A SunCam online continuing education course

LEED for Existing Buildings
The Standard Setting the Standard for Tomorrow's Buildings

by

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Introduction

It's no secret that between our population growth, economic and climate fluctuations, water shortages, and increasingly limited natural resources, that we are faced with no other option but to review the impact of how one our major users of energy and materials, buildings, affects our dwindling resources and use of space, and to develop a new industry paradigm.

Sustainability is a collective term currently being used for all things related to renewal and reduction and specifically for buildings, defined within five general categories: sustainable site management, water efficiency and safeguarding surface and groundwater, energy efficiency, use of renewable energy, and reducing emissions, conservation of materials and resources, and indoor environmental quality.

Within the built environment, most activities where contributions to sustainability can be made are after the building is built, is in the operation of the building itself. Sustainable design is a strategy which seeks to reduce the use of nonrenewable resources and increase the use of renewable resources and recycled content materials, with the ultimate goal of minimizing a project's environmental impact and creating a better living/working space.

Many organizations and businesses are contributing to the advancement of sustainability (in some ways by reverting back to methodologies that were used hundreds of years ago before modern technology made life so easy), but the US Green Building Council (USGBC) was one of the front runners in establishing a credit-based certification system called Leadership in Energy and Environmental Design (LEED®), consisting of a set of guidelines and metrics by which buildings could be built. It was established in 1998 and is currently in version 3 (v3), though most active projects are registered and undergoing certification in version 2.

This training will focus on the the LEED for Existing Buildings rating system (LEED - EB), under the Green Buildings and Operations and Maintenance category (LEED - EB:O&M).

Stewart D. Kaplow, P.A., an attorney in Baltimore, MD focuses his practice on green building and sustainable business. His definition of LEED for Existing Buildings effectively summarizes the intent of this rating system:

LEED EB:O&M is a standard for the ongoing operations and maintenance of existing non-residential buildings. The certification standard identifies and rewards current best practices and provides a checklist for buildings to reduce costs associated with building operations, reduce environmental impacts, create healthier and more productive employee workspaces, and provide public recognition for leadership in sustainability.

To help understand how to achieve this certification, this training will focus specifically on:

- How it should be considered in parallel with LEED for New Construction and Major Renovations (LEED-NC)
- Making the case for an LEED - EB:O&M project
- Designing a successful LEED - EB:O&M project
- Policies and Procedures
- Federal, State, and Local Incentives

LEED Rating Systems

LEED consists of a suite of nine rating systems, for commercial, residential, and neighborhood projects. They are further segmented into five overarching specialty categories, which are listed below with date of launch*:

Green Building Design & Construction

- LEED for New Construction and Major Renovations (NC) (1998)

- LEED for Core & Shell Development (2006)
- LEED for Schools (2007)
- LEED for Retail New Construction (planned 2010)

Green Interior Design & Construction

- LEED for Commercial Interiors (2004)
- LEED for Retail Interiors (planned 2010)

Green Building Operations & Maintenance

- LEED for Existing Buildings: Operations & Maintenance (2004)

Green Neighborhood Development

- LEED for Neighborhood Development (2010)

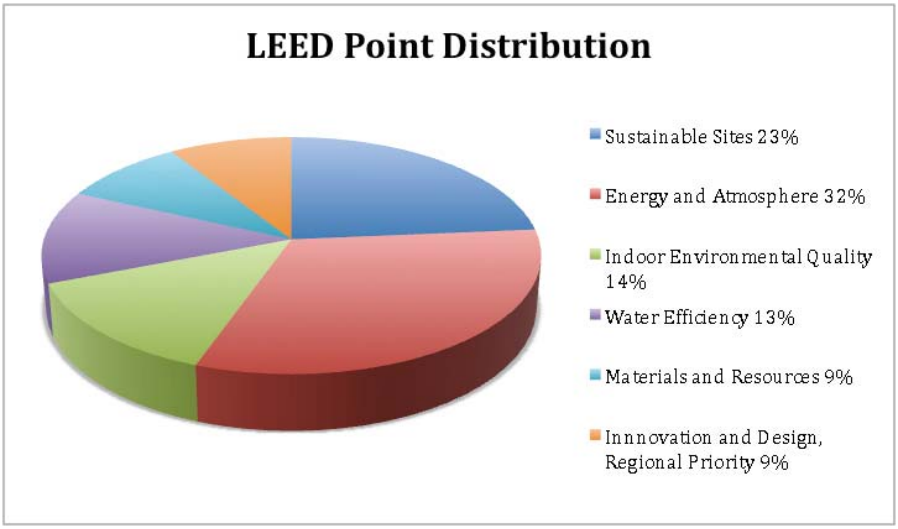
Green Home Design and Construction

- LEED for Homes (2008)

* As of April 2009

Each of the rating systems grew from the original Building Design and Construction rating system, and as LEED matured, the need for segmenting became apparent, incorporating the relative critical aspects into each new division. LEED - EB:O&M utilizes a 110-point total score, using the standard six categories as most of the rating systems, and the available points for each category are :

Sustainable Sites - 26	Water Efficiency - 14
Energy and Atmosphere - 35	Materials and Resources - 10
Indoor Environmental Quality -15	Innovation and Design, Regional Priority - 10



Previously LEED - EB:O&M was not a frequently sought after certification, the reasons being that building owners weren't looking to spend more money than necessary on operating a building and because many disciplines are involved in monitoring and maintenance for LEED - EB:O&M compliance, several being the cleaning team, facility and procurement management, and mechanical maintenance.

