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**THE ECONOMICS OF LEED FOR EXISTING BUILDINGS  
FOR INDIVIDUAL BUILDINGS  
2008 EDITION**

**A  
WHITE PAPER  
BY  
LEONARDO ACADEMY INC.**

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White Paper**

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## Preface

This is the 2008 edition of Leonardo Academy's annual white paper on the Economics of LEED for Existing Buildings (LEED-EB) for Individual Buildings.

## Objectives

This white paper was prepared to answer several important questions:

- What are the costs of implementing LEED for Existing Buildings?
  - First Costs – Hard Costs and Soft Costs
  - Identify low and no cost actions and higher cost actions
- How do the operating costs of LEED-EB certified buildings compare with the other buildings?
  - Comparison with operating costs in Building Owners and Managers Association International Experience Exchange Report.
- Comparison of energy
- A cost comparison of collected primary data to the Building Owners and Managers Association International's 2007 Experience Exchange Report.

Please contact Leonardo Academy if you have any questions, comments, or suggestions for this white paper.

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March 4, 2008

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## Section 1: Introduction

This is the 2008 edition of Leonardo Academy's annual white paper on the economics of LEED for Existing Buildings (LEED-EB) for Individual Buildings. It is based on a survey of owners of LEED-EB certified buildings.

### Methodology

The survey data presented in this report was gathered in 2006-2007. The survey was sent to the owners or managers of 53 LEED-EB certified buildings and 23 of them returned the survey. This is a response rate of 43 percent.

### Low or No Cost versus Significant Cost Measures

The survey (see Appendix A: Survey ) asked the LEED project manager or building owner of each of the buildings to indicate whether they found each of the measures that qualify for LEED-EB points to be "Low or No Cost Measures" or if they found them to be "Significant Cost Measures".

### Certification, Implementation and Process Costs

The survey form gathered the overall costs of the LEED-EB implementation and certification process. Out of 23 survey respondents, 14 (61%) provided this information. Of the 14, 13 provided enough information to be included in the analysis. The information gathered included the internal staff time and internal staff costs in achieving LEED-EB certification, the amount spent on LEED-EB consultants (if any), total soft costs of the process, and the total hard costs (for any building improvements made). This report includes analysis of the total costs, costs on a square foot basis and costs for the level of LEED-EB certification achieved (LEED-EB, LEED-EB Gold, LEED-EB Silver, or LEED-EB Platinum).

### Operating Cost Comparison

For operating costs comparisons, the LEED-EB certified building operating cost data was compared to the operating costs in BOMA's *Experience Exchange Report*. These comparisons are found in Section 3: Building Operations Costs with a Comparison to BOMA Data.

For the operating cost survey form, 13 of the 23 (57%) of the respondents provided the requested building operating cost data. Of these 13 responses with building operating cost data, 11 were included in this analysis because incomplete information was provided for one building and another building was of a building type very different from the others. All of the buildings included in this analysis have a significant component of office space.

This report provides analysis of both the total operating costs of the buildings as well as analysis of the components of the building operating costs, including cleaning expenses, repair and maintenance expenses, roads/grounds expenses, security expenses, administrative and utility expenses. The total operating costs are the sum of the individual expenses as listed for both the survey responses and the BOMA data.

## Section 2: Overall LEED-EB Implementation and Certification Costs

### LEED-EB Implementation and Certification Costs

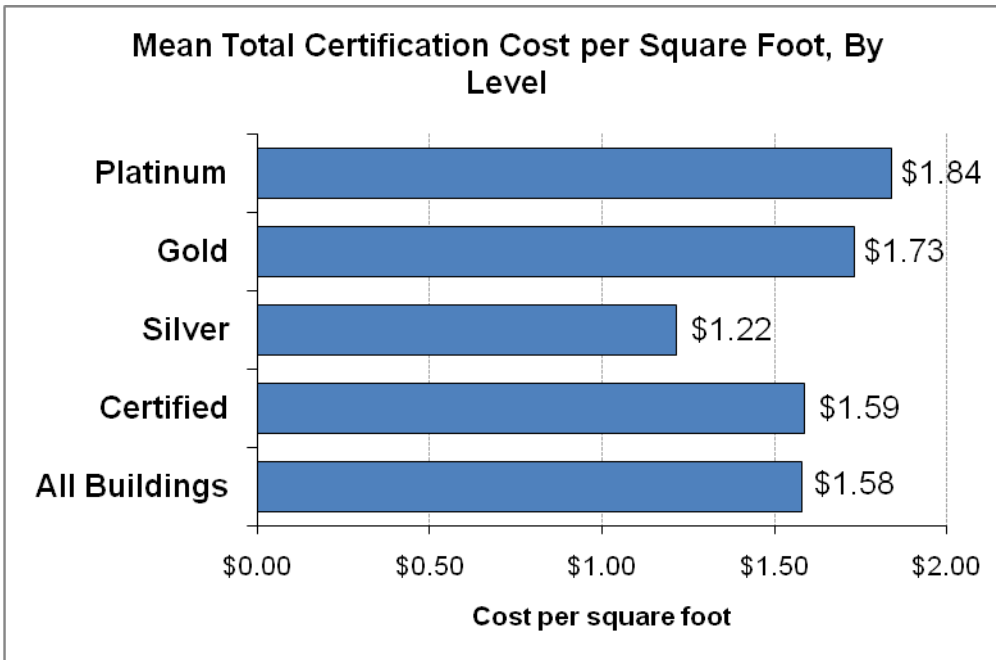
The costs for LEED-EB implementation and certification varied significantly from building to building. Table 1 below shows the minimum, maximum, median and mean values of various LEED-EB implementation and certification costs for LEED-EB certified buildings that responded to the survey with adequate information and that had significant office space in the building.

**Table 1. Costs of the Implementation & Certification Processes (\$ or hours/square foot)**

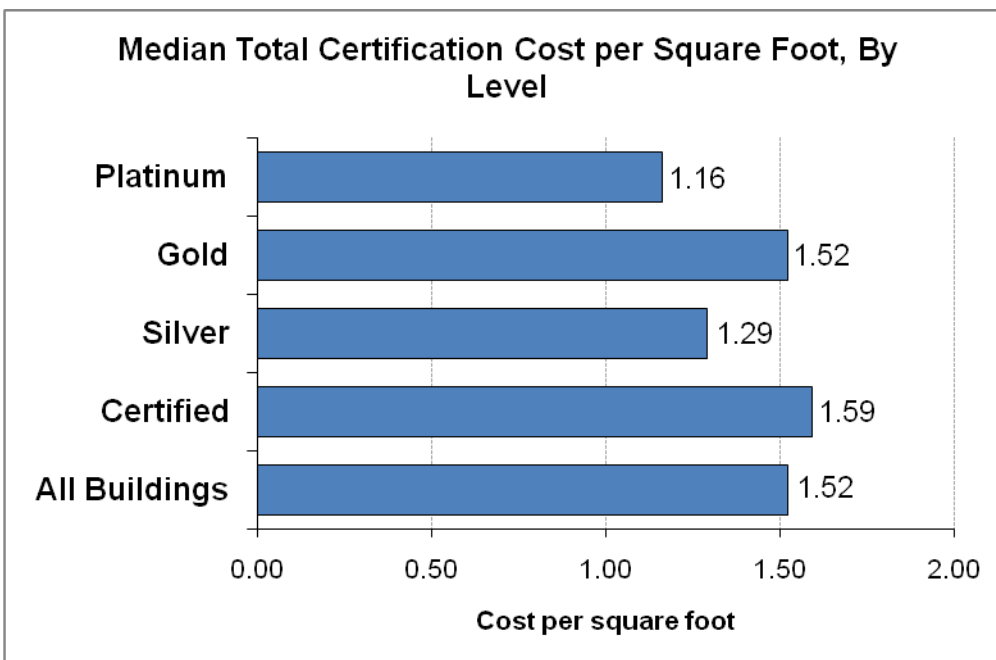
	Mean	Median	Minimum	Maximum
<b>All Buildings, n=13</b>				
Staff Hours	0.013 hr	0.008 hr	0.001 hr	0.041 hr
Staff Costs (internal labor)	\$0.59	\$0.33	\$0.00	\$1.78
Consulting Costs	\$0.24	\$0.04	\$0.00	\$1.49
Registration Fee	\$0.02	\$0.01	\$0.00	\$0.10
Application Fee	\$0.01	\$0.01	\$0.00	\$0.04
Other Soft Costs	\$0.01	\$0.00	\$0.00	\$0.06
<b>Total Soft Costs</b>	<b>\$0.86</b>	<b>\$0.67</b>	<b>\$0.01</b>	<b>\$1.89</b>
Total Soft Cost minus internal labor	\$0.27	\$0.10	\$0.01	\$1.54
<b>Total Hard Costs</b>	<b>\$0.73</b>	<b>\$0.11</b>	<b>\$0.00</b>	<b>\$3.14</b>
<b>Total: All Costs</b>	<b>\$1.58</b>	<b>\$1.52</b>	<b>\$0.02</b>	<b>\$5.01</b>
<b>LEED-EB Certified, n=2</b>				
Staff Hours	0.010 hr	0.010 hr	0.001 hr	0.019 hr
Staff Costs (internal labor)	\$0.82	\$0.82	\$0.04	\$1.60
Consulting Costs	\$0.12	\$0.12	\$0.04	\$0.20
Registration Fee	\$0.04	\$0.04	\$0.00	\$0.08
Application Fee	\$0.00	\$0.00	\$0.00	\$0.00
Other Soft Costs	\$0.04	\$0.04	\$0.01	\$0.60
<b>Total Soft Costs</b>	<b>\$1.02</b>	<b>\$1.02</b>	<b>\$0.14</b>	<b>\$1.89</b>
Total Soft Cost minus internal labor	\$0.19	\$0.19	\$0.10	\$0.29
<b>Total Hard Costs</b>	<b>\$0.58</b>	<b>\$0.58</b>	<b>\$0.11</b>	<b>\$1.04</b>
<b>Total: All Costs</b>	<b>\$1.59</b>	<b>\$1.59</b>	<b>\$0.25</b>	<b>\$2.93</b>

	Mean	Median	Minimum	Maximum
<b>LEED-EB Silver, n=4</b>				
Staff Hours	0.023hr	0.024 hr	0.005 hr	0.041 hr
Staff Costs (internal labor)	\$0.73	\$0.80	\$0.23	\$1.10
Consulting Costs	\$0.15	\$0.00	\$0.00	\$0.60
Registration Fee	\$0.03	\$0.01	\$0.00	\$0.10
Application Fee	\$0.001	\$0.00	\$0.00	\$0.01
Other Soft Costs	\$0.00	\$0.00	\$0.00	\$0.00
<b>Total Soft Costs</b>	<b>\$0.91</b>	<b>\$0.81</b>	<b>\$0.23</b>	<b>\$1.80</b>
Total Soft Cost minus internal labor	\$0.18	\$0.01	\$0.01	\$0.70
<b>Total Hard Costs</b>	<b>\$0.31</b>	<b>\$0.06</b>	<b>\$0.00</b>	<b>\$1.11</b>
<b>Total: All Costs</b>	<b>\$1.22</b>	<b>\$1.29</b>	<b>\$0.24</b>	<b>\$2.05</b>
<b>LEED-EB Gold, n=3</b>				
Staff Hours	0.007 hr	0.008 hr	0.002 hr	0.011 hr
Staff Costs (internal labor)	\$0.30	\$0.21	\$0.09	\$0.59
Consulting Costs	\$0.22	\$0.27	\$0.03	\$0.37
Registration Fee	\$0.004	\$0.001	\$0.00	\$0.01
Application Fee	\$0.02	\$0.03	\$0.00	\$0.03
Other Soft Costs	\$0.00	\$0.00	\$0.00	\$0.00
<b>Total Soft Costs</b>	<b>\$0.54</b>	<b>\$0.52</b>	<b>\$0.15</b>	<b>\$0.96</b>
Total Soft Cost without internal labor	\$0.24	\$0.31	\$0.05	\$0.37
<b>Total Hard Costs</b>	<b>\$1.19</b>	<b>\$0.56</b>	<b>\$0.04</b>	<b>\$2.97</b>
<b>Total: All Costs</b>	<b>\$1.73</b>	<b>\$1.52</b>	<b>\$0.19</b>	<b>\$3.49</b>
<b>LEED-EB Platinum, n=4</b>				
Staff Hours	0.007 hr	0.005 hr	0.002 hr	0.017 hr
Staff Costs (internal labor)	\$0.55	\$0.20	\$0.00	\$1.78
Consulting Costs	\$0.40	\$0.51	\$0.00	\$1.49
Registration Fee	\$0.01	\$0.01	\$0.00	\$0.02
Application Fee	\$0.02	\$0.01	\$0.01	\$0.04
Other Soft Costs	\$0.00	\$0.00	\$0.00	\$0.00
<b>Total Soft Costs</b>	<b>\$0.97</b>	<b>\$0.99</b>	<b>\$0.01</b>	<b>\$1.87</b>
Total Soft Cost without internal labor	\$0.42	0.07	\$0.01	\$1.54
<b>Total Hard Costs</b>	<b>\$0.87</b>	<b>\$0.17</b>	<b>\$0.003</b>	<b>\$3.14</b>
<b>Total: All Costs</b>	<b>\$1.84</b>	<b>\$1.16</b>	<b>\$0.02</b>	<b>\$5.01</b>

Figures 1A and 1B below show the total certification and implementation costs by certification level. Figure 1A shows the mean costs and Figure 1B shows the median costs. The results do not follow expectations of higher costs for higher certification levels, but this may be due to the very small sample size available at this time. This report will be updated annually to include new data collected during the year.



