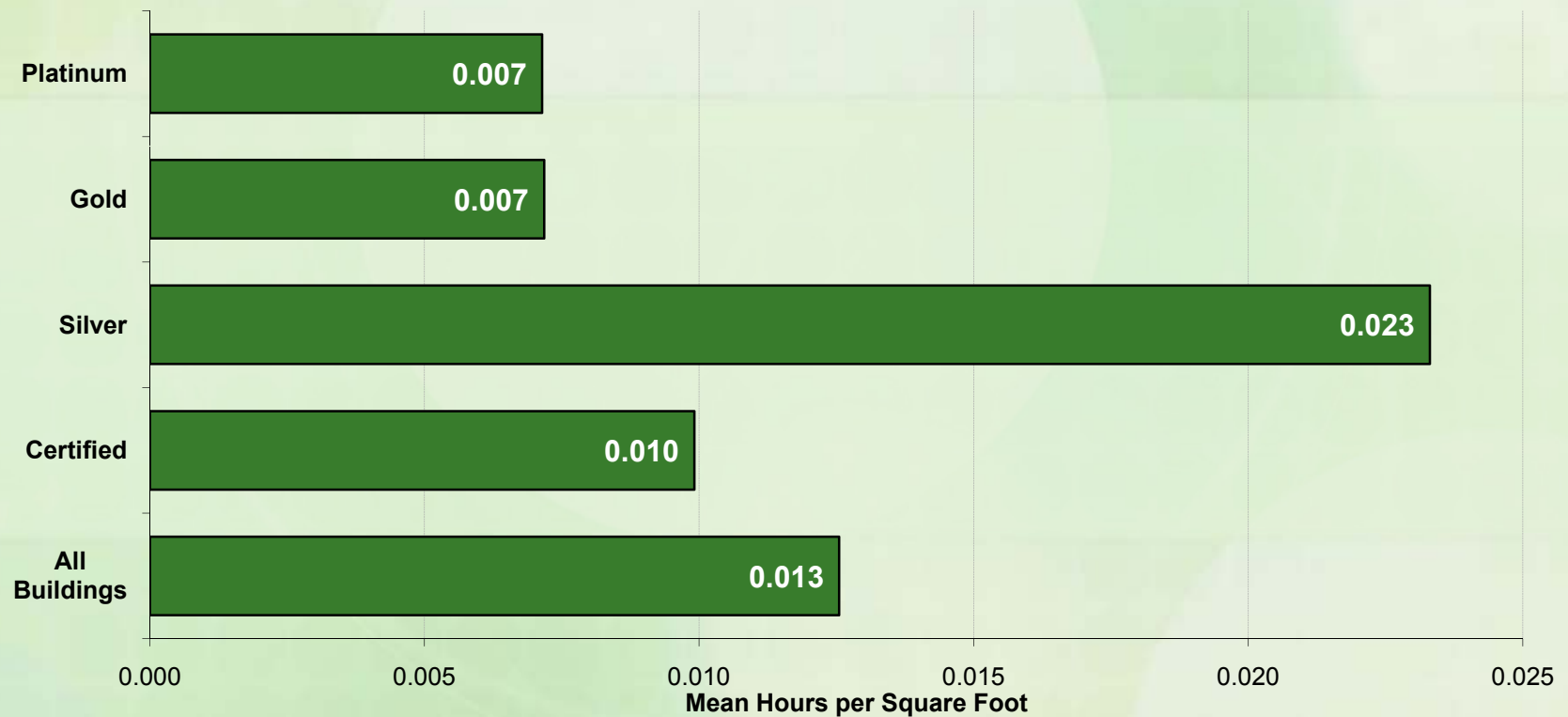
- Consulting Costs
- USGBC Registration Fees
- USGBC Application Fees

## – Hard Costs

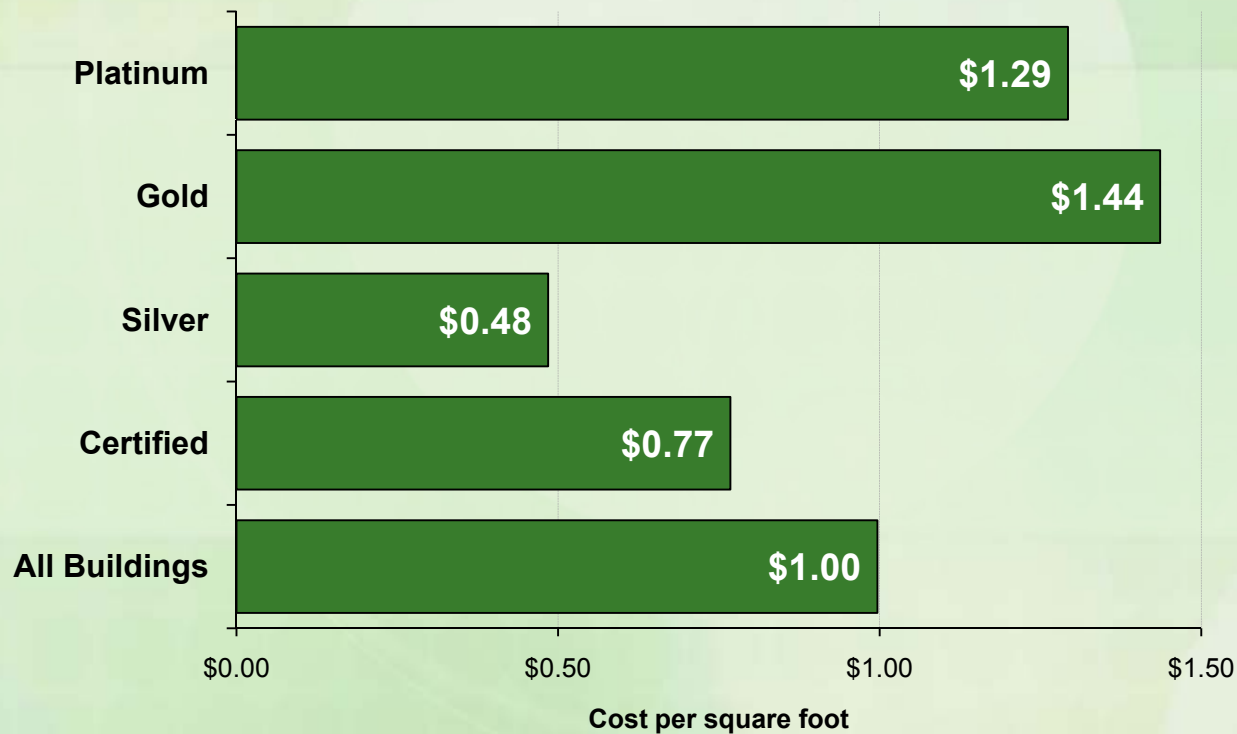
- Building improvement costs
- Equipment upgrade costs



