



# GREEN OPERATIONS GUIDE

INTEGRATING LEED INTO COMMERCIAL  
PROPERTY MANAGEMENT

# PREFACE FROM USGBC

The U.S. Green Building Council's LEED® Green Building Rating System™ provides a globally recognized framework for designing, building and operating high-performance buildings, using clearly defined environmental criteria, measurable goals and third-party verification of design intent and operational performance. LEED adoption has increased greatly as landlords and tenants realize the financial benefits of energy efficiency and indoor environmental quality both in their base building and tenant space. As of the printing of this guide, there are over 4.9 million office buildings in the United States, accounting for 18% of our nation's end-use energy consumption, representing the single greatest potential for retrofit and environmental impact within the built environment.

*The Green Operations Guide: Integrating LEED into Commercial Property Management* is meant to support the USGBC's strategic work in transforming building operations practices as well as complement the LEED for Existing Buildings: Operations & Maintenance rating system and reference guide by providing practical resources to help property owners, managers, and tenants work together to sustainably manage and operate properties. The information and tools in this guide have been developed to assist property owners and managers as well as their service providers in reducing the environmental impact associated with commercial real estate operations by articulating the business case for sustainable asset management and providing practical guidance on ways to reduce and measure energy, waste, water, etc. This guide also includes sample policies, practices and examples, as well as an online repository of usable worksheets and checklists that project teams can alter for LEED for Existing Buildings: Operations & Maintenance certification submittals within LEED Online.



**The U.S. Green Building Council (USGBC)** is a 501(c)(3) nonprofit Organization that certifies sustainable businesses, homes, hospitals, schools and neighborhoods. USGBC is dedicated to expanding green building practices and education, and it's LEED Green Building Rating System.



**The LEED Green Building Rating System** is a voluntary, consensus-based national rating system for developing high-performance, sustainable buildings. LEED addresses all building types and phases and emphasizes state-of-the-art strategies in five areas: sustainable site development, water savings, energy efficiency, materials and resources selection and indoor environmental quality.

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### Published by

U.S. Green Building Council  
2101 L Street, NW  
Suite 500  
Washington, D.C. 20037  
ISBN: 978-1-932444-59-9

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# INTRODUCTION

Every few years the real estate industry experiences a seminal event or identifies a new trend—the formation of the Resolution Trust Corporation, Y2K, REITS, hoteling, home offices—and each time we hear that this is going to change our business forever. Each of these, however, has proven to be either a short-term phenomenon or a minor change in the way real estate is owned or operated. Sustainability, though presented with similar media buzz, is different. It represents the convergence of scientific fact, political and regulatory action, and consumer awareness. But more importantly, it is a smart, long-term business opportunity for the owners and operators of commercial buildings. The transformation to sustainable operational practices in offices around the world is producing meaningful results for owners and occupants.

Through the introduction of new, sustainable strategies for building operations and maintenance practices, owners and managers have the opportunity to reduce environmental impacts and increase tenants' satisfaction while also insulating themselves against price and regulatory volatility. U.S. Green Building Council's (USGBC) LEED® (Leadership in Energy and Environmental Design) green building rating system provides a globally recognized framework, clearly defined sustainability criteria, measurable goals and third-party verification of environmental performance. LEED for Existing Buildings: O&M is intended to measure operating performance over time. By design, it addresses the unique opportunities and challenges of managing and operating sustainable office properties. Owners cannot reduce ecological impacts without good managers; property managers cannot do their part without commitment from their leaders, clients, and service partners.

## Purpose of This Guide

This guide is intended as a resource to help property owners and managers understand the major elements and processes in greening property operations. Significant to this guide, and to the rating system it addresses, is the focus on building the right team and measuring progress. Using the framework of LEED for Existing Buildings: O&M, building owners and managers can measure and reduce the effects of commercial real estate on our planet's resources, while reducing the costs, and mitigating the risks of operations. Additionally, this guide contains process information and example documentation to aid in the pursuit of LEED for Existing Buildings: O&M certification.

## Who Should Use This Guide

This guide has been developed for owners, asset managers, building managers, engineering staffs and their service partners. Though focused on multitenant office properties, the information will be useful to all individuals responsible for the operations of commercial properties. The guide makes frequent reference to LEED for Existing Buildings: O&M but is not a how-to manual for the implementation of this rating system, nor is it a prescriptive path toward certification, like the LEED

Reference Guide for Green Building Operations & Maintenance. Rather, it gives the user a deeper understanding of the process, intent and application of the rating system and serves as an aid for the creation and implementation of sustainable building policies and practices. Readers with questions about the intent and requirements of a particular credit in the LEED for Existing Buildings: O&M system should refer to the reference guide for specific guidance.

## Organization of This Guide

### This guide has four sections:

- Section 1: The Business Case for Green Real Estate Management**, is primarily for property owners and landlords; it considers how greening an older building can positively impact the bottom line.
- Section 2: How to Green Operations**, outlines a rational process for property managers, beginning with establishing a baseline for operations, then implementing the changes, and finally measuring and verifying the results. It also considers how lease structures affect what owners and property managers can do and describes different approaches to financing green strategies.
- Section 3: Incorporating Green into Operations**, discusses five areas of opportunity that should be addressed to improve the environmental performance of a property: energy; water; waste; health, safety and indoor environmental quality; and community infrastructure. These sections offer many strategies for implementation.
- Section 4: Tools and Resources (Print and Online)**, provides example policies filled in using a fictitious building as an example to give the user an idea on how such forms should be completed. There is also an online component which provides several more example policies/calculators that purchasers can use to help with the LEED certification and documentation process of their own buildings.



# THE BUSINESS CASE FOR GREEN REAL ESTATE MANAGEMENT

## Environmental Impact of Buildings

### SECTION 1.1

According to the U.S. Department of Energy, commercial buildings in the United States indirectly contribute 18%, or 6 billion metric tons, of the nation's carbon dioxide (CO<sub>2</sub>) emissions through the consumption of energy, and consume 35.8% of all electricity generated in the United States.<sup>1</sup> More than 50% of this electricity is derived from carbon-intense energy sources, such as coal and petroleum.<sup>2</sup>

It is no stretch to see that commercial buildings need to be part of the solution as our country seeks to tackle its carbon challenge. Of course, a building's impact is not limited to its energy consumption. Commuting patterns of occupants, the use and consumption of goods and materials, waste production, and water use are all areas in which buildings adversely affect our planet and its resources.

### Buildings Are a Major Part of the Carbon Solution

Over the next 30 years in the United States, it is estimated that property owners will collectively build or renovate about 75% of all buildings that will be operating in the year 2040, indicating that a major improvement in aggregate building energy performance is possible. However, for any gains to be realized, the focus of the real estate industry will have to shift from designing and constructing low-energy-using and “net-zero energy” new buildings to improving the performance of existing buildings. According to the climate action group Architecture 2030, “This transformation of the built environment over the next 30 years provides an historic opportunity to dramatically reduce the building sector's CO<sub>2</sub> emissions.”<sup>3</sup>

Studies by the international consulting firm McKinsey and Company in 2007 and 2008 demonstrated that the transformation to a low-carbon world could be accomplished at reasonable economic cost just by using existing technology.<sup>4</sup> The McKinsey report highlighted the conflict between many building owners and tenants. A misalignment of cost and benefit exists between the two groups, wherein owners make the improvements, but tenants, by virtue of many lease structures, get the benefit of reduced energy costs. Fortunately, this problem can be resolved in many situations, a subject that will be discussed later in this guide.

Table 1. U.S. Commercial Building Energy Profile<sup>5</sup>

Office buildings in United States, 2006	4.7 million
End-use energy consumption by buildings, as percentage of total U.S. energy consumption	17%
CO <sub>2</sub> emissions from buildings, as percentage of total U.S. CO <sub>2</sub> emissions	18%
Growth of CO <sub>2</sub> emissions, 1990 to 2003	+26%
Forecasted business-as-usual greenhouse gas emissions, 2050 vs. 2005	+28% (2030, just carbon)

Table 1 reveals that there are almost five million buildings ripe for retrofit into energy-efficient structures. Inevitably, some structures will be replaced, but demolition of existing structures and new construction account for only 1% and 4%, respectively, of the building stock on an annual basis.<sup>6</sup> To address our energy challenges, the operations of existing buildings must be improved.

## Continuous Greening of Buildings

In 2009, LEED for Existing Buildings: O&M became the fastest-growing LEED rating system, with more than 2,000 new projects (representing more than 400 million square feet) registering for certification. More than 80% of these projects were registered by private sector owners, the surest indication that greening of real estate operations delivers marketplace benefits.<sup>7</sup>

LEED for Existing Buildings: O&M Rating System helps building owners and operators measure operations, improvements, and maintenance on a consistent scale, with the goal of maximizing operational efficiency while minimizing environmental impacts. LEED for Existing Buildings: O&M addresses whole-building cleaning and maintenance (including chemical use), recycling programs, exterior maintenance programs, and systems upgrades. It can be applied both to existing buildings seeking LEED certification for the first time, and to projects previously certified under LEED for New Construction, Schools, or Core & Shell.

LEED for Existing Buildings: O&M provides a set of tools for moving beyond the initial LEED certification to documenting long-term performance while demonstrating to current and prospective tenants, owners, and prospective buyers that the building is being operated not only in an environmentally responsible or optimal way, but also in a financially sound way.

A review of the opportunities to implement green building practices in existing buildings will identify countless chances to improve the energy and environmental performances of these structures for everyone's benefit.

## The Business Case for Green Operations

The business case for greening existing buildings is based on a framework of benefits: economic, financial, productivity, risk management, public relations and marketing, and project funding.<sup>8</sup> In this section, we explore benefits and motivations for building owners and facility managers in greening their buildings and facilities while using the LEED for Existing Buildings: O&M rating system.

Understanding the wide-ranging benefits of green buildings is important when making the decision to pursue green building certification. Some benefits accrue directly to the building occupants, some immediately to the property owner or manager, and some to the building's future financial and economic performance. The beneficiary often depends on the exact nature of the lease or ownership arrangements. In a considerable body of green building research, all of these benefits have been considered valuable at some time to some building owners and occupants.

Use the following list of potential benefits<sup>9</sup> as a starting point for examining and constructing a business case relevant to your own situation:

- Utility cost savings for energy and water, typically 25% to 40%, along with reduced “carbon footprint” from lower energy use;
- Maintenance cost reductions from commissioning and other measures that ensure proper HVAC system performance;
- Higher building value, based on increased net operating income and improved public relations, with higher rents and greater occupancy in certified buildings<sup>10</sup>;
- Tax benefits for specific green building investments, such as those specified in state and federal legislation since 2005<sup>11</sup>;
- More competitive real estate holdings for private sector owners, over the long run, especially in competition with newly constructed LEED-certified buildings;
- Productivity improvements for tenants and occupants<sup>12</sup>;
- Health benefits for tenants and occupants, including reduced absenteeism and illness<sup>13</sup>;
- Risk mitigation, including reduced exposure to irritating or toxic chemicals in building materials from renovations or remodels and in cleaning and pest management practices;
- Marketing benefits, especially in major cities with tenant populations and corporate real estate managers favorably disposed to locating in LEED-certified buildings;
- Public relations benefits, especially for developers, building owners, and building managers, that may help with tenant recruitment and retention;
- Improved recruitment and retention of key employees and higher morale, both for tenants or occupants and for building owners and managers;
- Increased availability of both debt and equity funding for building sales and for upgrading building performance; and
- Demonstration of commitment to sustainability and environmental stewardship, and shared values with important stakeholders.

## Benefits and Motivations for Building Owners

The easiest justification for greening an existing building is the direct economic benefits to the building owner through reduced operating costs, higher rents, greater occupancy, and higher resale value. Increased economic benefits are the prime drivers of change for most innovations. For energy-efficient and green buildings, these benefits take a variety of forms, and a comprehensive consideration is vital for promoting any sustainability initiatives.

The large number of LEED for New Construction and Core & Shell projects developed and built since 2005 suggests that most major national property development, management, and ownership interests see a positive business case for greening new buildings. As in most businesses, profitability over both the short and long term is the key. Only when savings exceed costs is a business truly sustainable.

Andrew McAllan is Senior Vice President of Real Estate Management at Oxford Properties Group in Toronto, the firm responsible for 255 King Street West in Toronto, the first multitenant LEED for Existing Buildings: O&M-certified building in Canada. He explained his firm's motivations:

...green is rapidly going to become an integral component of being a first-class office building. As one of the largest owner-managers of first-class office buildings in Canada and having a number of what are considered flagship properties across the country [Canada], it was just a must-have situation. We did some back-of-the-envelope calculations, but it's a challenge to empirically prove the payback calculation in advance. Rather, it's more about the sensitivity analysis. In this case we concluded that if it assisted us in leasing the vacant space—an average of 6 months earlier than we would have otherwise leased it—then just on that alone, it paid for itself.”<sup>15</sup>

Oxford Properties also knew it had to compete with newly constructed LEED-certified buildings in the vicinity. This realization has occurred to corporate real estate circles. “It’s no coincidence that new buildings in downtown Toronto all have LEED certification. I’m hesitant to just categorize it as marketing because it’s a lot more than marketing; it’s a business decision and it’s also part of our corporate social responsibility. When we achieve LEED for Existing Buildings: O&M certification, we are getting the seal of approval from an independent group, saying this property employs appropriate practices, systems and equipment, etc.”

Andrew McAllan understands the benefit of endorsements by recognized third parties, such as the U.S. Green Building Council (through a LEED for Existing Buildings: O&M certification) or the U.S. EPA (via an ENERGY STAR label) in validating a building owner’s claims about sustainable practices and energy efficiency.

**“We no longer see a green premium; we believe the market will be placing a brown discount on properties that are not making the effort to improve efficiency.”<sup>14</sup>**

**— Gerald D. Oliver, Senior Vice President of Property Management, Behringer Harvard**

## Reduced Operating Costs

With electricity and gas prices rising steadily in many metropolitan areas, energy-efficient buildings make good business sense. In “triple-net” leases, in which the tenant pays all operating costs, landlords still want to offer tenants the most economical space so that the tenant’s total occupancy cost is minimized. Without significant capital costs, green buildings can save on energy operating costs for years to come. In an 80,000-square-foot building using \$3 per square foot per year of electricity, an owner’s savings of 25% to 40% translates into \$60,000 to \$96,000 (\$0.75 to \$1.20 per square foot) of reduced operating costs per year, year after year. **Depending on lease structure, this generates higher net operating income (NOI) or delivers a more competitive building with lower operating costs for tenants.**

Retrocommissioning of commercial buildings is a structured way to examine potential energy savings improvements and to upgrade a building’s ENERGY STAR score, easily and quickly. Explained in detail later in this guide, retrocommissioning typically yields 5% to 10% annual energy savings, according to a 2008 survey.<sup>16</sup> Buildings that have undergone retrocommissioning also tend to be much easier to operate and maintain. Benefits include extended equipment life, greater thermal comfort, and improved indoor air quality.<sup>17</sup> Conducting comprehensive functional testing of all energy-using systems in normal operations can ensure a smoother-running building because potential problems are identified on a regular basis.

Energy costs can represent 25% to 35% of a typical building’s operating costs and are subject to rate fluctuation beyond the control of most building management.<sup>18</sup> In many major markets, commercial buildings are subjected to time-of-day utility cost structures—higher utility rates during peak load periods such as midday and midsummer—as utilities try to reduce demand growth by increasing peak-period rates. In many large building retrofits, peak demand reduction is a crucial strategy in reducing utility costs. Anything one can do to reduce thermal loads in a building, such as installing reduced-wattage lamps, occupancy sensors, and daylight sensors, will also reduce peak-period electrical demand for cooling as well as the charges an owner has to pass through to the tenants.

## Tax Benefits and Incentives

**Green building tax benefits.** Many states offer tax benefits for green buildings, including tax credits, tax deductions, property tax abatement, and sometimes sales tax relief. For example, New York’s tax credit allows builders who meet energy goals and use environmentally preferable materials to claim up to \$3.75 per square foot for interior work and \$7.50 per square foot for exterior work against the state tax bill. In rehabilitated buildings, energy use cannot exceed 75% of the amount allowed under the New York State energy code.<sup>19</sup>

**Federal energy incentives.** The 2005 Energy Policy Act and subsequent amending legislation offer two major tax incentives for greening existing buildings: first, a tax credit of 30% on installed cost of both solar thermal (water heating) and solar electric (photovoltaic) systems, good through the end of 2016; and second, a tax deduction of up to \$1.80 per square foot for projects that reduce energy use for lighting, HVAC, building envelope measures, and water heating systems by 50% compared

with a 2001 baseline standard, good through the end of 2013.<sup>20</sup> These are great incentives for energy conservation. For example, on a 300,000-square-foot commercial office building, a tax deduction of up to \$540,000 is available, netting a potential tax savings of \$135,000 at a 25% marginal federal tax rate.

**Local energy incentives.** Other incentives are offered at the state and local government level as well as through rebate programs established by regional electric and, in some cases, gas utilities. Current information on all types of incentives is given in the Database of State Incentives for Renewable Energy and Energy Efficiency, available from the North Carolina Solar Energy Center.<sup>21</sup> The U.S. Green Building Council also maintains a list of public programs and incentives for green buildings.

Readers should consult the following online databases, as new programs are being added constantly and the requirements for existing programs are often modified: [www.dsireusa.org](http://www.dsireusa.org) and [www.usgbc.org/PublicPolicy/SearchPublicPolicies](http://www.usgbc.org/PublicPolicy/SearchPublicPolicies)

**Green building incentives.** Depending on where a project is located, other financial and project incentives may be specifically targeted at green building investments.

Here are a few to look for:

- State tax credits and sales tax exemptions in various states on green material purchases<sup>22</sup>;
- Property tax exemptions;
- Utility cash rebates, grants, and subsidies (typically based on energy savings and/or use of renewable energy systems);
- Audit and retrofit incentives from state and county agencies;
- Permit assistance, including faster permitting or priority processing for major renovations (varies by jurisdiction); and
- Increased financing from socially responsible investors, such as pension funds and green building focused REITs and private investment groups, sometimes facilitated through organizations such as the Clinton Climate Initiative.

## Risk Mitigation

Risk in building operations has multiple dimensions: financial, market, legal, and reputational. Since it's often hard to increase net operating income from building operations in the near term, without rent or occupancy increases, mitigating the exposure to energy market cost fluctuations also has positive economic benefits. Recent studies have demonstrated that buildings operated in a green manner have lower utility costs. Additionally, each point of increase in ENERGY STAR score reduces energy costs by 0.83%.<sup>23</sup>

Commercial building owners are realizing that LEED-certified buildings can be more competitive in certain markets. Green buildings with lower operating costs and better indoor environmental quality are inherently more attractive to a growing group of corporate, public, and individual tenants. "Green" will not soon replace such real estate attributes as price, location, and conventional amenities, but green features will increasingly enter into tenants' decisions about leasing space and

into buyers' decisions about purchasing properties and homes. There is also growing evidence of greater resale value for LEED- and ENERGY STAR-labeled buildings.<sup>24</sup>

Certifying a property using LEED for Existing Buildings: O&M can help make an older structure more competitive with the many new LEED-certified buildings coming on line in just about every major city, helping to mitigate the risk of obsolescence in older properties. The converse is also true: older properties that cannot upgrade to LEED for Existing Buildings: O&M standards face the prospect of value erosion over time, as motivated tenants seek out and more easily find LEED-certified office space.

### **Access to Capital**

Denis Blackburne is CFO of Melaver, Inc., a sustainably minded commercial real estate development company based in Savannah, Georgia. He says,

One financial aspect of LEED certification is how it helped us when we refinanced some of our properties. We did our homework and presented our case to the financial community by saying, 'We have six properties that have quality tenants, are in the right location, look great, are well-managed, have high occupancy, and by the way, they are high-performing, in the sense that they are energy efficient and environmentally friendly.' All of a sudden the doors opened and we were able to refinance this portfolio and exceed our objective by far. When we looked at the future cash flow projections, we were given full credit for the future benefits that were included in the LEED certification.<sup>25</sup>

Blackburne's experience is one that holds special significance in financially constrained markets where liquidity is nearly nonexistent.

### **Branding**

A developer or owner with a strong commitment to sustainability and a growing portfolio of green projects may enhance credibility in the tenant marketplace and win business from major corporate tenants. Jerry Lea, of Hines, says that

green building has definitely enhanced our reputation. We've always had good buildings in terms of energy conservation, indoor air quality and building systems. [Before LEED] nobody gave us credit for that or understood that. [LEED] allows a person to understand that not only do our buildings look good, but they're good buildings to be in.<sup>26</sup>

In other cases, green building certifications might present a golden opportunity to reposition older office properties as more upscale or trend setting. Establishing and improving the environmental performance of older properties could be an essential element in rebranding and repositioning them to be more attractive to tenants looking for green office space.

## Benefits and Motivations for Tenants and Occupants

The focus of the Green Operations Guide is helping property owners and managers develop practices, policies, and plans for achieving LEED for Existing Buildings: O&M certification, but building occupants are critical to the success of the project. Tenants and occupants have their own motivations, sometimes congruent with those of the owners and managers, and sometimes more directly related to the largest cost of occupancy, the salaries and benefits paid to employees. Some of the growth in LEED for Existing Buildings: O&M certifications have come from increased interest in green building practices by tenants.

### Productivity Gains

In the service economy, productivity gains for healthier indoor spaces may be worth anywhere from 1% to 5% of employee costs, or about \$3 to \$30 per square foot of leasable or usable space. This estimate is based on average employee costs of \$300 to \$600 per square foot per year (based on \$60,000 average annual salary and benefits and 100 to 200 square feet per person).<sup>27</sup> With energy costs typically less than \$3 per square foot per year, productivity gains from green buildings could easily equal or exceed the entire energy cost of operating a building.