**Figure 1A. Mean Total Certification Costs per Square Foot**



**Figure 2B. Median Total Certification Costs per Square Foot**



Figures 1C and 1D show the mean and median hard and soft certification costs per square foot. As with the mean values, the costs do not follow the expectation of higher costs for higher certification levels. This is probably due to the small sample size.

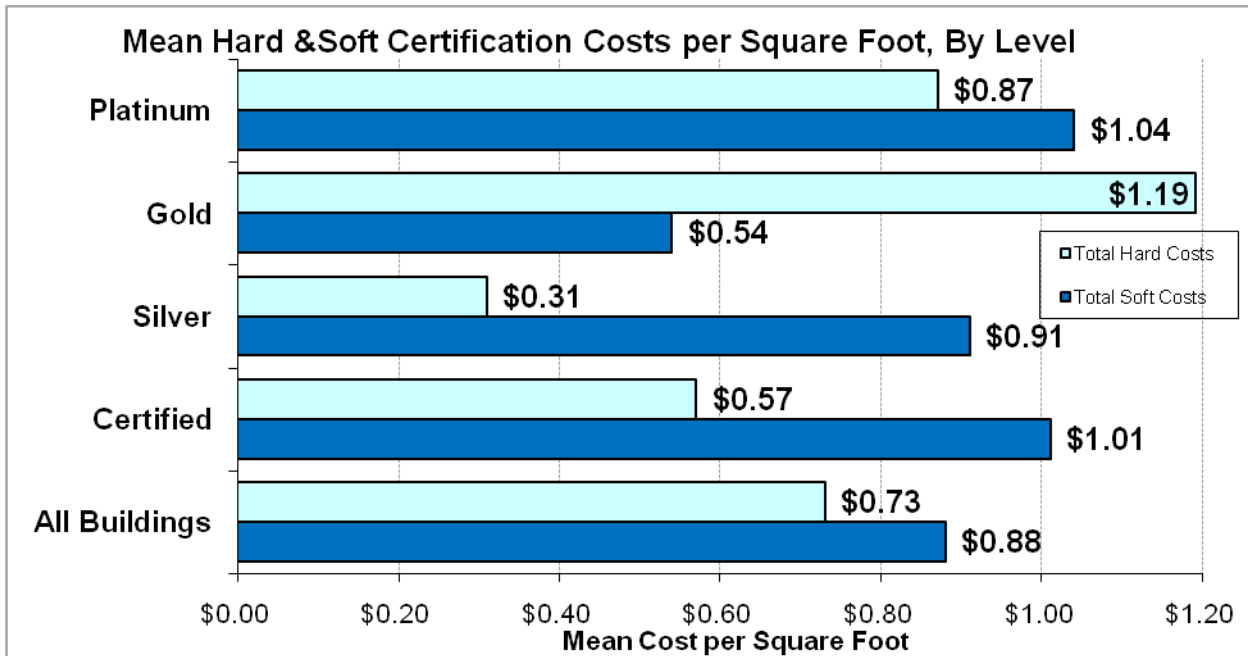


Figure 1C. Mean Hard and Soft Certification Costs per Square Foot, by Level

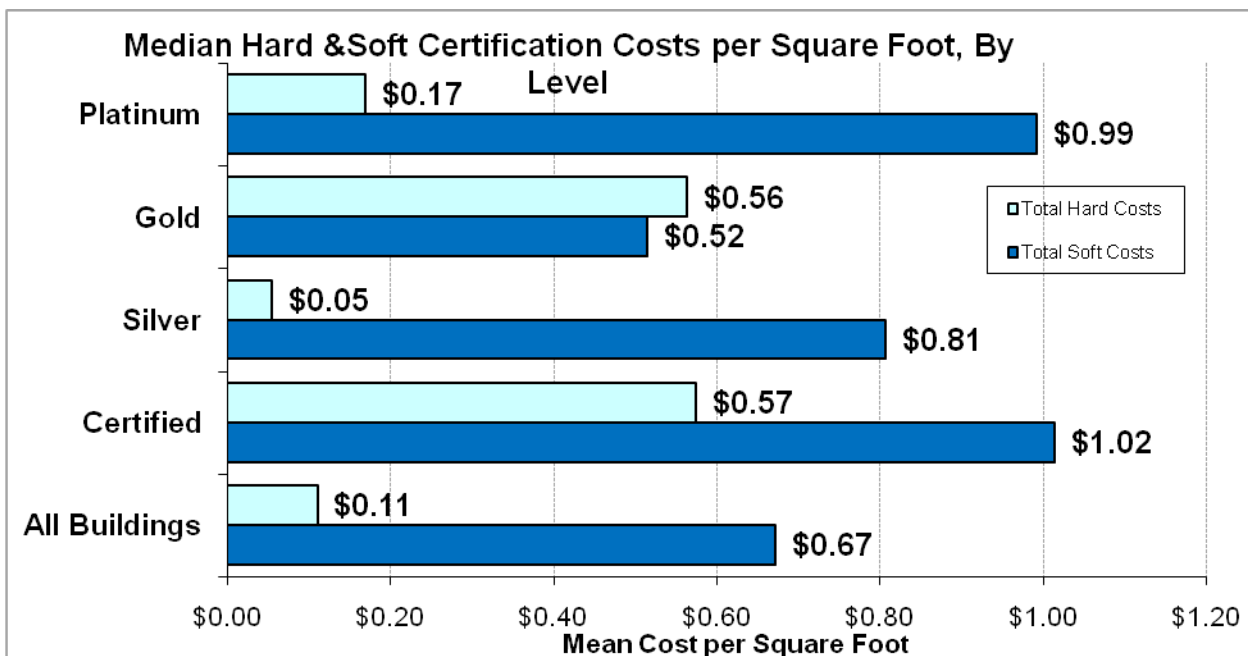
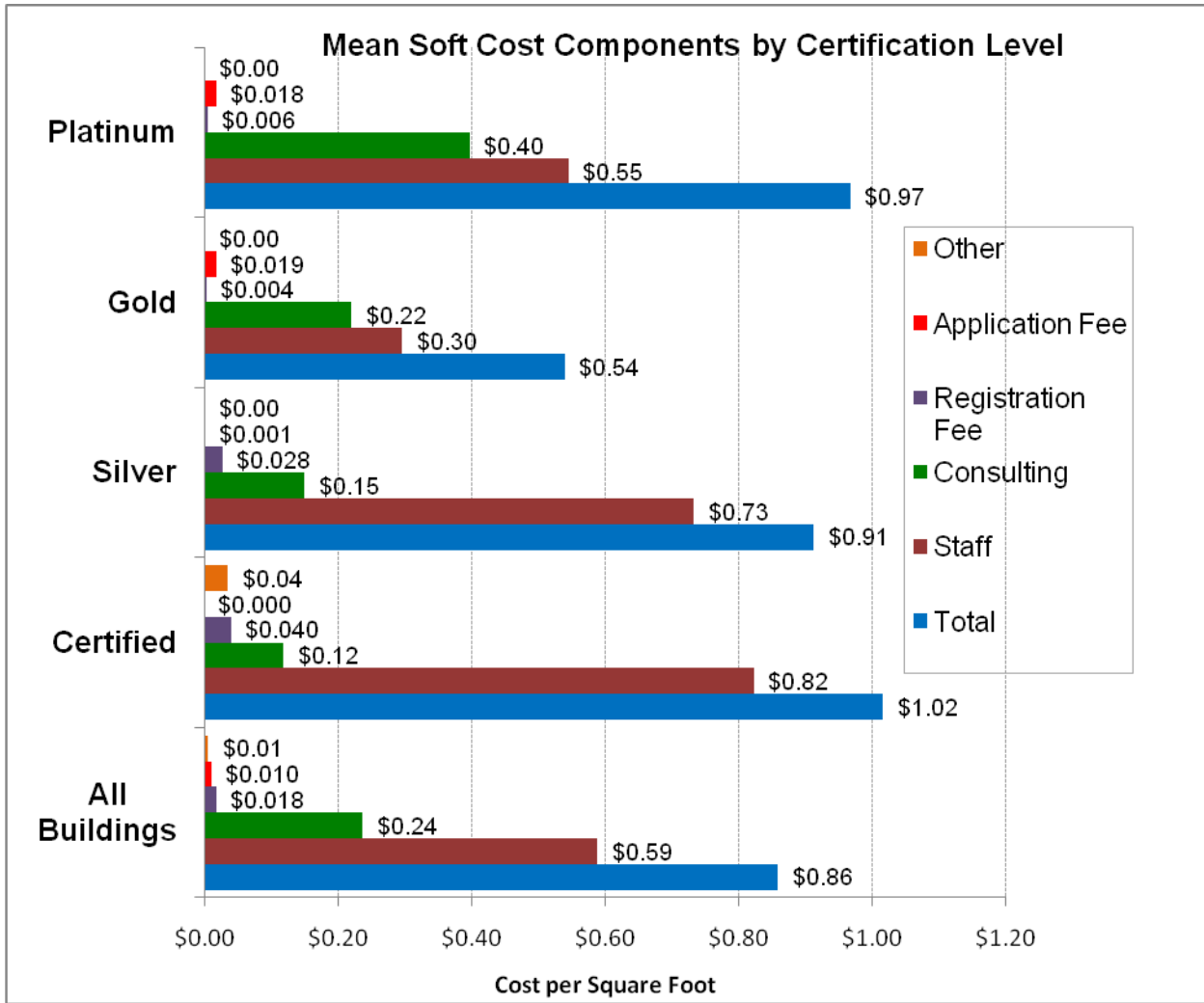


Figure 1D. Median Hard and Soft Certification Costs per Square Foot, by Level

Figures 2A and 2B show the mean and median for each component of soft costs by certification level.



**Figure 2A. Mean Soft Components of Certification Cost, by Certification Level**

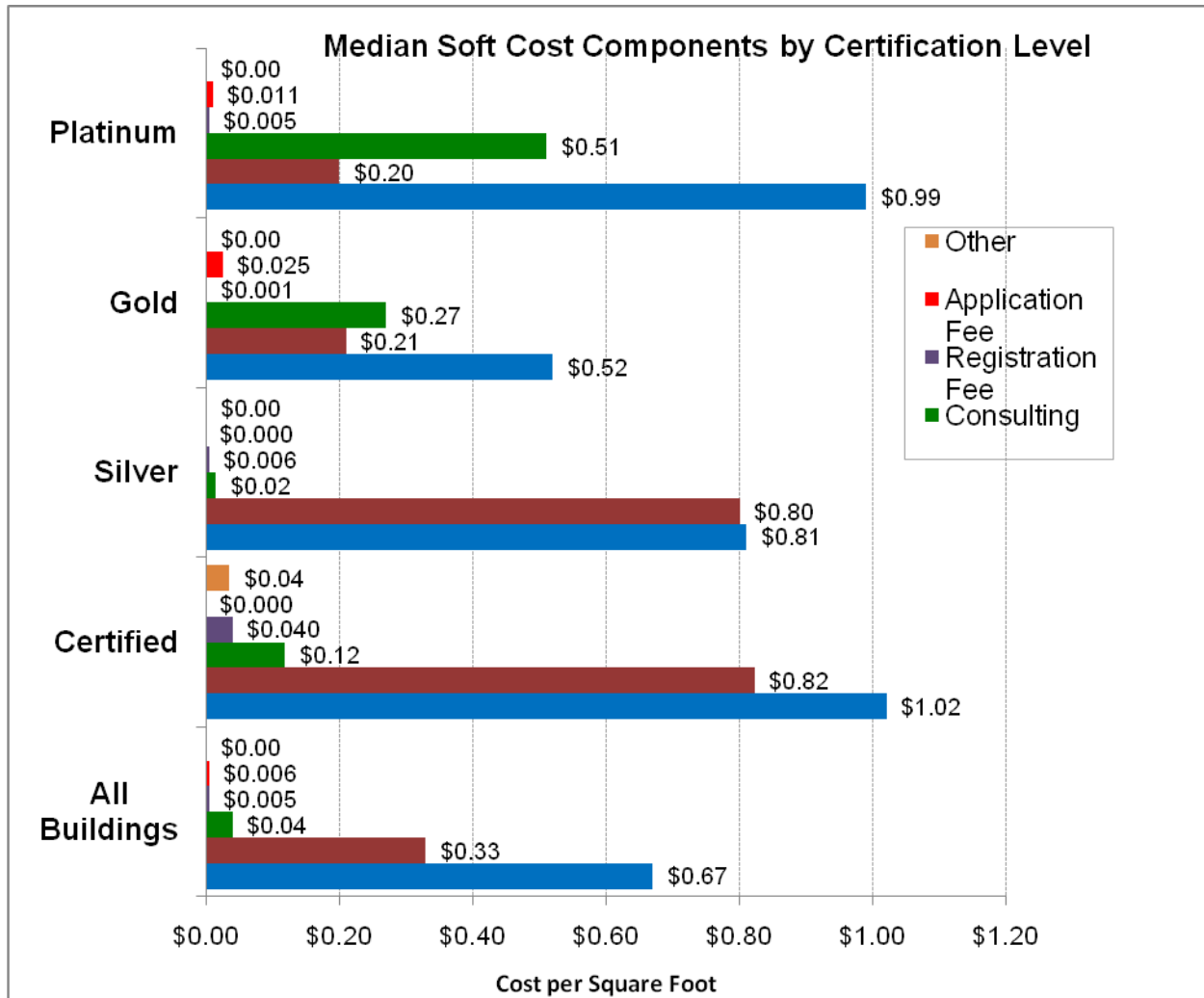


Figure 2B. Median Soft Components of Certification Cost, by Certification Level

## Section 3: Evaluation of Which LEED-EB Prerequisites and Credits have Low Costs or No Costs and Which Have Significant Costs

Respondents were asked to identify each of the measures that qualify for LEED-EB points as being “low or no cost” or “significant cost” measures. The results below are based on the responses of the 23 LEED-EB project managers at each of the 23 facilities that responded.