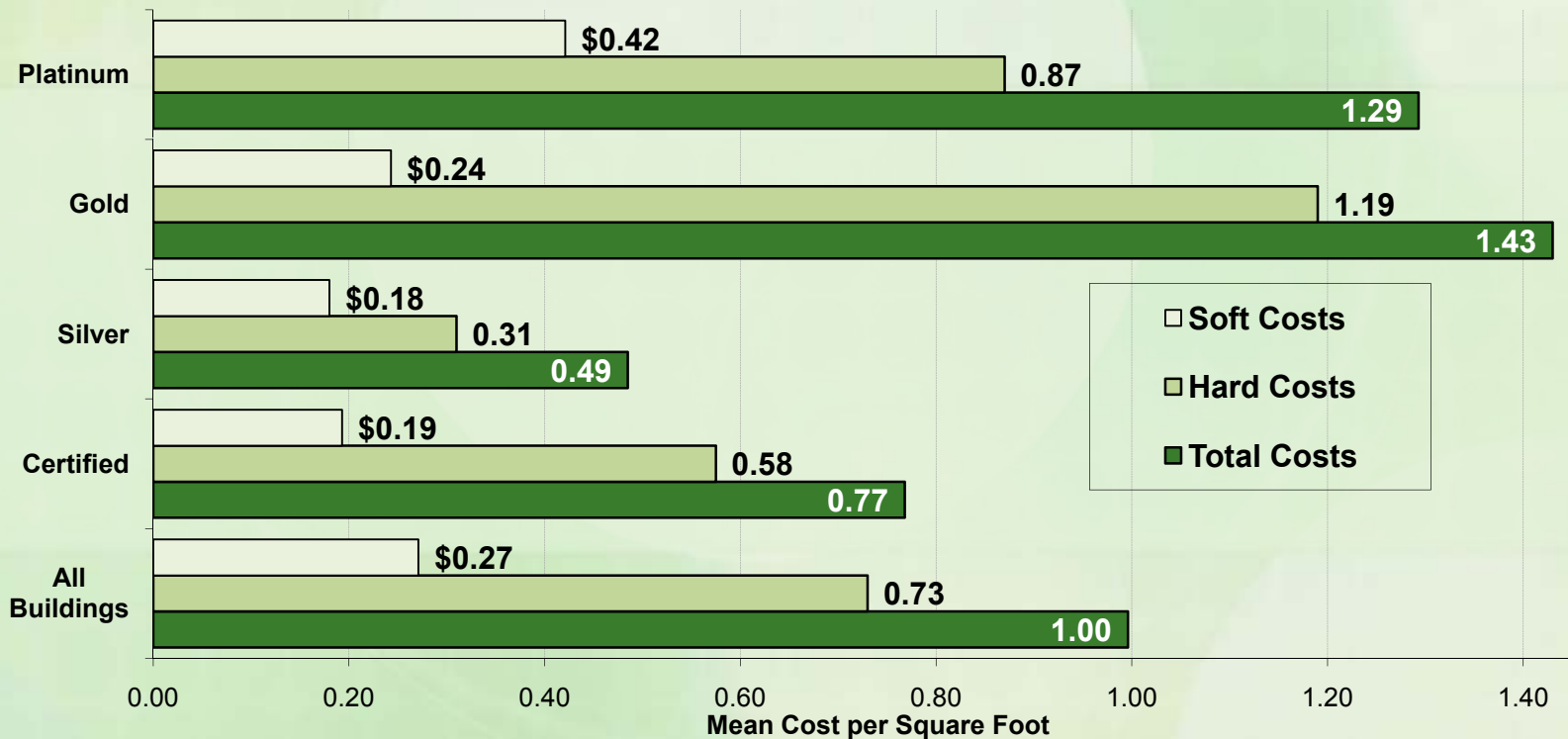
# Mean Staff Hours per Square Foot for Certification, by Level



# Mean Total Certification Costs per Square Foot by Certification Level



# Mean Soft, Hard & Total Certification Costs per Square Foot, by Level



# LEED for Existing Buildings Economics:

## Perception of Low/No Cost Versus Significant Costs

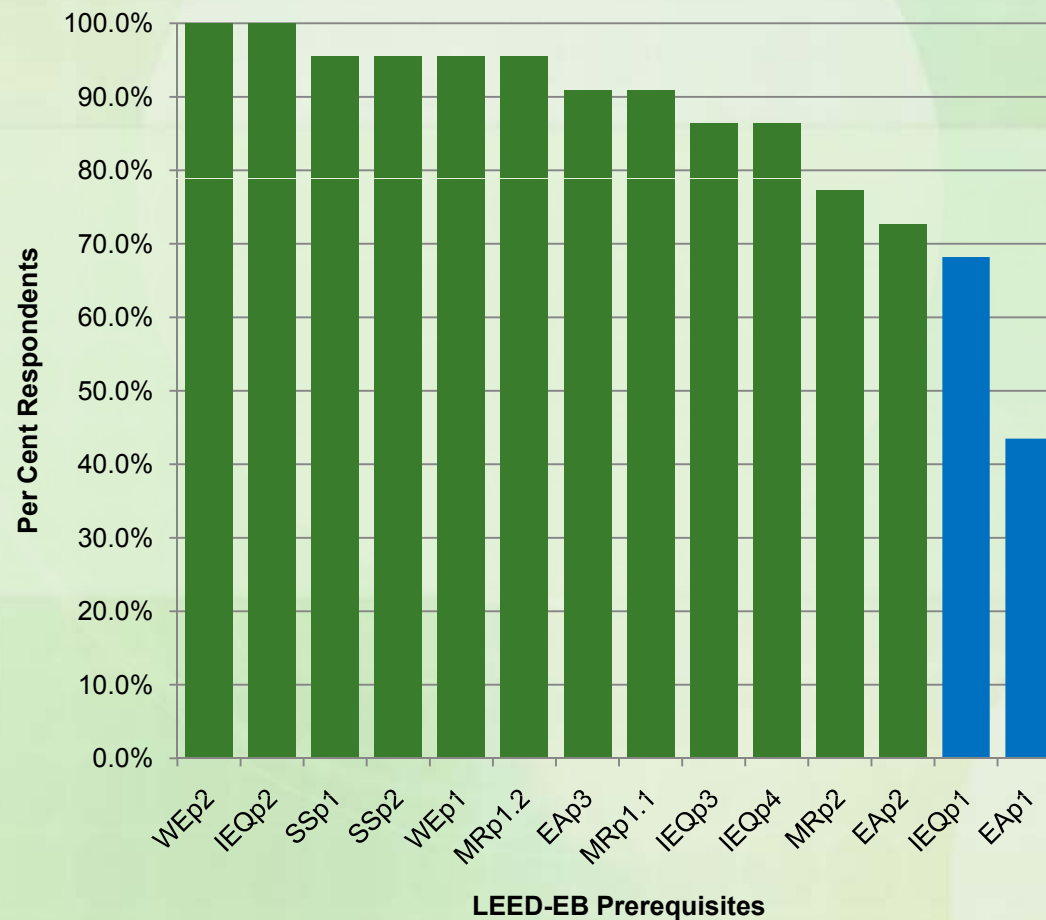
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- Respondents were asked to identify which prerequisites and credits they perceived to be:
  - Low or no cost actions or
  - Significant cost actions