As one example, Carnegie Mellon University, in Pittsburgh, reported median productivity gains from high-performance lighting retrofits of 3.2% in 11 studies, or about \$1 to \$2 per square foot per year, an amount equal to about half the cost of energy.<sup>28</sup> These savings are in addition to a reported average savings of 18% on total energy bills from more efficient and more effective lighting. For corporate and institutional owners and occupiers of buildings, that's a meaningful amount both financially and in terms of productivity benefits. For landlords, it's important to consider that tenants may be starting to anticipate productivity gains associated with green buildings. For this reason, buildings using LEED for Existing Buildings: O&M certification to improve daylighting integration and improve indoor air quality (often through changes suggested by retrocommissioning audits) may provide important benefits for a company or prospective tenant.

A study by the Center for the Built Environment at the University of California–Berkeley reviewed more than 33,000 surveys of occupant satisfaction in more than 200 buildings, including 16 green-certified buildings. The study showed a statistically significant gain in satisfaction in certified green buildings compared with those that were not certified. In the words of the researchers, “Our results suggest that on average the strategies commonly employed in green buildings have been effective in improving occupant satisfaction with air quality and thermal comfort.”<sup>29</sup>

Researchers in 2009 surveyed 534 tenants in 154 LEED or ENERGY STAR buildings and found increased productivity and reduced absenteeism, comparable to results from prior studies.<sup>30</sup> Average productivity increased by nearly 5%, and absenteeism decreased by nearly three days per year. Total value of the increased productivity and decreased absenteeism was estimated at \$25.73 per square foot.



## Health Improvements

Of course, a major element of productivity is healthy workers. Where owners have taken measures to improve indoor environmental quality, such as increased ventilation, daylighting, views to the outdoors, and low-toxicity finishes and furniture, workers show an average reduction in illness symptoms of 41.5% on an annual basis, according to 17 academic studies reviewed by researchers at Carnegie Mellon University.<sup>31</sup>

A building refurbishment of 500 Collins Street in Melbourne, Australia, which met the Australian Green Star standard (similar to LEED), documented the following benefits:

- 39% reduction in average sick leave days;
- 44% reduction in the average cost of sick leave; and
- 7% increase in lawyers' billings, despite a 12% decline in the average monthly hours worked.<sup>32</sup>

This project showed a positive correlation between measures to improve indoor air quality and daylighting and gains in employee health, which together led to positive economic outcomes.

## Operating Cost Reductions

Green building operations can offer a solution to the misalignment of cost and benefit between owners and tenants, since both parties and the environment all gain.

We pointed out earlier how an owner might benefit from reducing operating costs, but under many leasing arrangements, the tenant or occupant could also see reductions of \$0.75 per square foot or more from owner investments in energy and water conservation and building systems efficiency upgrades. Reductions in operating costs and increases in tenant satisfaction can lead to increased rates of lease renewal and eventually higher rents.

## Public Relations and Marketing

Marketing is an essential component of all building operations, both public and private. Companies, public agencies, universities, and many nonprofit organizations seek to maximize their “brand equity” and increasingly rely on marketing and public relations activities to accomplish this goal. Locating in certified green buildings can contribute to meeting these goals. Of course, the PR value of LEED for Existing Buildings: O&M or ENERGY STAR certification accrues to both the building owner and the individual tenant.

## Stakeholder Relations

Tenants and employees appreciate a demonstrated concern for their welfare as well as for that of the planet. Progressive building owners realize how to market these benefits to a discerning and skeptical client and stakeholder base, using the advantages of LEED and ENERGY STAR to demonstrate a positive response to a growing concern for the long-term health of the environment.

## Employee Recruitment and Retention

One often-overlooked aspect of green buildings is their effect on individuals' willingness to join or stay with an organization. Green operations may increase satisfaction and therefore retention among current employees.<sup>33</sup> In some cases, people leave because of poor-quality physical environments. It

costs an estimated 150% of annual salary to lose a good employee, and most organizations experience 10% to 20% turnover per year, often including people they didn't want to lose.<sup>34</sup>

In a workforce of 200 people, turnover at that level would mean a loss of 20 to 40 people per year. What if a green building could reduce turnover by 5% and keep one or two people of the 20 to 40? Taken alone, the value of that would be \$50,000 to possibly as much as \$300,000, more than enough to justify the out-of-pocket costs of certifying a building project.<sup>35</sup> A law firm that loses just one good attorney billing \$400,000 per year might lose \$250,000 in gross profit; that sum could more than pay for the extra cost of a green building or green tenant improvement project that would retain that lawyer.

For many companies, green buildings represent one of the few tangible and easily achievable measures for demonstrating a commitment to sustainable operations. This in turn provides them with a story that may help attract and keep good people. The issue of recruitment and retention is now emerging as a rationale for many large companies to consider greening all of their existing buildings. The rationale may be even stronger for recruiting and retaining the younger generation of employees, who tend to be passionate about environmental issues.<sup>36</sup>

### **Corporate Social Responsibility**

It is no longer enough to be a good employer; companies need to be good neighbors in the larger community as well. Developers, large corporations, local government, and building owners have long recognized the marketing and public relations benefits of a demonstrated concern for the environment. Green buildings fit right in with this message.

One company that benefited from taking this approach is Adobe Systems, Inc., a major software maker based in San Jose, California. In 2006, Adobe announced that it had received LEED for Existing Buildings: O&M Platinum certification for each of its three headquarters towers. Not only did Adobe reap great publicity, but the firm showed that the investments as a whole had returned a net present value almost 20 times the initial cost. It saved more than it spent, with less than one-year simple payback on most projects within the buildings.<sup>37</sup> Similar case studies abound for LEED for Existing Buildings: O&M projects completed in 2007 through 2009.<sup>38</sup>

Many larger public and private organizations have well-articulated sustainability mission statements that include how their real estate choices both reflect and advance those missions. Responsible property investing (RPI) is a worldwide movement among socially conscious developers, investors, and building owners and managers. New York-based developer Jonathan F. P. Rose notes,

Having a socially and environmentally motivated mission makes it easier for businesses in the real estate industry to recruit, and retain, top talent. Communities are more likely to support green projects than traditional projects, and it is easier for such projects to qualify for many government contracts, subsidies, grants and tax credits. The real estate industry can prosper by making environmentally responsible decisions.<sup>39</sup>

## Policy Trends Driving the Greening of Existing Buildings

### Building Energy Labeling

The European Union's Energy Performance in Buildings Directive, effective in 2010 in all member countries, requires building energy labeling of all public and private buildings. Performance is compared with national averages and is based on actual performance for existing buildings. In the United Kingdom, for example, buildings are labeled with grades A through F. An A-rated or B-rated building might correspond to an ENERGY STAR building, while an E-rated building might perform worse than national averages. Owners of existing buildings are required to show their energy certificates to all prospective tenants and all prospective buyers. Similar public information could have a significant impact on property marketing and values if this system becomes widespread in the United States.

### Public Disclosure Requirements

Legislation in the United States is moving toward building rating disclosure. California Assembly Bill 1103 would require an owner or operator of a commercial property to disclose her building's energy performance rating for the most recent 12 months to a prospective buyer, lessee of the entire building, or a lender. In 2008 The District of Columbia enacted legislation that requires disclosure of ENERGY STAR benchmarks on all public and private buildings of 10,000 or more gross square feet.

Because more cities, counties, and states throughout the United States are adopting green building guidelines, it's likely that laws will be promulgated to dictate requirements for existing building operations, beyond just energy efficiency labeling. For example, as of April 2010, laws, executive orders, resolutions, ordinances, policies, and other initiatives that specifically mentioned LEED existed in 45 of the 50 states, including 202 localities (138 cities, 36 counties, and 28 towns), 33 state governments, 14 federal agencies or departments, 17 public school jurisdictions, and 41 institutions of higher education across the United States.<sup>40</sup>

## Summary

The motivation for green buildings does not end with purely financial benefits. It extends to many other tangible and intangible factors, including productivity and health gains, public relations, employee retention, access to financing, and building a reputation as a sustainable enterprise. The prospect of regulation of carbon emissions will also drive the business case for energy-efficiency building upgrades by the owners, operators, and managers of large buildings. Future legislation mandating building energy labeling and performance disclosures will also drive retrofits faster than strictly marketplace dynamics.

The first step to reaping the benefits associated with green buildings is to understand the business case for sustainable operations. A second step is to consider LEED for Existing Buildings: O&M certification across the existing building portfolio. According to Don Horn, Director, PBS Sustainability Program for the U.S. Government Services Administration, "LEED is a

comprehensive tracking, evaluation, and benchmarking system that will help you green your operations and engage your entire workforce in the effort.”

As of March 2010, more than 4,300 projects using LEED for Existing Buildings: O&M were in progress (with 532 certified), involving nearly 1.4 billion gross square feet of building area, with an average of 326,000 square feet per project.<sup>41</sup> Commitments to using LEED for Existing Buildings: O&M are growing in both the private sector and public and nonprofit sectors. This trend is strong, and building owners and managers should examine their portfolios to see how they can participate in greening their own real estate operations.

# 2 HOW TO GREEN OPERATIONS

## Commitment to Sustainability

### SECTION 2.1

The process of integrating LEED into property management is not always a linear journey. There are multiple entry points, and most owners and operators will have already started on many of the tasks outlined in this guide. Regardless of where one begins, there are several consistent elements to achieving success, beginning with making a commitment.

Changing the manner in which commercial property is operated does not need to be complex, but it has to start with commitment from the stakeholders. Building managers and owners must be committed to adopting sustainable practices and incorporating sustainability into their decision making. Many measures and policy changes can help transform a building's operation, but without a commitment, these actions will not necessarily deliver the intended results. Greening an existing building does not always demand a significant capital investment, but it does require the desire to find solutions and willingness to measure efforts.

### Greening Process

Section 3 of this guide presents five areas in which building operations can be greened: energy; water; waste; health, safety, and indoor environmental quality; and community infrastructure. For each, following three basic steps will help owners and operators achieve the desired outcomes, enable continued improvement, and communicate results to stakeholders:

- 1. Baseline operations.** For each project, establish measurement criteria. For energy-saving and water-conserving initiatives, the usual criteria are units of consumption. For indoor environmental quality, measurements may be more subjective, such as the occupants' comfort and satisfaction.
- 2. Implement changes.** Change management is often an overlooked element for today's harried property managers, but the success of the implementation phase can be easily compromised by lack of rigor. Effective change management requires assembling the right team, gaining buy-in from the affected constituents, assessing the potential strategies, and following through on the change.
- 3. Measure and verify.** Feedback is an important tool to gauge the effectiveness of each initiative: "That which gets measured gets managed." All the constituencies that are served by the building will be eager to see the results of the green efforts, and accurate measurement and interpretation will allow continuous improvement cycles.

For every property, the steps may vary. When working with an individual property, it is common to start with energy initiatives, because they tend to have immediate paybacks, and build enthusiasm for continuing a sustainability program. Conversely, teams working on greening entire portfolios may find it more effective to start by examining and integrating sustainability into the portfolio policies. This is an effective means of aligning the expectations among large distributed teams of management personnel. After the portfolio policies have been changed, altering the contracts for subcontracted services, such as cleaning and pest control, helps to communicate the green goal to the larger audience. By working to communicate the goals and align the expectations among both internal and external staff, property managers can alter the direction of the organization.

## LEED for Existing Buildings: O&M Certification

Not every property may be able to achieve LEED for Existing Buildings: O&M certification in the near term, but even buildings that cannot be certified can reduce their harmful effects on our planet and communities.

### Process

The route to achieve certification can be described as an incremental, step-by-step process. The process on a typical property takes nine to 14 months, depending on a variety of factors, including the project's initial status and conformance with LEED prerequisites and the managers' ability to create and implement policies and procedures, dedicate the time required to manage the certification application submission, and develop a comprehensive understanding of the LEED rating system. The process can be defined in five stages:

- 1. Assessment.** One of the most critical stages of the certification process is to establish a property's probability of achieving LEED certification and the potential costs involved.

Assessment can determine whether the pursuit of certification is practical or additional work should be done first, and it assists in the decision making process about which credits to pursue.

The assessment can be a simple checklist or a more complex gap analysis. The gap analysis determines the property's potential score and likely certification level by identifying credits that appear to be achieved and those that will require additional work. Preliminary cost estimates are provided relative to potential achievement of certified, silver, gold, or platinum status. The USGBC checklist and reference materials are helpful for conducting an assessment.

Understanding the nuances of the rating system and how the application of these to a specific property are important to provide accurate cost modeling and performance expectations.

Table 2. LEED 2009 for Existing Buildings: Operations & Maintenance Prerequisite Checklist

LEED 2009 for Existing Buildings: Operations & Maintenance Prerequisite Checklist			
Project Name:			
Project Address:			
Yes	No	?	Water Efficiency
Y			Prereq 1 Minimum Indoor Plumbing Fixture and Fitting Efficiency
Yes	No	?	Energy & Atmosphere
Y			Prereq 1 Energy Efficiency Best Management Practices
Y			Prereq 2 Minimum Energy Efficiency Performance
Y			Prereq 3 Fundamental Refrigerant Management
Yes	No	?	Materials & Resources
Y			Prereq 1 Sustainable Purchasing Policy
Y			Prereq 2 Solid Waste Management Policy
Yes	No	?	Indoor Environmental Quality
Y			Prereq 1 Minimum Indoor Air Quality Performance
Y			Prereq 2 Environmental Tobacco Smoke (ETS) Control
Y			Prereq 3 Green Cleaning Policy

Access LEED rating system checklists online at <http://www.usgbc.org/LeedRatingSystems>

2. **Preperformance period.** During this stage, the LEED team devises and implements policies, upgrades measures and procedures, and checks the tracking methodologies and measurement and verification routines that will allow a property to meet the rating system requirements. Identifying the proper staff for each task and establishing the expectations and a clear timeline are crucial prior to beginning your performance period. Properly preparing for the performance period will help in the preparation of the submittal documentation, in stage 4.
3. **Performance period.** As defined in the USGBC reference guide, the performance period can be as short as three months and as long as 24 months. Obviously, the shorter the performance period, the less overall time the certification process will take. During the performance period, the team will be measuring the building’s compliance with the policies and procedures established during stage 2, as well as recording energy and water consumption.
4. **Application submission.** Following the completion of all credit performance periods (which must end within’ 30 days of one-another) it should be expected that completing and checking all LEED Online submittal documentation will take approximately 3 to 4 weeks, taking into account that GBCI must receive the application within’ 60 days of the end of the final performance period. All data from tracking mechanisms established to support prerequisite and credit requirements must be accumulated, checked, and entered into LEED Online. Details of purchases for items such as lamps, cleaning chemicals, restroom supplies as well as water and energy consumption information during the Performance Period are often not available until sometime after you have completed Stage 3. This common delay in billing or data availability accounts for some of the time required to complete Stage 4. A thorough check of all materials entered and uploaded into LEED Online should be completed during Stage 4 to ensure that all information is correct and to streamline the review process with the GBCI.
5. **Review and response.** GBCI allows for two rounds of review, an initial and a final review cycle. After the initial review, GBCI may request clarifications about items submitted through the online system; the applicant team has 30 days to respond. Supplying additional documentation as requested and preparing concise written responses to each question will smooth the process and improve the chances of certification. It is

Table 3. LEED Existing Buildings: O&M Certification Project Timeline

LEED Existing Buildings: O&M Certification Project Timeline											
Task Name	Jul '10	Aug '10	Sep '10	Oct '10	Nov '10	Dec '10	Jan '11	Feb '11	Mar '11	Apr '11	May '11
LEED-EB Certification Project Timeline	7/15   7/15										
Project Assessment											
Gap Analysis Assessment	7/15  8/14										
Decision to Proceed with Certification											
Initial Certification Kickoff Meeting	8/14   8/16										
Policy Implementation - Pre-Performance Period	8/16  10/15										
Performance Period	10/15  1/13										
Documentation Collection and Submittal Preparation	1/13  2/12										
Project Submission											
USGBC Primary Project Review	2/13  3/29										
Project Team Review and Response Submission to USGBC Primary Review	3/29   4/8										
USGBC Final Project Review	4/8  5/8										
Receipt of LEED-EB Certification Award											

important to remember that since the reviewers will not come to a property, the more precise the submittal, the clearer the picture is for the reviewer.

Based on a three-month performance period, the timeline in Table 3, approximates a complete certification project from gap analysis through receipt of certification from GBCI.

### Cost

The costs associated with LEED for Existing Buildings: O&M certification have come down significantly over the past several years. The median cost was \$2.13 per square foot<sup>42</sup> in 2008 but in 2010 is \$0.24 per square foot.<sup>43</sup> This reduction is partially attributable to limited sample size of certification projects in 2008, when LEED for Existing Buildings: O&M was introduced. Additionally, the early adopters of LEED for Existing Buildings: O&M tended to pursue high levels of certification for their organizations. Many of these projects required significant retrofit and capital investment to reach those high performance levels, and consultants lacked experience with the new rating system. Although the cost decrease is dramatic, it is important to note that every building situation is unique; good planning and experience can help minimize costs.

LEED for Existing Buildings: O&M certifications are not typically capital intensive and the requirements are not meant to drive capital projects. The primary costs of LEED for Existing Buildings: O&M certification involve meeting specifications of the prerequisites, fees to USGBC, and if needed, third-party consultation fees.

Some elements of certification commonly require outside expertise, and potential applicants should assess whether existing staff can perform the tasks required by the following:

- EA Prerequisite 1, ASHRAE Level I Audit
- EA Credits 2.2–2.4, ASHRAE Level II Audit or Retrocommissioning
- EQ Prerequisite 1. Outdoor Airflow Measurement and Verification

The system was created to allow a property owner to meet the standards without incurring third-party or consultant fees. Nevertheless, many applicants commonly outsource the tasks and documentation associated with these prerequisites and credits, and use of external resources affects the budget for certification.

### Team

Gathering the right team is critical to the success of a LEED for Existing Buildings: O&M certification effort. A person with knowledge of the rating system—whether an in-house LEED Accredited Professional (AP) or an outside consultant—should lead the project. Not every member

### COST OF CERTIFICATION FOR LEED FOR EXISTING BUILDINGS: O&M

“Four years ago, LEED seemed too expensive. Now the costs, especially for commissioning, have come down” says Ron Coffey of Parkway properties, Inc.

During the certification process, Jacqueline Lovell-Harmon of AEW was surprised that the thorough building evaluation did not indicate the need for system retrofitting. Most of the effort during the certification process was in gathering information and tracking measurements. They did change some landscaping to more drought-resistant plants. They anticipate savings in water consumption and green cleaning.



of the team needs to be a LEED AP or have experience with the LEED rating system, but all must have a commitment to the project, understand their roles and responsibilities, and realize that it is a collaborative venture involving interconnected parts. Leveraging the depth of the team will ensure the project has a positive outcome.

Subcontractors and service provider partners are of vital importance to a LEED certification project. Their involvement, buy-in, understanding of their roles, and ability to perform will affect achievement of many credits. Most properties already have contracts with janitorial, pest control, landscaping, and other service providers. These vendors should be added to the certification project team early in the process so that they can play their role in meeting the standards, or if they cannot, the property manager has time to seek a vendor who can.

More and more vendors are accustomed to LEED policies, plans, and procedures and have LEED APs on staff, so it is important to engage such service provider partners in the process and draw on their expertise.

Other subcontractors may be brought in for the sole purpose of meeting LEED prerequisite and credit requirements. Frequently, these vendors work with a property to meet Energy &

Atmosphere Prerequisite 1 (ASHRAE Level I Audit), Energy & Atmosphere Credits 2.1–2.3 (Existing Building Commissioning: Analysis, Implementation, and Ongoing Commissioning), and Indoor Environmental Quality Prerequisite 1 (Outdoor Air Introduction and Exhaust Systems).

Contracting with professionals who are experienced in LEED and have successfully performed work on other LEED projects can be vital to meeting the LEED requirements and uncovering energy-saving (and cost-saving) measures. Equally important is writing a clear scope of work for the consultant and establishing a basis for truly comparative bids. An effective scope of work is essential to meet the demands of the project and ensure that the reports formulated by the third-party vendors are effective in improving energy efficiency.

## Summary

In order to successfully pursue LEED for Existing Buildings: O&M certification, proper preparation and visioning is critical before commencing. Without buy-in from all of the involved parties, the creation of a committed team, and proper financial planning, projects run the risk of falling short on their certification goals.

### CREATE A CORE TEAM

**LEED for Existing Buildings: O&M requires a group of diverse individuals within an organization to work on different aspects of the project. Most of the team members will be stakeholders in the process and either resistant to change or concerned that the retro-evaluations will reflect badly on them. Randi Pearson of CBRE recalled a project, where “some of the problems revealed reflected badly on the Chief Engineer. Overtime, however, he came to recognize the value of having another set of eyes looking over the operations and became a proponent.” Stephen Howard of CBRE states, “While the Chief Engineer has the most work in the LEED for Existing Buildings: O&M process, he or she also has a lot to gain.”**

## Owner's Financial Considerations

Cost recovery of certification efforts and other improvements is often considered a barrier to undertaking energy and sustainability projects. An owner may view efficiency upgrades during the term of an existing lease as benefiting only the tenants; tenants may believe the improvement benefits only the owner, since they have little long-term stake in the property. Both parties can't be right, can they?

The answer lies in understanding the real benefit for each party as well as common lease structures and the way in which the marketplace is adapting to address these complexities.

### Leases

#### Standard Lease Structures

Despite the variation in operating expenses throughout the country, three primary types of leases are found within the commercial real estate market. The specific content and allowances of each lease should be reviewed prior to undertaking any certification effort or implementing improvement projects.

**Gross lease.** This form of expense recovery places the risk of cost inflation and performance of maintenance solely upon the landlord. The rent is generally quoted containing the provision of all goods and services for the operation of the building.

**Modified gross lease.** In this shared expense pool, the landlord is responsible for the provision of all goods and services necessary for the operation of the building but is responsible for only a base amount of cost in the expense pool. The base expense pool may be stated as a fixed amount, or as an amount equal to the actual costs of a year and increases after the base year are borne by tenants. Modified gross leases are by far the most prevalent type in multitenant commercial office properties.