### Results Across all LEED-EB Credit Categories

The point system for LEED-EB is categorized into six broad credit categories. These are:

Sustainable Sites  
Water Efficiency  
Energy and Atmosphere  
Materials and Resources  
Indoor Environmental Quality  
Innovations

The results of the survey are stated below and shown graphically in Figure 3.

- For the “Sustainable Sites” category the average percent of measures identified as “no costs or low cost” was 73%.
- For the “Water Efficiency” category the average percent of measures identified as “no costs or low cost” was 75%.
- For the “Energy and Atmosphere” category the average percent of measures identified as “no costs or low cost” was 58%.
- For the “Materials and Resources” category the average percent of measures identified as “no costs or low cost” was 82%.
- For the “Indoor Environmental Quality” category the average percent of measures identified as “no costs or low cost” was 71%.
- For the “Innovations” category the average percent of measures identified as “no costs or low cost” was 60%.

For tables of all of the prerequisites and credits listed in order, with the percent respondents indicating that the measure was “low or no cost”, please see Appendix C: Survey Response Summary Tables by Prerequisite and Credits Organized by LEED Category. For a table of all the prerequisites and credits listed in order of percent of respondents indicating that the measure was “low or no cost”, please see Appendix D: Survey Response Summary Tables Sorted By Percent Indicating “Low or No Cost”.

For a visual representation of the distribution of per cent respondents considering each prerequisite and credit as Significant Cost, see Appendix E.

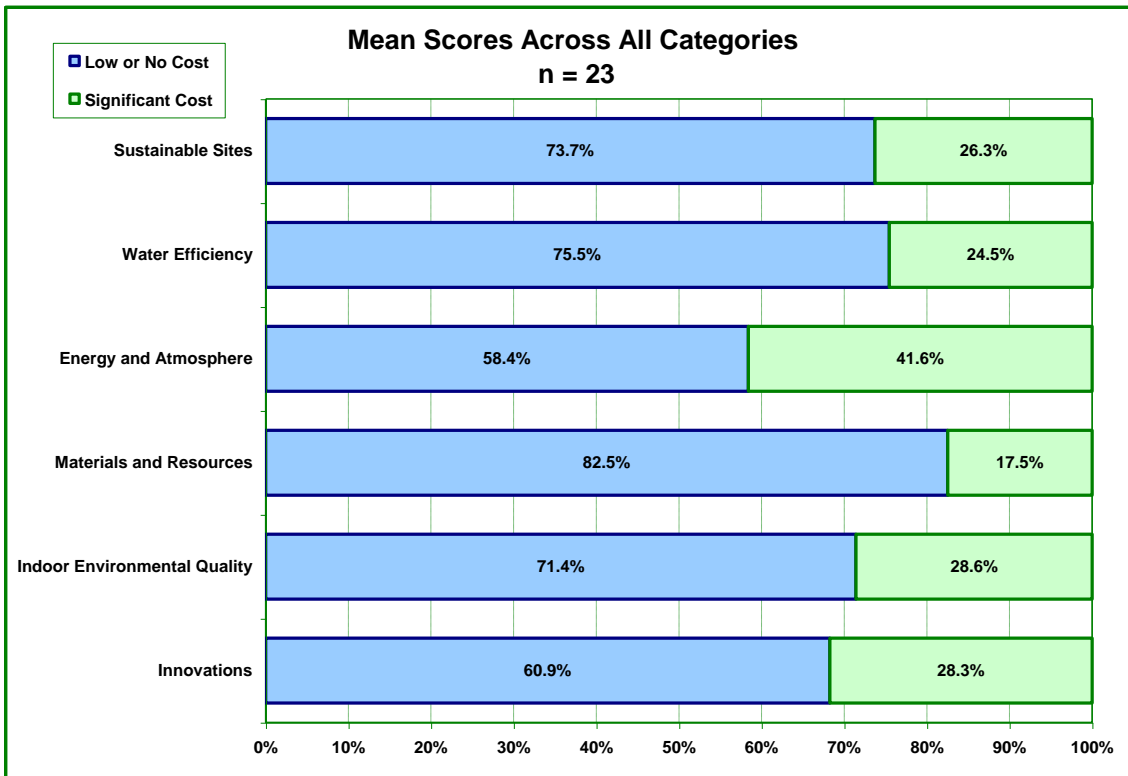


Figure 2. Mean Scores Across All LEED Credit Categories

### Cost of Prerequisites for LEED-EB

In order for a building to earn LEED-EB status, it must meet all the prerequisites in all of the categories. Therefore, it is worth noting the costs of these prerequisites separately. The prerequisites are listed below in Table 2 and also presented in Figure 4.

All but one of the prerequisites are categorized as “no or low cost” measures by more than 68% of the respondents. The exception is building commissioning, with only 43.5% of the respondents indicating that this was a low-cost measure.

**Table 2. Cost of LEED-EB Prerequisites**

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%

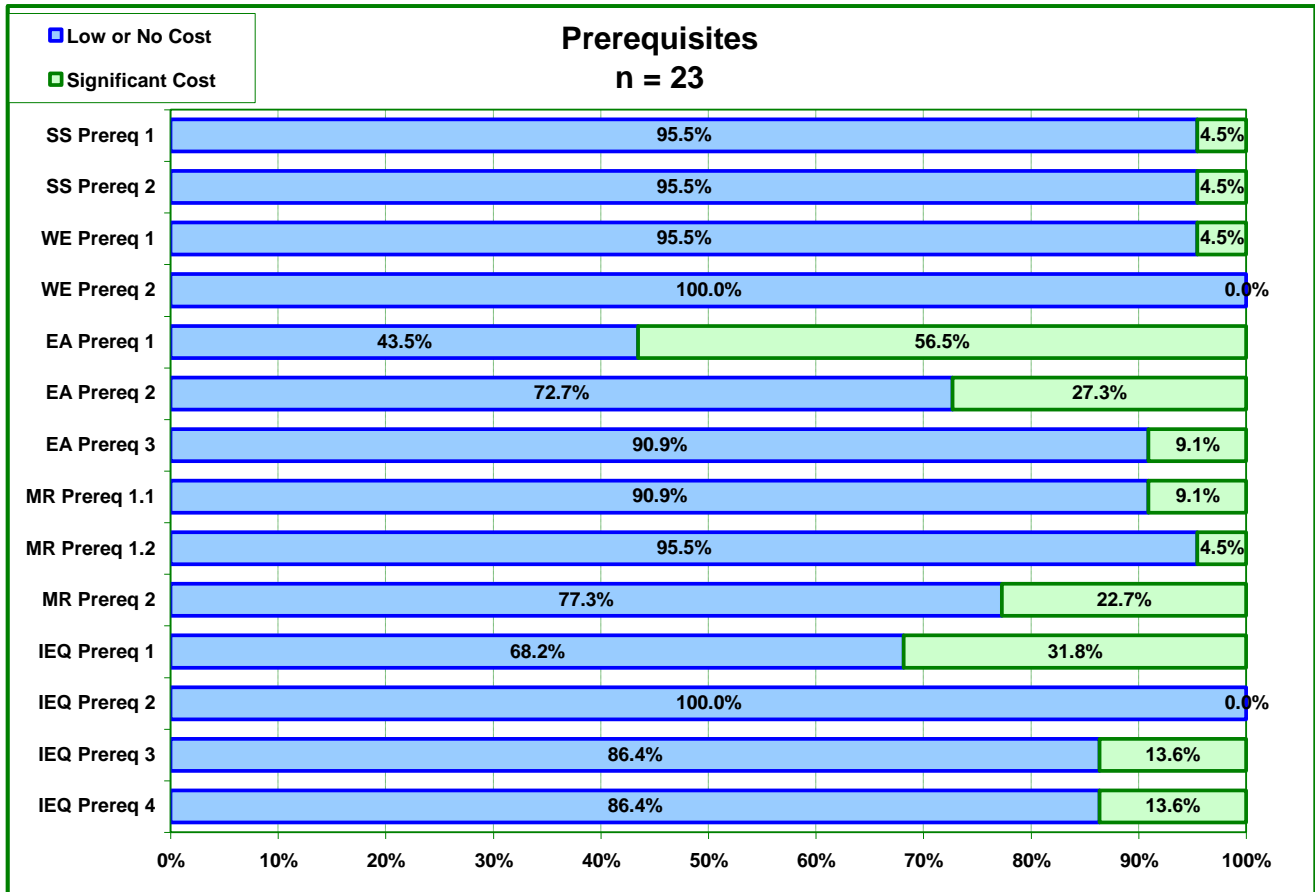


Figure 3. Cost of LEED-EB Prerequisites

### Results by Credit in Each of the LEED Credit Categories

The LEED-EB measures in each of the LEED credit categories can be found in Appendix B: LEED-EB Credits. In this section, they will be referred by the Credit number. Please see Appendix B: LEED-EB Credits for the names of each of the credits.

#### Sustainable Sites

Both of the prerequisites for the Sustainable Sites category were declared “low or no cost” measures by 95.5% of the respondents. The credits were found to be “no or low cost” items by 36.8% to 90% of the respondents. The credit reported to be “no or low cost” by the greatest number of respondents (90%) was Credit 3.1 - Alternative Transportation: Bicycle Storage & Changing Rooms. The credit that was scored most often (63.2%) as a “significant cost” measure was Credit 6.2 - Heat Island Reduction: Roof. See Figure 5.