# LEED-EB Prerequisite Cost Curve

Per Cent Respondents Identifying Each Prerequisite as Low/No Cost (Green  $\geq 70\%$ )



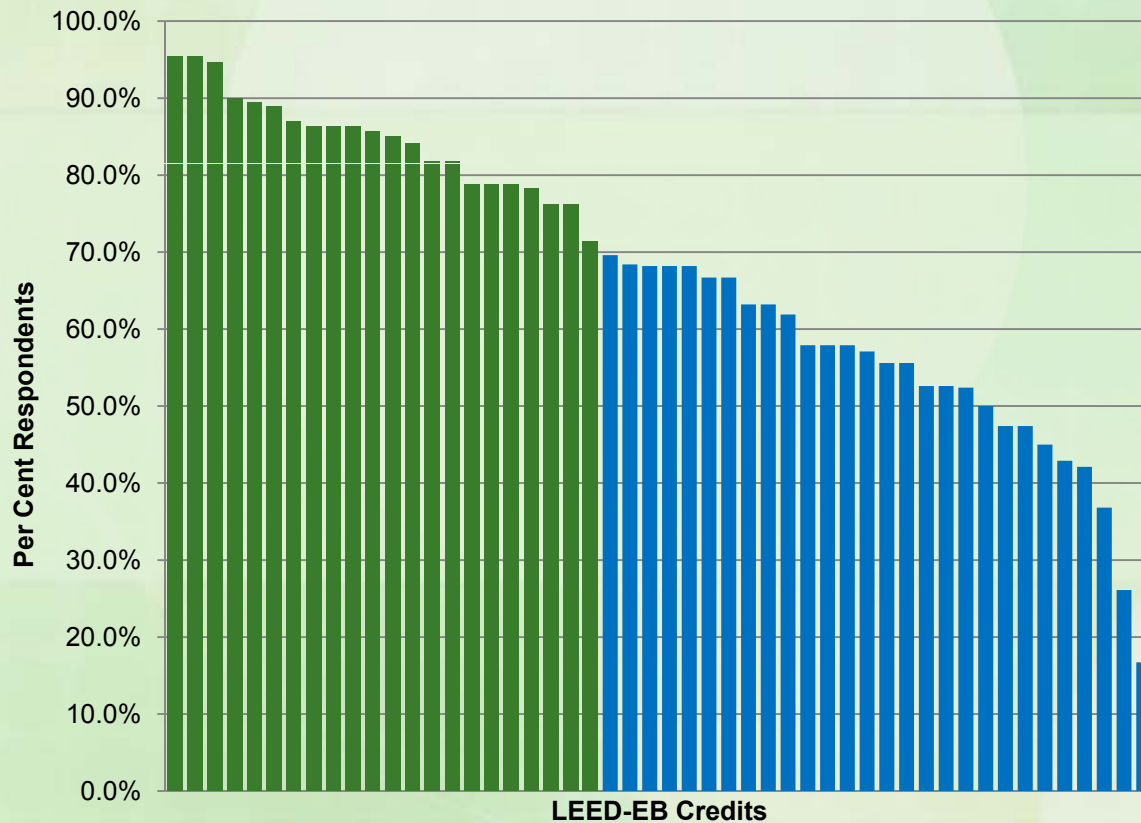
# LEED-EB Economics:

Individual Prerequisites - Actions Perceived to be Low/No Cost vs. Significant Cost (green  $\geq 70\%$ )

Number	Prerequisite Detail	Percent of Respondents Indicating this is a “no or low cost” measure
SS Prereq 1	Erosion and Sedimentation Control	95.5%
SS Prereq 2	Age of Building	95.5%
WE Prereq 1	Minimum Water Efficiency	95.5%
WE Prereq 2	Discharge Water Compliance	100.0%
EA Prereq 1	Existing Building Commissioning	43.5%
EA Prereq 2	Minimum Energy Performance	72.7%
EA Prereq 3	Ozone Protection	90.9%
MR Prereq 1.1	Source Reduction and Waste Management: Waste Stream Audit	90.9%
MR Prereq 1.2	Source Reduction and Waste Management: Storage & Collection of Recyclables	95.5%
MR Prereq 2	Toxic Material Source Reduction: Reduced Mercury in Light Bulbs	77.3%
IEQ Prereq 1	Outside Air Introduction and Exhaust Systems	68.2%
IEQ Prereq 2	Environmental Tobacco Smoke (ETS) Control	100.0%
IEQ Prereq 3	Asbestos Removal or Encapsulation	86.4%
IEQ Prereq 4	PCB Removal	86.4%