However, with a revamp of the rating system in 2006 and the launch of v3, changes were made which removed or rebalanced credits so that they became more specific to operations and maintenance, namely:

- Removal of pre-requisite points related to erosion on the construction site
- Reduction in the number of points available for daylighting and views

- Removal of a commissioning pre-requisite but allowing for up to 6 Innovation points to be achieved for commissioning
- Addition of an energy audit as a pre-requisite
- Addition of a building systems management plan as a pre-requisite
- Available energy points increased from 23 to 35
- Increase in the number of Water Efficiency points by 5%, relative to the increased overall point system for LEED - EB:O&M
- An EPA Energy Star score of 69 or higher is required for all certified buildings.

Additionally, a set of minimum performance requirements (MPRs) was identified, which creates less loopholes for achieving LEED - EB:O&M than in previous versions. These MPRs include:

- Building must comply with all applicable Federal, State, and local environmental laws and regulations in place where the project is located.
- Must be a building
- Must use a reasonable site boundary
- Must comply with minimum full time equivalents (employees) and floor area requirements
- Must comply with minimum occupancy rates
- Registration and certification activity must comply with reasonable timetables and rating system sunset dates
- Must allow USGBC access to whole-building energy and water usage data
- Must comply with a minimum building area to site area ratio

Now building owners are increasingly choosing LEED - EB:O&M for several reasons. As mentioned, limited resources and increased energy costs play a role as building owners are looking for cost savings. Studies are also finding that healthy buildings can increase the productivity levels of its users. But also, and maybe more importantly, maintaining a facility to its peak performance level is becoming a *responsibility*, a stewardship which ultimately leads to reduced costs, a win-win situation, known as the triple bottom line: Equity, Economy, and Environment.

According to a 2008 white paper by the Leonardo Academy, the average cost per square foot required for LEED - EB:O&M certification was $2.43. This report also found that the payback time was quick, with 60% of the the certified buildings having achieved lower operating costs when compared to the Building Owners and Managers Association (BOMA) average.

From the owner's perspective, a 2007 report prepared for California's Sustainable Task Force found that by a mere 2% increased investment at the front stage of building design, on average, resulted in savings of 20% of the total construction costs. As well, building sale prices for energy efficient buildings are as much as 10% higher per square foot than conventional buildings, and rent ration increases of 3% can be expected.

With 5 million commercial buildings available in the U.S., and, as of June 1, 2010 4,346 registered LEED - EB:O&M projects and 649 certified (contrasted with 3,150 registered and 16,118 certified under LEED:NC), industry analysts predict that LEED - EB:O&M will surpass the LEED-NC rating system in use within the next several decades, namely because fewer buildings will be built and building owners will continue to realize that such a building will have a continuous environmental benefit.

Making the Case for LEED EB:O&M

As LEED NC creates the *potential* for sustainable performance and is all based on project scope, it does nothing to maintain it, nor does it create a check and balance system, for a building's continued performance. Studies indicate that over 50% of buildings which received a NC

certification did not qualify for the the baseline EPA Energy Star ® label, a distinction which illustrates how a given facility's performance rates against similar facilities nationwide, based on a scale of 1-100. In fact 15% scored even lower than at least 70% of comparable buildings in their category relative to energy usage. While LEED NC has a very important place in the design and build phases, the building itself can best contribute to reducing its environmental impact over the long run by having its workings monitored for continuous improvement. A popular saying which applies for EB:O&M is " you can't manage what you can't measure."

The decision to seek LEED certification is the beginning of a team effort. Building owners, its occupants, developers, REITS, lessors, and construction professionals are all active participants who will ultimately benefit financially or by increasing their reputation within the industry. And as incentives are more frequently being offered to build sustainably or incorporated into Requests for Proposals (RFPs) with readily available improved technologies, offering these value-added advantages will soon become a standard rather than a frill.

If a team is to truly commit to a living, regenerative environment, the best process is to first seek NC certification, if this is a new building, to set the foundation of sustainability, designing with longevity and EB:O&M in mind, and then, after the required monitoring periods, seek EB:O&M certification. This flow will almost guarantee that green practices will be followed for the life of the building. With a new building project, the design can be more straightforward and easily checked against the the LEED NC credit requirements, determining where the best efforts should be placed to most economically achieve certification. In an existing building, USGBC recognizes that the owner wants to improve upon the building *performance* which is the basis of the EB:O&M system and what makes it unique within the rating systems.

As LEED is evolving there are still opinions within the industry that the costs of building sustainably does not provide a timely return on investment. Part of the reason for this thinking is that, until now, production and supply of materials did have premium costs associated with them, but that is becoming less of a rationale. Additionally there were not many examples of certified buildings which could illustrate the operational savings over time.

Several LEED EB:O&M buildings have now been well-documented under version one of this rating system, and those involved have graciously made their credit information, costs, and other financial data available. One such building, the JohnsonDiversey Headquarters, located in Lancaster, PA, has provided detailed report of their LEED Platinum 2007 project, with an overview of the financial benefits:

Economic Summary of Benefits

Building floor space	277,440 ft^2
Initial Implementation Cost	$73,800
Initial Implementation Cost per ft^2	$0.27
Annual Net Savings	$137,320
Annual Net Savings per ft^2	$0.49
Life Cycle Net Present Value*	$1,351,535
Life Cycle Net Savings per ft^2	$4.87
ROI	0.5 years

Source: http://www.usgbc.org/docs/LEEDdocs/JohnsonDiversey_Case_study.pdf

Other building project links are provided at the end of this paper.