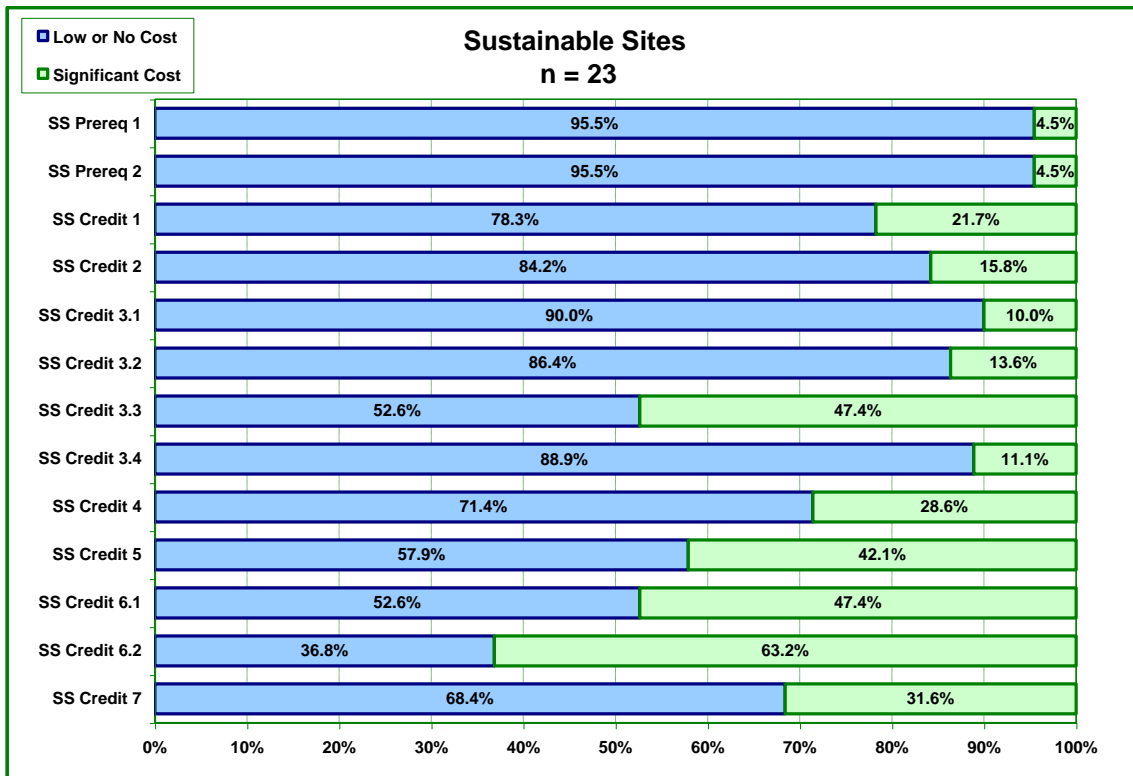
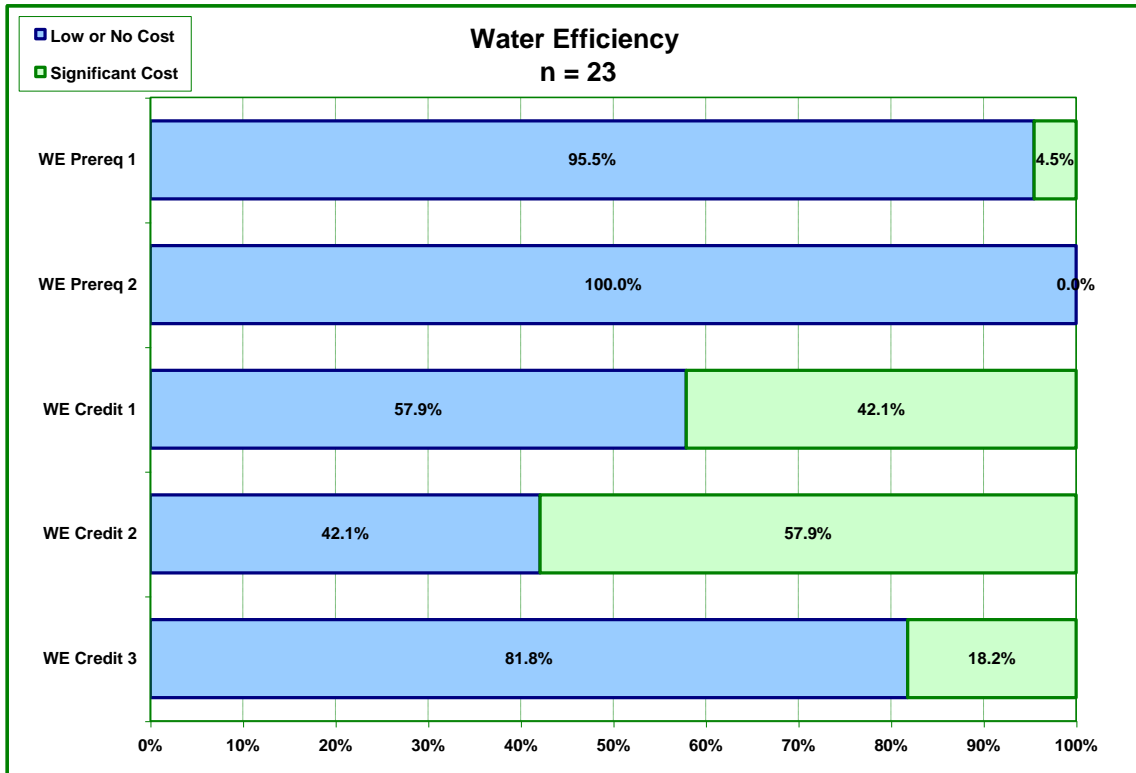


Figure 4. Sustainable Sites



**Water Efficiency**

Prerequisite 1, Minimum Water Efficiency, was found to be a “no or low cost” measure by 95.5% of the respondents. Prerequisite 2, Discharge Water Compliance, was found to be a “no or low cost” measure by 100% of the respondents. The three credit areas and their cost rankings can be found in Figure 5 below. WE Credit 3 – Water Use Reduction, was found to be “no or low cost” by the most respondents, 81.8%.



**Figure 5. Water Efficiency**

### Energy and Atmosphere

The prerequisites for Energy and Atmosphere credits are scored as “no or low cost” measures by 43.5% to 90.9% of the respondents, depending on the prerequisite. Prerequisite 1 - Existing Building Commissioning was scored as a “significant cost” measure by 56.5% of the respondents. Prerequisite 2 - Minimum Energy Performance, was scored as a “no or low cost” measure by 72.7% of the respondents, and Prerequisite 3 - Ozone Protection, was scored as a “no or low cost” measure by 90.9% of the respondents. See Figure 7.

The credits also vary widely in their scores. EA Credit 2 - On-site and Off-site Renewable Energy, was scored as a “significant cost” measure by 83.3% of the respondents. The credit in the Energy and Atmosphere category most often scored as a “low or no cost” measure is EA Credit 3.2 - Building Operations and Maintenance: Building Systems Maintenance, with an 87% score.

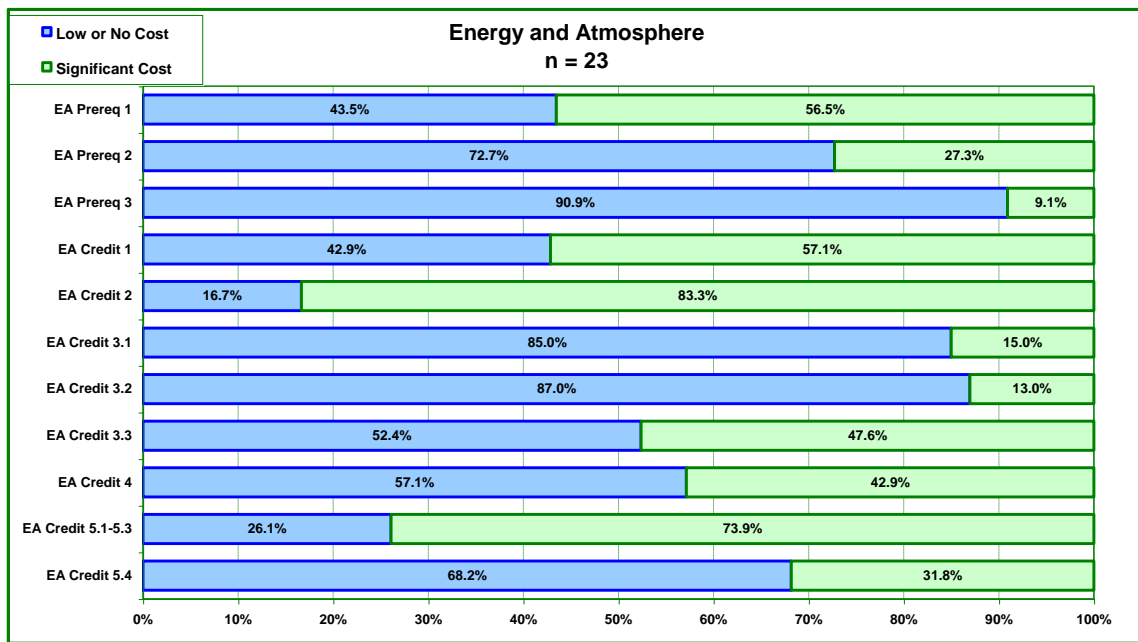


Figure 6. Energy and Atmosphere

### Materials and Resources

The Materials and Resource category contains the measures with the most overall “no or low cost” scores. Both of the prerequisites are scored as “no or low cost” measures by over 90% of the respondents, and all of the credits are scored as “no or low cost” measures by at least 66.7% of the respondents. See Figure 8.

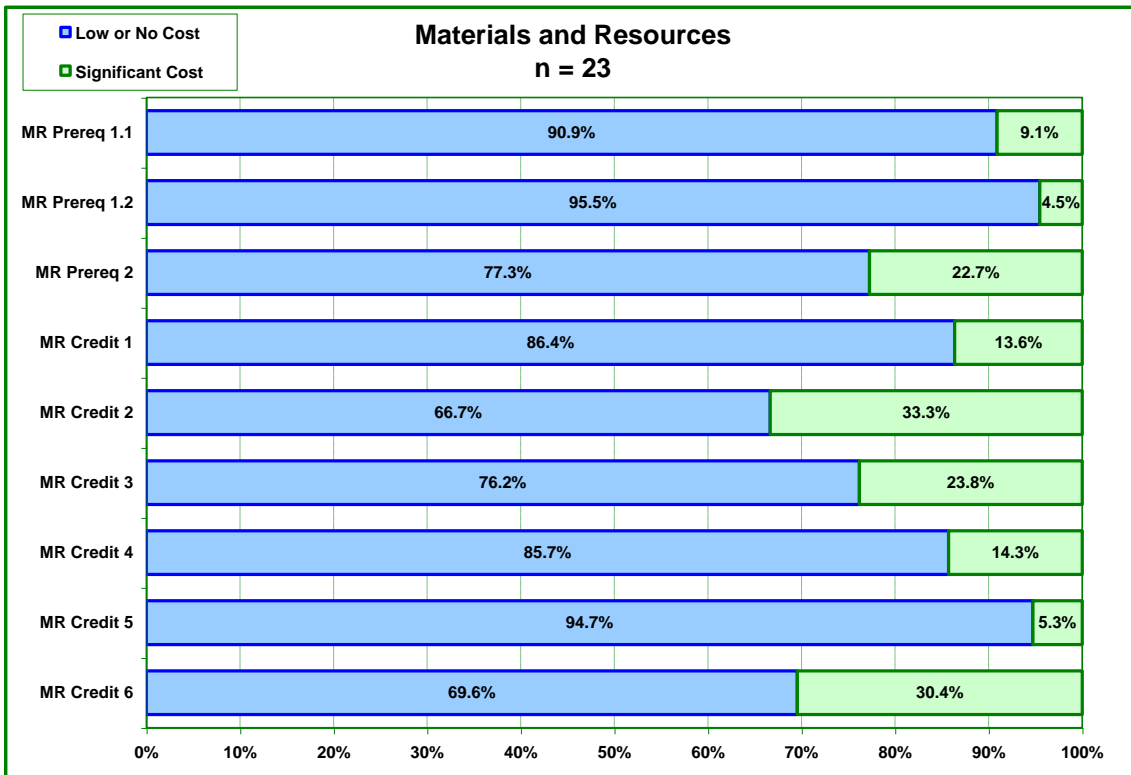


Figure 7. Materials and Resources

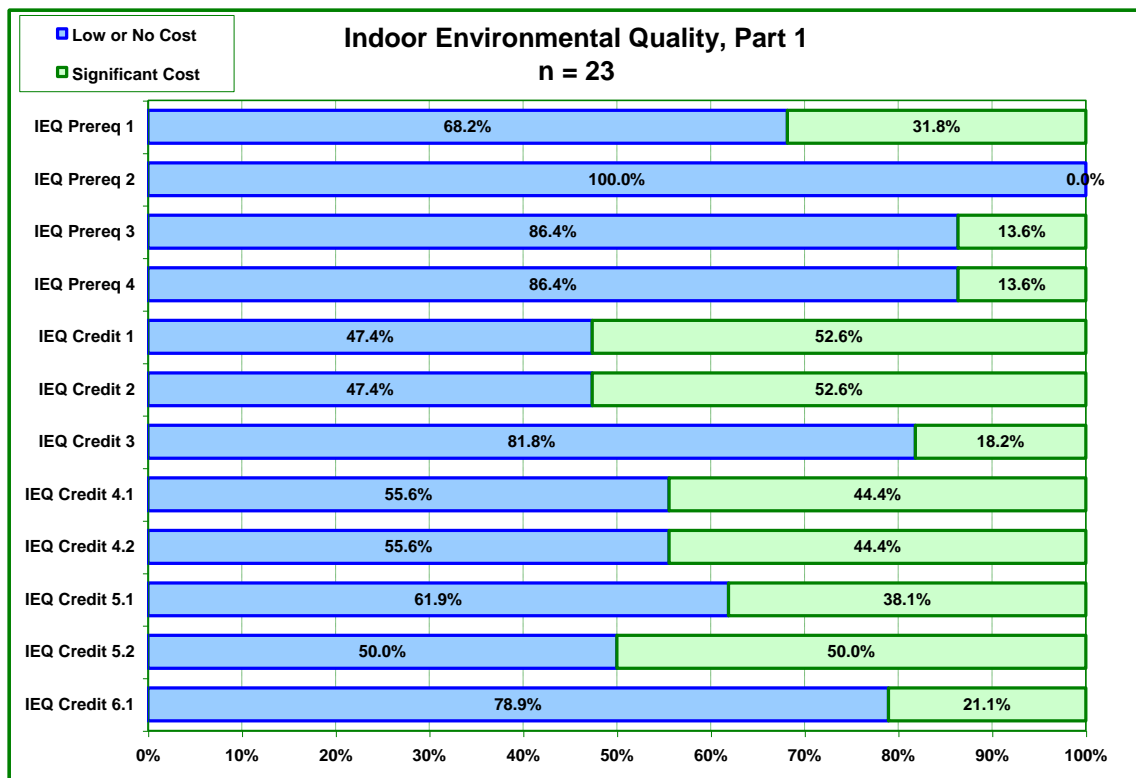
### Indoor Environmental Quality

Given the number of credits in this category, the results are split into two figures, Figure 9 and Figure 10.