**Triple net lease.** This lease traditionally makes the care and control of the asset the responsibility of the tenant, but there may be a manager who owes a duty to the landlord. The cost of operations for the property is borne solely by the tenant. The term triple net comes from rental payments' being net of taxes, net of utilities, and net of operating costs.

The varying mechanisms for the recovery of property operating costs insulate the risk of cost increases from the rental rate to different degrees. In a triple net lease, the landlord has a more predictable stream of rental revenue into the future and consequently a higher level of certainty about the value of his property. Quite the opposite is true of gross lease structures, where the landlord may be forced to absorb cost increases that are well beyond her ability to control, such as property taxes. In gross leases, the cost of the improvement and the benefit in reduced operating costs both rest with the landlord.

This perceived misalignment of the risk of cost increases and the cost of improvements has hampered many efficiency projects. The perception is that the cost of an improvement project is not an operating expense, yet the operating cost reduction may benefit only the tenant if the expense pool is beyond the base costs. Many operating expense clauses, however, contain language that allows owners to amortize the capital costs of improvements that result in a reduction of operating costs. Managers should consider the impacts on building value when calculating the benefit of efficiency improvements.

A property owner's return may also come in the form of asset value. Value is a function of net operating income (rent less expenses, where the rent is primarily a function of market forces). Although there may be resistance to an investment that lowers the expense pass-through of the current tenants, landlords will benefit from efficiency improvements through increased net rent on lease renewals and new leases. By lowering operating costs and resetting base operating expenses under modified gross



leases, the landlord increases the net income on new leases or renewals, since rental rates are largely determined by market forces. Since building value is a function of net operating income, the increase in a building's value can be demonstrated through modeling the future cash flows, taking into account the effect of lease renewals and retenanting.

### Modifying Existing Leases

Working within the confines of existing lease representations and obligations can be challenging. It is important to review each lease and understand the implications of the operating expense clause, building rules, specified services, and rollover terms. In many cases little or no capital may be required when pursuing LEED for Existing Buildings: O&M. If investment in systems is needed, the manager must thoroughly understand these variables.

If both the tenants and the owner are committed to pursuing sustainability, the operating expense clause can be altered to provide for amortization of cost saving improvements. The outcomes from greening buildings benefit the occupants through the quality of the work environment. The shared commitment from the landlord and tenants may allow a manager to find creative ways to introduce conservation measures.

In some cases a project can entice a tenant to renew early; in others it may be necessary to consider phasing in retrofits or financing the improvements through vehicles that do not require direct

## SECTION 2.2

investment by either the landlord or the tenants, such as property-assessed clean energy (PACE) financing or performance contracting.

Managers who intend to implement change within the building may need to ensure that they are within the rights of the landlord. Most modified gross leases contain building rules governing the behavior and use by tenants and specified services that the landlord is under obligation to deliver. If one green measure is to offer air-conditioning on demand for Saturday hours rather than on a set schedule, but the leases specify the hours of service, input from the tenants will be required. Understanding their motivations and tailoring the message will be critical to gaining buy-in for even small changes.

**Existing lease language need not deter managers from improving a building's operations. Much can be done within the scope with little cost impact and disruption to the building occupants. Many tenants today recognize that sustainable operations are good for their employees and will help control costs under their leases.**

### Green Leases

Increasingly common, “green leases” provide both the landlord and the tenant with a framework to address the misalignment challenge. The market continues to define clauses under green leases, and standards continue to emerge.

#### Elements of green leases may include the following:

- Building rules and standards that support low and no cost efforts as well as environmentally friendly use and occupancy;
- Guidelines for leaseholder improvements;
- Operating cost provisions that allow for the amortization of improvements that reduce operating expenses; and
- Separate metering for tenants' utilities.

USGBC published the *Green Office Guide: Integrating LEED into Your Leasing Process* to detail other elements of green leases and strategies to support alignment of tenant and landlord interests. The *Green Office Guide* is available for purchase at [www.usgbc.org/publications](http://www.usgbc.org/publications).

Despite their promise, green leases have given rise to concern about their use in the marketplace. If specified in a lease, the maintenance of LEED certification for a property could become problematic as occupancy changes affect the building. Will a landlord have liability to Tenant 1 under a green lease when Tenant 2, a heavy user of energy, moves in and the building's ENERGY STAR score falls, precluding recertification? Even if the landlord installs submetering, so that Tenant 2 pays for the additional usage and does not affect the operating costs for Tenant 1, the certification that may have been a selection criterion for Tenant 1 may be difficult to keep. To date, there have been no such reported instances, but in any emerging marketplace unanticipated outcomes are possible.

Landlords would be wise to ensure that the lease gives them the tools to achieve certification but avoid representations of certification. Litigation has occurred in the new construction field when contractors and architects have ended up at odds with developers for failing to achieve a certain level of performance or certification at the end of a project.

## Capital Planning

The process of greening building operations is not so much a discrete project as a new way of managing properties. Tracking metrics allow the manager to continually find new opportunities to enhance a property's performance. Some initiatives may be simple procedural changes; others may require extensive retrofitting or the replacement of antiquated equipment and systems.

**In 2007 a distribution center tenant sought to reduce their facilities operating costs. After optimizing their equipment, they approached their landlord about replacing the lighting and mechanical system throughout the building. The landlord did not have a direct motivation with the tenant responsible for energy costs, yet the tenant saw a 23 month pay-back on the project. In the end the tenant spent their own money to install new energy efficient lighting, the landlord contributed \$10,000 and the lease was extended for two more years.**

For building managers, it is important to understand the goals of a property owner when assessing the options and setting priorities. Operational deficiencies should be addressed first, since many performance goals can be met using procedural changes and efficient property operations. Any proposed capital projects must align with the owner's objectives. There are always multiple ways to make improvements, and understanding the goals and constraints of the owner is critical. One rationale for implementing upgrades is that helping tenants lower their occupancy costs can lead to lease extensions, and should

the tenants not renew when leases expire, the owner benefits from a property that can be marketed with lower documented occupancy costs.

Simply put, capital investments are those projects that are not related to daily operations, but every firm has its own guidelines on what to capitalize. As a manager, one should review guidelines for capitalization of expenses with the owner. Even some projects that may be budget neutral and return savings in excess of their costs within the budget year may require capitalization. Proper long-term capital expense planning, in which upgrade costs are budgeted over time, can help reduce large upfront expenditures.

### Capital planning approaches for property managers:

- Establish a long-term plan, looking ahead at least five years, to balance the immediate opportunities available from operational changes and the potential for capital projects.
- List potential actions in preparation for new opportunities, such as incentive programs from the utility company, changes in energy cost or leasing activity.
- Align performance-improving projects with maintenance activities, such as timing the installation of panels for on-site generation of energy from photovoltaics to coincide with a planned roof replacement. Plans can take many forms, but typically they will look forward at least the next five years to align with property maintenance and anticipated leasing activities.

Another way to integrate sustainability projects is through ongoing building activities. Instead of implementing new controls throughout the building, a manager could retrofit spaces incrementally, as the tenant renews or the space is retented. This not only reduces the first cost for the building owner but also allows for adopting new technology as advances come to market. The treatment of capital dollars may be more advantageous for tenant fit-out than for a single large-scale upgrade.

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### Financial Decision-Making Tools

Managers are often challenged by owners to justify the necessity of efficiency projects. There are several ways of modeling benefits, and managers need to apply the most appropriate model, based on the owner's requirements and business practices. Some approaches are simple concepts; others may provide

strategies for blending multiple projects together as part of an overall greening strategy.

**ENERGY STAR's building upgrade value calculator, available for free at [http://www.energystar.gov/index.cfm?c=comm\\_real\\_estate.building\\_upgrade\\_value\\_calculator](http://www.energystar.gov/index.cfm?c=comm_real_estate.building_upgrade_value_calculator), can assist in performing this analysis.**

#### Simple Payback

The most basic way of expressing the cost versus financial return of a project is simple payback. Simple payback is calculated by dividing the cost of the project by the estimated annual savings. It is then expressed as a period, such as 1.5-year payback or an 18-month payback. This is a quick calculation, effective for comparison purposes, but it does not account for the cost of capital. Projects with under a one-year payback are sometimes referred to as budget neutral, meaning that the cost of the project can be recouped within the budget year. Often, property owners offer a target threshold for consideration of projects, such as a two- or three-year payback. Managers must be able to design their improvement projects to come in under the threshold.

#### Internal Rate of Return (IRR)

IRR is a financial calculation that evaluates the profitability of the use of capital. It is expressed as an interest rate and often compared on that basis as well. If an owner can achieve a 10% return on his money through other investments but 12% on an improvement project, it is advantageous for him to invest in the property upgrade. IRR is always expressed over a defined period, typically the useful life of the improvement or the remaining holding period of the investment.

**Example:** A proposed relamping project will cost \$100,000 to complete but is calculated to save \$32,000 in annual energy costs for the lighting system, \$2,000 in annual energy costs by reducing the cooling load, and another \$1,000 in annual maintenance costs. The expected life of the proposed lamps is 20,000 hours, and the building operates 80 hours per week. Thus the lamps have an expected life of 4.8 years.

The simple payback of the proposed project is calculated by dividing \$100,000 by \$35,000, for 2.86 years. Calculating the IRR requires determining the expected interest rate where the capital cost is factored against the future cash flows.

Table 4. Simple Payback

Project Investment	Year 1 Savings	Year 2 Savings	Year 3 Savings	Year 4 Savings	Year 5 Savings*
\$(100,000.00)	\$35,000.00	\$35,000.00	\$35,000.00	\$35,000.00	\$28,269.22
*note that the year 5 savings represents a partial year based upon the useful life					
	Internal Rate of Return		20.91%		
	Internal Rate of Return		=IRR(A\$2:F\$2)		
	Simple Payback		2.86		
	Simple Payback		=A2/B2		



In this example, the rate of return on the lighting project is 20.91%. If the owner has an IRR hurdle rate, or threshold, of 10%, presenting this project in terms of its 20.91% IRR would likely win approval.

### Life-Cycle Cost Analysis

Life-cycle cost analysis (LCCA), or total cost of ownership (TCO), is another tool for comparing alternatives, such as two new installations or rehabilitation versus replacement of existing equipment. LCCA, which is different from life-cycle assessment (LCA) seeks to take into account every variable that may affect the calculation. In its simplest terms, it attempts to quantify the total cost of a project over its useful life. The lighting retrofit example, above, showed a 20.91% return but didn't account for inflation or any changes in energy pricing. Now consider a proposal for a lighting retrofit with lamps that will last 100,000 hours and deliver annual energy savings of \$42,000. This new technology costs more, however; the initial investment is now \$500,000. Since the useful life of the technologies is different, a manager must make additional assumptions to produce financial models and also expect to replace the lamps in years 9, 14, and 19. Even though the second technology saves more in energy costs, the rate of return is far lower than in the first example. Further complicating the analysis are the labor costs involved in replacing the lamps in year 5 versus year 9, and the disposal costs.

Table 5. Life-Cycle Cost Analysis

Scenario 1	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
Annual Savings	\$35,000.00	\$35,000.00	\$35,000.00	\$35,000.00	\$35,000.00	\$35,000.00	\$35,000.00	\$35,000.00	\$35,000.00
Project Costs	\$(100,000.00)				\$(100,000.00)				\$(100,000.00)
Cumulative Cashflow	\$(65,000.00)	\$35,000.00	\$35,000.00	\$35,000.00	\$(65,000.00)	\$35,000.00	\$35,000.00	\$35,000.00	\$(65,000.00)
Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19
\$35,000.00	\$35,000.00	\$35,000.00	\$35,000.00	\$35,000.00	\$35,000.00	\$35,000.00	\$35,000.00	\$35,000.00	\$35,000.00
				\$(100,000.00)					\$(100,000.00)
\$35,000.00	\$35,000.00	\$35,000.00	\$35,000.00	\$(65,000.00)	\$35,000.00	\$35,000.00	\$35,000.00	\$35,000.00	\$(65,000.00)
								Internal Rate of Return	29.42%
								Simple Payback	2.86

Scenario 2	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
Annual Savings	\$42,000.00	\$42,000.00	\$42,000.00	\$42,000.00	\$42,000.00	\$42,000.00	\$42,000.00	\$42,000.00	\$42,000.00
Project Costs	\$(500,000.00)								
Cumulative Cashflow	\$(458,000.00)	\$42,000.00	\$42,000.00	\$42,000.00	\$42,000.00	\$42,000.00	\$42,000.00	\$42,000.00	\$42,000.00
Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19
\$42,000.00	\$42,000.00	\$42,000.00	\$42,000.00	\$42,000.00	\$42,000.00	\$42,000.00	\$42,000.00	\$42,000.00	\$42,000.00
\$42,000.00	\$42,000.00	\$42,000.00	\$42,000.00	\$42,000.00	\$42,000.00	\$42,000.00	\$42,000.00	\$42,000.00	\$42,000.00
								Internal Rate of Return	5.91%
								Simple Payback	11.90

Life-cycle costing is often the best means to compare efficiency projects, but even if the total calculations make a convincing case for a project, an owner may not spend dollars that don't deliver a payback during her expected ownership period. The simple payback of the second lighting retrofit example was 11.9 years, and the IRR worked out 5.91%—hardly numbers that would meet most investors' requirements. The initial cost of this upgrade would be a big hurdle.

For more information on LCCA, refer to the following references:

ASHRAE: [www.ashrae.org/lifecycle](http://www.ashrae.org/lifecycle)

NIST Office of Applied Economics: [www.bfrl.nist.gov/oea/oea.html](http://www.bfrl.nist.gov/oea/oea.html)

ACTIVE ASTM STANDARD: E2204-05 Standard Guide for Summarizing the Economic Impacts of Building-Related Projects <http://www.astm.org/Standards/E2204.htm>

ACTIVE ASTM STANDARD: E917-05 Standard Practice for Measuring Life-Cycle Costs of Buildings and Building Systems <http://www.astm.org/Standards/E917.htm>

National Institute of Building Sciences, Whole Building Design Guide <http://www.wbdg.org/resources/lcca.php>

## Obtaining Capital

### Strategies in Single-Tenant Buildings

Managers of single-user facilities often face special challenges. If the firm requires significant capital to launch products or services, managers are often in fierce competition for its resources to fund building and system improvements. Those who are the most successful can translate occupancy costs to a unit of firm output. Typically, a facility manager may think of his energy costs in a per square foot measure or even a per person measure, but if he can equate that same cost to the measure of firm output, the decision to deploy capital for leadership becomes much clearer. For a manufacturer, energy savings can be expressed as a reduction in total cost per piece. For a retailer, a facility manager might demonstrate the payback in terms of the cost of goods sold. For a publicly traded company, the project's payback might be translated into earnings per share.

Understanding how the decision makers think and articulating the value of the project in terms that are meaningful to them is crucial. The return on building efficiency projects is often much quicker than many other production-related expenditures; in fact efficiency projects drop dollars straight to the bottom line of a corporation.

### Performance Contracting

When capital is difficult to obtain to fund improvement projects, consider alternative financing structures. In 2009, the Building Owners and Managers Association introduced the BOMA Energy Performance Contracting (BEPC) Model<sup>44</sup> to provide an industry standard for the performance contract model. USGBC has also created the Paid from Savings Guide to Green Existing Buildings which was developed with the support of the Energy Services Coalition to provide owners, facility managers, and ESCOs with detailed information on how to undertake a comprehensive green retrofit without restrictive up-front costs. Performance contracting allows a third party to recover the capital invested in a building through the savings the project produces. This third party is often the contractor for a project, but in another kind of performance contracting, a utility company



funds energy improvements through its utility bills, essentially allowing the firm to pay at the preimprovement consumption levels until the cost of the improvement and associated carrying costs are returned. Traditional contractors may offer performance contracting based upon a long-term contract. For commercial property investors the encumbrances that this places on a property have typically been a barrier to adoption. Additionally, the cost of the capital provided by the contracting firm is typically above the cost that a commercial property owner may be able to obtain funds for.

USGBC has published the *Paid From Savings Guide to Green Existing Buildings* as a guide to the performance contracting process. The *Paid From Savings* guide is available for purchase from [www.usgbc.org/publications](http://www.usgbc.org/publications).

### Energy Service Companies (ESCO)

An ESCO is a business that develops, installs, and arranges financing for projects designed to improve the energy efficiency and maintenance costs for facilities over five to 20 years. ESCOs generally act as project developers for a wide range of tasks and assume the technical and performance risk associated with the project.<sup>45</sup> Additionally, ESCOs serve as agents of programs from utilities. Since utilities are not equipped to provide project-level support and verification, an ESCO fills this role with the capital coming through the utility dollars. ESCOs are a form of performance-based contracting and use lower-cost capital made available through demand-side management by utility companies.

### Property-Assessed Clean Energy (PACE)

PACE is a form of project financing that gained significant traction in 2009 through federal bond guarantees contained in the American Recovery and Reinvestment Act. It allows a property owner to finance the cost of energy improvements through a lien supported by property taxes. Since the obligation to repay the cost of the improvements belongs to the property, not the investor or owner in the event of a sale, the repayment obligation passes with the title to the property. The program works with a savings-to-investment ratio greater than one, meaning that the utility expense savings must exceed the monthly cost of principal and interest to repay the improvement.

## Implementation Strategies

Given capital limitations, not every improvement or efficiency project can be undertaken at once. There are two main strategies to consider.

### Staggering Investments

A property manager can use the savings generated from the initial projects to help fund the remaining items. Return to the first example of a lighting retrofit: Once completed, the project will generate \$35,000 a year in savings—cash flow that can be deployed for the next project. Taking this approach minimizes the capital required from the property owner and funds the remaining projects that the building requires. Staggering investments requires careful planning over several years. This approach is especially useful when an owner has very limited capital.

## SECTION 2.2

### **Blending Investments and Packaging**

Another way to fund multiple projects is to look at blending projects with lower simple paybacks with those that may be beyond the typical threshold. As in the previous approach, a building manager may need to prioritize the projects to be funded, selecting projects that will have deeper savings over longer payback periods. The investment calculator available from ENERGY STAR accommodates multiple projects for analyses of this type.

### **Summary**

The financial bottom line of any building project will almost always be the primary driver for an owner's decision to pursue LEED certification, whether the financial benefits are direct or indirect. In order to maximize return on investment in sustainability, it is of the utmost importance to fully understand the multiple financial vehicles that are available. Proper financial planning at the onset of a project can pave the way for years of increased returns that are well beyond whatever costs may have been associated with certification.

## Communicating with Stakeholders

Owners and managers of multitenant buildings may find it difficult to proceed with efficiency improvements unless they gain buy-in and engagement from the occupants and their employers. Engaging the occupants has a direct relationship to the success of the efforts. Managers who plan on pursuing LEED certification will need to gather feedback from the building occupants at several stages.

Surveys consistently suggest that people want a sense of community. As our lives become increasingly busy, the workplace becomes the one location that we spend predictable time. Research conducted by Wesley Schultz, of the California State University–San Marcos, demonstrates that people will modify their behavior to comply with a perceived social norm. A building manager can use these sociological observations to improve the behaviors of occupants and promote conservation as the norm of the building.

In a study that Schultz performed on residential utility customers, households were provided weekly information concerning their energy usage. Each household was also given information about the average consumption level for comparable houses. Over time, the high energy users curtailed their consumption to move toward the average, and some of the below-average users increased their consumption. Schultz then added positive and negative indicators to the weekly reports, a smiling face or a frowning face. This simple change caused the excessive users to make further reductions in their consumption, and those who had begun to increase usage corrected their behaviors.<sup>46</sup> This study provides us with insight into the effect of simple and consistent communication on human behavior.

The need to communicate plans and progress cannot be understated, and those communications will need to target different groups within the building.

Typically there are three groups to consider:

- Building occupants, who need to be encouraged to turn off lights, increase their recycling, reduce their waste generation, and modify their commuting preferences;
- Office managers, who set policy within the suites and act as a communication bridge to the general occupants; and
- Lease holders, who have made the decision to locate in the building but may not actually occupy space at the property.

Each of these groups is likely to focus on certain elements of greening the property. The building occupants, for example, may appreciate the sense of community and pride in accomplishment when energy consumption is reduced. The lease holder may focus on controlling operating cost increases and reducing absenteeism. Each message should highlight the points that will appeal to its audience.

## SECTION 2.3

Before beginning any new program or campaign, advance communication with office managers is vital. They can become the champions of conservation within their organizations, a conduit for feedback, and a source of ideas for future programs. A facility manager should meet with them to introduce LEED certification and the strategy for greening the property. The effort may lead to a stronger partnership with the tenants.

Regular and frequent communication will be needed throughout the process. The communication plan should identify the avenues and frequency of engagement. It should explain any projects that may affect the work patterns of the occupants and alert them to any special events, such as e-waste recycling days. Use every opportunity to reinforce the commitment to sustainable practices.

Some of the most common tenant communication channels include the following:

- Tenant newsletters;
- Tenant meetings;
- Lobby posters;
- Flyers in garage access points, restrooms or elevators;
- Information boards in mailrooms;
- Property websites or on-line maintenance request systems; and
- Letters to stakeholders.

The last channel, letters to stakeholders, is one of the most important, and the owner—the investor—is the most important stakeholder. This decision maker should hear about the new programs and upgrades in quarterly or other periodic executive briefings.

Reporting energy consumption, waste diversion, and water consumption trends allows tenants to see the continued progress in building performance. Often this may be as simple as a scorecard, but the numbers can also be translated into tangible outcomes, such as number of trees saved, vehicle miles avoided, or homes powered. See, for example, the U.S. Environmental Protection Agency (EPA) Web site on paper recycling, <http://www.epa.gov/osw/conservation/materials/paper/basics/index.htm>. Whatever the choice of metrics, sustained messaging is important.