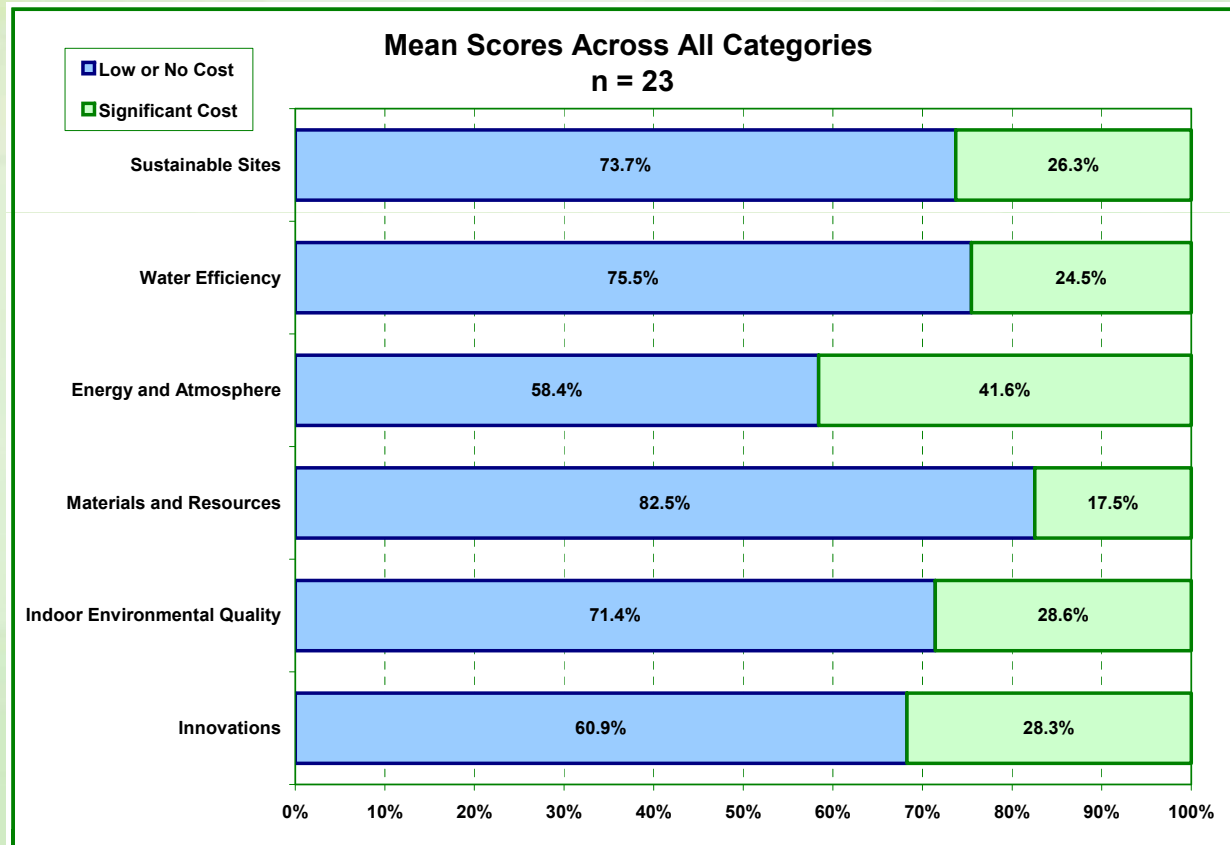
# LEED-EB Credit Cost Curve

Per Cent Respondents Perceiving Each Credit as Low/No Cost (**Green  $\geq 70\%$** )



# LEED-EB Economics:

## Mean Percent in Each Credit Category Perceived to be Low/No Cost vs Significant Cost



# LEED-EB Economics:

Mean Percent Prerequisites and Credits in Each Category Perceived as Low/No Cost vs Significant Cost (**Green  $\geq 70\%$** )

Prerequisite and Credit Category	Mean Percent of Prerequisites and Credits in Each Category Perceived as “no or low cost” measures
Materials and Resources	82.5%
Water Efficiency	75.5%
Sustainable Sites	73.7%
Innovations	72.7%
Indoor Environmental Quality	71.4%
Energy and Atmosphere	58.4%

# LEED-EB Operating Costs

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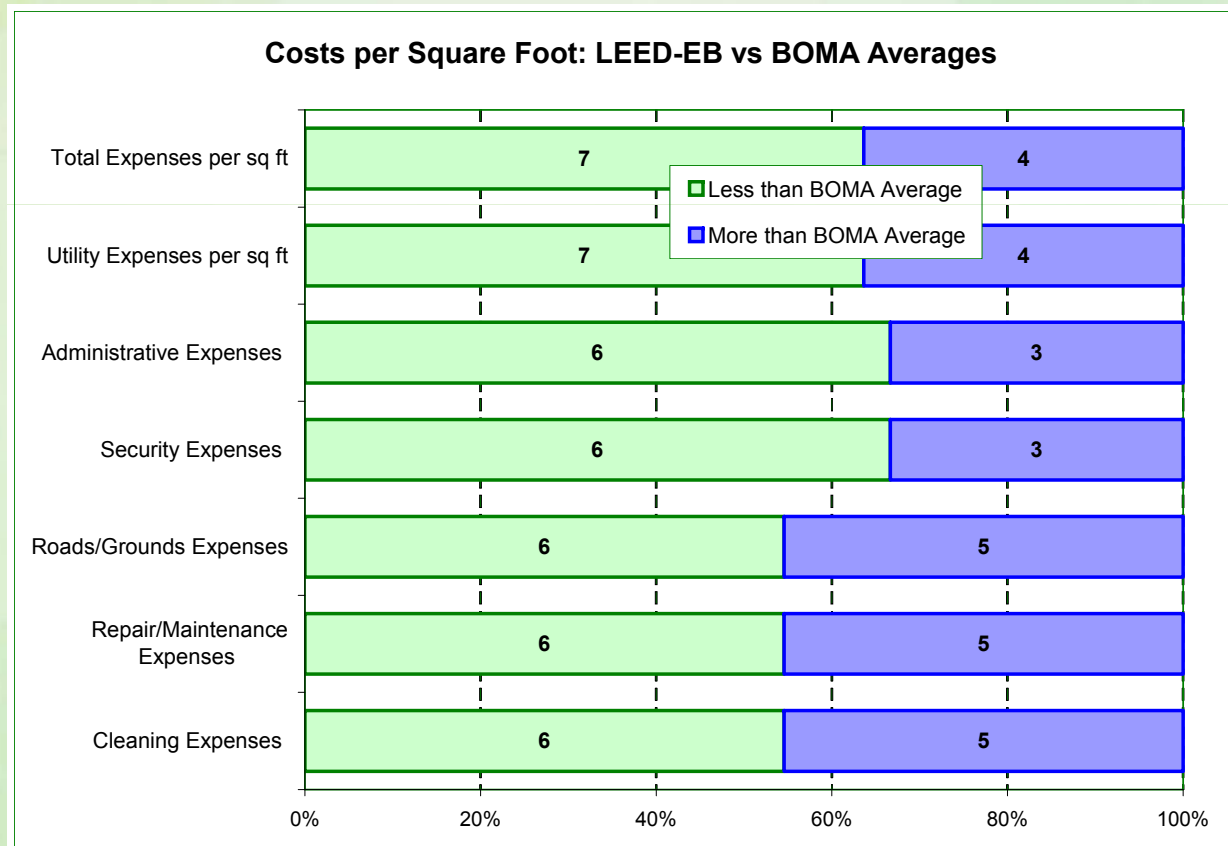
- Respondents were asked for specific operating costs for their buildings.
- Responses were expressed as dollars per square foot.
- Responses were compared to the 2007 BOMA data available for their region.