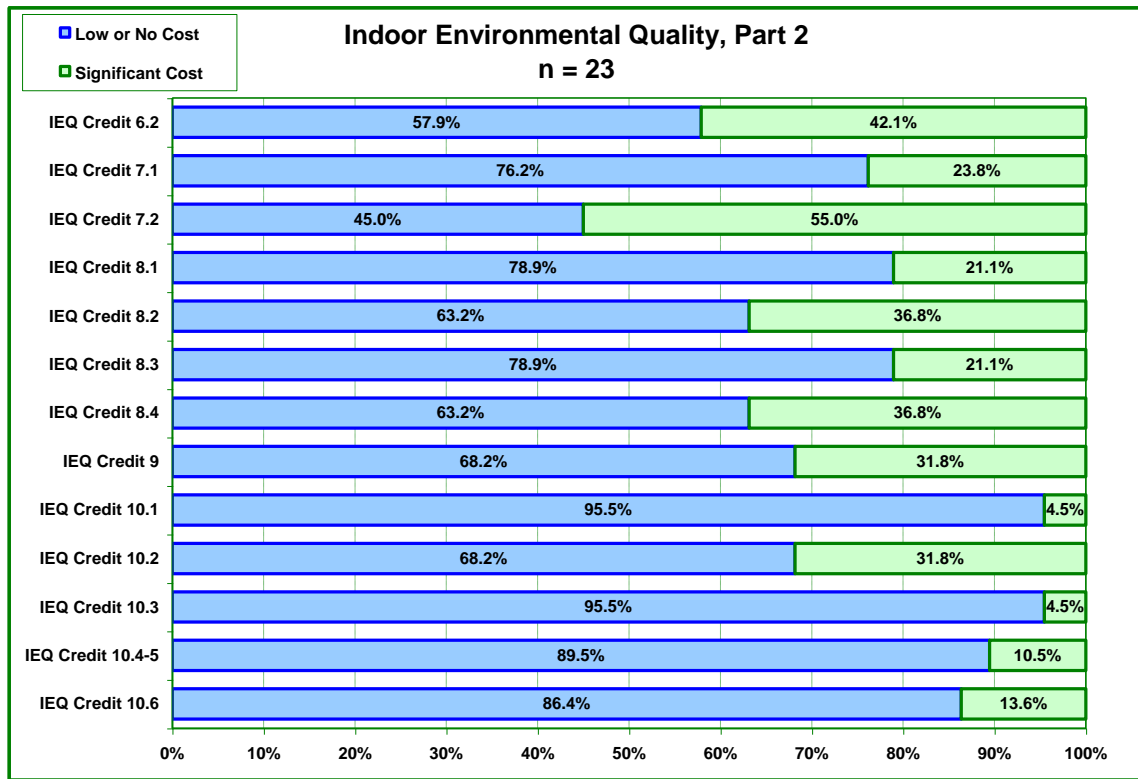
The prerequisites in this category are considered to be “no or low cost” measures. Prerequisite 1 – Outside Air Introduction and Exhaust Systems, is considered by only 68.2% of the respondents to be a “no or low cost” measure. However, the other three prerequisites are considered to be “no or low cost” measures by 86.4% or 100% of the respondents.

The credits available to LEED-EB applicants in this category are usually considered to be “no or low cost” measures by most of the respondents. The two credits with the highest number of respondents (95.5%) indicating that they are “no or low cost” measures are Credit 10.1 – Green Cleaning: Entryway Systems and Credit 10.3 - Green Cleaning: Low Environmental Impact Cleaning Policy. There are three credits available that are considered to be “significant costs” by slightly more than half of the respondents; these are Credit 1 - Outdoor Delivery Monitoring (52.6%), Credit 2 – Increased Ventilation (52.6%), and Credit 7.2 – Thermal Comfort: Permanent monitoring System (55.0%).

**Figure 8. Indoor Environmental Quality, Part 1 of 2**



**Figure 9. Indoor Environmental Quality, Part 2 of 2**



**Innovation in Operation, Upgrades and Maintenance**

Innovation credits are defined by the LEED-EB applicants, so what they are varies from applicant to applicant. What is significant for this category is that 67 percent of the 63 innovation credits were found to be “low cost or no” cost by the respondents.

Innovation measures found to be “low or no cost”	Percent found to be “low or no cost”
42	66.7%

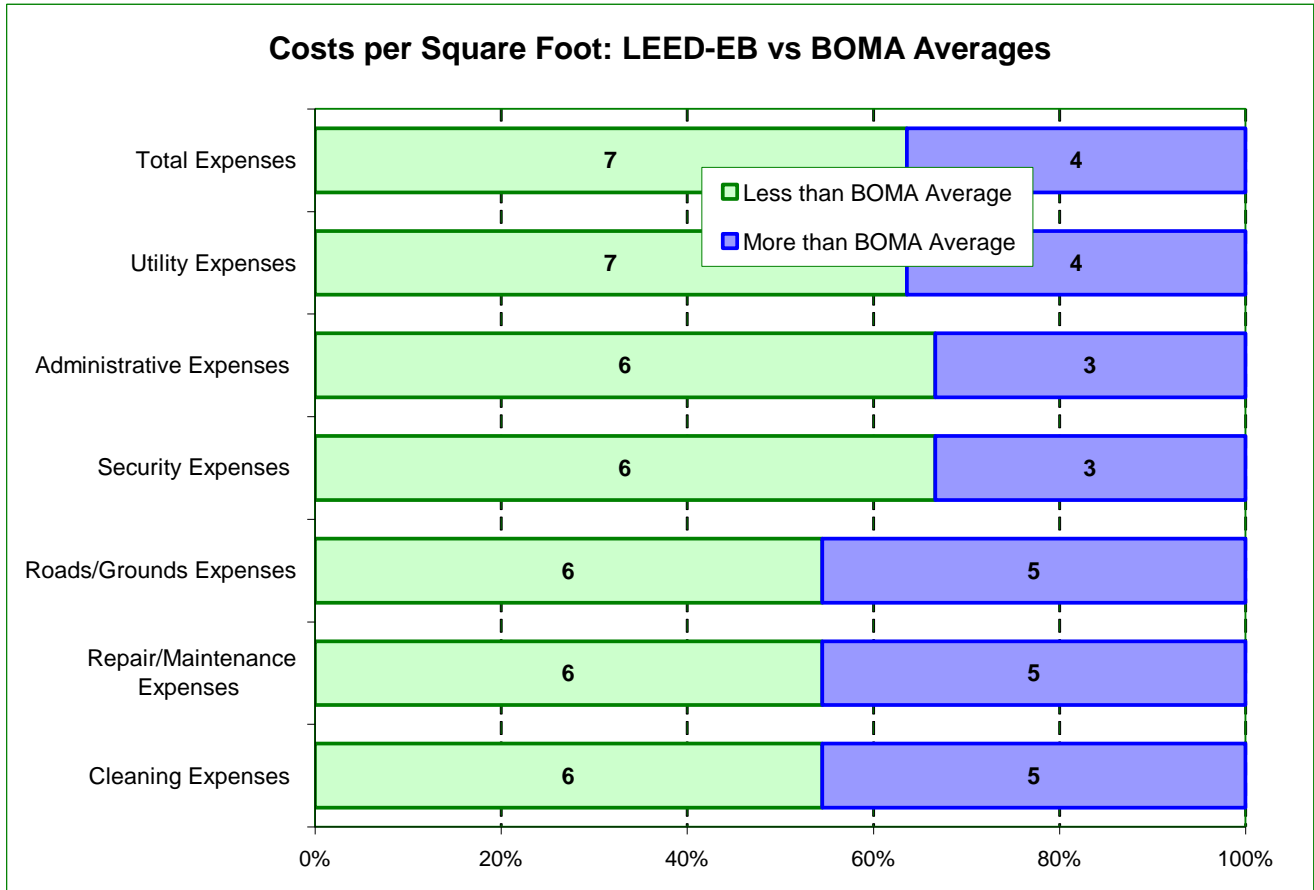
## Section 3: Building Operations Costs with a Comparison to BOMA Data

Among the survey respondents, 13 of the 23 (57%) of the respondents provided the requested building operating cost data. Of these 13 responses with building operating cost data, 11 were included in this analysis because incomplete information was provided for one building and another building was of a building type very different from the others. All of the buildings included in this analysis have a significant component of office space.

This section provides analysis of both the total operating costs of the buildings as well as analysis of the components of the building operating costs, including cleaning expenses, repair and maintenance expenses, roads/grounds expenses, security expenses, administrative and utility expenses.

Some of the respondents were unable to provide complete building operations cost data. However, we can examine what data is available and will update the analysis as more surveys are completed and returned.

Figure 10 below compares the average building operating costs per square foot for LEED-EB buildings with the average costs of similar buildings as listed in BOMA's *Experience Exchange Report 2007*. (BOMA: Building Owners and Managers Association International) In all the categories of operating costs, more than 50% of the LEED-EB buildings have expenses less than the BOMA average for the region. Total expenses per square foot of the LEED-EB buildings are less than the BOMA average for 7 of the 11 buildings (64%).



**Figure 10. Building Operating Costs per Square Foot: LEED-EB vs BOMA Averages**

Table 3 below presents the summary data for the various building operating costs. For each building, the average and median BOMA costs for the region were identified. Then the average, median, minimum and maximum was determined for each set of data: the BOMA averages for the buildings and the BOMA medians for the buildings.

Table 4 on the following page presents the data by building. In order to protect the identity of the companies that provided us with this data, the data for each building is presented as a percent of the BOMA average and median for that building's region. For example, Building 1's cleaning expenses are 129% of the BOMA average for that region, and 107% of the median for the region. Building 2's cleaning expenses are 50% of the BOMA average for the region, and 53% of the median for the region. Values that are above 100% indicate that the building's expenses in that category are higher than the BOMA values for the region. Values that are below 100% indicate that the building's expenses in that category are lower than the BOMA values for the region; these values are in bold and the cells are shaded green.

**Table 3. Summary of Building Operating Expenses per Square Foot**

Expenses – all values are per square foot	Mean	Median	Minimum	Maximum
Cleaning in LEED-EB Certified Buildings	\$1.79	\$1.24	\$0.48	\$7.41
BOMA Average Cleaning	\$1.28	\$1.18	\$0.86	\$1.82
BOMA Median Cleaning	\$1.28	\$1.14	\$0.90	\$1.89
Repair/Maintenance in LEED-EB Certified Buildings	\$1.73	\$1.17	\$0.51	\$5.74
BOMA Average Repair/Maintenance	\$1.52	\$1.53	\$0.61	\$2.37
BOMA Median Repair/Maintenance	\$1.45	\$1.52	\$0.54	\$2.19
Roads and Grounds in LEED-EB Certified Buildings	\$0.31	\$0.33	\$0.06	\$0.82
BOMA Average Roads and Grounds	\$0.22	\$0.14	\$0.04	\$0.86
BOMA Median Roads and Grounds	\$0.16	\$0.08	\$0.04	\$0.47
Security Expenses in LEED-EB Certified Buildings	\$0.24	\$0.04	\$0.00	\$1.19
BOMA Average Security	\$0.53	\$0.63	\$0.10	\$0.81
BOMA Median Security	\$0.48	\$0.54	\$0.10	\$0.82
Administrative Expenses in LEED-EB Certified Buildings	\$0.85	\$0.78	\$0.00	\$3.03
BOMA Average Administrative	\$1.21	\$1.07	\$0.74	\$2.14
BOMA Median Administrative	\$1.15	\$0.99	\$0.72	\$2.14
Utility Expenses in LEED-EB Certified Buildings	\$1.76	\$1.45	\$0.95	\$3.68
BOMA Average Utility	\$2.09	\$2.06	\$1.39	\$2.78
BOMA Median Utility	\$2.13	\$2.11	\$1.20	\$2.82
Total Expenses in LEED-EB Certified Buildings	\$6.68	\$6.07	\$4.94	\$15.59
BOMA Average Total Expenses	\$6.85	\$6.97	\$4.88	\$8.39



**Table 4. Percent Differences in Building Operations Expenses**

All values are based on per square foot calculations	Building 1	Building 2	Building 3	Building 4	Building 5	Building 6	Building 7	Building 8	Building 9	Building 10	Building 11
Cleaning Compared to BOMA Average	129%	50%	189%	85%	72%	53%	138%	136%	41%	686%	94%
Cleaning Compared to BOMA Median	107%	53%	179%	82%	79%	62%	132%	140%	47%	650%	86%
Repair/Maintenance to BOMA Average	136%	57%	77%	21%	71%	231%	105%	40%	46%	375%	378%
Repair/Maintenance to BOMA Median	115%	59%	77%	28%	77%	261%	101%	44%	45%	378%	427%
Roads and Grounds to BOMA Average	236%	98%	65%	837%	52%	65%	1172%	295%	298%	95%	38%
Roads and Grounds to BOMA Median	236%	89%	73%	837%	122%	61%	1172%	295%	379%	107%	106%
Security to BOMA Average	no data	34%	110%	5%	153%	12%	6%	7%	4%	no data	347%
Security to BOMA Median	no data	55%	112%	5%	168%	12%	6%	7%	6%	no data	327%
Administrative to BOMA Average	36%	89%	14%	39%	83%	179%	no data	284%	25%	no data	141%
Administrative to BOMA Median	36%	108%	16%	40%	87%	182%	no data	278%	25%	no data	140%
Utility to BOMA Average	132%	151%	46%	43%	73%	73%	102%	70%	90%	57%	102%
Utility to BOMA Median	135%	103%	45%	43%	82%	70%	102%	67%	96%	56%	118%
Total to BOMA Average	97%	84%	76%	48%	83%	111%	99%	105%	56%	217%	140%
Total to BOMA Median	95%	99%	83%	54%	90%	114%	96%	111%	54%	235%	180%

## Section 4: Energy Star Scores and Building Operational Costs

The Energy Star score requirements for LEED-EB have been moving around a little bit.