### Engagement through Special Events

Special events at a building provide a great way to involve the occupants in a greening program and are a critical component for successful LEED certification. Many are inexpensive to set up, and even those that are tangential to building performance can provide opportunities to communicate with occupants about greening the property.

Here are some common low- or no-cost event ideas:

- Recycling or reuse events. Hold an e-waste collection day or a office supply reuse swap (discussed later in this guide).
- Bike to Work Day (third Friday of May). This event promotes the use of bicycles as a commuting option.
- Change the World, Start with ENERGY STAR pledge drive. This contest to promote energy conservation, hosted by ENERGY STAR, runs annually through Earth Day of each year. More information at <http://www.energystar.gov/index.cfm?fuseaction=globalwarming.showPledgeHome>.
- Earth Hour. Organized by the World Wildlife Fund, this global event asks people to turn off their lights for one hour on the last Saturday of March each year. More information is available at [www.earthhour.org](http://www.earthhour.org).
- Arbor Day. Another global event, Arbor Day encourages people to plant trees. In the United States, it takes place the fourth Friday in April.
- Earth Day. Celebrated on April 22 Earth Day raises awareness about the environment. More information is available at <http://www.earthdaanet/>

Such opportunities can be built upon to raise awareness of the building's greening program, encourage feedback on changes, and solicit ideas. Managers who are pursuing LEED will need to survey the tenants to learn about their comfort levels and commuting habits. These opportunities can serve as program milestones and facilitate implementation of necessary modifications. Describing the efforts in terms of metrics important to the occupants—saving money, improving indoor air quality and comfort, benefiting the building community, helping the overall environment—keeps the greening projects relevant.

## Summary

Engaging building occupants is a critical step for building owners and managers focused on sustainability. In order to properly align the interests of all parties involved, it is important to establish proper communication so as to make tenants feel like they are part of the process. This is especially important, and sometimes challenging, when pursuing LEED EB: O&M certification of multi-tenant buildings.

# SECTION 3 INCORPORATING GREEN INTO OPERATIONS

Now that we have laid a framework for greening your commercial property management, we will now discuss areas of opportunity that should be addressed to improve the environmental performance of your property. Remember to utilize the process outlined in section two:

- Baseline your Operations
- Implement Change
- Measure and Verify

In the following sections, credits most applicable to certain strategies will be highlighted. Please reference the following LEED for Existing Buildings: O&M checklist below for additional information. Consult the Green Building Operations and Maintenance reference guide for in depth information pertaining to each credit or prerequisite.

LEED for Existing Buildings: Operations & Maintenance 2009										Possible Points 110
Yes	?	No	Sustainable Sites	Possible Points	26					
			Credit 1 LEED Certified Design and Construction	4						
			Credit 2 Building Exterior and Landscape Management Plan	1						
			Credit 3 Integrated Pest Mgmt, Erosion Control, and Landscape Management Plan	1						
			Credit 4 Alternative Commuting Transportation	3 to 15						
			Reduce by 10%	3						
			Reduce by 13.75%	4						
			Reduce by 17.5%	5						
			Reduce by 21.25%	6						
			Reduce by 25%	7						
			Reduce by 31.25%	8						
			Reduce by 37.5%	9						
			Reduce by 43.75%	10						
			Reduce by 50%	11						
			Reduce by 56.25%	12						
			Reduce by 62.5%	13						
			Reduce by 68.75%	14						
			Reduce by 75%	15						
			Credit 5 Site Development—Protect or Restore Open Habitat	1						
			Credit 6 Stormwater Quantity Control	1						
			Credit 7.1 Heat Island Reduction—Nonroof	1						
			Credit 7.2 Heat Island Reduction—Roof	1						
			Credit 8 Light Pollution Reduction	1						
Yes	?	No	Water Efficiency	Possible Points	14					
			Prereq 1 Minimum Indoor Plumbing Fixture and Fitting Efficiency	1 to 2						
			Credit 1 Water Performance Measurement	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						
			Nonpotable Water Source Use	2						
Yes	?	No	Energy & Atmosphere	Possible Points	35					
			Prereq 1 Energy Efficiency Best Management Practices	1 to 18						
			Prereq 2 Minimum Energy Efficiency Performance	2						
			Prereq 3 Fundamental Refrigerant Management	3						
			Credit 1 Optimize Energy Efficiency Performance	4						
			ENERGY STAR Rating of 71 or 21st Percentile Above National Median	2						
			ENERGY STAR Rating of 73 or 23rd Percentile Above National Median	3						
			ENERGY STAR Rating of 74 or 24th Percentile Above National Median	4						
			ENERGY STAR Rating of 75 or 25th Percentile Above National Median	5						
			ENERGY STAR Rating of 76 or 26th Percentile Above National Median	6						
			ENERGY STAR Rating of 77 or 27th Percentile Above National Median	7						
			ENERGY STAR Rating of 78 or 28th Percentile Above National Median	8						
			ENERGY STAR Rating of 79 or 29th Percentile Above National Median	9						
			ENERGY STAR Rating of 80 or 30th Percentile Above National Median	10						
			ENERGY STAR Rating of 81 or 31st Percentile Above National Median	11						
			ENERGY STAR Rating of 82 or 32nd Percentile Above National Median	12						
			ENERGY STAR Rating of 83 or 33rd Percentile Above National Median	13						
			ENERGY STAR Rating of 84 or 34th Percentile Above National Median	14						
			ENERGY STAR Rating of 85 or 35th Percentile Above National Median	15						
			ENERGY STAR Rating of 86 or 36th Percentile Above National Median	16						
			ENERGY STAR Rating of 87 or 37th Percentile Above National Median	17						
			ENERGY STAR Rating of 88 or 38th Percentile Above National Median	18						
			ENERGY STAR Rating of 89 or 39th Percentile Above National Median	19						
			ENERGY STAR Rating of 90 or 40th Percentile Above National Median	20						
			ENERGY STAR Rating of 91 or 41st Percentile Above National Median	21						
			ENERGY STAR Rating of 92 or 42nd Percentile Above National Median	22						
			ENERGY STAR Rating of 93 or 43rd Percentile Above National Median	23						
			ENERGY STAR Rating of 94 or 44th Percentile Above National Median	24						
			ENERGY STAR Rating of 95 or 45th+ Percentile Above National Median	25						
			Credit 2.1 Existing Building Commissioning—Investigation and Analysis	2						
			Credit 2.2 Existing Building Commissioning—Implementation	2						
			Credit 2.3 Existing Building Commissioning—Ongoing Commissioning	2						
			Credit 3.1 Performance Measurement—Building Automation System	1						
			Credit 3.2 Performance Measurement—System-Level Metering	1 to 2						
			40% Metered	1						
			80% Metered	2						
			Credit 4 On-site and Off-site Renewable Energy	1 to 6						
			3% On-site or 25% Off-site Renewable Energy	1						
			4.5% On-site or 37.5% Off-site Renewable Energy	2						
			6% On-site or 50% Off-site Renewable Energy	3						
			7.5% On-site or 62.5% Off-site Renewable Energy	4						
			9% On-site or 75% Off-site Renewable Energy	5						
			12% On-site or 100% Off-site Renewable Energy	6						
			Credit 5 Enhanced Refrigerant Management	1						
			Credit 6 Emissions Reduction Reporting	1						
Yes	?	No	Materials & Resources	Possible Points	10					
			Prereq 1 Sustainable Purchasing Policy	1						
			Prereq 2 Solid Waste Management Policy	1						
			Credit 1 Sustainable Purchasing—Ongoing Consumables	1 to 2						
			40% of Electric	1						
			40% of Furniture	1						
			Credit 3 Sustainable Purchasing—Facility Alterations and Additions	1						
			Credit 4 Sustainable Purchasing—Reduced Mercury in Lamps	1						
			Credit 5 Sustainable Purchasing—Food	1						
			Credit 6 Solid Waste Management—Waste Stream Audit	1						
			Credit 7 Solid Waste Management—Ongoing Consumables	1						
			Credit 8 Solid Waste Management—Durable Goods	1						
			Credit 9 Solid Waste Management—Facility Alterations and Additions	1						
Yes	?	No	Indoor Environmental Quality	Possible Points	15					
			Prereq 1 Minimum Indoor Air Quality Performance	1						
			Prereq 2 Environmental Tobacco Smoke (ETS) Control	1						
			Prereq 3 Green Cleaning Policy	1						
			Credit 1.1 Indoor Air Quality Best Management Practices—Indoor Air Quality Management Program	1						
			Credit 1.2 Indoor Air Quality Best Management Practices—Outdoor Air Delivery Monitoring	1						
			Credit 1.3 Indoor Air Quality Best Management Practices—Increased Ventilation	1						
			Credit 1.4 Indoor Air Quality Best Management Practices—Reduce Particulates in Air Distribution	1						
			Credit 1.5 Indoor Air Quality Best Management Practices—Facility Alterations and Additions	1						
			Credit 2.1 Occupant Comfort—Occupant Survey	1						
			Credit 2.2 Controllability of Systems—Lighting	1						
			Credit 2.3 Occupant Comfort—Thermal Comfort Monitoring	1						
			Credit 2.4 Daylight and Views	1						
			Credit 3.1 Green Cleaning—High Performance Cleaning Program	1						
			Credit 3.2 Green Cleaning—Custodial Effectiveness Assessment	1						
			Credit 3.3 Green Cleaning—Purchase of Sustainable Cleaning Products and Materials	1						
			Credit 3.4 Green Cleaning—Sustainable Cleaning Equipment	1						
			Credit 3.5 Green Cleaning—Indoor Chemical and Pollutant Source Control	1						
			Credit 3.6 Green Cleaning—Indoor Integrated Pest Management	1						
Yes	?	No	Innovation in Operations	Possible Points	6					
			Credit 1.1 Innovation in Operations: Specific Title	1						
			Credit 1.2 Innovation in Operations: Specific Title	1						
			Credit 1.3 Innovation in Operations: Specific Title	1						
			Credit 1.4 Innovation in Operations: Specific Title	1						
			Credit 2 LEED Accredited Professional	1						
			Credit 3 Documenting Sustainable Building Cost Impacts	1						
Yes	?	No	Regional Priority Credits	Possible Points	4					
			Credit 1.1 Regional Priority: Specific Credit	1						
			Credit 1.2 Regional Priority: Specific Credit	1						
			Credit 1.3 Regional Priority: Specific Credit	1						
			Credit 1.4 Regional Priority: Specific Credit	1						
Project Total (Certification Estimates)										110
LEED for Existing Buildings: Operations & Maintenance 2009										
Certified 40–49 points										
Silver 50–59 points										
Gold 60–79 points										
Platinum 80–110 points										

## ENERGY

In greening property management operations, energy conservation is often the first area addressed. The benefits are obvious: Reduced consumption reduces costs, which reduces risk of future cost fluctuations. From an environmental viewpoint, reducing energy use has a direct effect on reducing the greenhouse gas emissions from commercial properties. Many approaches can be taken to increase efficiency; even steps that don't immediately seem obvious can have a large effect on energy consumption.

### Baseline

Establishing a baseline is critical to understanding current performance, but more importantly, it provides a measure to guide decision making and future performance. Begin by creating an inventory of energy-using equipment, then measure energy usage, either with the ENERGY STAR system (the most common approach in the United States) or through an energy audit.

### Equipment Inventory

A comprehensive inventory of equipment is essential to operating and maintaining physical plant equipment. Whether the building management staff uses a computerized maintenance management system, building automation system (BAS), or manual methods, the inventory should include the location, size, date of installation, asset tag or unique identifier, manufacturer, model number, serial number, and any other unique information. The inventory should be updated as equipment is installed or retired and also reviewed annually. Changes made to the equipment inventory should also prompt changes to the database of equipment for the preventive maintenance program.

### ENERGY STAR



EA Prerequisite 2  
EA Credit 1

The ENERGY STAR performance rating of a building is an accepted benchmark of energy efficiency. ENERGY STAR is a voluntary program operated by EPA and the U.S. Department of Energy, and although there are close ties between the ENERGY STAR Buildings program and LEED for Existing Buildings: O&M, they are distinct programs. Not all ENERGY STAR buildings qualify for LEED, and vice versa. In addition, ENERGY STAR's main focus is on energy and energy efficiency, while LEED focuses on all aspects of green building.

Although distinct, ENERGY STAR and LEED are complementary. LEED for Existing Buildings: O&M utilizes the ENERGY STAR benchmark score as a measure of building efficiency, allowing a property to earn points for superior energy performance. The better the energy performance score, the more points a building can earn under the LEED system. Under LEED for Existing Buildings: O&M, buildings must have a minimum ENERGY STAR score of 69 to meet the Energy and Atmosphere (EA) Prerequisite 2. Under EA Credit 2.1, up to an additional 18 points are available

for buildings achieving higher levels of efficiency, with incremental point accumulation for scores of 71 through 100. The system provides information on a building's energy intensity, as required by LEED for Existing Buildings: O&M.

An ENERGY STAR score is obtained by loading whole-building actual energy consumption data (and other operational characteristics) into a free online tool called Portfolio Manager, an energy tracking tool. Given the importance of properly measuring energy performance, proper setup and data input into Portfolio Manager are critical. EPA and other organizations provide resources and training in the use of Portfolio Manager.

Portfolio Manager normalizes the energy usage of a building for several factors, such as weather, building size, and operating hours, and it reports an energy performance score on a scale of 1 to 100. An ENERGY STAR score of 50 represents an average building. Buildings with a score of 75 or higher are in the top quartile of energy performance compared with similar buildings nationwide and are eligible for the ENERGY STAR label. For a building to receive a label, a professional engineer or registered architect must inspect the building and validate the data entered in Portfolio Manager. The ENERGY STAR label must be revalidated annually to ensure that the property continues to perform in the top quartile of energy efficiency.

Not all building types qualify for an ENERGY STAR performance rating. In these cases, Portfolio Manager reports an energy use intensity (EUI) for the building. Simply put, the EUI is the building's annual energy consumption divided by its gross square footage. The energy consumption of these buildings is then compared with the national average EUI for that building type. Both Energy Star ratings and the national average are derived from Commercial Buildings Energy Consumption Survey (CBECS) data, which is collected by the Department of Energy. The LEED for Green Buildings Operations & Maintenance Reference Guide details an alternative path for properties that are unable to qualify for an ENERGY STAR score. The alternative path is described in detail under the EA Credit 1 section of the LEED EB 2009 reference guide.

## Energy Audits



### EA Credit 2.1

An energy audit, another tool to baseline energy consumption, is an analysis of a building's energy use with an eye toward recognizing energy conservation measures that will not only improve a building's performance and save money but also enhance occupants' comfort. Such audits take various forms and can involve significantly different scopes of work. LEED for Existing Buildings: O&M uses the American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE) guidelines to identify the elements an energy audit must include

To learn more about EPA's ENERGY STAR buildings program and the Portfolio Manager tool, visit <http://www.energystar.gov/benchmark>. LEED Online provides a calculator for assisting property managers who must use the alternative paths to benchmark their properties energy use.



to meet the requirements for certain LEED credits. Although the ASHRAE guidelines are reasonably well defined, establishing a clear scope of work when soliciting proposals for energy audits will ensure that suppliers submit competitive and comparable bids.

## ASHRAE Level I audit



### EA Prerequisite 1

An ASHRAE Level I audit, commonly referred to as a walk-through assessment, focuses on readily identifiable major problem areas that can be addressed at low cost or no cost through property or operational improvements. In LEED, the ASHRAE Level I audit is a requirement (EA Prerequisite 1).

In an ASHRAE Level 1 audit assessment, the auditor must complete the following inspections and calculations:

- Determine the building's gross conditioned square footage and record the information on the building characteristics form. Classify the primary use of the building. Ensure that the standard definition of gross area is used.
- Assemble copies of all utility bills and summarize them for a period of at least one year, preferably three. Review the monthly bills for opportunities to reduce utility costs by taking advantage of different utility rate classes. Review the monthly patterns for irregularities.
- Complete an energy performance summary to develop the energy index and the cost index for each fuel or demand type and their combined total.
- Compare the energy use intensity and the cost index with those of buildings having similar characteristics. Comparison should also be made with publicly available energy indices of similar buildings available through CBECS (<http://www.eia.doe.gov/emeu/cbecs/>). In all cases, ensure that the comparison is made with current data, using consistent definitions of building use and floor area.
- Derive target energy, demand, and cost indices for a building with the same characteristics as the subject building. Several methods are available for this work.
- Compare the energy and cost savings if the building were to reach the target EUI. Using these values, determine whether further engineering analysis is warranted.
- Perform a walk-through survey of the facility to become familiar with its construction, equipment, operation, and maintenance.
- Review the property with the owner or appropriate representatives to learn about any special problems or needs. Determine whether any maintenance problems or practices may affect efficiency.
- Perform a space function analysis, guided by the forms in the walk-through data section of the ASHRAE guide. Determine whether efficiency may be affected by functions that differ from the original purpose of the building.
- Estimate the approximate breakdown of energy use for significant end-use categories, including weather- and nonweather-related uses.
- Identify low-cost and no-cost changes to the facility or to operating and maintenance procedures and determine the savings that will result from these changes. The savings should include those related to energy consumption, energy demand, and maintenance costs.
- Identify potential capital improvements for further study and provide an initial estimate of potential costs and savings.
- Quantify the savings potential from changing to a different utility price structure.

(continued on next page)

In an ASHRAE Level 1 audit assessment, the auditor must complete the following inspections and calculations (continued):

- Identify irregularities found in monthly energy use patterns and their possible causes.
- Identify the energy index for similar buildings. Report the source, size, and date of the samples used for comparison. The names of comparable buildings should be given, if known.
- Identify the method used to develop target indices. Where comparison is made to other buildings, name those buildings. Where experience of someone other than the author is used to develop the target, provide the source. Where the target is developed by calculation, show the calculation or quote the name and version of the software used and include both input and output data.
- Provide total energy and demand cost by fuel type for the latest year and preceding two years, if available. Show potential savings in dollars.
- Summarize any special problems or needs identified during the walkthrough survey, including possible revisions to operating and maintenance procedures.

### ASHRAE Level II audit



#### EA Credit 2.1

An ASHRAE Level II audit builds on the ASHRAE Level I scope; it is a much more detailed and comprehensive analysis that takes into consideration building systems and controls not addressed in a Level I assessment. It is used to analyze the building's current mechanical and electrical systems, examine operating and maintenance procedures, and list practical measures to reduce overall energy use.

The ASHRAE Level II audit is not required for LEED certification but can assist managers in identifying deficiencies and opportunities in existing buildings and developing more detailed payback scenarios for upgrades.

In an ASHRAE Level II assessment, the auditor performs the following activities:

- Review mechanical, electrical, and controls systems design, installed condition, maintenance practices, and operating methods.
- Review existing operating and maintenance problems. Determine planned building changes.
- Measure key operating parameters (for example, operating schedules, heating and cooling water temperature, supply air temperature, space temperature and humidity, ventilation quantities and task light levels) and compare them with design specifications.
- Break down the total energy use into end-use components, as illustrated in the ASHRAE handbook (section on energy analysis summary and recommendations).
- List all possible modifications to equipment and operations that would save energy. Make preliminary cost and savings estimates. Areas of analysis include lighting, HVAC systems, controls, building envelope, and all other energy-using systems in the subject property.
- Review the list of proposed modifications with the property owner or a designated representative and prioritize the modifications for order of implementation.
- For each measure, estimate the potential savings in energy cost and its energy index. To account for interaction among modifications, assume that modifications with the highest operational priority and/or best return on investment will be implemented first. Estimate the cost of each.

(continued on next page)

In an ASHRAE Level II assessment, the auditor performs the following activities (continued):

- Estimate the effect of each measure on building operations, maintenance costs, and nonenergy operating costs.
- Estimate the combined energy savings from implementing all measures and compare the result with the potential derived from the ASHRAE Level I analysis. Savings from each modification should be based on the assumption that all previous modifications have already been implemented, such that the total savings reflect all interactions and modifications.
- Evaluate the estimated total potential investment using a simple payback method and/or the property owner's preferred techniques and criteria.
- Evaluate chlorofluorocarbon (CFC) and refrigerant management issues and any interrelated energy savings opportunities.

**More information on the requirements and checklists for the ASHRAE audits is available from ASHRAE, at [www.ashrae.org](http://www.ashrae.org).**

## Implementation and Verification

A clear understanding of a building's energy use profile gives its operators a powerful tool when striving for energy efficiency. A property manager should meet with the team to review the ASHRAE Level II audit documentation or ENERGY STAR score and select measures for implementation or further analysis. The final report from this review should list any measures considered but found impractical, with brief reasons for their rejection.

For each energy efficiency measure deemed practical for implementation, provide the following:

- Discussion of the current situation and why it is using excess energy;
- Description of the proposed measure, including its expected effects on occupants' health, comfort, and safety;
- Description of any repairs that are required for a measure to be effective;
- Expected effects on services for occupants, such as ventilation for late occupancy or year-round cooling;
- Expected effects on operating procedures, maintenance procedures, and costs;
- Expected life of new equipment and any consequences for the life of existing equipment;
- List of any new skills required in operating staff and training related to implementation of new procedures and equipment;
- Estimated cost, savings, and financial performance indicator, with a note on the accuracy of the values;
- Proposed sequence of implementation, with the proviso that the savings may differ if a different implementation sequence is followed;
- Discussion of any differences between the projected savings from the Level II analysis and those derived from the Level I analysis;
- Recommended measurement and verification methods that will be required to determine actual effectiveness; and
- If the measure is capital intensive, discussion of whether an ASHRAE Level III analysis is warranted.

## SECTION 3.1

An ASHRAE audit is not the only way to develop a list of budget-neutral energy conservation measures: Onsite engineering and property staff may also be able to propose measures with limited up-front cost and almost immediate payback.