# LEED-EB Economics:

## Operating Costs

### LEED-EB Certified Buildings vs BOMA Averages



# LEED-EB is Evolving

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- Survey participants certified buildings under LEED-EB versions:
  - Pilot
  - [v2.0](#)
- Since then LEED-EB vO&M and vO&M2009 have been released
  - So you should keep in mind a few key changes in LEED-EB for perspective on this study

# Key Changes in LEED-EB Versions From: v2.0 to vO&M to vO&M 2009

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- Energy Prerequisite (EAp2)
  - v2.0 before June 2007: Min. Energy Star Score: 60
  - v2.0 after June 2007: Min. Energy Star Score: 67
  - vO&M: Min. Energy Star Score: 69
  - vO&M 2009 Min. Energy Star Score: 69



# Key Changes in LEED-EB Versions From: v2.0 to vO&M to vO&M 2009

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- Commissioning

- v2.0:

- » Prerequisite: Full commissioning in 1-5 years

- » Credit: 1 point for additional commissioning

- vO&M:

- » Prerequisite: Operating plan plus basic energy audit

- » Credit: 6 points for implementing commissioning

- vO&M 2009:

- » Prerequisite: Operating plan plus basic energy audit

- » Credit: 6 points for implementing commissioning



# Key Changes in LEED-EB Versions From: v2.0 to vO&M to vO&M 2009

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- Water Fixture Prerequisite (WEp1)
  - v2.0:
    - » All Fixtures:
    - » Baseline = Water use of EPACT fixtures x 1.2
  - vO&M & vO&M 2009:
    - » Fixtures installed before 1994:
    - » Baseline = Water use of IPC/UPC-2006 fixtures x 1.6
    - » Fixtures installed 1994 or later:
    - » Baseline = Water use of EPACT fixtures x 1.2
- Water Fixture Points (WEc2)
  - v2.0: 2 points
  - vO&M and vO&M 2009: 5 points



# Competitive Market-Based Benefits of Sustainable Buildings

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# The Competitive Market: Creating Financial Benefits for Certification

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- As benefits of LEED Certified buildings gain recognition in the marketplace these will be recognized in financial transactions:
  - Building insurance rates:
  - The impact of sustainability on sales in retail environments is starting to be recognized.
  - Office Building Leasing



# Reduced Building Insurance Costs:

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- Reduced building insurance rates for LEED certified buildings
  - Pioneered by Fireman's Fund Insurance
  - Other Insurance companies have followed in addressing LEED in their building insurance policies



# Reduced Building Insurance Costs:

## What Fireman's Fund Insurance Provides

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- For LEED certified buildings:
  - Provides reduced building insurance rates for LEED certified buildings
  - Provides rebuilding to LEED Certification after a partial or total loss
- For buildings that are not LEED certified:
  - Provides rebuilding to LEED Requirements to the extent practical after a partial or total loss



# Increased Sales in Sustainable Buildings

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- Skylighting

- Adding skylights increased retail sales

- An estimated 40% (31-49%) increase in sales
    - \$2 per sq.ft. sales grew to an estimated \$2.61-\$2.98 per sq.ft. with addition of skylighting
    - For retail chain studied, adding skylights to all stores would increase gross sales by an estimated 40%

# Walmart's Experience with Skylighting

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- Skylighting present for half the store
  - Result:
    - Sales higher on skylit side than for same products at other stores without skylights
- Swap products from artificially lit side of store to skylit side
  - Result:
    - Shift of a product from artificial light to skylight increased sales
    - Shift of a product from skylight to artificial light returned sales to national average

# CoStar Studies Show Demand for LEED Certified Buildings in the Marketplace

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- The Studies:
  - 166 LEED Buildings
  - Buildings compared with peers
- Results show demand by property investors and tenants for LEED certified buildings
  - Results on following slides

- April 2008 and September 2009 CoStar Group Studies
- Miller, N., J. Spivey, and A. Florance. Does Green Pay Off? *Journal of Real Estate Portfolio Management*, 2008, 14:4, 385–99.

# CoStar Study Results: Occupancy Rates

Occupancy Rates of LEED Buildings Compared with Peers				
	Year			
	2006	2007	2008	2009
Occupancy rate (1st quarter)	91.1%	89.2%	92.0%	90.0%
% above Peer buildings	2.9%	1.6%	4.1%	5.4%

- April 2008 and September 2009 CoStar Group Studies
- Miller, N., J. Spivey, and A. Florance. Does Green Pay Off? *Journal of Real Estate Portfolio Management*, 2008, 14:4, 385–99.

# CoStar Study Results: Rental Rates

Rental Rates for LEED Buildings Compared with Peers				
	Year			
	2006	2007	2008	2009
Rental rate (1st quarter)	\$33.69	\$45.65	\$42.38	\$38.88
\$ above Peer buildings	\$6.66	\$16.84	\$11.33	\$9.06

- April 2008 and September 2009 CoStar Group Studies
- Miller, N., J. Spivey, and A. Florance. Does Green Pay Off? *Journal of Real Estate Portfolio Management*, 2008, 14:4, 385–99.

# CoStar Study Results: Sales Price

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Sales Price per Square Foot of LEED Buildings Compared with Peers	
% advantage	9%

- September 2009 CoStar Group Studies
- Miller, N., J. Spivey, and A. Florance. Does Green Pay Off? *Journal of Real Estate Portfolio Management*, 2008, 14:4, 385–99.

# Another Study: Green Noise or Green Value?

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## – The study:

- April 2009
- 292 LEED buildings
- Compared LEED office buildings with non LEED

## – Results:

- 8% higher occupancy rate
- 5% higher rent
- 25% higher sales price

Fuerst, Franz and McAllister, Patrick “Green Noise or Green Value? Measuring the Price Effects of Environmental Certification in Commercial Buildings”, University of Reading, Henley Business School. April 25, 2009.

Fuerst, Franz and McAllister, Patrick “An Investigation of the Effect of Eco-Labeling on Office Occupancy Rates”  
Journal of Sustainable Real Estate, 2009, Vol 1, No 1.

# Federal Government Leases LEED Buildings

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- LEED Silver certification was required:
    - build-to-suit leases over 10,000 square feet
    - federal government is the sole tenant.
  - Federal projects LEED certified:
    - 90 projects, 10 million square feet
    - 25% leased from private sector
  - Federal projects registered:
    - 743 projects, 149 million square feet
- \*\*Federal requirements are helping push forward the market for LEED certified buildings.

# The Competitive Market: Expect Growth in Financial Benefits for LEED Certification

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- The door has been opened for financial recognition of the benefits of LEED certification in the competitive marketplace !
- Expect the scope and magnitude of financial recognition to expand in the future.