Under LEED-EB v2.0 certified buildings need to obtain an Energy Star score of 60 to meet Energy and Atmosphere prerequisite 2: Minimum Energy Performance.

Projects registered under LEED-EB v2.0 after June 2007 need to have to earn at least two energy points under EA Credit 1 which requires an Energy star score of at least 67.

And going forward project certifying under LEED-EB OM will need to have an Energy Star Score of at least 69.

We asked the survey respondents to provide us with the Energy Star score of the building when they received their LEED-EB certification. We received data for only ten buildings, so the results presented in this section are preliminary and should be viewed as anecdotal.

### Energy Star Scores

Table 5 below presents the Energy Star scores and the LEED-EB certification levels for each of the buildings whose data is used in this section of the report.

**Table 5. Energy Star Scores and Certification Levels of Respondents**

Energy Star Score	LEED-EB Certification Level
98	Silver
95	Platinum
93	Gold
90	Gold
87	Gold
84	Platinum
77	Silver
76	Silver
75	Platinum
70	Silver

### Correlations between Energy Star Scores, and the Costs of Building Operations and LEED-EB Certification

Table 6 below shows the correlation factors for the buildings' Energy Star scores and different costs associated with LEED-EB certification and building operations. The only notable relationship is, not surprisingly, between utility expenses and Energy Star scores. The higher the Energy Star score, the

lower the utility expenses are for the buildings. All other expenses are not related to the Energy Star score achieved during the LEED-EB certification.

**Table 6. Correlation Factors of Energy Star Scores and Costs**

Energy Star Score to Cost per Square Foot for:	Correlation Factor:
Internal Staff Time	0.209
Internal Staff Costs	0.170
Total Soft Costs	-0.278
Total Hard Costs	0.215
Cleaning Expenses	0.115
Repair/Maintenance Expenses	0.120
Roads/Grounds Expenses	-0.218
Security Expenses	0.352
Administrative Expenses	-0.144
Utility Expenses (\$)	-0.673
Total	-0.013

## Section 5: Conclusion

### The Overall Cost of LEED-EB Implementation and Certification

The overall cost of LEED-EB implementation and certification ranges from \$0.02 to \$5.01 per square foot of floor space, with an average of \$1.58 per square foot. These results are not correlated with the level of certification achieved. This is probably because the level of certification achieved is dependant on the pre-LEED-EB implementation performance of the building rather than on the LEED-EB implementation expenditures.

### The Cost of Implementing the LEED-EB Prerequisites

Table 7 shows all the LEED-EB prerequisites ranked by the percentage of survey respondents that found each measure to be “low cost or no cost”. All but 4 were found to be “low cost or no cost” by more that 80 percent of the survey respondents.

MR Prerequisite 2, Toxic Material Source Reduction: Reduced Mercury in Light Bulbs, was found to be “low cost or no cost” by 77 percent of the survey respondents. With the continuing increase in availability of low mercury bulbs and of mercury content information from bulb manufacturers, this action should be found to be “low cost and no cost” by an increasing number of LEED-EB certified buildings as time goes on. In LEED-EB v2008, this LEED-EB v2.0 prerequisite becomes a credit.

EA Prerequisite 2, Minimum Energy Performance, was found to be “low cost or no cost” by 72 percent of the survey respondents. This is a significant prerequisite in LEED-EB v2.0, requiring an Energy Star Score of at least 60. Minimum Energy Performance became more significant with the USGBC adoption in June of 2007 of the requirement that buildings registered after that date also earn a minimum of 2 points under EA Credit 1, or a minimum Energy Star Score of 67. In LEED-EB v2008, this prerequisite becomes even more significant because the minimum achievement level is raised from 60 in LEED-EB v2.0 to 69 in LEED-EB O&M v2008. As this prerequisite becomes more stringent, building owners will need to recognize that they can achieve significant reductions in the environmental impacts of their buildings by implementing all the other feasible LEED-EB prerequisites and credits in the near term, even if it takes them some time to raise the building’s energy performance above the level required by this prerequisite.

IEQ Prerequisite 1, Outside Air Introduction and Exhaust Systems, was found to be “low cost or no cost” by 68 percent of the survey respondents. This prerequisite in LEED-EB requires documenting that ASHRAE 60.2 outdoor air intake requirements are met or if the ventilation system has physical constraints that prevent these ASHRAE 60.2 requirements from being met, documenting that a 10cfm per occupant minimum ventilation is achieved. Based on Leonardo Academy’s experience with LEED-EB certification reviews from 2002 through the present, the majority of LEED-EB certified buildings have not required upgrades to their ventilation systems.

EA Prerequisite 1, Existing Building Commissioning, was found to be “low cost or no cost” by 43 percent of the survey respondents. This is a significant prerequisite in LEED-EB, but the results of an extensive study by Lawrence Berkley Laboratory show that the median cost of existing buildings

commissioning is 27 cents per square foot floor space, the energy savings is 15 percent and the pay back is 0.7 years. In LEED-EB v2008, this prerequisite becomes a credit that can earn up to 3 points.

**Table 7. LEED-EB Prerequisites**

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

### **Comparison of the Operating Cost of the LEED-EB Certified Buildings with Those in the BOMA's *Experience Exchange Report***

The comparison of the operating costs of the LEED-EB buildings with operating costs in BOMA's *Experience Exchange Report 2007* shows that the total expenses per square foot of the LEED-EB buildings are usually less than the BOMA average for the region. The operating costs are lower for LEED-EB certified buildings than for the BOMA buildings for 7 of the 11 buildings, and range from \$4.94 to \$15.59 per square foot of floor space, with an average of \$6.68 and a median of \$6.07.

## Appendix A: Survey Instrument

### LEED-EB Implementation Costs - Quick Survey

Help us separate the Low Cost or No Cost measures from the Significant Cost measures for your building

**Estimated Time to Complete this Form: 10 minutes**

**Guidance for filling out this Survey Form:**

(1) In answering please consider *only costs incurred after you decided to earn LEED-EB Certification*.

(2) Please provide responses for all prerequisites and credits whether or not the credits were applied for in the LEED-EB certification application for your building.

(3) For each Credit and Prerequisite - Please Put a "1" in the Low Cost or No Cost Action column OR a "1" in the Significant Cost Action column based on your view of what each Prerequisite or Credit did cost or would have cost if implemented in your building during the LEED-EB Certification Application Period.

**Table 2: LEED-EB Cost By Prerequisite and Credit**

What is your view of how much each Prerequisite and Credit did cost or would cost if implemented for your building?			
		Low Cost or No Cost Action	Significant Cost Action
<b>STATE SERVICES BUILDING LEED-EB Cost By Prerequisite and Credit</b>			
<b>Sustainable Sites</b>			
SS Prereq 1	Erosion and Sedimentation Control	1	
SS Prereq 2	Age of Building	1	
SS Credit 1	Plan for Green Site and Building Exterior Management	1	
SS Credit 2	High Development Density Building and Area	1	
SS Credit 3.1	Alternative Transportation: Public Transportation Access	1	
SS Credit 3.2	Alternative Transportation: Bicycle Storage & Changing Rooms	1	
SS Credit 3.3	Alternative Transportation: Alternative Fuel Vehicles		
SS Credit 3.4	Alternative Transportation: Car Pooling & Telecommuting		
SS Credit 4	Reduced Site Disturbance: Protect or Restore Open Space	1	
SS Credit 5	Stormwater Management: Rate and Quantity Reduction		
SS Credit 6.1	Heat Island Reduction: Non-Roof		
SS Credit 6.2	Heat Island Reduction: Roof		
SS Credit 7	Light Pollution Reduction		
<b>Water Efficiency</b>			
WE Prereq 1	Minimum Water Efficiency	1	
WE Prereq 2	Discharge Water Compliance	1	
WE Credit 1	Water Efficient Landscaping: Reduce Water Use		
WE Credit 2	Innovative Wastewater Technologies		
WE Credit 3	Water Use Reduction	1	

<b>Energy &amp; Atmosphere</b>			
EA Prereq 1	Existing Building Commissioning	1	
EA Prereq 2	Minimum Energy Performance	1	
EA Prereq 3	Ozone Protection	1	
EA Credit 1	Optimize Energy Performance	1	
EA Credit 2	On-site and Off-site Renewable Energy		
EA Credit 3.1	Building Operations and Maintenance: Staff Education		
EA Credit 3.2	Building Operations and Maintenance: Building Systems Maintenance	1	
EA Credit 3.3	Building Operations and Maintenance: Building Systems Monitoring		
EA Credit 4	Additional Ozone Protection	1	
EA Credit 5.1-5.3	Performance Measurement: Enhanced Metering	1	
EA Credit 5.4	Performance Measurement: Emission Reduction Reporting	1	
<b>Materials &amp; Resources</b>			
MR Prereq 1.1	Source Reduction and Waste Management: Waste Stream Audit	1	
MR Prereq 1.2	Source Reduction and Waste Management: Storage & Collection of Recyclables	1	
MR Prereq 2	Toxic Material Source Reduction: Reduced Mercury in Light Bulbs	1	
MR Credit 1	Construction, Demolition and Renovation Waste Management	1	
MR Credit 2	Optimize Use of Alternative Materials	1	
MR Credit 3	Optimize Use of IAQ Compliant Products		
MR Credit 4	Sustainable Cleaning Products and Materials	1	
MR Credit 5	Occupant Recycling		
MR Credit 6	Additional Toxic Material Source Reduction: Reduced Mercury in Light Bulbs	1	

<b>Indoor Environmental Quality</b>			
IEQ Prereq 1	Outside Air Introduction and Exhaust Systems	1	
IEQ Prereq 2	Environmental Tobacco Smoke (ETS) Control	1	
IEQ Prereq 3	Asbestos Removal or Encapsulation	1	
IEQ Prereq 4	PCB Removal	1	
IEQ Credit 1	Outside Air Delivery Monitoring		
IEQ Credit 2	Increased Ventilation		
IEQ Credit 3	Construction IAQ Management Plan	1	
IEQ Credit 4.1	Documenting Productivity Impacts: Absenteeism and Healthcare Cost Impacts		
IEQ Credit 4.2	Documenting Productivity Impacts: Other Impacts		
IEQ Credit 5.1	Indoor Chemical and Pollutant Source Control: Non-Cleaning – Reduce Particulates in Air Distribution	1	
IEQ Credit 5.2	Indoor Chemical and Pollutant Source Control: Non-Cleaning –High Volume Copying/Print Rooms/Fax Stations		
IEQ Credit 6.1	Controllability of Systems: Lighting		
IEQ Credit 6.2	Controllability of Systems: Temperature & Ventilation		
IEQ Credit 7.1	Thermal Comfort: Compliance		
IEQ Credit 7.2	Thermal Comfort: Permanent Monitoring System	1	
IEQ Credit 8.1	Daylighting and Views: Daylighting for 50% of Spaces		
IEQ Credit 8.2	Daylighting and Views: Daylighting for 75% of Spaces		
IEQ Credit 8.3	Daylighting and Views: Views for 40% of Spaces		
IEQ Credit 8.4	Daylighting and Views: Views for 80% of Spaces		
IEQ Credit 9	Contemporary IAQ Practice	1	
IEQ Credit 10.1	Green Cleaning: Entryway systems	1	
IEQ Credit 10.2	Green Cleaning: Isolation of Janitorial Closets	1	
IEQ Credit 10.3	Green Cleaning: Low Environmental Impact Cleaning Policy	1	
IEQ Credit 10.4-5	Green Cleaning: Low Environmental Impact Pest Management Policy		
IEQ Credit 10.6	Green Cleaning: Low Environmental Impact Cleaning Equipment Policy	1	
<b>Innovation in Operation, Upgrades and Maintenance</b>			
IU Credit 1.1	IOUM: (Innovation in Upgrades, Operations & Maintenance)	1	
IU Credit 1.2	IOUM: (Innovation in Upgrades, Operations & Maintenance)	1	
IU Credit 1.3	IOUM: (Please describe Innovation)		
IU Credit 1.4	IOUM: (Please describe Innovation)		
<b>Total number of actions in each category</b>		39	0



**Building Operating Costs (2006)**

1) Please fill in your building's operating cost for as many years as you have time or data to complete. We will provide you with results from your own building as well as the aggregated results from the LEED-EB Certified Buildings Group. Buildings will not be identified by name in the LEED-EB Certified Buildings Group Operating Cost Summary and Report.