### No cost low cost checklist:

- Work with building occupants and the janitorial vendor to implement a program ensuring that all electrical systems that can be operated manually, including lighting for storage rooms and equipment room, are turned off at closing.
- Look for space heaters, open windows, covered diffusers, and personal fans as indicators of possible equipment operation or thermal comfort problems.
- Check thermostats for proper operation and settings of minimum and maximum ranges, settings, setbacks, and lockouts. Also randomly check thermostat calibration.
- Adjust unit or plant start times to stagger startup demand, and adjust stop times to reduce operating hours. Give consideration to hours of services stipulated in leases, outside weather conditions, and demand billing structure of the utility.
- Check water-heating systems' thermostat settings for proper temperature use and settings. Adjust hot water in bathrooms to 90 degrees if tempered water mixing valves are installed. Main water heaters should be set at 140 degrees.
- Install occupancy sensors, passive infrared lighting switches, or timers on individual offices, equipment, and storage rooms.
- Delamp where possible. The industry has tended to overdesign lighting, so light levels (measured in foot-candles) are often excessive.
- Inspect the building envelope (walls, ceilings, joints) to identify any air loss or infiltration to conditioned air space. Look for missing ceiling tiles, open joints, and cracked surfaces; access panels should be weather-tight.
- Ensure proper building pressurization to prevent outside air infiltration.
- Ensure that all doors are operating properly and adjust resting positions to avoid gaps for air leakage or entry.
- Check for weather-tight windows and doors in conditioned space areas.
- Shut off (or set back) water heaters and circulators during unoccupied times manually, by installing a time clock, or through the building management system.
- Confirm that all dead bands are correct, so that there is no simultaneous heating and cooling unless by design.
- Periodically check control strategies and schedules that are easily overridden or circumvented and return them to their normal operating mode.

### Ventilation



EA Credit 1



IEQ Prerequisite 1

Over time, a building's population, space layout, and floor configurations can change, and without monitoring and adjustment, it can take in either too much or not enough outside air to meet ventilation requirements. Most building managers, however, conduct air balancing only after facility alterations or additions. Mandating air balancing at the completion of every facility alteration is a best practice to ensure that the new space meets code. Main air intakes should also be evaluated on an annual basis. Annually confirming that fresh airflow, as measured in cubic feet per minute

(cfm), meets the operational requirements of the building can save energy and increase occupants' comfort.

Installing permanent airflow monitoring on all outside air intakes is one approach. Mechanically ventilated buildings with variable air volume (VAV) intake systems can adjust the amount of outside air based on ambient atmospheric conditions and building demands. Integrating airflow monitoring into the ventilation system can provide operators or the BAS with real-time data to minimize energy use while improving occupants' comfort under all operating scenarios.

Whether the airflow is tested by a test and balance technician or by airflow monitoring sensors through a building automation system, the readings should be compared with current ASHRAE 62.1 standards and the design flow rates of mechanical equipment.

## HVAC



EA Credit 1



IEQ Prerequisite 1  
IEQ Credit 1

The maintenance of heating, ventilation, and air-conditioning equipment has a direct bearing on energy use and the comfort of building occupants. Equipment that is not in the building inventory is likely not being maintained in accordance with the manufacturer's recommendations and is likely compromising the system design. Locating HVAC equipment for ease of maintenance can be challenging in occupied space. Employ a formal asset tagging system to allow technicians to find equipment placed above dropped ceilings. Incorporate functional testing and calibration as part of all HVAC system maintenance. Proper operation will improve system performance, save energy, and enhance occupants' comfort and safety.



Dampers and actuators for terminal air equipment such as VAV and fan-powered boxes should be regularly calibrated. Verify that space temperature sensors are reading accurately and communicating correct information to the BAS. For larger plant equipment, such as chillers and boilers, compare actual operating performance with design specifications. For chillers, this could mean calculating energy inputs to energy outputs, such as kilowatt hours per ton of cooling produced. Compare current operating data with historical data to identify patterns and opportunities to improve performance.

## Plumbing Pumps



EA Credit 1



WE Credit 1

To increase operational efficiency, consider adding speed controls, variable frequency drives, or “soft-start” modules to existing pump installations. Domestic pumps in high-rise buildings often run constantly even when there is no demand. Condenser water pumps may run at full speed during nights and weekends to support process equipment or data rooms with only a limited load. To reduce energy use and combat equipment overuse, evaluate pump run times and speeds for reduction opportunities. When purchasing new pumps, invest only in premium-efficiency motors with high power factor ratings. Before investing in new equipment, find out whether the utility company offers rebates for more efficient equipment.

## Lighting



EA Credit 1

A buildings lighting system is one of the areas where major efficiencies can be achieved through small changes in operation methods. Depending on the controllability of ones lighting system, the following strategies can offer a significant payback.

### Buildings with centralized lighting control:

- Regularly inspect and maintain system components, such as relays, contactors, and sensors.
- Review and adjust automated schedules to match actual operating patterns of tenants, seasonal daylight patterns, and the operating hours of the janitorial staff.
- Review system override requests and verify that the system returns to the regular schedule afterward. Construction projects can commonly require that a schedule be overridden; ensure lighting is turned off manually at night and weekends. When implementing lighting controls, make sure each suite or floor can be integrated into the building control system.
- Evaluate night and weekend operating schedules for opportunities to reduce operating times. For example, if a building is occupied on Saturdays, work with occupants to arrange for lighting and HVAC on demand versus automatically running entire systems.
- Consider daytime cleaning to reduce evening operating hours of the systems.
- Place exterior lighting on automatic controls and use astronomical clock settings when possible to minimize run time.

### Buildings without centralized lighting control:

- Mandate localized motion sensors in new facility alterations and all infrequently occupied areas, such as janitorial closets and mechanical rooms.
- Evaluate electrical circuiting patterns to determine the feasibility of adding lighting controls at a future date. Work with electrical contractors to preserve the segregation of lighting circuits for other loads.
- Investigate daylight harvesting technology and localized control systems in high-use areas where a centralized lighting control system may not be feasible.
- Work with both tenants and building operating staff to establish operating schedules that meet their needs and comply with the lease while reducing waste.
- Ensure that the janitorial vendor or security vendor turns off lights manually after hours.

## Occupancy Sensors



EA Credit 1



IEQ Credit 2.2

Occupancy sensors can be used to automatically turn lights on and off in offices, corridors, conference rooms, utility rooms, mechanical rooms, and restrooms. According to the EPA, occupancy controls reduce energy consumption 13% to 50% in private offices, 30% to 90% in restrooms, 22% to 65% in conference rooms, 30% to 80% in corridors and hallways, and 45% to 80% in storage areas. At a minimum, controls should be installed wherever occupancy in a space is intermittent or not predictable, such as in restrooms, conference rooms, storerooms, and stairwells.

There are two main types of occupancy sensor technologies, infrared and ultrasonic. Passive infrared sensors detect temperature changes in a room, and ultrasonic sensors use high-frequency sound to detect motion. Sensors that combine both technologies increase accuracy and flexibility in detecting occupancy. Advanced systems using self-adaptive technologies can collect and process data over a 24-hour period and subsequently adapt the lighting schedule, automatically adjusting the settings of each fixture in a zone.

Items to consider when choosing occupancy sensors include ceiling and cubicle height, interconnectivity with other building systems, motion type, number of controlled units, power supply, and fixture type—passive infrared, ultrasonic, dual or self-adaptive. Onsite engineering staff and other engineering service provider partners can help determine the most appropriate solutions.

## Heaters



EA Credit 1

Check water-heating systems' thermostat settings for proper temperature, depending on the application. Adjust hot water in bathrooms to 90 degrees if tempered water mixing valves are installed. Main water heaters should be set at 140 degrees. When domestic water-heating devices are replaced, consider the installation of on-demand water heating. These appliances have flow sensors that activate heating elements only when there is a demand for hot water, thus eliminating the energy consumption of heating water during unoccupied periods.

## Operating Hours



EA Credit 1

Map tenants' needs to see whether there are hours that can be eliminated from the schedule. Weekend cooling, for example, could be switched to an on-demand system. It may be possible to update lease provisions to include realistic standards for floor-level lighting schedules based on the occupant's actual needs. Prepare a formal building operating plan that defines the start-stop times of all major energy-using equipment and review the plan annually to keep it current.



## Maintenance Management



### EA Credit 1

Preventative maintenance avoids unexpected equipment failures and is preferable to time-based maintenance, which is expensive and labor intensive and often disrupts service, inconveniencing the occupants. As part of an on-going program, regularly evaluate the wear of components of operating equipment and maintain adequate replacement stocks onsite. For critical operating equipment, have a maintenance management system that ensures timely inspection.

Evaluate the effectiveness of existing preventive maintenance programs and vendor contracts. A preventive maintenance work order system should include firm deadlines to ensure that maintenance and inspections are delivered in the correct time frames. Spot-check completed work orders to evaluate vendors' and staff performance.

## Retrocommissioning



### EA Credit 2.2

Retrocommissioning ensures the proper functioning of equipment and systems and optimizes how they operate together in order to reduce energy waste and costs and improve building operation and comfort.

A retrocommissioning process typically has three or four phases, depending on whether the work is performed in-house or contracted to a commissioning agent.

1. **Planning.** Determine which building systems should be analyzed and assign responsibilities.
2. **Investigation.** Establish how the selected systems are supposed to operate, measure and monitor actual performance, and list the operating deficiencies and corrective measures.
3. **Implementation.** Correct the highest-priority operating deficiencies and verify proper operation.
4. **Hand-off** (from third-party commissioning contractor). The commissioning agent should report improvements made and instruct staff in how to maintain proper operation.

Retrocommissioning of older buildings can deliver numerous benefits:

- Identification of system operating, control, and maintenance problems;
- Assistance in long-term planning and major maintenance budgeting;
- A healthful, comfortable, and productive working environment for occupants;
- Reduction in energy waste and ensures that energy-using equipment operates efficiently;
- Energy cost savings that often pay back the investment in retro commissioning;
- Reduction of maintenance costs;
- Reduction in premature equipment failure;
- Complete and accurate building documentation;
- Training for operating staff; and
- Enhanced ability to serve customers and tenants.

Retrocommissioning is an asset management activity. **Undertaking the process can be the first step toward changing the old paradigm of operations and maintenance as the cost of doing business, to a new paradigm of operations and maintenance as part of sound asset management.** It is a way to reduce risk—loss of tenants, early equipment failure, indoor air quality problems, high utility bills. It is also a benchmarking technique: The documentation and testing completed during the commissioning process can be used to set the internal benchmarks for building operating performance, including indoor environmental quality. And finally, retrocommissioning is part of the energy management program, supporting the efficient operation of the energy-using equipment in the building. This is a low-cost method for obtaining savings without capital outlay—savings that can help offset the cost of other capital improvements.

### Equipment Replacement



EA Credit 1



MR Prerequisite 1

A building equipment inventory identifies the age of all capital equipment. It can also cover nonmechanical equipment, such as building facades and roofs, that require periodic maintenance or inspection. Resources to identify the expected life of building components include RS Means, Whitestone Research, and ASHRAE. Develop one-, five- and 10-year capital plans to replace major operating equipment. When replacing equipment, consider life-cycle costs, inclusive of energy and maintenance.

ASHRAE has an online database that considers the expected service life of many common types of equipment; it is available free at [http://xp20.ashrae.org/publicdatabase/service\\_life.asp](http://xp20.ashrae.org/publicdatabase/service_life.asp).

### Sequencing of Operations



EA Prerequisite 1

Develop and maintain a current Sequence of Operations document for all major energy-using equipment. Operation methods and modes may change over time, requiring that sequences be updated at least annually or whenever capital equipment is replaced. Train building operating staff on the sequence of operations of major equipment to improve inspection and maintenance programs and evaluate current sequences against potential changes for energy savings. For properties with BAS, work with the controls contractor to develop narrative forms of existing coded programs.

### Building Controls



EA Credit 3.1

Evaluate current control strategies against the building operating plan and sequence of operations on an annual basis. Check that software programs within the BAS match expected run times. Use BAS software to evaluate equipment performance over time using trend logs. For buildings with pneumatic systems, consider upgrades to direct digital controls to improve energy efficiency and occupants' comfort.

## SECTION 3.1

Consider adding speed controls, variable frequency drives, or “soft-start” modules to existing equipment installations. Integrate VFD/VSD (Variable Frequency Drives & Variable Speed Drives) inputs and outputs into control sequences within the BAS to provide operators with real-time and trended data on equipment performance.

### Daylighting



EA Credit 1



IEQ Credit 2.4

For centuries, architects and builders captured sunlight to make buildings more useful and habitable, but with the introduction of the electric light, daylight declined as a primary source of illumination. In recent years, daylighting has been reincorporated into occupied space based studies showing that the connection with the out-of-doors makes workers healthier, more content, and more productive.<sup>47</sup> Lighting controls can dim lights automatically in response to available daylight, thereby saving energy. Proper integration of the building’s lighting system and daylighting are necessary to reduce energy consumption.



### Day Cleaning



EA Credit 1



IEQ Prerequisite 3

The primary benefit of a day cleaning program is reducing energy and greenhouse gas emissions. A building that switches off all lights five or six hours earlier on a 255-day-per-year schedule can significantly reduce energy consumption and CO<sub>2</sub> emissions. This low-cost, no-cost operational

adjustment has other benefits as well. Day cleaning promotes communication and understanding between service staff and occupants, thereby reducing complaints while also improving security. It allows tenants to play an active role in managing occupancy costs and conserving energy, and once employees establish personal relationships with the janitorial staff who clean their space, they assume more responsibility for maintaining the tidiness of their work area: Employees are less likely to leave spills on the floor if their actions are no longer anonymous. Day cleaning creates more full-time day jobs, with higher wages and better working hours. Cleaners can spend more time with their families, without having to commute in the dark. Enhanced job satisfaction contributes significantly to lower staff turnover and increased productivity.

## WATER

The costs of extracting, buying, and using fossil fuels as well as concerns over fossil fuel dependency and depletion have focused attention on energy conservation. Conversely, relatively low water utility rates and perceived abundance have made water conservation and resource management seem less important. Although water consumption has been restricted in some areas of the United States because of dwindling supplies, by and large, water-saving technologies are less commonly employed. The potential for widespread drought and the continual expansion of the built environment, however, are making water efficiency a higher priority. Water-efficient technologies conserve both water and energy, generating benefits for both the environment and the bottom line.

Readily available and relatively inexpensive products—faucet aerators and sensors, low-flow showerheads, reduced-flush and composting toilets, high-efficiency and waterless urinals—can conserve potable water and reduce costs. Programs that combine the use of water-efficient technologies with long-term water resource planning, effective system operation and maintenance, and education programs will provide the greatest benefit.

**EPA's WaterSense program promotes water efficiency and seeks to enhance the market for efficient products and practices; products that bear the WaterSense label are certified to provide measurable water savings. See [www.epa.gov/watersense/index.html](http://www.epa.gov/watersense/index.html) for more information.**

### Baseline



#### WE Credit 1

Barriers to water conservation are several: inadequate information about how much water a facility uses, low water and sewer costs, lack of knowledge about the cost-effectiveness of water conservation projects, and misconceptions about the abundance of freshwater supplies. LEED for Existing Buildings: O&M recognizes the importance of measuring and monitoring water use in its Water Efficiency (WE) credit category. Tracking water consumption is critical for understanding usage patterns that can help a facility manager identify problem areas and develop effective strategies for conservation.

**An occupant and water fixture survey template is provided in the online tools portion of this guide. In addition, ENERGY STAR's Portfolio Manager provides capabilities for benchmarking and tracking water consumption.**

Reducing water consumption usually starts with installing limited submetering to track specific use patterns. All installed fixtures, with their flow and flush rates and date of installation, should be inventoried to establish a baseline, as described in the requirements for WE Prerequisite 1. Because of plumbing code changes enacted in 1993, the fixture installation date

directly affects the baseline calculation. Major renovations to restrooms, including replacement of porcelain fixtures and associated plumbing systems in 1993 or later, will also trigger a baseline calculation change.

Submetering allows food service operators to control consumption and costs. In the typical commercial kitchen, it makes sense to separately submeter dishwashing and sink use. Dishwashing in commercial, industrial, and institutional kitchens offers significant opportunities to save water. Many of the water-saving measures that can be used in these applications are the same as those used in residential applications. Past studies have shown that industrial kitchens can achieve water reductions of approximately 15% through process modifications alone.<sup>48</sup> Making consumption visible to significant users helps them modify their behaviors.

## Implementation and Verification

A building can reduce its consumption of water in many ways. Throughout the United States utilities have rebate programs for water efficiency. Before undertaking a water efficiency project, ask the local utility about any rebates or other incentives that include fixture retrofits or upgrades; rebates and incentives may not be available after products are installed. The programs may specify certain products or reward units of water conserved over a period of time.

Although the cost of water is still low and the payback periods for fixture replacements can be measured in years, water conservation projects can be a very cost-effective expenditure. Typically, a payback analysis considers only the cost of water, when in fact energy savings and reductions in sewage volume should be included as well. When all costs are included, the discounted payback period for water efficiency projects is significantly shorter.

**At Northpark Town Center, a 1.5 million square foot LEED EB Silver certified project in Atlanta, Georgia, management retrofitted water closets from a mixture of 3.5 and 4.5 gpf to 1.6 gpf and reduced their water consumption from over 13.6 million gallons annually to 6.2 million gallons a year, a savings of approximately 7.4 million gallons of potable water. The project had a simple payback of three years.**

Water-saving technologies, as well as the amount of water that can be saved with each product, can vary widely even within one category. Take the time to determine which product will be most functional at a building and test the selected method prior to committing to a building-wide installation. Be certain that the water pressure on each floor will be adequate. Shutoff valves, drain line slopes, waste lines, and venting should also be reviewed before installation.

## Kitchens



### WE Prerequisite 1

Faucet aerators are not appropriate for kitchen sinks, since filling containers takes the same amount of water whether the flow is reduced or not, and aerators only create wait times and

frustration. A much more effective water conservation measure is to specify water-conserving dishwashers, which use less water than hand washing; dishwashers also encourage the use of reusable plates. The minimal cost to install energy-efficient and water-saving dishwashers should be part of all tenant improvement programs when updating building standards. Ensure compliance during tenant build-outs and remodeling.

### Landscape Irrigation



WE Credit 3



SS Credit 5

A building's landscape can consume large amounts of water. Proper management, planning, and implementation of irrigation strategies can achieve significant water savings.

Most properties rely on a contract landscaper, whose crews may visit only 30 to 50 times per year. The property staff sees the landscaping every day and can experiment by cutting back on water and noting the effects. Submetering, weather-based controllers, rain sensors, and drip irrigation are parts of an effective irrigation water management program, but manual oversight by a building employee is still required to provide an extra level of potential problem identification and supervision. A best practice is to put a single individual in charge of the building's irrigation program.

**Weather-based controls.** Reducing potable water use through improved irrigation methods is a major component of landscaping and water use strategy. Conventional controllers are typically programmed for time-of-day watering and are modified only a few times a year, often wasting water when irrigation is not needed. These controls may be set to provide water for the most water-intense installation (often turf grass) on a property and operate regardless of sun and shade exposures, thereby overwatering shaded areas to provide adequate moisture for sunny areas. In contrast, weather-based controllers are configured to receive, store, and implement daily station-specific irrigation schedules. Their innovative features include complete telecommunications capabilities for accessing the Internet to receive updated watering schedules and software-activated stations. The controllers typically reduce water consumption from 30% to 50% compared with conventional spray irrigation controllers.

Installation of irrigation submeters allows the property manager to track usage and compare historical data that may indicate leaks and damaged sprinkler heads or drip hoses. Ensure that the landscape management contract contains maintenance provisions to address any leaks in a timely way. Maintenance staff should look for water puddles that indicate impermeable soil, water spray outside the landscaped area, and irrigation run times during rainstorms or outside normal nighttime watering patterns.

**Plant selection.** Another way to reduce outdoor water use is to plant native and drought-tolerant plant species. Work with the landscape contractor to identify opportunities to reduce turf area and introduce native and regionally adapted plants as part of routine landscape maintenance, and list commercially available plants native to the region.



A landscape design that incorporates native or adapted vegetation will preserve ecological integrity, enhance natural diversity, provide wildlife habitat, minimize energy waste, minimize water waste, and minimize the need for fertilizer and pesticides. Such plants can also enhance aesthetics and avoid the costs of frequently replacing plant materials.

It is not often practical to convert a property to 100% native and adapted vegetation, but phasing in native trees, shrubs, and perennials over a period of time can make the new landscape plan economically feasible. Turf grass should be phased out entirely.

### Process Cooling



#### WE Credit 4

To maximize water efficiency and minimize environmental harm, the property's cooling tower management plan should include strategies for performance measurement, preventive maintenance, chemical management, conductivity and bleed-off, biological control, and staff training. This is best accomplished by working with a cooling tower service provider.

Cooling towers are generally the most efficient means to remove large amounts of heat from air and equipment, but they use a tremendous amount of potable water even under optimum operating conditions and can waste even greater amounts of water when not maintained or monitored properly. To minimize waste, develop a water management plan that addresses chemical treatment, bleed-off, metering and automatic controls, biological control, and staff training.



## SECTION 3.2

The property's chemical treatment system and conductivity meter can automatically adjust the bleed rate and maintain proper concentration at all times. Conductivity should be tested on an ongoing basis by the building's cooling tower conductivity controller. The optimum control limits are set and bleed-off is initiated when conductivity falls outside of the designated limits. Additionally, pH, oxidation, and water hardness should also be tested and included in a standard water treatment program, with control limits. Actual chemical use will depend on the content of the building's supply water and its interaction with the metals in the chilled water loop.

Many measures are needed to ensure that a cooling tower system is operating for peak water efficiency. At minimum, the system should have a dedicated water meter that is read weekly by the onsite engineering staff (this meets the requirement of WE Credit 4) and a conductivity meter to maintain proper bleed-off rates. In addition, the use of biocides and corrosion inhibitors and filtering equipment can greatly reduce water use while properly maintaining the equipment.