LEED Analysis

As part of the decision process whether to attempt LEED certification, a feasibility study should be conducted. The facets of such an analysis within a building environment include more than dollars and cents. It addresses, at first, what is the current maintenance status of the facility and then, what are the current building operational practices. The task should be conducted by a third party consultant, one who has a solid knowledge of commercial real estate, environmental design, energy services, and LEED project experience.

Then, a determination must be made to ensure that the building can satisfy all nine prerequisites minimums as written in the LEED EB:OM standard. Typically the show stopper is in the Energy

and Atmosphere category, Prerequisite 2 for "minimum energy efficiency performance." A full 12 months of continuously measured energy data must show that the EPA's Energy Star Manager Portfolio can reach a score of at least 69 points. In looking at the costs of mechanical upgrades which must be made to reach this threshold, some building owners will choose to forego certification but will still incorporate sustainability into the project.

The other pre-requisites, nine in total, for even attempting a LEED EB:OM project include:

Minimum Water Efficiency	Energy Audit and Best Manufacturing Practices
Fundamental Refrigeration Management	Sustainable Purchasing Policy
Minimum Indoor Air Quality Performance	Tobacco Smoke Control
Green Cleaning Policy	Waste Management Policy

In knowing the state of the facility, vis à vis the six LEED categories, the team next begins to review the LEED points they will attempt to achieve, with an end point of certification in mind, LEED Certified to Platinum. A GAP analysis matrix should be created with all points possible, and delineated as 'yes', 'no' or 'maybe' for achievement. This is essentially identifying what it will take to get to a range of target points. For instance, if a building has a 25-year old mechanical system is part of a building, identify what will be needed to update the system to reach the minimum required Energy Star rating of 69. Or, if you have a multi-tenant building, what efforts will be required to get compliance from the tenants, how can a waste stream audit be achieved, and who will be responsible for the monitoring of the recycling program? This will take some honest evaluation of the current situation and environment and identify what will be the cost of success. Then strive to move all the 'maybes' to 'yes.' Many teams choose to focus on water and energy credits, as they most readily pay for themselves in the reduction of operating costs. Credits of waste recycling, green cleaning, and environmental purchasing are low hanging fruits, and they have an additional benefit of involving the building occupants which can help create a path for a high-performance building. Remember that LEED EB:OM relates to the whole building, so all tenants have to be on board and willing to cooperate for the project to be a success.

USGBC provides a check list as an overview of the rating system credits, which helps keep track of the credit sought. The full checklist can be found on the USGBC website, the category of Water Efficiency is illustrated here.

LEED for Existing Buildings: Operations & Maintenance
Registered Project Checklist

0	0	0	Water Efficiency			Possible Points:	14
Y	?	N					
Y			Prereq 1	Minimum Indoor Plumbing Fixture and Fitting Efficiency			
			Credit 1	Water Performance Measurement			1 to 2
					Whole building metering		1
					Submetering		2
			Credit 2	Additional Indoor Plumbing Fixture and Fitting Efficiency			1 to 5
					Reduce by 10%		1
					Reduce by 15%		2
					Reduce by 20%		3
					Reduce by 25%		4
					Reduce by 30%		5
			Credit 3	Water Efficient Landscaping			1 to 5
					Reduce by 50%		1
					Reduce by 62.5%		2
					Reduce by 75%		3
					Reduce by 87.5%		4
					Reduce by 100%		5
			Credit 4	Cooling Tower Water Management			1 to 2
					Chemical Management		1
					Non-Potable Water Source Use		2

Source: www.usgbc.org

Next, the 'yes' points should be given an estimated cost, and serve as the budget for the project. The budget should include registering the project and final submittal (which varies with building size), as well as funds for credit appeals should they need to be submitted after USGBC review. Frequently at this stage some points are chosen over others because they have a lower overall cost and can provide a similar benefit. However, as the project moves along, points which were moved aside come back into the fold for a number of reasons, so at least costing out the 'maybes' can give a better overall assessment of the final project costs. The take away here is that the project team should always have a few extra points.

Once the sought-after points have been determined, the points need to be assigned to the various team members. Each team can develop their own type of spreadsheets for tracking progress and

viewing comments and there is software which is more advanced than simple spreadsheets. Using something that each team member can have access to, and have a place to provide comments, can save a lot of time compared to back and forth emails and phone messages.