# The Soft Benefits of LEED Buildings

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Soft Now but Expected to be Powerful in the Future -  
Occupant Productivity, etc.



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# Overview of the Soft Benefits of LEED

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- While the soft benefits of LEED are a nice positive extra now, as the evidence on these benefits grow they will become a compelling driver for increased building sustainability.
- The current soft benefits include:
  - Occupant productivity
  - Recruiting
  - Reduced turnover
  - Increase sales in retail buildings
  - Reduced building insurance costs
  - Potential for reduce health care costs

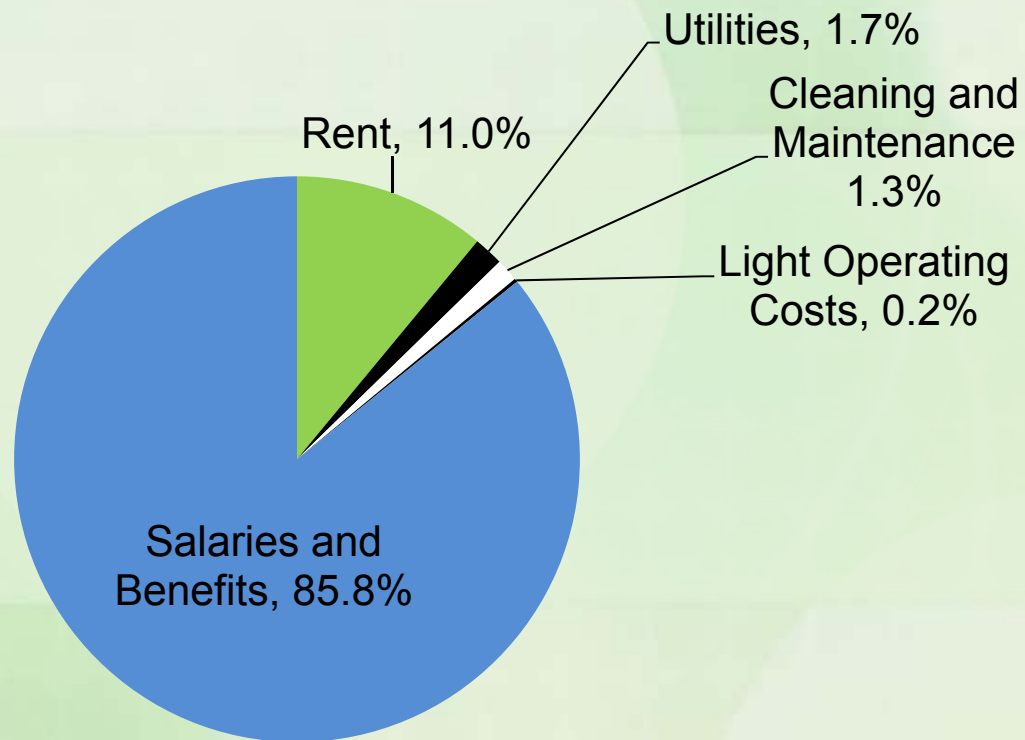


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# Why is increasing occupant productivity so important?



# Occupants' Salaries are 85% of the Cost of Office Building Operation



Percent Cost per Square Foot,  
Energy Star Building Upgrade Manual,  
Jan. 2008

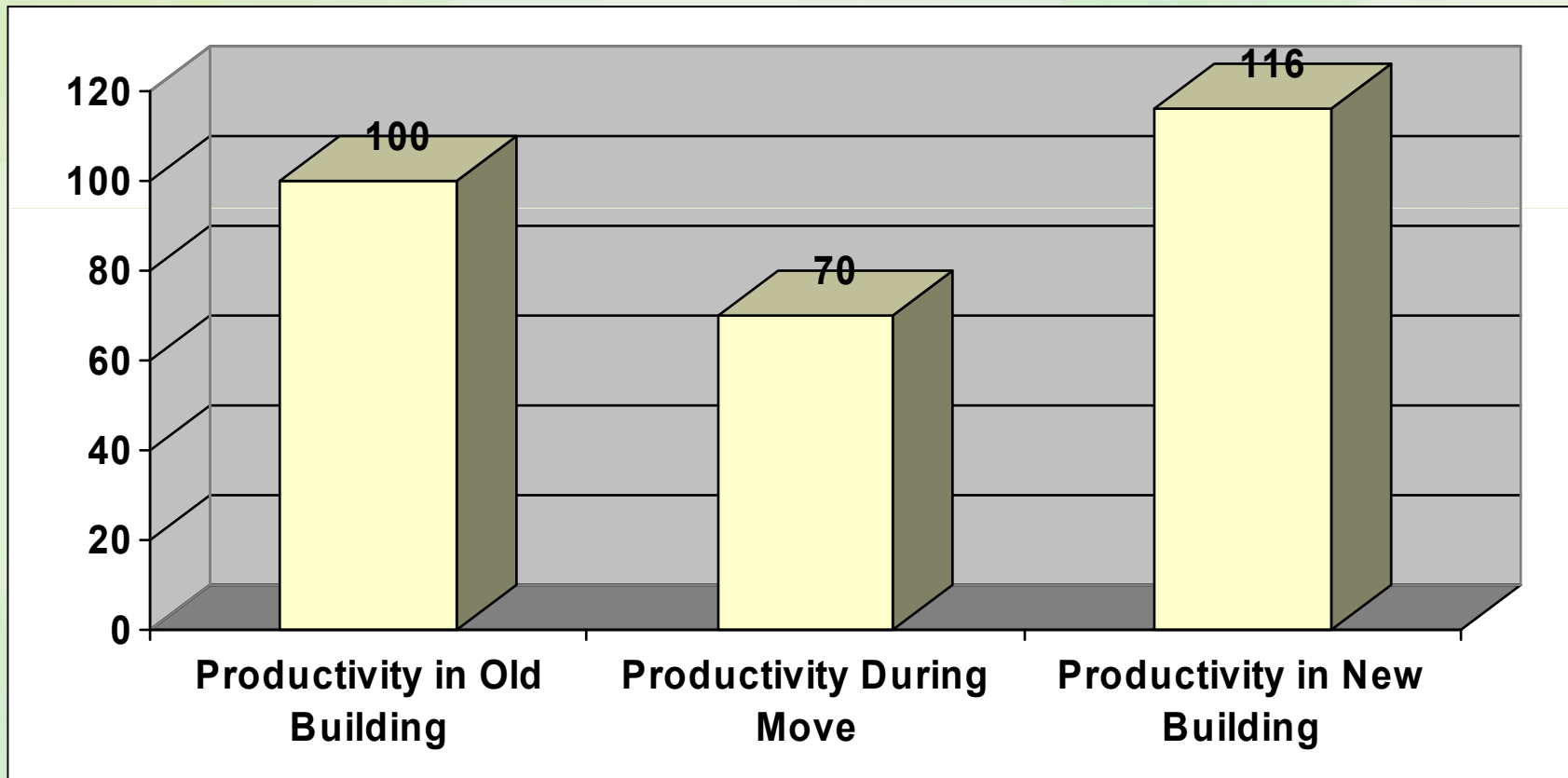


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# Studies on Increased Occupant Productivity in Sustainable Buildings