During cooling season the property's cooling towers must be visually inspected on a weekly basis for algae, fungi, or other biological growth, and also sampled and subjected to incubation or similar testing to assess biological activity. On an annual basis, the cooling tower should be cleaned and sanitized under the direction of the property's water treatment contractor.

Staff training is critical to make certain that the plan is properly adhered to. Each of the building's operating engineers should receive a minimum of four hours of training per year specific to cooling tower preventive maintenance, chemical management, conductivity and bleed-off, and biological controls. Staff training should focus on early identification of water management problems and cooling tower maintenance and can include classroom training, professional safety videos, chemical manufacturers' manuals, manufacturers' printed literature, and onsite training from the building's water treatment contractor. The building's water treatment contractor should conduct monthly interviews with property operators to assess their ongoing understanding and compliance with the water treatment plan.

### Waterless and Low-Flow Fixtures

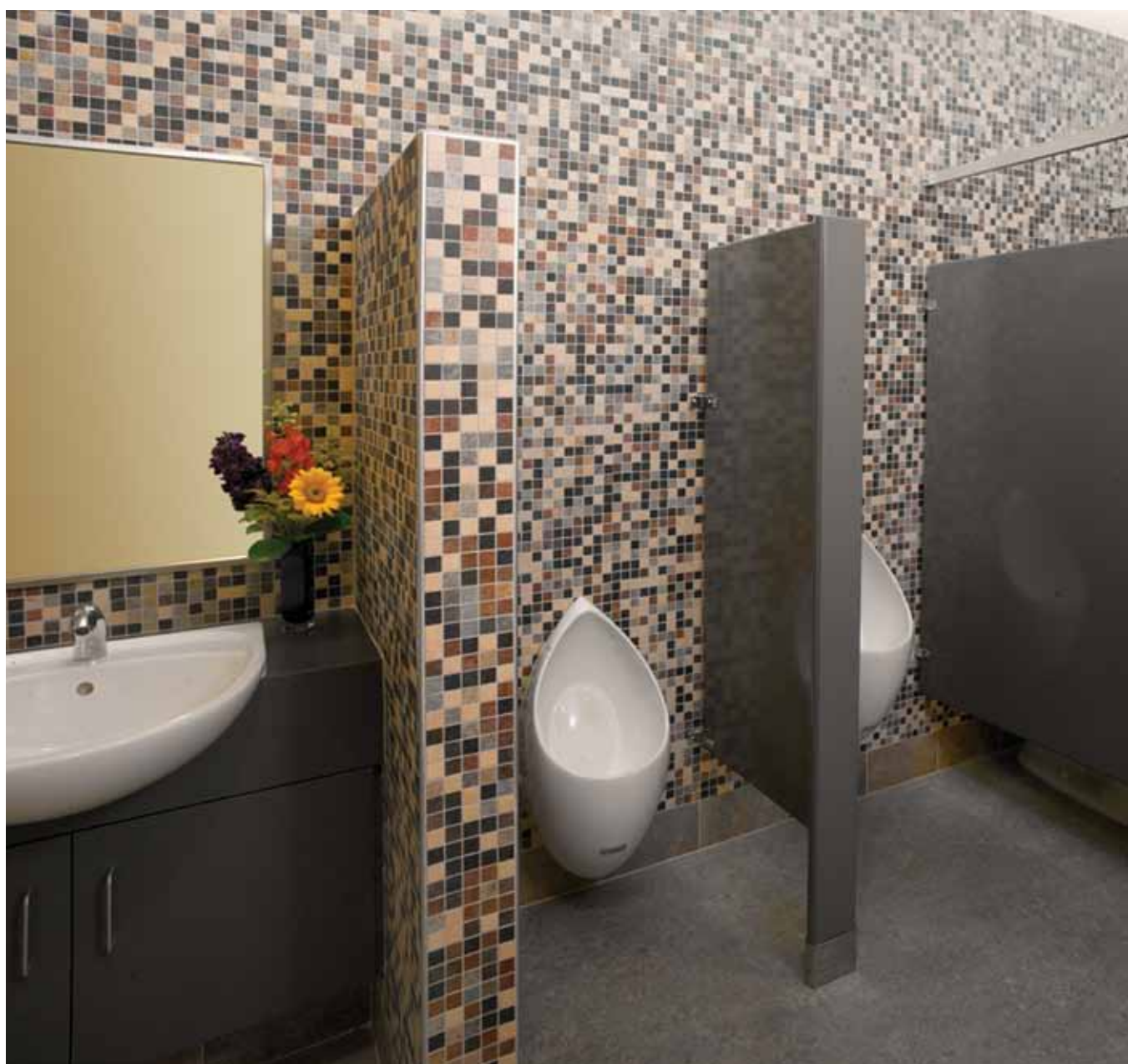


#### WE Credit 2

Installing low-flow aerators is one of the least expensive and yet highly effective measures that can be taken to reduce water consumption. The current Uniform Plumbing Code and International Plumbing Code specify a flow rate of 0.5 gallons per minute (gpm) for faucets. Structures built prior to major code changes in 1994 typically have restroom fixtures that use older technologies, and their aerators may have flow rates of 2.2 gpm or greater. In a 30-story high-rise office building, changing out 2.2-gpm aerators with 0.5-gpm aerators will save approximately 800,000 gallons of water per year. Aerators for most faucet types cost \$5 to \$10 and are easily installed.

Routine maintenance on lavatory aerators is required to ensure that the expected water savings continue. At a minimum the engineering staff should inspect aerators along with run time on automatic faucets and also spot-check faucets to determine that flow rate remains as designed.

The efficiency of today's urinals and water closets delivers a substantial reduction in water use. Low-flow and waterless restroom fixtures have become common, and the installation of these fixtures can save millions of gallons of water per year, preparing a property to meet the WE prerequisite in LEED and even earn up to five additional points. Although the current code prescribes that a maximum 1.6 gallons per flush (gpf) for water closets and urinals a maximum 1.0 gpf for urinals, typical fixtures in most U.S. buildings, primarily those built prior to 1994, have rates of 3.5 gpf or higher. Dual-flush valves and low-flow flushometers are viable options for most porcelain models, but often full valve replacement is required to meet current code and LEED credit requirements. The likelihood is that not all the fixtures at a property will need to be replaced to meet LEED credit requirements. A floor-by-floor analysis of current fixtures and occupant use determines the level of replacements necessary. The water use analysis tool in Section 4 provides guidance.



## WASTE

Businesses contribute about 35% to 45% of the 250 million tons of municipal solid waste<sup>53</sup> generated each year. The waste generated by the typical multitenant office building contains materials that are commonly feeder stock for production of new materials. Although overall recycling rates in the United States remain around 33%, commercial office buildings can achieve diversion rates in excess of 80% through good messaging and involvement of occupants in the process. This also makes good economic sense, since the greater the diversion rate, the lower the cost of waste hauling. Even in areas where recycling is a service with a cost, the cost of processing and resale of the commodities is lower than hauling waste to a landfill. Effective recycling programs not only save on property operating costs<sup>49</sup> but also involve occupants in the overall greening process.

Building managers should be aware of increasing regulation and enforcement of existing regulations surrounding the disposal and handling of wastes generated at commercial office buildings. The Resource Conservation and Recovery Act (RCRA), enacted in 1976, governs the disposal of municipal and hazardous wastes. RCRA established minimum standards and thresholds for the handling of certain common toxins, primarily mercury and lead, that are present in buildings, but also allowed states to establish standards that may be more stringent than federal regulations. Both mercury and lead are classified as universal wastes; that is, they should not be released into the environment. These substances can be found in fluorescent lighting, batteries, and thermostats, among other devices that are regularly found in commercial buildings. Managers should be certain that they understand the regulations governing their proper storage and disposal.

### ECONOMIC BENEFITS

Many businesses across the country are turning green. Doing so not only helps their image, but also can help their bottom line. Recycling materials in your building reduces hauling and landfill fees for waste removal.

### ENVIRONMENTAL BENEFITS

Waste reduction through source reduction, recycling, and reuse have multiple environmental benefits. By using fewer resources, mining or harvesting virgin material is reduced. Waste reduction reduces Green House Gas (GHG) emissions and saves energy. A building that recycles 10 tons of aluminum is reducing GHG emission per year equivalent to not driving 24 passenger cars and light trucks for one year.

### SOCIAL BENEFITS

As cities compete to be classified as “greenest”, promoting recycling in your building enhances your property’s image and that of your tenants and occupants. Also, many consumers are demanding and expect recycling bins in public areas. Promoting an environmental message like recycling will send a positive message to the occupants in the building as well as to prospective tenants.



Federal regulations are available at the EPA site, <http://www.epa.gov/epawaste/hazard/wastetypes/universal/index.htm>, and links to all of the state regulations can be found at <http://www.epa.gov/epawaste/hazard/wastetypes/universal/statespf.htm>.

### Compliance with RCRA



#### MR Prerequisite 2

Compliance with RCRA is generally easy if managers and their staff follow two simple rules. First, establish a recycling program for all lamps, batteries, and ballasts. Although some states allow limited quantities to enter municipal solid waste, these limitations continue to be reduced over time. Quantities are often expressed as picograms per volume of waste. Given that the amount of universal waste per item varies by manufacturer and waste bin volumes also vary, it is clearly easier not to put fluorescent tubes and batteries into the municipal waste stream. Recyclers of these materials are regulated by the state; when contracting with a recycler, ask for information to ensure that the building's wastes are going to a properly licensed facility. Local lighting distributors may help with setting up a recycling program. Manufacturers' mail-back programs also exist, and many retailers, such as large home improvement stores, offer recycling for lamps and batteries.

#### Examples of Recyclable Materials Commonly found at Commercial Properties:

- Paper
- Ballasts and Batteries
- Plastic Electronics
- Glass
- Lamps
- Corrugated Cardboard
- Food Waste
- Aluminum
- Wooden Pallets
- Ink/Toner Cartridges
- Chemicals/Solvents
- Copper

### Baseline



#### MR Credit 6

The first step in developing a plan to reduce waste in a building is measuring the existing waste stream. The waste stream typically has two components:

- On-going waste from tenant and building operations; and
- Nonrecurring waste from construction, tenant improvements, or capital projects, often referred to as construction and demolition (C&D) debris.

The measurement of the waste stream will provide a baseline to judge the effectiveness of programs and activities. Consider all potential sources of materials coming into a building and evaluate how they leave. This will help in targeting effective programs to reduce the waste stream. The percentage of waste that is recycled instead of hauled to a landfill is called the diversion rate. The higher the diversion rate, the better for the environment and the financial performance of the property.

## SECTION 3.3

A waste assessment provides both qualitative and quantitative data on what waste is generated and collected at the property, establishes a baseline to measure progress, and may point out opportunities to generate revenue from recycling. What types of waste are generated at the property, and how much of each? What are the waste-related costs for trash and recycling containers, hauling, recycling, and labor?

**There are three primary approaches to conducting a waste assessment:**

1. **Records examination;**
2. **Building walk-through and questionnaire;**  
and
3. **Waste sort, or audit.**

**Worksheets outlining the steps included in all three waste assessments can be found in this guide's online reference documents; see Section 4.**

Most commercial office properties use a combination of the first two approaches to establish the baseline and develop a program; a waste sort is the most accurate but also requires time and space.

### **Records Examination**

A review of the following records can provide information on the quantity of waste and current hauler terms:

1. Work order, inventory, maintenance, and operating logs for equipment and services;
2. Supply and equipment invoices; and
3. Waste hauling and disposal invoices, weight tickets, and contracts.

### **Building Walk-Through and Questionnaire**

This approach provides qualitative information. During a walk-through, observe the types and amounts of waste generated. What specialized operations do tenants have? Observe how waste

moves through the building. Assess existing space and equipment that can be used for storage of waste, processing of recyclables, and other collection tasks. A walk-through is also an opportunity to talk to building occupants about their waste generation and disposal habits. First-hand observation of waste handling practices is the major advantage of a building walk-through.

### **Waste Sort**

The most comprehensive waste assessment is a waste sort, or audit. Staff examine the contents of waste receptacles throughout the building and evaluate what materials are being thrown away, and how much of each type. If the building has an area where a week's worth of waste can be sorted, this is the most effective way to get an accurate assessment. A sort should be performed out of sight of



the building's population so that occupants do not modify their customary behavior. Some haulers provide this service or can coordinate an audit at the transfer facility.

Table 6. Comparison of Waste Assessment Approaches

Strengths	Limitations
<b>Records Examination</b> <ul style="list-style-type: none"> <li>Provides weights and volumes of waste generated</li> <li>Tracks potential waste from point of origin</li> <li>Identifies expensive or valuable components of organization's waste</li> <li>Documents financial benefits of reuse and recycling, including total revenues and avoided disposal costs</li> <li>Requires less time and effort than other approaches</li> </ul>	<ul style="list-style-type: none"> <li>Might not provide quantitative data about specific waste components</li> <li>Does not provide qualitative data on how or why wastes are generated</li> <li>Might require substantial effort to collect and analyze data</li> </ul>
<b>Building Walk-Through &amp; Questionnaire</b> <ul style="list-style-type: none"> <li>Requires less time and effort than waste sort</li> <li>Allows first-hand examination of facility operations</li> <li>Provides qualitative information about major waste components and waste-generating processes</li> <li>Reveals waste-reduction activities</li> </ul>	<ul style="list-style-type: none"> <li>Might not identify all wastes generated</li> <li>Might not be representative if conducted only once</li> <li>Relies on estimates based on extrapolation</li> </ul>
<b>Waste Sort</b> <ul style="list-style-type: none"> <li>Provides quantitative data on total waste generation and specific waste components</li> </ul>	<ul style="list-style-type: none"> <li>Requires more time and effort than other approaches</li> <li>Might not be representative if conducted only once</li> <li>Does not provide qualitative data on how or why wastes are generated</li> </ul>

Establish a set of measures to monitor performance annually or quarterly, using the same collection methodology. The results will allow the team to correct problems and report successes to the public, occupants, tenants, and owner.

## Implementation and Verification



### MR Prerequisite 2

Full participation is crucial for developing and sustaining a waste reduction strategy. Ensure that all the appropriate stakeholders, including janitorial and tenant representatives, are involved.

EPA regional offices and state and/or local agencies have representatives who can help develop goals for a property. They can provide invaluable experience and recommendations, based on the information that results from the waste assessment. The decisions in a waste reduction plan may



not be able to be made all at once. For example, selecting a collection system will inform the bin choice, and choosing the materials to target will dictate the necessary storage equipment.

### Collection System Choices



MR Credit 7  
MR Credit 8

Two basic options are available for gathering recyclable material: separate stream (multistream), and single stream (commingled) with post-treatment separation. Each system has its advantages and disadvantages.

**Separate stream.** Building occupants and visitors place each type of recyclable in a separate bin. This ensures that recycled materials are of high quality—newsprint is not contaminated with liquids from soda cans, for example—which improves their market value and the accuracy of program reporting.

**Single stream.** Building occupants and visitors place all recyclables in a single bin, and the material is sorted later, usually at a materials recovery facility. This method sometimes results in lower-quality material, particularly for paper. Manufacturers that purchase these processed recyclables must often remove the contaminated materials and send it to landfills.<sup>51</sup> Additionally, single-stream programs can typically report only the commodity breakdown of the output of the entire sorting facility, making it more difficult for a property manager to assess progress in his program.

Be aware of local jurisdictional requirements for waste management and recycling. Many cities and local governments have ordinances requiring recycling in all facilities and may require the use of a particular service provider. Identify which materials are covered by the regulations and determine whether there are targets for recycling (e.g., 30% of all waste, 20% of paper waste). This is particularly important not only for compliance and for LEED but also for gaining support from occupants and owners.

A common problem is finding space for a staging area where recyclables from throughout the building are collected and the hauler can pick up the material. In addition to standard bins, a building that receives a large number of daily deliveries may need to accommodate pallet storage and bailing of cardboard. Some haulers allow for recyclables to be included in trash compactors if they are separated in bags, by color, so that they are easily identified and quality is maintained.

Bin selection depends on current waste collection system, staff safety, and health requirements. Recycling containers should always be located next to trash cans to reduce contamination. Staff should check and empty the waste bins often so that people do not use the recycling bins for regular trash. Another way to prevent contamination is to buy bins with distinct openings (round for bottles and cans, slotted for paper).

### Communication and Education

The programs developed for office, maintenance, and construction and demolition waste should be tailored to each audience—occupants, staff, subcontractors, perhaps even customers. Staff

education begins as soon as a plan is developed. Occupants' education begins with implementation. For a successful, long-term recycling program, all groups will need continuous education and reminders. Communicate about the process to all stakeholders and report successes in terms relevant to each; for example, the owner will want to know about not just progress toward the diversion rate goal but also cost savings.

Tools exist to measure the environmental impact of recycling. EPA's Waste Reduction Model (WARM) estimates the greenhouse gas and energy savings from alternate waste management practices. The model can help managers equate the recycling of materials into metric tons of carbon or carbon equivalents. Quantifying the amount of waste collected can be challenging, but without accurate measurement, it is difficult to improve or expand. With the initial waste assessment as a baseline, conduct quarterly or annual assessments using the same methodology to monitor the program.

If waste contractors provide mixed volume and weight data, use EPA's conversion factors to help monitor progress; see [http://epa.gov/climatechange/wycd/waste/calculators/Warm\\_home.html](http://epa.gov/climatechange/wycd/waste/calculators/Warm_home.html) and [http://www.epa.gov/osw/conserve/tools/recmeas/docs/guide\\_b.pdf](http://www.epa.gov/osw/conserve/tools/recmeas/docs/guide_b.pdf).

Expenses may be higher during the first year of a new program because of the upfront costs associated with the purchase of collection bins, but often the reduced hauling costs offset those costs. Without exception, effective recycling programs generate long-term cost savings for properties as well as provide environmental benefits.

### Beyond Traditional Recyclables



#### MR Credit 8

Most recycling programs start with paper, aluminum, and plastic. Once that collection program is running, consider recycling additional materials. Some commercial properties are starting to



recycle organic materials from their food service operations or tenant kitchens. Organic waste is typically heavy and does not compact, making it expensive to haul away. Discuss options with haulers, recycling providers, landscape contractors, and other team members.

Property managers are often surprised by building occupants' positive reactions to recycling programs. Outreach efforts at

## SECTION 3.3

commercial properties increasingly include specialized recycling days or reuse drives. Because most commercial leases prohibit the disposal of e-waste in the building waste stream, some managers schedule collection days with contractors that handle e-waste. Since it contains hazardous materials, always check with the building owner before coordinating an event and ensure that the contractor is licensed to dispose of it. E-waste collection days can serve as a great opportunity to engage the building occupants in the greening effort.

### Construction and Demolition Waste



#### MR Credit 9

C&D waste varies with the projects that are undertaken at a property. To manage debris, building owners and managers need to develop contractual requirements and incorporate the goals and reporting structure into contracts with all firms involved with construction and demolition. When working with outside contractors, communicate the project goals and requirements during the planning and pricing stage and hire contractors that are familiar with LEED requirements. Good environmental practices that should be documented and placed in the waste reduction plan include the reuse of paneling, doors, and other building materials; this saves costs while reducing the waste stream. Formalizing the guideline into the waste reduction plan ensures continuity of the practice through turnover in contractors and property personnel.

**The California Integrated Waste Management Board has produced sample C&D specifications in a standardized Construction Specification Institute format (see <http://www.calrecycle.ca.gov/condemo/Specs/>); these specs provide a starting point and can be modified to fit particular projects. Include routine and regular progress reports in the contracts so that the contractors follow through.**

### Source Reduction



#### MR Prerequisite 1

The best possible waste management practice is source reduction—the design, manufacture, purchase, or use of materials that reduces their quantity before they reach the waste stream. Some opportunities to limit waste generation, however, are outside a manager’s direct control. Promoting the benefits of waste reduction can influence tenants to make wiser purchasing and operational decisions.

Source reduction, instead of simply recycling, is crucial to the success of reducing the environmental impact of a property. Many new products can help achieve the goal. New restroom paper dispensers, for example, control of the amount of paper per use. By metering the dispensed portion, a manager can modify the behavior of building occupants and better control usage of paper products. Microfiber mops and towels are another example. Because they trap dust and contaminants very effectively, they are part of a “green cleaning” program, but they also reduce dependence on disposable cleaning cloths and paper towels.

Increasingly, suppliers are offering consumables with reduced packaging waste and better shipping efficiency. Managers may overlook the amount of packaging waste that the building's janitorial supplies generate if cleaning is done after hours. While developing a waste reduction plan, ask suppliers to explore options for bulk or reduced packaging.



## HEALTH, SAFETY, AND INDOOR ENVIRONMENTAL QUALITY

Owners and managers of buildings have a responsibility for the people who work in their structures. Removing the irritants from the airstream and preventing their return are integral to a green operating strategy. As indoor air quality improves, occupants' comfort and productivity improve, promoting tenants' satisfaction and retention, which in turn serves both tenants and landlords through lower turnover costs. Fundamentally, this is about quality. Buildings that have better indoor air quality (IAQ) tend to perform better environmentally and financially.

### Baseline

Air is often not managed or monitored to the extent that energy and water are. After measuring outside air intake and indoor air quality, building operators are better equipped to provide a comfortable environment for those who work within. LEED addresses indoor air quality (IAQ) in its Indoor Environmental Quality (IEQ) credit category.

### Air Quality Testing



#### IEQ Credit 1.1

Often the subject of IAQ testing makes building owners or managers think of lawsuits, liability, bad publicity, and costly remediation. Yet the failure to identify IAQ problems and respond promptly and effectively is what can have potentially dire consequences. As detailed in LEED for Existing

Buildings: O&M, IEQ Credit 1.1, a comprehensive IAQ management plan identifies, prevents, and mitigates indoor air hazards. It is important to establish a process that encourages exchange of information with occupants and to respond to each IAQ complaint by gathering information, identifying appropriate corrective actions, and taking action to solve the problem.