A simple example of a tracking sheet may look like this:

Office and Building Credit Assignments

Materials & Resources (MR)				
Credit		Assigned to	Comments	Completion Date
Pr 1	**Storage & Collection of Recyclables**		Complete Diagrams	
Cr 1.1	**Building Reuse**, Maintain 75% of Existing Walls, Floors & Roof			
Cr 1.2	**Building Reuse**, Maintain 100% of Existing Walls, Floors & Roof			
Cr 1.3	**Building Reuse**, Maintain 50% of Interior Non-Structural Elements			
Cr 2.1	**Construction Waste Management**, Divert 50% from Disposal		Obtain dump reports from hauler	
Cr 2.2	**Construction Waste Management, Divert 75% from Disposal**		Obtain dump reports from hauler	
Cr 3.1	**Materials Reuse**, 5%			
Cr 3.2	**Materials Reuse**,10%			
Cr 4.1	**Recycled Content**, 10% (post-consumer + ½ pre-consumer)		Meet with sub on this	
Cr 4.2	**Recycled Content,** 20% (post-consumer + ½ pre-consumer)		Meet with sub on this	
Cr5.1	**Regional Materials**, 10% Extracted, Processed & Manufactured Regionally		Confirm origin of drywall and insulation	
Cr 5.2	**Regional Materials**, 20% Extracted, Processed & Manufactured Regionally		Confirm origin of drywall and insulation	
Cr 6	**Rapidly Renewable Materials**			
Cr 7	**Certified Wood**			
	Seeking Credits			

Source: Architectural Support Group

Eight Steps for Project Success

As with any successful project, a well-developed plan should establish the goal, scope, objectives, and parameters to meet the goal. Jenny Craig of YRG Sustainability has described eight steps to follow within a project:

1. **Know the Performance Period Parameters**

   a. The performance period is defined as the period during which building performance data is collected for inclusion in a certification application. This can include utility bills, recycling and ventilation rates, procurement records, and policies and procedures. Each credit which requires a performance period must strictly follow the reference guide guidelines rules and strategies, adhering to the various standards defined within.

2. **Have the Right Tools on Hand**

   a. The appropriate reference guide for EB:O&M is titled *Green Building Operation and Maintenance,* and will become your most comprehensive guide to a successful project.

   b. Register your project early in the game. Most projects are engaged in a two-year minimum process prior to final submission to USGBC, and LEED updates its standards every two years. Registering a project during the beginning stages guarantees that credits and requirements won't change in the middle of a project. Additionally, having a registered project provides entree to detailed narratives which can be helpful in understanding the requirements of the credit and how to complete the submittal forms.

3. **Begin the Energy Benchmarking Period Early, Gather Data Often and Accurately**

   a. In LEED v.3, LEED EB:O&M has been allocated more potential points in the Energy and Atmosphere category, now a total of thirty-five. The three prerequisites require an analysis or benchmarking of the state of the building. Requirements vary by prerequisite or credit, but include energy usage over a 12-month period, an ASHRAE Level 1 walk-through,

assessing the minimum level of a building's operational performance relative to similar-sized buildings, and identifying the refrigerant types used in the building equipment.

Benchmarking is the most critical element of a EB:O&M project; the discovery of how the building will change with LEED certification. Essentially it's looking at how your building will perform as compared to a typical building in the same climate with the same occupancies, and substantiating that operational improvements have been made as a result of the modifications. It's absolutely critical to gather data as required by the pre-requisite or credit, keep the numbers up to date monthly, and incorporate quality control checks and to ensure that data has not been either misread or entered incorrectly. There are two benchmarking paths for EAp2 and EAc1, called Case 1 and Case 2. Case 1 includes most types of buildings. If a project falls within this grouping, the project manager can register on www.energystar.gov, and via their Portfolio Manager tracking documents, begin monitoring or benchmarking desired equipment and processes identified within a project. For compliance within case 2-type buildings which are not eligible for Energy Star rating (including manufacturing, laboratory, malls and multifamily structures), a different set of guidelines must be followed to meet the prerequisite. However, even though the building is not eligible for an Energy Star rating, the Portfolio Manager can still be used as a tracking tool, http://www.energystar.gov/benchmark.

USGBC encourages applicants to extend the performance periods beyond the minimum, to capture seasonal fluctuations, changes in occupant's behaviors, and possible tenant turnover.

4. **Create and Maintain Well-Written Policies, Plans, and Programs**

- Further discussed in another section

To understand the format which needs to be developed during the certification process, *policies* are the overall strategic approach statements to which an organization commits, describing the course of action, and are required in three pre-requisites: Materials and Resources p1 Indoor Environmental Quality p3, and Energy and Atmosphere p1. These are high-level statements which set the stage for the lower-level, though no less important, *plans and programs.* Plans are

devised to implement the policies, and should be thought of as the working document, while programs are the prescribed steps which lay out the actions required to meet the sustainability goal and should be very detailed orientated. To capture data required of programs, logs should be developed which track the compliance as developed, from which performance is assessed, and serves as raw data for LEED documentation. Example

5. **Establish a Tracking System**

a. This usually takes the form of a spreadsheet which lists credits sought, status of completion, responsible party, and should be updated monthly at a minimum. As related to performance periods the following need to be considered before starting the data gathering or analysis period:

Minimum Performance Periods:

- **3 months** for all prerequisites except Energy and Atmosphere Prerequisite 2 and Credit 1
- **1 year** for Energy and Atmosphere Prerequisite 2 and Credit 1 Utility Bill Example
- **24 months** maximum duration of any performance period, per discretion of the project team
- **All** performance periods have to end within the same **30-day** time period

Additionally, remember that project submittal to USGBC must be **no later than 60 day**s after the final data collection of the performance period termination interval

- Buildings must recertify every **1 to 5** years for the entire lifecycle of the building

Requirement	Description
Scope	Describe to what operations the policy applies, and which part of management
Performance Metrics	Characterize how the performance will be measured and/or evaluated
Goals	Identify the sustainability goals particular to the building
Procedures and Strategies	Establish what is needed to meet the goals and intents of the policies, as per the requirement
Responsible Party	Assemble the teams and individuals who will be engaging in the activities pertaining to the policy
Time Period	Define the time period over which the policy covers