# LEED (NC) Case Study: Productivity at West Bend Mutual Insurance



# Do Green Buildings Make Dollars & Sense for Health & Productivity?

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## – Health

- Largest study of its kind to date
- Occupants of Green Buildings are more productive in new green building than in old non-green building:
  - 45% of occupants reported fewer occupant sick days
    - » Annual net impact about \$5 per square foot

(Study by University of San Diego & CB Richard Ellis Group, November 2009)

# Do Green Buildings Make Dollars & Sense for Health & Productivity?

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## – Productivity:

- Occupants of Green Buildings are more productive in new green building than in old non-green building:
  - Greater self-reported productivity
    - » 55% of occupants reported greater productivity
    - » 4.88% average increase for all green buildings (LEED & Energy Star)
  - Net impact for these occupants about \$20 per square foot

(Study by University of San Diego & CB Richard Ellis Group, November 2009)

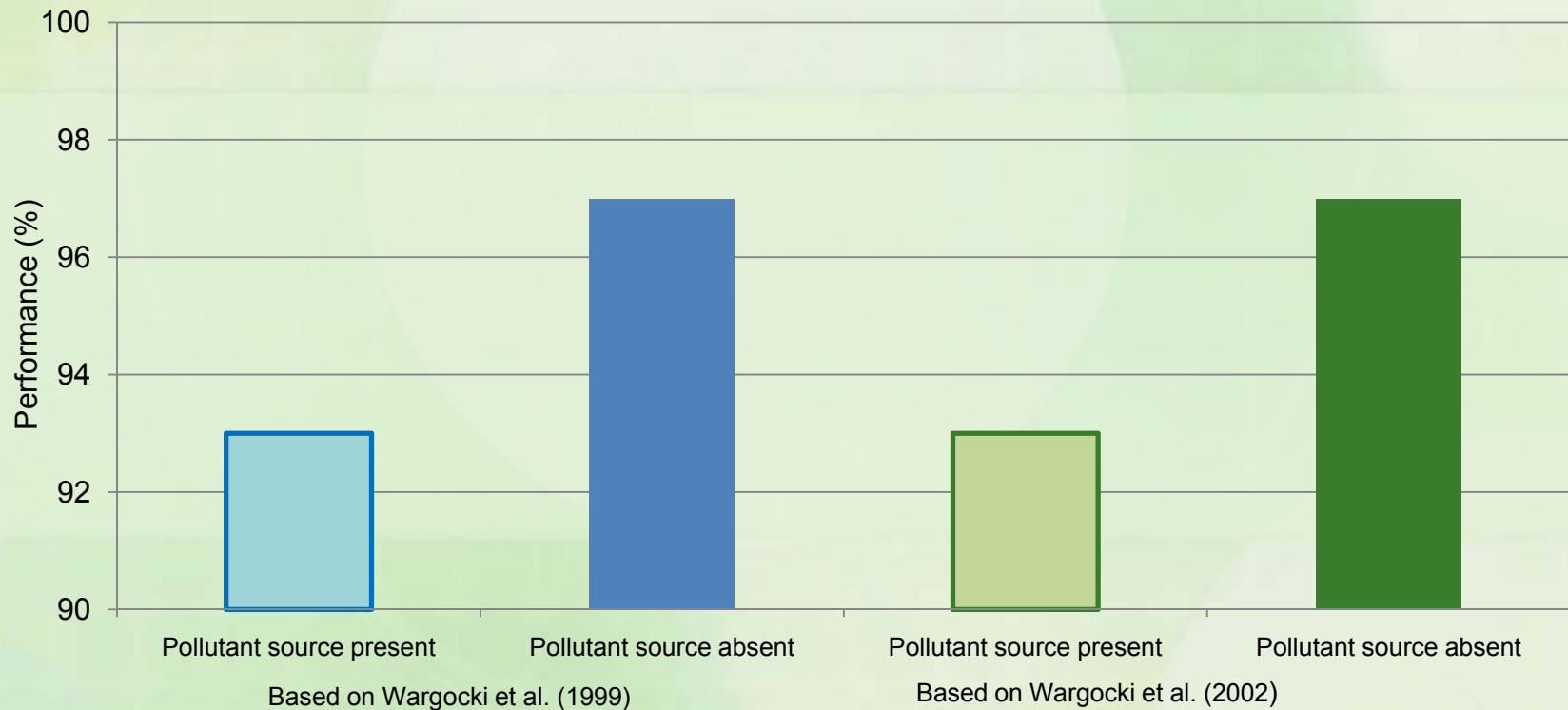
# Ventilation Rates & Sick Building Syndrome Symptoms

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- Analysis of existing data for office buildings
- Results
  - Decrease ventilation rate from 17 to 10 cfm per person
    - 15% increase in Sick Building Syndrome symptoms
  - Increase ventilation rate from 17 to 50 cfm per person
    - 33% decrease in symptoms