**Air quality testing procedures, based on EPA's Building Education and Assessment Model (I-BEAM) program, are designed to ensure that the quality of the indoor environment meets certain standards. See [http://www.epa.gov/iaq/largebldgs/i-beam/visual\\_reference/index.html](http://www.epa.gov/iaq/largebldgs/i-beam/visual_reference/index.html).**

Conducting air sampling tests is often not the most practical or useful tool to manage indoor air quality in a building. Recognizing this, LEED for Existing Buildings: O&M rewards those properties that establish a comprehensive IAQ program, called an IAQ Pollutant Source Management Policy. The purpose of the policy is to prevent and identify IAQ issues by incorporating a comprehensive on-going intion process into standard building procedures.

## Ventilation



EA Credit 1



IEQ Prerequisite 1  
IEQ Credit 1.3

Although changing airflow requirements can readily be measured in terms of energy usage, the optimum ventilation for building occupants' health is less easily determined. ASHRAE completed studies in 1989 and 1999 that determined acceptable ventilation for indoor air quality; other researchers have tried to establish the relationships among sick leave, outdoor air supply, humidification, and tenant complaints.<sup>51</sup> The ASHRAE study created minimum standards of airflow per space, by usage type and occupant load, but the ventilation standards primarily focus on occupants' perception of indoor air quality rather than specific health benefits.

Even though the standard total outdoor ventilation flow rate may be drawn into the HVAC system, thermal imbalances can starve certain zones, thereby creating localized IAQ problems. The objective of airflow measurement and verification, required in LEED's IEQ Prerequisite 1, is that ventilation air flow rates supplied to different zones in the building should be consistent, regardless of design conditions, and should satisfy current operating conditions. In LEED, outdoor airflow measurement and verification, using the current ASHRAE 62 calculator (see Section 4) identifies actual building performance.

Airflow measurements are taken at the air-handling unit level, but many buildings also measure CO<sub>2</sub> at the breathing zone, as an extra determinant of IAQ. However, CO<sub>2</sub> measurements do not take into account square footage or address the off-gassing of outside materials brought into a building.

Dedicated outdoor air systems (DOAS), which only use outside air as opposed to a mix of outdoor and indoor, remedy many of the issues associated with standard VAV air distribution systems installed in most buildings. Although DOAS is not practical for all regions, given that cooling and dehumidifying the high quantities of outdoor air in the summer and humidifying and heating the air in the winter are energy intensive, where applicable DOAS can place the proper ventilation air quantities into every space.

Additional information on dedicated outdoor air systems can be found at <http://doas.psu.edu/>.

## Occupant Comfort Surveys



IEQ Credit 2.1

Surveying building occupants on a periodic basis builds trust in the occupant-owner relationship and provides building management staff with the feedback required to address problems. As part of LEED for Existing Buildings: O&M, a point is available for conducting an occupant survey and establishing a procedure for addressing the survey responses.

Additionally, having a periodic dialogue with occupants about building-wide environmental programs not only raises their awareness of green building issues but also fosters a sense of



## SECTION 3.4

community at the property, which can translate to higher tenant retention and higher employee satisfaction. Establishing an environmental education policy can support a property's existing LEED for Existing Buildings: O&M initiatives, encourage LEED for Commercial Interiors projects among tenants, and promote ongoing environmental innovation among building occupants.

The goal of the education policy should be to reach 100% of building occupants on an annual basis. Strategies include environmental awareness events, email campaigns, newsletters, lobby signage, a building Web site, and meetings with representatives from each tenant company to provide an update on base building environmental initiatives and introduce LEED for Commercial Interiors and other environmental initiatives.

### Purchasing Review

Approximately 65% of a property's operating costs are considered controllable<sup>52</sup>, and a manager's choices greatly influence the extent to which environmental goals will be incorporated and adopted.

To establish a baseline, first classify each purchase as consumable goods, durable goods, facility alternations and additions, or services.

- Consumables have a low cost per unit and are regularly used and replaced through the course of business; they include office paper, janitorial paper towels, toner cartridges, binders, batteries, filters and lighting supplies (bulbs and ballasts) but exclude light fixtures, food and beverages.
- Durable goods have a higher cost per unit and goods and are replaced infrequently, sometimes requiring capital program outlays. These include office equipment (computers, monitors, printers, copiers, scanners, fax machines), appliances (refrigerators, dish washers, water coolers), furniture, onsite vehicles, and fleet vehicles.
- Facilities alterations and additions, such as renovations, demolitions, refits, and new construction additions, may require the purchase of building components and structures (wall studs, insulation, doors, and windows), panels, attached finishings (drywall, trim, ceiling panels), carpet and other flooring material, adhesives, sealants, paints, and coatings. It may be helpful to consider facilities alterations and additions as anything that would meet the definition of real property, while durable goods can be viewed as personal property.
- Services are maintenance and operations activities, whether provided on a spot buy or recurring basis. This category covers those materials that are traditionally provided or used on the property by a service provider but not identified as a line item in proposals or invoices. Examples include janitorial, landscaping, pest control, mechanical services, move management, and professional services (architecture, engineering, consulting).

A sustainable purchasing strategy may require subdividing those sections so that independent strategies can be developed for each. The authorization for purchases in each category is likely different; not all purchases of goods may be paid for directly from the building account. Less sophisticated supply chain organizations may bundle some goods into their services for efficiency reasons, but this should not preclude implementing a standard and policy.

A review of operations should identify where all the materials—restroom paper products, trash can liners, lamps and batteries, carpet, wallboard, paints, adhesives, air filters—come from. Suppliers and third parties that are responsible for any purchasing decisions should be part of the team that develops the purchasing policy.

## Implementation and Verification

To reduce the unnecessary exposure of building occupants and workers to potential hazards, a green cleaning strategy should ensure that the chemicals used inside a building are the least toxic available and that they are handled responsibly.

### Chemical Handling



IEQ Prerequisite 3  
IEQ Credit 3.1

Chemical use and storage in an office building directly affect IAQ and occupants' health and should be addressed in each vendor contract that provides service to the project. A green cleaning policy that meets LEED for Existing Buildings: O&M guidelines calls for the use of cleaning products that minimize environmental impacts while maintaining acceptable cleaning standards. Chemical storage should be located in a secure area that is separately vented or otherwise separated from the building air supply. To minimize any problems from chemical storage, the cleaning staff should maintain the smallest possible inventory. Chemical storage areas should be checked daily to ensure that they are free from spills, and stocked chemicals should be reviewed periodically to ensure that none are leaking and that the expiration dates have not passed. A periodic cleanout should be conducted to prevent the accumulation of unnecessary chemicals.

Flammable liquids, acids, bases, and reactives need to be stored separately, and solid and liquid chemicals should also be kept separate, to reduce the possibility of unwanted chemical reactions. Material safety data sheets (MSDSs) for all hazardous substances used on the premises must be maintained onsite in a location readily accessible to all employees. Each chemical container should be clearly labeled; no unlabeled chemicals should be used. Chemical dispensing systems must be fitted with backflow preventers, and product dilution rates should be regularly verified.

Similar provisions for chemical use and storage apply to indoor pest management and cooling tower management. Having an MSDS for each chemical brought onsite is essential for understanding the recommended methods of storage and the reactivity, incompatibility and stability of chemicals.

**Chemicals should be segregated and stored by hazard class.**

### Ventilation of Storage Areas



IEQ Prerequisite 3  
IEQ Credit 3.1

Products used by building cleaning services may contain volatile organic compounds (VOCs), which may escape to the atmosphere and react with sunlight to form smog. Many state and local authorities restrict the use of VOCs because both VOCs and the smog they produce cause asthma attacks and irritation of the eyes, nose, throat, and lungs. All VOC-containing substances should be stored in a segregated area, with venting separate from the building's common air supply.



## Nontoxic Chemicals



### IEQ Credit 3.3

The chemicals used to maintain and clean the built environment can be effective without harming the natural environment or building occupants. Under Green Seal's evaluation program, environmentally preferred products (EPPs) have best-in-class criteria for performance, reduced environmental impact, and enhanced safety, and they typically cost no more than less sustainable options.

To qualify as an Environmentally Preferred Product, the product must meet standards in a minimum of 11 of these 12 categories:

- Human toxicity;
- Carcinogens and reproductive toxins;
- Skin and eye irritation;
- Skin sensitization;
- Combustibility;
- Ozone, VOCs;
- Aquatic toxicity;
- Aquatic biodegradation;
- Eutrophication;
- Recyclable packaging;
- Concentrate; and
- Prohibited ingredients;

#### Dispensing System Criteria for Environmentally Preferred Products

- Safe, spill-tight, permanently integrated head and bottle;
- Backflow prevention;
- Portable dispensing;
- Dual-flow rate dispensing (high-flow for buckets; low-flow for bottles);
- Ergonomically designed handle;
- Accurate dilution rates that can be verified; and
- 100% recyclable container.

Understanding occupant sensitivities is essential to accommodating vulnerable building occupants. The management team may need to minimize or eliminate use of a cleaning product in a certain area of the building, alter the time and day that cleaning takes place, or propose the occupant's relocation to a different area of the building.

Occupants may be differentially affected by the building's cleaning practices, ventilation, and pest control applications. Reactions to the cleaning chemicals or methods may be due to hypersensitivity to odors, preexisting health conditions, reduced immune system function, or other factors. The property's pollutant source management policy should specify how an occupant can raise concerns about indoor environmental quality.

Conduct major cleaning areas on Fridays or before holidays, allowing maximum time for the area to be "flushed" with fresher air to minimize lingering contaminants. Ensure that all products meet the standards outlined in the chemical specifications. If products with strong odors or off-gasing must be used, alert occupants before the work begins.

## Product Attributes

Using the precautionary principle, one considers whether a product or procedure might be harmful and whether we should mitigate the risk. For example, where systems are complex but we suspect or believe that a substance may harm human health, it is prudent not to use it. Some adhesives used to lay glue-down carpet in commercial space, for example, release volatile organic compounds that may be a health hazard for occupants, and it is now possible and preferable to use alternatives to such products.

## Particulate Control



IEQ Credit 1.4

IEQ Credit 3.5

Particulate matter can be harmful over periods of long exposure. By managing the introduction and removal of particulate matter from the air, a building operator is able to ensure that a building's indoor air quality is safer for occupants.

**High MERV filters.** The minimum efficiency reporting value (MERV) rating system for air filters identifies, on a scale of 1 to 16, the filter's efficiency at capturing particles. The higher the MERV, the more particles the air filter catches. Most building systems have filters in the range of MERV 8 or 9; LEED's IEQ Credit 1.4 requires filters of MERV 13 or higher. Although a higher MERV rated filter remove more minute particles from the air, it also creates more resistance to airflow, potentially increasing energy use and affecting air distribution. The limitations of each air-handling unit's fan power will dictate the appropriate MERV rating. Some high-efficiency filters also cost more.

**Trapping dirt.** Most particulate matter enters a building as people come inside. The best line of defense is adequate entryway mats at all building entrances. IEQ Credit 3.5 calls for a 10-foot permanent entryway mat system inside each regular building entrance to capture dirt, water, and other materials. For the purpose of meeting this credit, "permanent" can mean removable mats that are properly maintained and periodically replaced. The method of maintaining the mats is detailed in the green cleaning policy, in Section 4. Such a system, if regularly maintained, keeps contaminants out of the air filtration system, extends the life of flooring materials, and reduces the need for additional cleaning.

## Carpeting



IEQ Credit 3.5

In 1992, the Carpet and Rug Institute (CRI) initiated its Green Label program to test carpet and adhesives to help identify products with very low emissions of VOCs. CRI subsequently launched Green Label Plus for carpet and adhesives. Using test methodology developed in cooperation with EPA and adopted by the American Society for Testing and Materials, the Green Label Plus program sets a higher standard for indoor air quality. Building owners and managers should also consider the use of Carpet Tiles as their easy replacement minimizes potential waste.

## Microfiber Products



### IEQ Credit 3.1

Microfiber cleaning cloths and mops in commercial office buildings use less water and cleaning chemicals yet attract dust debris and other particles more readily than conventional cotton products. Microfiber is a strong, lint-free synthetic fiber that is very absorbent; its positive electrostatic charge holds dust and dirt particles rather than redistributing them. Because it dries quickly, microfiber reduces the risk of bacterial growth and cross-contamination. Microfiber pads can also be changed frequently to reduce cross-contamination, and their use avoids paper towel waste. The cost of switching to microfiber should be borne by the janitorial contractor, because in a life-cycle cost analysis, it is more cost-effective for the supplier. Resistance from the contractor is probably a good indication that this company's goals do not align well with the environmental commitment of the owner and manager.

Although microfiber cleaning cloths and mops cost more than traditional cloths, the useful life of a microfiber is significantly longer than cotton products. Additionally, installing onsite

washing and drying equipment for use in conjunction with the microfiber cleaning materials may be required if the cleaning contractor is unable to provide for this service.

Information on single-attribute standards and certification programs can be found at <http://www.epa.gov/oppt/epp/> and <http://www.globalecolabelling.net/index.html>.

## Certified Products



- MR Prerequisite 1
- MR Credit 1
- MR Credit 2
- MR Credit 3
- MR Credit 7
- MR Credit 8
- MR Credit 9

An environmental purchasing policy will likely rely upon third-party certifications and single-attribute standards. The marketplace for certification has blossomed as the public's environmental conscious has grown. Independent certifying bodies have matured over the past decade, but their rigor and standards vary.

An ecolabel is a labeling system for consumer products (excluding foods and medicine) that are made in a way that avoids detrimental effects on the environment. Ecolabels are not always the single answer to help guide purchasing decisions, however. The ENERGY STAR label for appliances, for example, is an indicator of a product's energy efficiency and can be used to compare appliances within a given category, but by itself it is not an indicator that a product is environmentally friendly. ENERGY STAR is a single-attribute label that looks only at the energy performance of a product. A

purchaser may also want to consider many other attributes, such as the component materials, the energy required to manufacture it, or handling of the product at the end of its useful life.

Ecolabels that consider more than one attribute are called multiattribute standards. ISO, the International Standards Organization, has developed three standards in the 14020 series that will make their way into the marketplace over the next several years.

**ISO 14024, Type I label.** This label uses criteria established by a third party and allows manufacturers to certify to that standard. Much of what we see in the marketplace today, with programs such as Green Seal and ENERGY STAR, are Type I labels, though they may not have gone through the ISO standards process.

**ISO 14021, Type II label.** These ecolabels are self-declarations—the environmental claims of manufacturers promoting their products. “All Natural” and “100% Postconsumer Content” are among today’s Type II labels.

**ISO 14025, Type III label.** This approach to environmental claims for goods and services seeks to create a marketplace that allows consumers to make informed choices. ISO 14025 provides a framework for each product category to involve stakeholders in a collaborative format to decide what attributes should be considered by users, then establishes a third-party-certified “environmental product disclosure” (EPD). EPDs are already available from some office furniture and carpet manufacturers in the United States; internationally, product category rules (PCRs) are in place or being developed for everything from toilet paper to waste removal. A list of available PCRs can be found at <http://www.environdec.com>. EPDs will advance green purchasing for real estate because they are a multiattribute approach; they identify each attribute and allow consumers to decide which qualities are important to them. In this way, a consumer can choose the product that aligns best with her needs.

The carpet and furniture industries are leading in the application and development of ISO-compliant ecolabels. Each type of environmental label and declaration encourages demand for and supply of products and services that cause less stress on the environment. Consulting standards and ecolabels as part of a green purchasing strategy and making purchasing decisions accordingly will help stimulate market-driven environmental improvements.

Building managers have the ability to be drivers in the marketplace through their purchasing decisions. An effective purchasing policy educates your suppliers and the public on preferences for environmentally friendly goods and services. But be aware of misinformation about environmental friendliness—“greenwashing”—and demand transparency of vendors.



## SECTION 3.4

### **Influencing Others' Purchasing Decisions**

Whether the purchases are made by building staff, contractors, or tenants, materials typically can be controlled through standards set by building management. In some cases it may be necessary to unbundle a commodity purchase from the services so that compliance with the policy can be verified.

Some tenants may not assist in tracking purchases or be willing to alter their purchasing decisions. This is why building the team of stakeholders is crucial for greening a building and pursuing LEED for Existing Buildings: O&M certification. The most significant purchases that most commercial building tenants make are office supplies, and most major office supply companies have staff who understand the data needs of a building pursuing certification. Tenants who are engaged in the process of greening a building are more likely to work with their suppliers to collect data on their purchases. The exercise often provides them with a chance to reevaluate their product selections and identify opportunities to reduce their costs or improve the environmental attributes of their selections.

## COMMUNITY INFRASTRUCTURE

A building affects its community's infrastructure in two major ways: the commuting habits of its occupants and its flow of runoff from roofs and parking lots.

Energy consumption and greenhouse gas emissions from transportation are an indirect element of a building's carbon footprint. In nonurban locations, the vast majority of workers and customers arrive and depart by single-occupant vehicles. A manager may not be able to move the mass transit infrastructure to the building, but she can help connect the building to existing routes.

Commonly overlooked in existing buildings is the impact of wastewater treatment on the community. EPA estimates that 3% of our national energy consumption is used to treat wastewater and produce drinking water.

### Baseline



SS Credit 4

For transportation, conduct a survey of the building occupants to understand the existing transit preferences and typical working hours. Depending upon the situation, information such as home zip codes may be helpful for devising strategies to reduce the number of vehicle miles traveled associated with the building.

It is not practical to baseline the consequences of an individual building's wastewater on the community, but the high volume of wastewater produced by buildings in aggregate can strain wastewater treatment plants and necessitate costly upgrades and expansions, whose costs are borne by corporate as well as individual citizens.

### Implementation and Verification

#### Mass Transit



SS Credit 4

Even if mass transit is available near a building, people may not be using it: Perhaps they are unaware of it, or the schedules were not convenient the last time they checked into it. Make the building a resource point for this information by posting available schedules in the mailroom or including the information in tenant communications. Some transit authorities also offer the ability to resell passes or tickets, allowing a building to sell directly to occupants. By making the use of mass transit more accessible, a building can support the local jurisdiction's efforts to reduce single-occupancy car traffic.

## SECTION 3.5

Often the barrier to making mass transit appealing to building occupants is the “last mile”—the distance between the nearest bus or rail stop and the front door of the building. Contracting with a firm to provide a van shuttle between the building and the stop may encourage people to take part. Explore the possibility of sharing the cost of the shuttle with neighboring buildings or within a business park. Shuttles are a great way for building managers to increase awareness for many other elements of a sustainability program. The captive audience of shuttle riders can be significant assets in helping to promote or introduce other programs.

### Carpools



SS Credit 4

Facilitating carpooling can also cut down on the number of single-occupancy vehicle trips. First engage tenant contacts to gauge their interest and potential support. Several low-cost and fee-services ease the administration of the process and reduce the reporting burden on your staff. NuRide and eRideshare are sponsored by local governments and may even offer benefits to your building occupants for sharing a ride like restaurants gift cards, tickets for shows and attractions and retailer discount. Ask the city government about other services in the area. To encourage ridesharing, offer preferred parking or periodic complimentary car washes for carpool vehicles. Record the results of any program, which will be needed for LEED certification.

### Bicycling



SS Credit 4

Building managers can help promote cycling to work by offering a secure bicycle storage space, lockers, showers, route assistance, or, in partnership with local bike shops, bicycle maintenance programs. Such shops may be willing to help create a program to promote themselves and the clubs they work with.



### Erosion Control



SS Credit 4  
SS Credit 6

Property owners and managers should seek to preserve the integrity of ecological areas, including nearby streams. Have site protection plans and contractual language ready for any construction project that may cause property disruption. A typical commercial property may have large areas of hardscape for parking. Pavement generally creates stormwater runoff that picks up oils, sediment, and other contaminants, which must then be treated by the municipal wastewater system. Sometimes stormwater overwhelms the storm drains and contaminates local watersheds.



Several strategies can prevent such problems.

- Pervious pavements allow water to seep through and percolate back to the water table rather than running along the surface.
- Bioswales filter stormwater onsite, in a retention area, before it is allowed to enter a natural drainage.
- Aeration of soils compacted by equipment allows water to soak in and also improves irrigation efficiency.

Heavy storms may require more intensive measures, but the greatest portion of contamination typically happens within the first inch of rainfall. Thus, small-capacity retention and pervious areas provide a benefit even if they cannot handle a megastorm.

# SECTION 4 TOOLS & RESOURCES

## Tools Disclaimer

The following section of the Green Operations Guide contains a series of sample policies designed in accordance with the requirements of the *LEED 2009 for Existing Building: Operations and Maintenance Green Building Rating System*. Each policy contains text and information pertaining to a hypothetical existing building. These sample policies are meant to exemplify the format and content required to comply with the various prerequisites and credits of this rating system. Additional policies and resources may be available for download on the USGBC website. Additional information regarding the criteria of this rating system is available in the 2009 edition of the *LEED Reference Guide for Green Building Operations and Maintenance*.

The hypothetical project represented below, Green Street Plaza (“GSP”), was created to illustrate the application of the sustainable strategies and concepts described throughout this guide. The GSP consists of a 22 story suburban class A office property built in 1990. The building represents an older property for its submarket that now competes against newer product. The building ownership has committed to pursuing LEED-EB: O&M certification for the property as a means of continuing to improve the profile and optimize the operations of the asset.

The policies and procedures for GSP have been tailored to reflect the attributes of this hypothetical project. Each property consists of unique elements, characteristics and conditions. Users must consider such factors in creating policies narrowly tailored to best suit their property’s particular needs.

## Green Street Plaza

Green Street Plaza (GSP) was created to illustrate the application of policies and procedures mentioned throughout this guide. The property is a fictitious, suburban class A office property built in 1990 standing approximately 22 stories tall. The building represents an older

property for its submarket that now competes against newer properties. The building ownership has committed to pursuing LEED for Existing Buildings: O&M certification for the property as a means of continuing to improve the profile and optimize the operations of the asset.