LEED-EB Certification Level & Date of Certification	<b>Cert. Level</b>	<b>Award Date</b>
LEED-NC Certification Level (if applicable) & Date of Certification		

<b>Building Characteristics</b>	<b>2006</b>	<b>2005</b>	<b>2004</b>	<b>2003</b>	<b>2002</b>
Type of Building (Library, office etc.)					
Building Floor Area (Square Feet)					
Total Grounds Area Maintained By Facilities Department (Acres):					
Building Full-Time Equivalent Occupants					

<b>Building Operation Costs (\$)</b>	<b>2006</b>	<b>2005</b>	<b>2004</b>	<b>2003</b>	<b>2002</b>
<b>Cleaning Expenses</b> (Payroll, Taxes, and Fringes for In-House Janitorial Support, Routine Contract, Window Washing, Other Specialized Contracts, Supplies/Materials, Miscellaneous, Trash Removal, and Unsegregated Cleaning Expenses)					
<b>Repair/Maintenance Expenses</b> (Payroll, Taxes, Fringes, Elevator, HVAC, Electrical, Structural/Roofing, Plumbing, Fire/Life Safety, General Building Interior, General Building Exterior, Parking Lot, Miscellaneous, and Unsegregated Repair/Maintenance)					
<b>Roads/Grounds Expenses</b> (Landscaping, General Parking, Snow Removal, Miscellaneous/Other (interior plants), and Unsegregated Roads/Grounds)					
<b>Security Expenses</b> (Payroll, Taxes, Fringes, Contracts, Equipment, Miscellaneous/Other and Unsegregated Security Expenses)					
<b>Administrative Expenses</b> (Expenses directly connected with administration of building including: Payroll, Taxes, Fringes, Allocated Overhead Fee, Management Fees, Professional Fees, General Office Expenses, Employee Expenses, and Miscellaneous/Other (coffee/vending))					
<b>Utility Expenses (\$)</b>					
Electricity					
Natural Gas					
Fuel Oil					
Steam					
Chilled Water					
Water					
Sewer					
Unsegregated Utility Expenses					
<b>Other Operating Expenses</b>					

<b>Total Building Operating Costs (\$)</b>	\$0	\$0	\$0	\$0	\$0
<b>Total Building Operating Costs (\$/Sq. Ft.)</b>	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
<b>Total Building Operating Costs Per Occupant (\$)</b>	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

<b>Annual Utility Use (amount)</b>	<b>2006</b>	<b>2005</b>	<b>2004</b>	<b>2003</b>	<b>2002</b>
Electricity (Kwh)					
Natural Gas (Therms)					
Fuel Oil (Gallons)					
Steam (Pounds)					
Other (Add name of type of fuel and units of measurement)					
Water (Gallons)					

**Non Sustainable Building Operating Costs for Comparison**

What are the best comparable non sustainable building cost data in your area that you are aware of for comparing your building's operating costs?					
Please identify a source for these comparables, contact information and provide operating numbers (\$/Sq. Ft.) if available.					

**LEED-EB Certification Process Costs**

<b>Description of Certification Process: Soft Costs</b>	<b>Hours</b>	<b>Costs (\$)</b>
LEED-EB Registration Fee		
LEED-EB Application Fee		
Internal staff time (Approximate Gross Hours)		
Internal staff costs (Approximate Incremental)		
LEED-EB Consultants		
Other (please list)		
<b>Total</b>	<b>0.0</b>	<b>\$0</b>

**LEED-EB Certification Budgeted Hard Costs**

<b>LEED-EB Certification Hard Costs</b>	<b>Costs (\$)</b>
<b>Description of Major Hard Cost Components: (Please type in list of major components)</b>	
<b>Total Hard Costs</b>	

## Appendix B: LEED-EB Credits

### Sustainable Sites

14 Possible Points

Prereq 1 - Erosion and Sedimentation Control (Required)

Prereq 2 - Age of Building (Required)

Credit 1 - Plan for Green Site and Building Exterior Management (2 points)

Credit 2 - High Development Density Building and Area (1 point)

Credit 3.1 - Alternative Transportation: Public Transportation Access (1 point)

Credit 3.2 - Alternative Transportation: Bicycle Storage & Changing Rooms (1 point)

Credit 3.3 - Alternative Transportation: Alternative Fuel Vehicles (1 point)

Credit 3.4 - Alternative Transportation: Car Pooling & Telecommuting (1 point)

Credit 4 - Reduced Site Disturbance: Protect or Restore Open Space (2 points)

Credit 5 - Stormwater Management: Rate and Quantity Reduction (2 points)

Credit 6.1 - Heat Island Reduction: Non-Roof (1 point)

Credit 6.2 - Heat Island Reduction: Roof (1 point)

Credit 7 - Light Pollution Reduction (1 point)

### Water Efficiency

5 Possible Points

Prereq 1 - Minimum Water Efficiency (Required)

Prereq 2 - Discharge Water Compliance (Required)

Credit 1 - Water Efficient Landscaping: Reduce Water Use (2 points)

Credit 2 - Innovative Wastewater Technologies (1 point)

Credit 3 - Water Use Reduction (2 points)

### Energy & Atmosphere

23 Possible Points

Prereq 1 - Existing Building Commissioning (Required)

Prereq 2 - Minimum Energy Performance (Required)

Prereq 3 - Ozone Protection (Required)

Credit 1 - Optimize Energy Performance (1-10 points)

(2 points mandatory for LEED for Existing Buildings projects registered after June 26, 2007)

Credit 2 - On-site and Off-site Renewable Energy (1-4 points)

Credit 3.1 - Building Operations and Maintenance: Staff Education (1 point)

Credit 3.2 - Building Operations and Maintenance: Building Systems Maintenance (1 point)

Credit 3.3 - Building Operations and Maintenance: Building Systems Monitoring (1 point)

Credit 4 - Additional Ozone Protection (1 point)

Credit 5.1-5.3 - Performance Measurement: Enhanced Metering (3 points)

Credit 5.4 - Performance Measurement: Emission Reduction Reporting (1 point)

Credit 6 - Documenting Sustainable Building Cost Impacts (1 point)

## **Materials & Resources**

16 Possible Points

Prereq 1.1 - Source Reduction and Waste Management: Waste Management Policy and Waste Stream Audit (Required)

Prereq 1.2 - Source Reduction and Waste Management: Storage & Collection of Recyclables (Required)

Prereq 2 - Toxic Material Source Reduction: Reduced Mercury in Light Bulbs (Required)

Credit 1 - Construction, Demolition and Renovation Waste Management (2 points)

Credit 2 - Optimize Use of Alternative Materials (5 points)

Credit 3 - Optimize Use of IAQ Compliant Products (2 points)

Credit 4 - Sustainable Cleaning Products and Materials (3 points)

Credit 5 - Occupant Recycling (3 points)

Credit 6 - Additional Toxic Material Source Reduction: Reduced Mercury in Light Bulbs (1 point)

## **Indoor Environmental Quality**

22 Possible Points

Prereq 1 - Outside Air Introduction and Exhaust Systems (Required)

Prereq 2 - Environmental Tobacco Smoke (ETS) Control (Required)

Prereq 3 - Asbestos Removal or Encapsulation (Required)

Prereq 4 - PCB Removal (Required)

Credit 1 - Outside Air Delivery Monitoring (1 point)

Credit 2 - Increased Ventilation (1 point)

Credit 3 - Construction IAQ Management Plan (1 point)

Credit 4.1 - Documenting Productivity Impacts: Absenteeism and Healthcare Cost Impacts (1 point)

Credit 4.2 - Documenting Productivity Impacts: Other Impacts (1 point)

Credit 5.1 - Indoor Chemical and Pollutant Source Control: Non-Cleaning – Reduce Particulates in Air Distribution (1 point)

Credit 5.2 - Indoor Chemical and Pollutant Source Control: Non-Cleaning –High Volume Copying/Print Rooms/Fax Stations (1 point)

Credit 6.1 - Controllability of Systems: Lighting (1 point)

Credit 6.2 - Controllability of Systems: Temperature & Ventilation (1 point)

Credit 7.1 - Thermal Comfort: Compliance (1 point)

Credit 7.2 - Thermal Comfort: Permanent Monitoring System (1 point)

Credit 8.1 - Daylighting and Views: Daylighting for 50% of Spaces (1 point)

Credit 8.2 - Daylighting and Views: Daylighting for 75% of Spaces (1 point)

Credit 8.3 - Daylighting and Views: Views for 45% of Spaces (1 point)

Credit 8.4 - Daylighting and Views: Views for 90% of Spaces (1 point)

Credit 9 - Contemporary IAQ Practice (1 point)

Credit 10.1 - Green Cleaning: Entryway systems (1 point)

Credit 10.2 - Green Cleaning: Isolation of Janitorial Closets (1 point)

Credit 10.3 - Green Cleaning: Low Environmental Impact Cleaning Policy (1 point)

Credit 10.4-5 - Green Cleaning: Low Environmental Impact Pest Management Policy (2 points)

Credit 10.6 - Green Cleaning: Low Environmental Impact Cleaning Equipment Policy (1 point)

### **Innovation in Operation, Upgrades and Maintenance**

5 Possible Points

Credit 1.1 - Innovation in Operation & Upgrades (1 point)

Credit 1.2 - Innovation in Operation & Upgrades (1 point)

Credit 1.3 - Innovation in Operation & Upgrades (1 point)

Credit 1.4 - Innovation in Operation & Upgrades (1 point)

Credit 2 - LEED Accredited Professional (1 point)

### **Project Totals**

80 possible base points plus 5 for Innovation in Operation, Upgrades and Maintenance

Certified: 32–39 points

Silver: 40–47 points

Gold: 48–63 points

Platinum: 64–85 points

## Appendix C: Survey Response Summary Tables by Prerequisite and Credit

Prerequisite or Credit Number	Description of Prerequisite or Credit	Percent of Respondents Saying Low Cost
<b>Sustainable Sites</b>		
SS Prereq 1	Erosion and Sedimentation Control	95.5%
SS Prereq 2	Age of Building	95.5%
SS Credit 1	Plan for Green Site and Building Exterior Management	78.3%
SS Credit 2	High Development Density Building and Area	84.2%
SS Credit 3.1	Alternative Transportation: Public Transportation Access	90.0%
SS Credit 3.2	Alternative Transportation: Bicycle Storage & Changing Rooms	86.4%
SS Credit 3.3	Alternative Transportation: Alternative Fuel Vehicles	52.6%
SS Credit 3.4	Alternative Transportation: Car Pooling & Telecommuting	88.9%
SS Credit 4	Reduced Site Disturbance: Protect or Restore Open Space	71.4%
SS Credit 5	Stormwater Management: Rate and Quantity Reduction	57.9%
SS Credit 6.1	Heat Island Reduction: Non-Roof	52.6%
SS Credit 6.2	Heat Island Reduction: Roof	36.8%
SS Credit 7	Light Pollution Reduction	68.4%
<b>Water Efficiency</b>		
WE Prereq 1	Minimum Water Efficiency	95.5%
WE Prereq 2	Discharge Water Compliance	100.0%
WE Credit 1	Water Efficient Landscaping: Reduce Water Use	57.9%
WE Credit 2	Innovative Wastewater Technologies	42.1%
WE Credit 3	Water Use Reduction	81.8%
<b>Energy and Atmosphere</b>		
EA Prereq 1	Existing Building Commissioning	43.5%
EA Prereq 2	Minimum Energy Performance	72.7%
EA Prereq 3	Ozone Protection	90.9%
EA Credit 1	Optimize Energy Performance	42.9%
EA Credit 2	On-site and Off-site Renewable Energy	16.7%

Prerequisite or Credit Number	Description of Prerequisite or Credit	Percent of Respondents Saying Low Cost
EA Credit 3.1	Building Operations and Maintenance: Staff Education	85.0%
EA Credit 3.2	Building Operations and Maintenance: Building Systems Maintenance	87.0%
EA Credit 3.3	Building Operations and Maintenance: Building Systems Monitoring	52.4%
EA Credit 4	Additional Ozone Protection	57.1%
EA Credit 5.1-5.3	Performance Measurement: Enhanced Metering	26.1%
EA Credit 5.4	Performance Measurement: Emission Reduction Reporting	68.2%

Prerequisite or Credit Number	Description of Prerequisite or Credit	Percent of Respondents Saying Low Cost
<b>Materials and Resources</b>		
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%
MR Credit 1	Construction, Demolition and Renovation Waste Management	86.4%
MR Credit 2	Optimize Use of Alternative Materials	66.7%
MR Credit 3	Optimize Use of IAQ Compliant Products	76.2%
MR Credit 4	Sustainable Cleaning Products and Materials	85.7%
MR Credit 5	Occupant Recycling	94.7%
MR Credit 6	Additional Toxic Material Source Reduction: Reduced Mercury in Light Bulbs	69.6%
<b>Indoor Environmental Quality</b>		
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%
IEQ Credit 1	Outside Air Delivery Monitoring	47.4%
IEQ Credit 10.1	Green Cleaning: Entryway systems	95.5%
IEQ Credit 10.2	Green Cleaning: Isolation of Janitorial Closets	68.2%
IEQ Credit 10.3	Green Cleaning: Low Environmental Impact Cleaning Policy	95.5%
IEQ Credit 10.4-5	Green Cleaning: Low Environmental Impact Pest Management Policy	89.5%
IEQ Credit 10.6	Green Cleaning: Low Environmental Impact Cleaning Equipment Policy	86.4%
IEQ Credit 2	Increased Ventilation	47.4%
IEQ Credit 3	Construction IAQ Management Plan	81.8%
IEQ Credit 4.1	Documenting Productivity Impacts: Absenteeism and Healthcare Cost Impacts	55.6%
IEQ Credit 4.2	Documenting Productivity Impacts: Other Impacts	55.6%
IEQ Credit 5.1	Indoor Chemical and Pollutant Source Control: Non-Cleaning – Reduce Particulates in Air Distribution	61.9%