6. **Beware of Common Problem Areas**

- Particular credits to be discussed in another section

a. Calculations - Some credits that require calculations be derived in specific way, and LEED wants them done on the credit template itself, not on a spreadsheet prepared by a team member.

b. Reference Standards - Ensure that the current version and guidelines provided by the reference standard is followed. For example, Credit IEQ1.3, Best Management Practices - Increased Ventilation, requires the provision of additional outdoor air ventilation of 30% better than the 2007 American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) standard. While a newer standard has been adopted for 2010, the former standard is the reference which should be used.

c. Survey and Audit Protocol - When developing these measuring tools to satisfy credit intents, which typically involve building occupant's comfort levels, it's important to ask the right questions the first time so that the collected data is not skewed.

d. Data Capturing - Don't wait until the end of the testing period to begin gathering data, as it will be too late. Establish protocols and logs to capture the required information and analyze it promptly. In doing so, you'll be able to determine trends and easily see if misreads have occurred or if equipment is not working correctly. Data Capturing Error Example.

7. **Select Your Vendors Wisely and Manage Closely**

a. While it's appropriate to delegate product choices and purchasing plans to chosen vendors, always delegate with oversight. Vendors may be experiencing a learning curve regarding sustainability, and this should not be done at the building owner's expense. Always include a contractual obligation with your vendors, to assure that what they say that they are providing is in fact true.

8. **Ensure Multi-tenant Buy-in Early in the Process**

a. As mentioned with survey and audit protocol, frequently buildings house multi-tenants, so educating them early in the project and keeping them informed about the progress engages their activity interest and can lead to higher level of overall sustainability compliance.

Policies, Plans, and Programs

As LEED for New Construction is about creating a space, LEED EB:OM is about maintaining that space. To that end, after the space has been improved upon, and its users have been educated, it's time to codify all the the checks and balances that will occur, on a prescribed time frame, and begin maintaining the various forms that will support the plans.

Some instances of where Policies and Plans are required relate to the credits associated with MEP systems maintenance, green cleaning, alterations and additions, indoor air quality, staff and tenant training and education, tenant guidelines.

Policies and Procedures Examples

Tenant Guidelines

One example of a good multi-tenant building which has established good policies and procedures is One Boston Place, Boston, MA, managed by CB Richard Ellis. This 41-story Class A office tower is located in the center of Boston's Financial District, offering 80,444 ft^2 of office and retail space, occupied by thirty office tenants.

Some of the features of their space include the installation of a high-efficiency drip irrigation system for use with the outdoor landscaping, utilizing a condenser water loop which provides water to the computer room air conditioners, and upgraded indoor plumbing fixtures. Water saving strategies were incorporated to reduce water consumption by 50% (over 12 million gallons) per year. Goals of 12% reduction of electricity and diverting 70% of the construction waste from landfill was realized.

To help tenants maintain and engage in the sustainability aspects of the building, management provides a green office checklist which includes suggestions to help reduce the amount of materials, water and/or energy used within the leased space. The checklist which also helps to support the policy can be viewed at: One Boston Place Green Office Checklist

One Boston Place, Boston, MA

Another example of a plan to meet the policies and procedures in achieving the Indoor Air Quality Credit 1 includes narrative headings such as: Goals and Scope, Responsible Party, Guidance for Resources and Implementation, Performance Measurement, and Quality Assurance/Quality Control Processes. Click below to view a hypothetical IAQ management policy, written by **Sustainable Design Consulting, LLC**.

Indoor Air Quality Best Management Practices, IAQ Management Program

Common Problem Points

No programs go without scrutiny or analysis, including LEED. While the EB:OM rating system doesn't have the history of some of the others, users have provided input via blogs and comments to USGBC, trying to find clarity in interpretation and the most effective way to meet the intent of the credit so that it will be granted during project review.

Listed here are some of the credits that that users of the rating system have discovered which create a challenge to achieve. Note that most of the difficulty is due to the fact that there are multiple tenants in the building:

Credit: Energy and Atmosphere Prerequisite (EA)2: Minimum Energy Efficiency Performance, and Credit 1.1-1.8: Optimize Energy Efficiency Performance

Requirement

- Install or utilize an energy meter that measures all building energy use throughout the Performance Period
- Meters used to capture energy must be calibrated to its recommended interval if owned by the building owner, tenant, or management company; third-party owners are exempt
- A full 12 months of continuous energy capture

- If Option A is the chosen method from the credit requirement, an Energy Star EPA rating of greater than 69 is required.

Challenge

- If a multi-tenant space, the building owner/manager may not have control over heating, cooling lighting and plug loads in the various spaces
- Because of the prerequisite requirement, make sure that this can be achieved before a decision is made to seek certification; as mentioned this is frequently a gate keeper of a credit to determine whether the project can move forward

Meeting the Challenge

- In the short term, educate the building occupants on energy saving actions, such as One Boston Place has done
- In the long term, incorporate sustainability and efficiency requirements into tenant leases, which is becoming more standardized to the leasing process
- Look into government rebates that may be offered for undertaking energy-efficient initiatives

Credit: Indoor Environmental Quality (IEQ) Credit 2.1: Occupant Comfort:Occupant Survey

Requirement

- Design and implement a comfort survey for occupants, and an easy to use response system which can collect anonymous responses on topics of thermal comfort, acoustics, indoor air quality, lighting levels, building cleanliness, and other occupant comfort issues
- The survey must be received from a representative sample of the building, at minimum 30% of the total occupants; the completed survey must include an analysis of the overall respondent satisfaction of the building's performance and identification of any comfort-related problems

- Upon review of the responses, corrective actions must be developed to address comfort issues if more than 20% of the responses are negative for any question
- At least one occupant survey must be conducted during the performance period

Challenge

- With potential high turnover and insulated work environments, the issue of reaching the 30% requirement of survey response.