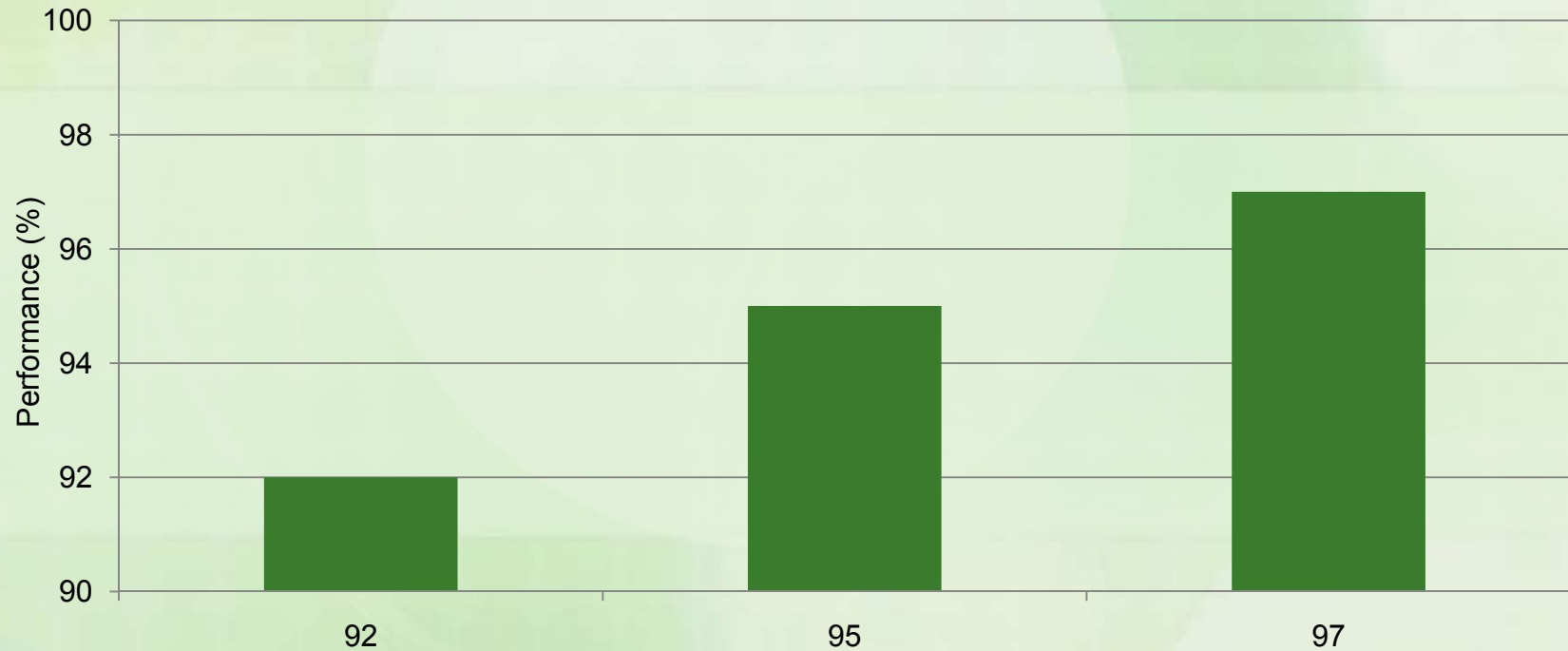
# Effect of Pollutant Source on Performance

Effect of Pollutant Source Presence on Office Work Performance at 20 cfm per person



# Effect of Ventilation Rate on Performance

Effect of CFM per Person on Office Work Performance



Based on Wargocki et al. (1999)

# Increased Student Test Scores in Sustainable Buildings

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- Controlled study
- Measure of student performance:
  - Math and reading tests at beginning and end of school year
- Student progress in rooms with most daylighting compared with those least daylighting
  - 20% faster progress in math
  - 26% faster progress in reading
    - Daylighting in Schools, Heschong Mahone Group, 1999

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# LEED-EB Case Studies



# Case Study 1: Diversey Inc. Distribution Center



# Building History Overview

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- Building History – Operation started on July 1, 2007
  - Built to suit leased building owned by Liberty Property
  - Diversey specified levels of LEED-NC and LEED-EB performance:
    - » in RFP and
    - » in Lease Contract



# Project History Overview

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- LEED Design and Construction Team
  - Owner: Liberty Property Trust
  - Lessor: Diversey Inc.
  - LEED-NC Consultant: ReVision Architects
  - LEED-EB Consultant: Leonardo Academy
  - Lessor Representative: A. Epstein and Sons International
  - Building Architect: Stephen Perry Smith Architects
  - Builder: Riley Construction



# Project History Bottom Line Overview

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- By specifying LEED-NC and LEED-EB performance in RFP and lease agreement and picking great partners who could deliver
  - Diversey got a great building with the benefits of both:
    - LEED-NC achievements of reduced environmental impacts of construction and potential for sustainable performance
    - A building designed to make it easy to succeed with delivered sustainable performance under LEED-EB



# LEED-EB Implementation and Certification

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- Diversey
  - LEED-EB implementation lead: David Nicklas
  - Building Manager: Bruce Maples
  - LEED Team includes: All internal staff and external service providers that support building operations and Leonardo Academy
- Cost of Implementing LEED-EB
  - Dave Nicklas, “There is a significant staff time commitment for getting up the learning curve on implementing LEED-EB. Our goal is for this to become standard practice and not an extra activity. Beyond registration and certification fees and consultant guidance, there are no significant costs for our implementing LEED-EB.”



# National Geographic Society Economic Benefits

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## National Geographic Society Headquarters, Washington DC



- First building certified under LEED-EB
- Certified LEED-EB Silver - November 2003
- LEED-EB Recertification Application Filed: September 2008



# National Geographic Society LEED-EB Costs & Benefits

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- Consistent with National Geographic Society mission
- Operating cost savings
  - Lower energy cost
  - Lower water consumption
  - Lower waste disposal expenses
  - Increased awareness of building operation



# National Geographic Society Filed Recertification Application

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- Project leaders:
  - Bob Cline, Director, General Services
  - Richard Neal, Chief Engineer
- Focus is on implementing operational improvements
- Using LEED-EB v2.0



# Johnson Controls Brengel Center Economic Benefits

## Johnson Controls Brengel Technology Center, Milwaukee, WI



- Initially Certified LEED Silver under LEED-NC in 2000
- Re-certified LEED Gold under LEED-EB March 2004



# Johnson Controls Brengel Center Economic Benefits

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- 25-30 percent operational savings (maintenance costs, janitorial costs) relative to other similar JCI facilities in Milwaukee area due to LEED Programs (NC and EB)
- No FTEs for maintenance and operations were added, even though 130,000 sq. feet were added



# Johnson Controls Brengel Center Economic Benefits

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- Reduction in Annual Utility Costs
  - \$91,000 savings per Year (Brengel Center Utilities = \$1.20 per square foot, BOMA downtown Milwaukee average value equals \$1.90 per square foot)
  - Brengel Center uses 0.86 watts per square foot for lighting, Wisconsin energy code is 1.2 watts per square foot



# Johnson Controls Brengel Center Economic Benefits

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Director of Facilities and Building Services,  
Ward Komorowski, Johnson Controls states:

*“I spend a good deal of time – at least once or twice a week – giving tours of the facility. Visits to the Brengel’s Showcase for Building Environments have been tracked, and they’re able to show an impact of \$223M in business.”*



# More Information About Leonardo Academy Training

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- For other Leonardo Academy training sessions

<http://www.leonardoacademy.org/training.html>

- To receive notification about upcoming training sessions by email

<http://www.leonardoacademy.org/contact.html>



# Contact for Additional Information

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