Prerequisite or Credit Number	Description of Prerequisite or Credit	Percent of Respondents Saying Low Cost
IEQ Credit 5.2	Indoor Chemical and Pollutant Source Control: Non-Cleaning –High Volume Copying/Print Rooms/Fax Stations	50.0%
IEQ Credit 6.1	Controllability of Systems: Lighting	78.9%
IEQ Credit 6.2	Controllability of Systems: Temperature & Ventilation	57.9%
IEQ Credit 7.1	Thermal Comfort: Compliance	76.2%
IEQ Credit 7.2	Thermal Comfort: Permanent Monitoring System	45.0%
IEQ Credit 8.1	Daylighting and Views: Daylighting for 50% of Spaces	78.9%
IEQ Credit 8.2	Daylighting and Views: Daylighting for 75% of Spaces	63.2%
IEQ Credit 8.3	Daylighting and Views: Views for 40% of Spaces	78.9%
IEQ Credit 8.4	Daylighting and Views: Views for 80% of Spaces	63.2%
IEQ Credit 9	Contemporary IAQ Practice	68.2%
Innovations		
IU Credit 1.1	IOUM	67.7%

## Appendix D: Survey Response Summary Tables Sorted By Percent Indicating “Low or No Cost”

**Table 8. All LEED-EB Prerequisites**

Prerequisite Number	Description of Prerequisite	Percent of Respondents Saying Low Cost
WE Prereq 2	Discharge Water Compliance	100.0%
IEQ Prereq 2	Environmental Tobacco Smoke (ETS) Control	100.0%
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%
MR Prereq 1.2	Source Reduction and Waste Management: Storage & Collection of Recyclables	95.5%
EA Prereq 3	Ozone Protection	90.9%
MR Prereq 1.1	Source Reduction and Waste Management: Waste Stream Audit	90.9%
IEQ Prereq 3	Asbestos Removal or Encapsulation	86.4%
IEQ Prereq 4	PCB Removal	86.4%
MR Prereq 2	Toxic Material Source Reduction: Reduced Mercury in Light Bulbs	77.3%
EA Prereq 2	Minimum Energy Performance	72.7%
IEQ Prereq 1	Outside Air Introduction and Exhaust Systems	68.2%
EA Prereq 1	Existing Building Commissioning	43.5%

**Table 9. All LEED-EB Credits**

Credit Number	Description of Credit	Percent of Respondents Saying Low Cost
IEQ Credit 10.1	Green Cleaning: Entryway systems	95.5%
IEQ Credit 10.3	Green Cleaning: Low Environmental Impact Cleaning Policy	95.5%
MR Credit 5	Occupant Recycling	94.7%
SS Credit 3.1	Alternative Transportation: Public Transportation Access	90.0%

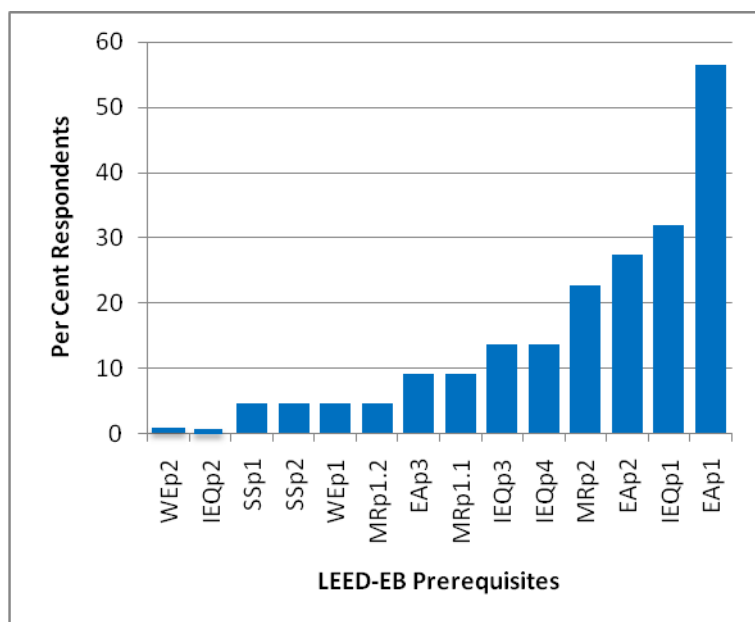
Credit Number	Description of Credit	Percent of Respondents Saying Low Cost
IEQ Credit 10.4-5	Green Cleaning: Low Environmental Impact Pest Management Policy	89.5%
SS Credit 3.4	Alternative Transportation: Car Pooling & Telecommuting	88.9%
EA Credit 3.2	Building Operations and Maintenance: Building Systems Maintenance	87.0%
SS Credit 3.2	Alternative Transportation: Bicycle Storage & Changing Rooms	86.4%
MR Credit 1	Construction, Demolition and Renovation Waste Management	86.4%
IEQ Credit 10.6	Green Cleaning: Low Environmental Impact Cleaning Equipment Policy	86.4%
MR Credit 4	Sustainable Cleaning Products and Materials	85.7%
EA Credit 3.1	Building Operations and Maintenance: Staff Education	85.0%
SS Credit 2	High Development Density Building and Area	84.2%
WE Credit 3	Water Use Reduction	81.8%
IEQ Credit 3	Construction IAQ Management Plan	81.8%
IEQ Credit 6.1	Controllability of Systems: Lighting	78.9%
IEQ Credit 8.1	Daylighting and Views: Daylighting for 50% of Spaces	78.9%
IEQ Credit 8.3	Daylighting and Views: Views for 40% of Spaces	78.9%
SS Credit 1	Plan for Green Site and Building Exterior Management	78.3%
MR Credit 3	Optimize Use of IAQ Compliant Products	76.2%
IEQ Credit 7.1	Thermal Comfort: Compliance	76.2%
SS Credit 4	Reduced Site Disturbance: Protect or Restore Open Space	71.4%
MR Credit 6	Additional Toxic Material Source Reduction: Reduced Mercury in Light Bulbs	69.6%
SS Credit 7	Light Pollution Reduction	68.4%
EA Credit 5.4	Performance Measurement: Emission Reduction Reporting	68.2%

Credit Number	Description of Credit	Percent of Respondents Saying Low Cost
IEQ Credit 10.2	Green Cleaning: Isolation of Janitorial Closets	68.2%
IEQ Credit 9	Contemporary IAQ Practice	68.2%
IU Credit 1.1	IOUM	67.7%
MR Credit 2	Optimize Use of Alternative Materials	66.7%
IEQ Credit 8.2	Daylighting and Views: Daylighting for 75% of Spaces	63.2%
IEQ Credit 8.4	Daylighting and Views: Views for 80% of Spaces	63.2%
IEQ Credit 5.1	Indoor Chemical and Pollutant Source Control: Non-Cleaning – Reduce Particulates in Air Distribution	61.9%
SS Credit 5	Stormwater Management: Rate and Quantity Reduction	57.9%
WE Credit 1	Water Efficient Landscaping: Reduce Water Use	57.9%
IEQ Credit 6.2	Controllability of Systems: Temperature & Ventilation	57.9%
EA Credit 4	Additional Ozone Protection	57.1%
IEQ Credit 4.1	Documenting Productivity Impacts: Absenteeism and Healthcare Cost Impacts	55.6%
IEQ Credit 4.2	Documenting Productivity Impacts: Other Impacts	55.6%
SS Credit 3.3	Alternative Transportation: Alternative Fuel Vehicles	52.6%
SS Credit 6.1	Heat Island Reduction: Non-Roof	52.6%
EA Credit 3.3	Building Operations and Maintenance: Building Systems Monitoring	52.4%
IEQ Credit 5.2	Indoor Chemical and Pollutant Source Control: Non-Cleaning –High Volume Copying/Print Rooms/Fax Stations	50.00%
IEQ Credit 1	Outside Air Delivery Monitoring	47.40%
IEQ Credit 2	Increased Ventilation	47.40%
IEQ Credit 7.2	Thermal Comfort: Permanent Monitoring System	45.00%
EA Credit 1	Optimize Energy Performance	42.90%
WE Credit 2	Innovative Wastewater Technologies	42.10%
SS Credit 6.2	Heat Island Reduction: Roof	36.80%

Credit Number	Description of Credit	Percent of Respondents Saying Low Cost
EA Credit 5.1-5.3	Performance Measurement: Enhanced Metering	26.10%
EA Credit 2	On-site and Off-site Renewable Energy	16.70%

## Appendix E: LEED-EB Prerequisites and Credits Arranged by Per Cent Respondents Identifying Each as Requiring Significant Cost to Achieve

Figure 12 shows the LEED-EB Prerequisites arranged by per cent of the respondents identifying each as requiring significant cost to achieve. The figure provides a visual representation of the distribution of costs required to achieve the prerequisites.



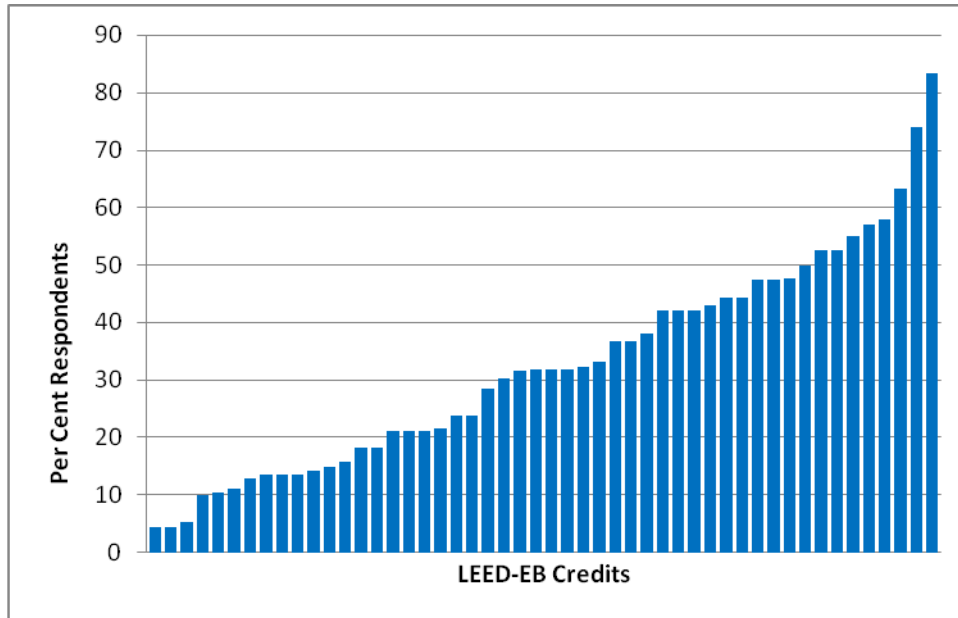
**Figure 12: Per Cent of Respondents Identifying Each Prerequisite as Requiring Significant Cost**

Table 9 shows the data used in Figure 12.

**Table 9: The LEED-EB Prerequisites Sorted by Increasing Number of Respondents Identifying Each as Requiring Significant Cost to Achieve**

Prerequisite	Per Cent Respondents	Prerequisite	Per Cent Respondents
WEp2	0	MRp1.1	9.1
IEQp2	0	IEQp3	13.6
SSp1	4.5	IEQp4	13.6
SSp2	4.5	MRp2	22.7
WEp1	4.5	EAp2	27.3
MRp1.2	4.5	IEQp1	31.8
EAp3	9.1	EAp1	56.5

Figure 13 shows the LEED-EB Credits arranged by per cent of the respondents identifying each as requiring significant cost to achieve. The figure provides a visual representation of the distribution of costs required to achieve the credits.



**Figure 13: Per Cent of Respondents Identifying Each Credit as Requiring Significant Cost**

Table 10 shows the data used in Figure 13.

**Table 10: The LEED-EB Credits Sorted by Increasing Number of Respondents Identifying Each as Requiring Significant Cost to Achieve**

Credit	Per Cent Respondents	Credit	Per Cent Respondents	Credit	Per Cent Respondents	Credit	Per Cent Respondents
IEQc10.1	4.5	WEc3	18.2	IEQc10.2	31.8	SSc3.3	47.4
IEQc10.3	4.5	IEQc3	18.2	IOUMc1.1	33.3	SS6.1	47.4
MRc5	5.3	IEQc6.1	21.1	MRc2	33.3	EAc3.3	47.6
SSc3.1	10.0	IEQc8.1	21.1	IEQc8.2	36.8	IEQc5.2	50.0
IEQc10.4-5	10.5	IEQc8.3	21.1	IEQc8.4	36.8	IEQc1	52.6
SSc3.4	11.1	SSc1	21.7	IEQc5.1	38.1	IEQc2	52.6
EAc3.2	13.0	MRc3	23.8	SSc5	42.1	IEQc7.2	55.0
SSc3.2	13.6	IEQc7.1	23.8	WEc1	42.1	EAc1	57.1
MRc1	13.6	SSc4	28.6	IEQc6.2	42.1	WEc2	57.9
IEQc10.6	13.6	MRc6	30.4	EAc4	42.9	SS6.2	63.2
MRc4	14.3	SSc7	31.6	IEQc4.1	44.4	EAc5.1-5.3	73.9
EAc3.1	15.0	EAc5.4	31.8	IEQc4.2	44.4	EAc2	83.3

SSc2	15.8	IEQc9	31.8
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