Meeting the Challenge

- Market to clients who are willing to embrace sustainability into their corporate culture, include training for new tenants, streamline the process for ease of use, and provide incentives for compliance such as raffles and prizes
- Engage facility management as the ambassadors for this credit for maximum compliance
- If you are also attempting Sustainable Sites Credit 4, consider combining the questionnaires

Credit: Sustainable Sites (SS) Credit 4: Alternative Commuting Transportation

Requirement

- Reduce commuting use of conventionally powered and fueled vehicles by regular building occupants

Challenge

- Building owner and manager must accomplish at least 10% reduction of commuting trips against the LEED baseline. A point range of 1 to 15 is awarded for decreasing conventional commuting trips by 10-75%
- Providing the appropriate incentives and infrastructure to reach the desired rate of alternative transportation

Meeting the Challenge

- Encourage all types of alternative commuting, to include a compressed work week, utilizing mass transit, walking, bicycling, car and van pools, using low-emitting, fuel-efficient, or alternative-fuel vehicles.

- Begin the assessment process early as behavioral changes can take time. Surveys and analysis conducted is valid for two years *before* the end of the performance period, providing enough time to develop, implement, and tweak alternative transportation programs.

Mandates and Executive Orders

As states and the Federal government are becoming engaged in sustainable design, they are encouraging the building industry to adapt by providing incentives, or stronger, mandates for new and renovated buildings. The incentives are offered in various forms, and may be county-specific including:

Density Bonus - Allowing higher density development than conventional projects if LEED certification is achieved. (MA, ME,VA, NJ, TN, NH)

Expedited Permitting- Fast tracking of projects developed using sustainable practices. Usually a LEED score card must follow the process whether or not certification is sought. (HI,VA,FL, WA, CA, DC)

Fee Reduction or Waiver- Can be as high at 50% of the building permitting fees (FL,TX) 10-25% for (NC)

Tax Credits- Property tax credits of up to 25% are allocated based on the level of LEED certification (MD, OH, TX)

Grants- Up to $25,000 (CA, WA) to build to LEED standards or meet particular levels of LEED certification. Pasadena, CA offers up to $100,000 for buildings which perform above electrical standards for their building size

Free Technical Service- Offered for both private and commercial buildings, based on the type of certification sought

Low Interest Loans- Low interest loans (4% below market rate) for energy efficiency measures and building materials that meet LEED or other generally accepted green building standards (NY), and for energy efficiency and renewable energy projects (PA)

Federal and State governments have an impressive push on the buildings which house the numerous US support services. Some examples include:

State of Florida - June 2008, *HB 7135* signed by Governor Crist, requiring:

- All new construction and State-owned and State-funded buildings must follow LEED, Green Globes, or Florida Green Building Coalition Standards. Any of the following buildings entering design after July 2008 must comply: counties, municipalities, school districts, water management districts, state universities, community colleges, and Florida
- State courts. The bill further requires that all new leases of state-occupied office space must meet Energy Star standards.
- In 2007, Governor Crist issued Executive Order #07-126, requiring LEED-NC for any new building conducted by the State.

State of New York - September 2009, Governor Paterson signed into law the *State Green Building Construction Act,* which stipulates:

> New state buildings and major renovations of existing buildings abide by the guidelines within the law, as established by the Office of General Service. The Office recognizes LEED, Green Gloves, and the American National Standards Institute as models of green building programs, as approved in the guidelines.

State of Rhode Island - November 2009, Governor Carcieri signed into law the *Rhode Island Green Building Act.*

- All major facility projects housing public agencies, and entering into the design phase after January 2010, must achieve LEED Certified or equivalent.

- Act also requires the establishment of a green buildings advisory committee to assist in administration and implementation (something many states will be developing). An annual report will be published, documenting the operating savings resulting from LEED certification, with further recommended changes to current policies.

Federal Government

In October of 2009, President Barack Obama signed *Executive Order 13423*, which provided overarching requirements to the Federal Government related to sustainability. Some of the requirements relate to:

- Reduced greenhouse gas emissions
- Increased water efficiency
- More diversion from landfill for construction and replenished furnishing and fixtures, such as computers, and monitors
- Implementation of storm water provisions
- Implementation of the 2030 Net Zero Energy building requirement

These regulations further enhanced what the Government Services Administration (GSA) had enacted in 2000, which sought to develop and measure sustainable design achievements throughout all Federal buildings. The GSA is the nation's largest civilian landlord, managing over 8,600 owned and leased buildings. They now require that *all* capital building projects and leased construction projects must earn at least LEED silver certification.

The USGBC maintains an updated list of Government LEED Incentives at:

http://www.usgbc.org/ShowFile.aspx?DocumentID=2021,

A dynamic public policy search with many drop down queries can be found at:

http://www.usgbc.org/PublicPolicy/SearchPublicPolicies.aspx?PageID=1776

Conclusion

Building sustainably is evolving into the standard within the construction industry, whether or not LEED certification is sought. Maintaining levels of sustainability require constant monitoring against established plans and adjusting when necessary. Being more in tune with the building operations, in the long run, maintains the soundness of an energy-efficient building, keeps costs in-check, and creates a sought-after working environment. LEED EB:OM is an efficient tool to assist in reaching that goal.

Examples to illustrate various approaches to a LEED-EB:O&M projects are listed below. Review them with a creative eye to see the myriad of ways to achieve certification, and to understand how the credits are interrelated.

Certified LEED -EB Projects

One and Two Potomac Yards, Arlington, VA
LEED Gold, 2006
http://www.epa.gov/greeningepa/documents/py_factsht_508.pdf

Armstrong World Industries, Lancaster, PA
LEED Platinum, 2007
http://www.revisionarch.com/Library/Armstrong%20Trifold.pdf

Bay Colony Corporate Center, Waltham, MA
LEED Silver, 2009
http://www.ugl-unicco.com/downloads/case-studies/Case-Study-Bay-Colony-LEED.pdf

References

"Full Set of LEED-EB Documentation Online". Posted on Real Life LEED.com, with direct link of <http://www.universityofcalifornia.edu/sustainability/leed.html>.

Jessica Boehland. *"LEED for Existing Buildings, Improving Performance Through Operations and Maintenance"* McGraw Hill Construction Continuing Education Center, November 2008.

"FAQ - LEED for Existing Buildings: Operations & Maintenance." USGBC.org.

"Leadership in Energy and Environmental Design." Wikipedia.org.

Wayne B. Trusty. *"Renovating vs. Building New: The Environmental Merits"*. <http://www.athenasmi.ca/publications/docs/OECD_paper.pdf>.

Daniel P. Perruzzi Jr. *"Green Design: New Construction vs. Renovation"* April 2008. <http://www.buildings.com/ArticleDetails/tabid/3321/ArticleID/5855/Default.aspx>.

Jenny Carney. *"LEED EBOM: Eight Steps to Success - Key Practices for Your Existing Building Certification."* LEEDuser.com.

"Executive Order 13423 — Strengthening Federal Environmental, Energy, and Transportation Management in Acquisition." June 2007. <http://management.energy.gov/documents/AcqGuide23pt0Rev1.pdf>.

Stewart Kaplow. *"A Step by Step Strategy for Greening an Existing Building."* October 2009. http://www.stuartkaplow.com/library3.cfm?article_id=164.

"Using LEED O&M to Manage the Greening of Your Building Portfolio." Webinar. Leonardo Academy.org.

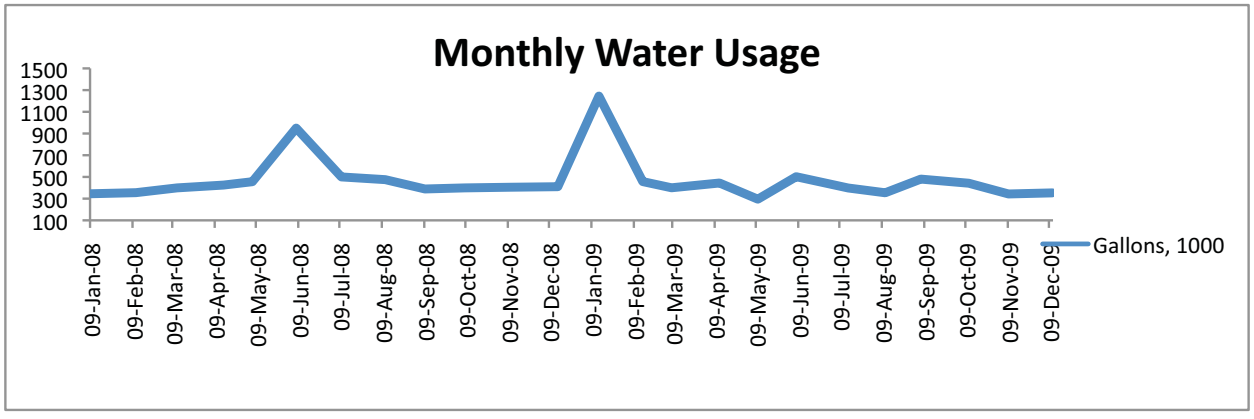
Tom Bauer. *"LEED-EBOM Efficient Operations & Maintenance LEED® to Savings"* February 2009.
< http://facilitymanagement.com/articles/maintenance3-0209.html>.

"LEED-EB Project Case Study: JohnsonDiversey Headquarters." <http://www.usgbc.org/docs/LEEDdocs/JohnsonDiversey_Case_study.pdf>.

Lance A Williams. *"Making the Green Building Business Case."* <http://secure.nhanced.net/sites/site30/site_images/1_Green_Building_Overview-USGBC.pdf >.

"LEED for Existing Buildings: Operations and Maintenance (LEED-EBOM 2009)". Leeduser.com (paid subscription).

Example of importance of regular data capturing during the performance period, analyzing on a monthly basis.



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The following is a hypothetical IAQ management program that would fulfill the requirement of the LEED-EB O&M IEQ credit 1.1.

Goals and Scope

By adhering to this IAQ Management Program, (Building) will strive to enhance IAQ by optimizing practices to prevent the development of IAQ problems in buildings, correcting IAQ problems when they occur, and maintaining the well-being of the occupants.

The (Building) IAQ Program incorporates guidance regarding the criteria below:

1. Conducting an IAQ building audit:
   1.1. This audit will include an assessment of all occupant symptoms associated with poor IAQ and all building factors affecting indoor air quality. Pollutants, contaminant sources, protocols for managing major sources of pollution in buildings, pollution transport, and ventilation will also be addressed.
2. Diagnosing and resolving IAQ-related health problems:

2.1. Problems will first be characterized and then potential causes will be assessed. Finally, thermal comfort, light, carbon dioxide, and contaminant measurements will be taken. Any problems must be dealt with according to the system requirements.

3. Practices to reduce IAQ risks:
   3.1. A regular maintenance program will be implemented and will include scheduled surveys of the building, establishment of areas requiring differential attention, training, and scheduled and unscheduled maintenance.
4. Planning IAQ compatible energy projects:
   4.1. Major renovations and new construction must all have IAQ design goals that meet identified IAQ codes and standards. The construction will be designed to minimize contamination of the indoor environment. The HVAC system, space use, and the building envelope will all be designed and planned to maximize IAQ.
5. Protecting occupants from exposures to construction and renovation contaminants:
   5.1. During construction, emissions will be monitored and controlled to protect occupants. An isolation strategy will be used to control IAQ when occupants are present. Once construction is complete, and IAQ evaluation will be done for the building.
6. Calculating the cost, revenue, and productivity impacts of planned IAQ activities:
   6.1. Costs and revenue will be documented in the form of tenant retention. Productivity will be measured through the morale and productivity of occupants and the value of these productivity improvements.

Responsible Party

1. Facility Manager
2. Building District IAQ Manager
3. Contact Person in case of IAQ Complaint

Guidance for Resources and Implementation

1. EPA's Indoor Air Quality Building Education and Assessment Model (I-BEAM), EPA Reference Number 402-C-01-001, December 2002: http://www.epa.gov/iaq/largebldgs/i-beam/index.html
2. Additional EPA guidance: http://epa.gov/iaq/largebldgs/baqtoc.html

Performance Measurement

Evaluation of the policy must be based on a complaint-response log and occupant feedback and information.

Quality Assurance/Quality Control Processes

The following method(s) will be used to assure the ongoing implementation and success of the program:

1. Routine inspection and monitoring of IAQ Program Implementation
2. Compliant-response long review
3. Training for supervisor and staff

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Timeline for Commissioning Process

2006/2008 UC/CSU/IOU Energy Efficiency Partnership Program

FORM C: MBCx Building/System Nomination Form - Milestone Schedule

PLEASE COMPLETE BLUE-SHADED CELLS
GRAY CELLS FILL AUTOMATICALLY

Milestone	Responsible	Duration	Planned Date	Note
Application Submitted	Campus		30-Sep-06	Date application submitted to IOU and NAM.
IOU Technical Approval	IOU	14	14-Oct-06	Large, complex projects may take longer.
Management Team Approval	Mgt Team.	14	28-Oct-06	
Co-funding Signed	Campus	0	28-Oct-06	CSU requirement.
Notice of Project Approval and RPCP Sent	IOU	7	4-Nov-06	
RPCP Signed and Returned	Campus	7	11-Nov-06	
Invoice #1 Submitted	Campus		11-Nov-06	Invoice #1 should be sumbitted with signed RPCP
Invoice #1 Paid	IOU	30	11-Dec-06	
Cx Agent Contract Executed	Campus	0	11-Dec-06	If applicable.
Planning Phase Complete	Campus	0	11-Dec-06	
Pre-investigation Phase Complete	Campus	30	10-Jan-07	
Metering Installed	Campus	30	9-Feb-07	
Investigation Phase Complete	Campus	90	10-May-07	
Baseline Established	Campus	0	10-May-07	Included in Investigation
Pre-functional Testing Complete	Campus	0	10-May-07	Included in Investigation
Implementation Phase Complete	Campus	90	8-Aug-07	
Handoff Phase Complete	Campus	60	7-Oct-07	
Final Report Submitted to NAM	Campus	7	14-Oct-07	
Project Complete, Notify IOU and NAM	Campus	7	21-Oct-07	
Project Verified	IOU	14	4-Nov-07	
Invoice #2 Submitted	Campus	1	5-Nov-07	

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Example of 12-month Utility Bills During Performance Period

Meter: GAS			
Building: UCOP			
November 22, 2006 - 03:13:58 PM			
Fuel Type: Natural Gas (therms) **Space(s):** Entire Facility			
Start Date	**End Date**	**Energy Use**	**Cost - US Dollars**
10/13/2006	11/10/2006	375	$428.63
9/14/2006	10/12/2006	43	$93.68
8/16/2006	9/13/2006	87	$144.55
7/15/2006	8/15/2006	0	$51.61
6/15/2006	7/14/2006	0	$49.95
5/16/2006	6/14/2006	0	$49.95
4/14/2006	5/15/2006	1,109.00	$1,361.70
3/17/2006	4/13/2006	1,579.00	$1,948.86
2/15/2006	3/16/2006	2,525.00	$3,212.00
1/13/2006	2/14/2006	2,349.00	$3,728.19
12/15/2005	1/12/2006	2,617.00	$3,984.05
11/15/2005	12/14/2005	2,101.00	$3,397.01

Source: LEED-EB Documentation, UC Office of the President Project LEED: Certified

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