The policies and procedures for GSP have been tailored to reflect the attributes of this sample project. Users will need to consider the unique elements of their property and tailor the individual policies to them.

To access the policies and tools which are hosted online, simply visit [www.usgbc.org/gopsgtools](http://www.usgbc.org/gopsgtools) and follow the instructions on the page.

# BUILDING EXTERIOR AND HARDSCAPE MANAGEMENT PLAN

## Instructions for Plan Creation and Use

Following is a LEED for Existing Buildings: Operations & Maintenance compliant Building Exterior and Hardscape Management Plan.

As with all Plans and Policies of the LEED rating systems, they must be customized to accommodate specific attributes and practices applicable to an individual project.

Areas of the Plan that must be reviewed and modified to contain property specific data include:

### GOALS AND SCOPE

The Plan must clearly identify the building's hardscape areas.

### RESPONSIBLE PARTIES

Responsibility for the various aspects of maintenance as described in the Plan must be clearly delineated.

### GUIDANCE FOR RESOURCES AND IMPLEMENTATION

**Exterior Maintenance Equipment** – All manual, mechanical, and conventional equipment used in the exterior cleaning processes must be identified. For identified conventional equipment a replacement plan must be created.

**Snow/Ice Removal** – The Plan must list the sites' snow and ice season if applicable and describe the specific methods used to remove snow and ice

**Cleaning of Building Exterior** – Building façade and roof materials must be identified and the methods of cleaning as well as the chemicals used need to be included in the Plan.

**Paints and Sealants Used on Building Exterior** – Determine if there are areas of the building exterior that require painting or sealants. Detail the areas requiring either of the aforementioned and describe the standards employed for the paint and sealant product types.

**Cleaning of Sidewalks, Pavement, and Other Hardscape** – Describe hardscape areas method and frequency of cleaning, and discuss how the practices employed are environmentally beneficial

### PERFORMANCE MEASUREMENT

The site must establish a method of measuring performance over a period of time to validate the Plan and create identifiable outcomes

### **QUALITY ASSURANCE / QUALITY CONTROL PROCESSES**

The frequency of inspections, who is responsible for the inspections and the frequency of quality control measures must be detailed.

### **PLAN APPROVAL**

The Plan must be executed by one of the responsible parties

In addition to the items listed-above, all parts of the Plan must be carefully reviewed to determine if they accurately reflect what is occurring at a site and to determine if the vendor(s) responsible for the activities detailed in the Plan can meet the requirements as set forth by the LEED rating system. Modifications can be made to language contained herein, however any edits must be reviewed to ensure that LEED requirements are still being met.

## **GREEN STREET PLAZA BUILDING EXTERIOR AND HARDSCAPE MANAGEMENT PLAN**

### **GOALS AND SCOPE**

The property maintains a comprehensive exterior and hardscape management plan in accordance with standards developed by the US Green Building's Council's LEED rating system. The plan incorporates best management practices which significantly reduce the use of harmful chemicals, energy waste, water waste, air pollution, solid waste and/or chemical runoff as compared to traditional practices.

The goal of the plan is to encourage environmentally-sensitive exterior and hardscape management practices that provide a clean, well-maintained and safe building exterior, while supporting high performance building operations.

The scope of the plan includes the building roof, exterior façade and the building hardscape. The building's hardscape consists of exterior sidewalks, and a paved loading dock area.

### **RESPONSIBLE PARTIES**

Exterior maintenance is directed by the Chief Engineer. Cleaning of the building's exterior is directed by the Cleaning Manager. Exterior paints and sealants are selected by the Chief Engineer. Cleaning of sidewalks, pavement, and other hardscape is be directed by the Cleaning Manager.

### **GUIDANCE FOR RESOURCES AND IMPLEMENTATION**

#### **EXTERIOR MAINTENANCE EQUIPMENT**

Best management practices call for the use of maintenance equipment with the smallest environmental impact in regards to energy use, water use, noise, emissions and soil compaction.

The property's exterior maintenance equipment consists of equipment owned and maintained by building ownership and equipment owned and maintained by third party service providers. The property's exterior and hardscape management plan is applicable to all of the building's equipment regardless of ownership.

Best management practices call for the replacement of maintenance equipment only at the end of its useful life. All maintenance purchases shall consider the expected life of the new equipment to be purchased as well as the equipment's environmental impact in regards to energy use, water use, noise, emissions and soil compaction.

**As with all plans the manager must make regionally appropriate choices.**

Best management practices specify a preference for the use of manual maintenance equipment and as such the property maintains a significant inventory of equipment that uses no energy or water and emits no noise or emissions. This equipment includes ladders, brooms, dustpans, etc.

The property also maintains an inventory of mechanical maintenance equipment that significantly reduces environmental impacts as compared with conventional practices. The property's electric swing stage reduces environmental impacts through decreased emissions and decreased noise pollution.

## **SNOW AND ICE REMOVAL**

The property is located in Florida and does not experience snow or ice.

## **CLEANING OF BUILDING EXTERIOR**

Best management practices call for the use of chemicals, equipment and procedures which minimize the use of harmful chemicals, energy waste, water waste, air pollution, solid waste and/or chemical runoff. More specifically, cleaning products shall meet one of the following requirements:

**Cleaning products shall meet one or more of the following standards for the appropriate category:**

1. Green Seal GS-37, for general-purpose, bathroom, glass and carpet cleaners used for industrial and institutional purposes
2. Environmental Choice CCD-110, for cleaning and decreasing compounds
3. Environmental Choice CCD-146, for hard surface cleaners
4. Environmental Choice CCD-148, for carpet and upholstery care

**Disinfectants, metal polish, floor finishes, strippers or other products not addressed by the above standards meet one or more of the following standards for the appropriate category:**

1. Green Seal GS-40, for industrial and institutional floor care products
2. Environmental Choice CCD-112, for digestion additives for cleaning and odor control
3. Environmental Choice CCD-113, for drain or grease traps additives
4. Environmental Choice CCD-115, for odor control additives

## SECTION 4.1

5. Environmental Choice CCD-147, for hard floor care
6. California Code of Regulations maximum allowable VOC levels for the specific product category

**Disposable janitorial paper products and trash bags meet the minimum requirements of one or more of the following programs for the applicable product category:**

1. US EPA Comprehensive Procurement Guidelines for Janitorial Paper and Plastic Trash Can Liners
2. Plastic Trash Can Liners no thicker than 0.70 mils (17.78 microns)
3. Green Seal GS-09, for paper towels and napkins
4. Green Seal GS-01, for tissue paper
5. Environmental Choice CCD-082, for toilet tissue
6. Environmental Choice CCD-086, for hand towels
7. Janitorial paper products derived from rapidly renewable resources or made from tree-free fibers

The exterior facade of the building consists of glass windows, concrete and marble while the building's roof is an elastometric coating.

The building's exterior windows are cleaned twice a year using Hillyard Green Select Degreaser Cleaner – a Green Seal certified product that is diluted at a ratio of 1-2 ounces per gallon. As compared to traditional practices, this practice reduces the use of harmful chemicals, air pollution, solid waste and/or chemical runoff.

The building's façade does not require cleaning. As compared to traditional practices, this practice reduces the use of harmful chemicals, energy waste, water waste, air pollution, solid waste and/or chemical runoff.

The building's roof is cleaned annually using Green Seal certified chemicals and a low-pressure electric power washer. As compared to traditional practices, this practice reduces the use of harmful chemicals, energy waste, water waste and chemical runoff.

### **PAINTS AND SEALANTS USED ON BUILDING EXTERIOR**

Best management practices call for the use of paints and sealants with the smallest environmental impact in regards to air pollution and chemical runoff.

The property has no painted exterior surfaces however if painting is needed in the future best management practices calls for the use of paints that meet GS-11 VOC limits of 50 grams/Liter for flat topcoats, 100 grams/Liter for non-flat topcoats, 100 grams/Liter for primers or undercoats, 100 grams/Liter for floor paint, 250 grams/Liter for anti-corrosive coatings, 50 grams/Liter for reflective wall coatings and 100 grams/Liter for reflective roof coatings.

The building's exterior sealants include Spec Seal Elastometric Firestop Sealant, which is

used to seal exterior penetrations. This material is used on an as-needed basis. As stated by the manufacturer, the VOC content of this material is 15 grams/Liter and the product thus minimizes occupant exposure to the high VOC emissions found in traditional outdoor sealants. South Coast Air Quality Management Rule 1168 limits are 150 grams/Liter for outdoor carpet adhesives, 100 grams/Liter for wood flooring adhesives, 65 grams/Liter for ceramic tile adhesives, 50 grams/Liter for VCT and asphalt tile adhesives, 50 grams/Liter for panel adhesives, 50 grams/Liter for cove base adhesives, 70 grams/Liter for multi-purpose construction adhesives, 100 grams/Liter for structural glazing adhesives and 250 grams/Liter for single ply roof membrane adhesives.

### **CLEANING OF SIDEWALKS, PAVEMENT AND OTHER HARDSCAPE**

Best management practices call for the use of chemicals, equipment and procedures with minimal use of harmful chemicals, energy waste, water waste, air pollution, solid waste and/or chemical runoff.

The building's sidewalks are swept daily with a manual broom and power-washed with hot water once/month. As compared to traditional practices, this practice reduces the use of harmful chemicals, energy waste, water waste, and/or chemical runoff.

### **PERFORMANCE MEASUREMENT**

The building has established numeric performance metrics to assess how actual outcomes and sustainability performance for each component of this plan will be measured and tracked over time.

On an annual basis the management team will calculate the total product and labor dollars spent on building exterior and hardscape management during the previous year. The management team will also assess the portion of this expenditure that is attributable to conventional exterior and hardscape management (dollars spent on gasoline, conventional deicer, non-compliant cleaning chemicals and equipment and/or non-compliant paints and sealants.)

- \_\_\_ At least 20% of annual exterior maintenance equipment expenditures shall meet the sustainability criteria outlined in this Plan.
- \_\_\_ At least 20% of annual snow and ice removal expenditures shall meet the sustainability criteria outlined by this Plan.
- \_\_\_ At least 20% of annual exterior cleaning expenditures shall meet the sustainability criteria outlined by this Plan.
- \_\_\_ At least 20% of annual paint and sealant expenditures shall meet the sustainability criteria outlined by this Plan.
- \_\_\_ At least 20% of annual expenditures related to sidewalk, pavement and other hardscape cleaning shall meet the sustainability criteria outlined by this Plan.



## SECTION 4.1

### QUALITY ASSURANCE / QUALITY CONTROL PROCESSES

At least once/week the Management Team conducts a building exterior and hardscape inspection to evaluate the continued efficacy of this plan.

The Management Team also convenes on a quarterly basis to discuss the building's most recent quarterly performance based on the performance metric described above. Results are logged in the LEED Compliance Log.

On a quarterly basis the Management Team convenes to discuss the continued viability of the performance metric as an effective measurement of the plan's successful implementation.

### PLAN APPROVAL

This plan was accepted, implemented and approved on December 30, 2009.

Manager's Name \_\_\_\_\_

Real Estate Manager \_\_\_\_\_

Green Street Plaza \_\_\_\_\_

# ENVIRONMENTALLY PREFERABLE PURCHASING POLICY

## Instructions for Plan Creation and Use

Following is a LEED for Existing Buildings: Operations and Maintenance (LEED-EBOM) compliant Environmentally Preferable Purchasing Policy.

As with all Plans and Policies of the LEED rating systems, they must be customized to accommodate specific attributes and practices applicable to an individual project.

Areas of the document that must be reviewed and modified to contain property specific data include:

### SCOPE

The Policy must clearly identify the areas of the building that are covered by the Policy.

### PERFORMANCE METRIC

The site must establish a method of measuring performance over a period of time to validate the Policy and create identifiable outcomes.

### PROCESSES AND STRATEGIES

**B. On-going Consumables** – Provide details on the type of items considered to be ongoing consumables for the areas covered by the Policy.

**C. Durable Goods** – Regularly purchased electronic equipment should be identified for areas that are covered by the Policy.

### RESPONSIBLE PARTY

The Policy must include identification of the party(ies) responsible for oversight of the Policy.

### POLICY APPROVAL

The Policy must be dated and executed by one of the responsible parties.

In addition to the items listed-above, all parts of the Policy must be carefully reviewed to determine if they accurately reflect what is occurring at a site and to determine if the vendor(s) responsible for the activities detailed in the Policy can meet the requirements as set forth by the LEED rating system. Modifications can be made to language contained herein, however any edits must be reviewed to ensure that LEED requirements are still being met.

## **GREEN STREET PLAZA ENVIRONMENTALLY PREFERABLE PURCHASING POLICY**

In compliance with this Policy, the Management Team maintains preferred supplier relationships with those companies who share in the property's commitment to environmentally conscious procurement. This document is intended to integrate the principles of sustainable procurement in a market sensitive and cost-effective manner.

### **SCOPE**

This Policy is applicable to those areas of the property that are directly controlled by building ownership. Directly controlled areas include the building exterior in addition to interior mechanical areas, common areas and building staff offices.

### **PERFORMANCE METRIC**

The building has established numeric performance metrics to assess how actual outcomes and sustainability performance for each component of this plan will be measured and tracked over time.

On a quarterly basis the management team will calculate the total dollar value of all building purchases that fall into one of the categories below. The management team will also assess the portion of these expenditures that meet acceptable sustainability criteria, as outlined below.

The performance metric will be the percentage of building purchases that are compliant with the policy.

### **GOALS**

The goal of this Policy is to reduce the environmental impacts of materials acquired for use in the operations and maintenance of the property.

Although the Management Team will strive to meet 100% compliance with this policy, there may be occasions where the team authorizes the purchase of non-compliant products due to budgetary limitations, the unavailability of compliant products and/or the functional limitations of compliant products. In these instances the Management Team will purchase non-compliant products while continuing to pursue effective alternatives that meet the sustainability guidelines below.

### **PROCESSES AND STRATEGIES**

#### **OVERVIEW**

The property will consider five criteria in all purchasing decisions:

1. Compliance with categorical procurement guidelines
2. Pollution prevention
3. Life cycle analysis

4. Relative environmental impacts
5. Past performance

### ONGOING CONSUMABLES

Ongoing consumable purchases that are covered by this policy include any material with a low-cost per unit that is regularly used and replaced through the course of business. Regularly purchased ongoing consumables include – but are not limited to – office supplies, catering/event supplies, uniforms (clothes, nametags, boots, etc.), building operating supplies (ID badges and stickers, recycling/waste bins, etc.), mechanical tools (e.g. ladders, shovels, etc.), and batteries.

In accordance with the goals above, ongoing consumable purchases shall meet one or more of the following guidelines:

- \_\_\_ Contain at least 10% post-consumer or 20% post-industrial material
- \_\_\_ Contain at least 50% rapidly renewable material
- \_\_\_ Contain at least 50% materials harvested and processed or extracted and processed within 500 miles of the project
- \_\_\_ Contain at least 50% Forest Stewardship Council (FSC) certified paper products
- \_\_\_ Rechargeable batteries

### DURABLE GOODS – ELECTRONICS

Electronics purchases that are covered by this policy include electronic devices that are purchased for the use of building staff. Regularly purchased electronics include desktop computers, notebook computers, network servers, printers and copiers.

In accordance with the goals above, electronic purchases shall meet one or more of the following guidelines:

- \_\_\_ ENERGY STAR labeled
- \_\_\_ The equipment replaces conventional gas-powered equipment

### DURABLE GOODS – FURNITURE

Furniture purchases that are covered by this policy include common area furniture in addition to furniture that is purchased for the use of building staff.

In accordance with the goals above, furniture purchases shall meet one or more of the following guidelines:

- \_\_\_ Contains at least 10% post-consumer or 20% post-industrial material
- \_\_\_ Contains at least 70% salvaged material from off-site or outside the organization
- \_\_\_ Contains at least 70% salvaged from on-site through an internal organization materials & equipment reuse program
- \_\_\_ Contains at least 50% rapidly renewable materials

## SECTION 4.2

- \_\_\_ Contains at least 50% Forest Stewardship Council (FSC) certified wood
- \_\_\_ Contains at least 50% materials harvested and processed or extracted and processed within 500 miles of the project

### **FACILITY ALTERATIONS AND ADDITIONS**

Facility alterations include those alterations with purchase decisions are under the direct control of Building Management.

In accordance with the goals above, materials procured for facility alterations and additions shall meet one or more of the following guidelines:

- \_\_\_ Contains at least 10% post-consumer or 20% post-industrial material
- \_\_\_ Contains at least 70% salvaged material from off-site or outside the organization
- \_\_\_ Contains at least 70% salvaged from on-site through an internal organization materials & equipment reuse program
- \_\_\_ Contains at least 50% rapidly renewable materials
- \_\_\_ Contains at least 50% Forest Stewardship Council (FSC) certified wood
- \_\_\_ Contains at least 50% materials harvested and processed or extracted and processed within 500 miles of the project
- \_\_\_ Adhesives and sealants with a VOC content less than the current VOC content limits of South Coast Air Quality Management District (SCAQMD) Rule #1168, of sealants used as fillers meet or exceed the requirements of the Bay Area Air Quality Management District Regulation 8, Rule 51
- \_\_\_ Paints and coating with VOC emissions not exceeding the VOC and chemical component limits of Green Seal's Standard GS-11 requirements
- \_\_\_ Noncarpet finished flooring that is FloorScore-certified
- \_\_\_ Carpet meeting the requirements of the CRI Green Label Plus Carpet Testing Program
- \_\_\_ Carpet cushion meeting the requirements of the CRI Green Label Testing Program
- \_\_\_ Composite panels and agrifiber products containing no added urea-formaldehyde resins

Composite wood and agrifiber products are defined as particleboard, medium-density fiberboard (MDF), plywood, oriented-strand board (OSB), wheatboard, strawboard, panel substrates, and door cores.

### **REDUCED MERCURY IN LAMPS**

Lamp purchases that are covered by this policy include lamps that are purchased by the building for use in both indoor and outdoor fixtures, as well as both hard-wired and portable fixtures.

In accordance with the goals above, the average lamp shall be required to contain no more than 90 picograms of mercury per lumen hour, as calculated based on standards developed by the US Green

Building Council and referenced in the LEED reference guide for Green Building Operations & Maintenance.

Life of bulb shall reflect the rated life at 3 hours on/20 minutes off for fluorescent bulbs and 11 hours on for HID lamps. Light output of fluorescent bulbs shall be measured with an instant-start ballast having a ballast factor of 1.0 (exception: T-5 bulbs are measured using program-start ballasts) as measured at 40% of bulb life.

Building Management will need to consider any regular purchases that they make and determine if they fit into one of the prior categories

Mercury content of bulb shall be measured as the highest value in the range if the manufacturer or supplier documentation shows a range in milligrams.

## OTHER

Where specific guidelines do not exist for a given product, the Property will seek industry accepted standards such as US EPA Procurement Guidelines.

## RESPONSIBLE PARTY

Compliance to this purchasing policy shall be the responsibility of all building staff involved in the purchase of those items outlined above. Ultimately, the building Operations Manager shall be responsible for overall policy compliance.

## TIME PERIOD

This policy is in place and will continue indefinitely.

## POLICY APPROVAL

This policy was accepted, implemented and approved on December 30, 2009.

Manager's Name \_\_\_\_\_

Real Estate Manager \_\_\_\_\_

Green Street Plaza \_\_\_\_\_

# SOLID WASTE MANAGEMENT POLICY

## Instructions for Plan Creation and Use

Following is a LEED for Existing Buildings: Operations and Maintenance (LEED-EBOM) compliant Solid Waste Management Policy.

As with all Plans and Policies of the LEED rating systems, they must be customized to accommodate specific attributes and practices applicable to an individual project.

Areas of the document that must be reviewed and modified to contain property specific data include:

### SCOPE

The Policy must clearly identify the areas of the building that are covered by the Policy.

### PERFORMANCE METRIC

The site must establish a method of measuring performance over a period of time to validate the Policy and create identifiable outcomes.

### PROCESSES AND STRATEGIES

- A. Ongoing Consumables Overview – Provide an overview of the recycling policy and how it is communicated to occupants and supported by building management in the long-term.
- B. Ongoing Consumables Paper/Cardboard Recycling – Detail the types of materials collected and the collection methods.
- C. Ongoing Consumables Glass/Metal/Plastic Recycling – Detail the types of materials collected and the collection methods.
- D. Ongoing Consumables Toner Cartridge Recycling – Provide a description of the collection methods including location of receptacles and frequency of disposal.
- E. Ongoing Consumables Battery Recycling – Describe materials collected, method of recycling and ongoing process to audit effectiveness of the described program.
- F. Ongoing Consumables Mercury Containing Light Bulbs – Describe the method of collection and disposal of the bulbs including frequency.
- G. Durable Goods Furniture – Detail the method of managing the disposal activity and means by which occupants are encouraged to participate in the program.
- H. Durable Goods Electronics – Detail the method of managing the disposal activity and means by which occupants are encouraged to participate in the program.



**RESPONSIBLE PARTY**

The Policy must include identification of the party(ies) responsible for oversight of the Policy.

**POLICY APPROVAL**

The Policy must be dated and executed by one of the responsible parties.

In addition to the items listed-above, all parts of the Policy must be carefully reviewed to determine if they accurately reflect what is occurring at a site and to determine if the vendor(s) responsible for the activities detailed in the Policy can meet the requirements as set forth by the LEED rating system. Modifications can be made to language contained herein, however any edits must be reviewed to ensure that LEED requirements are still being met.

## **GREEN STREET PLAZA SOLID WASTE MANAGEMENT POLICY**

**SCOPE**

For ongoing consumables, mercury-containing light bulbs, furniture, electronics and facility alterations and additions this Policy is applicable to those portions of the building under direct management control.

**PERFORMANCE METRIC**

The building has established numeric performance metrics to assess how actual outcomes and sustainability performance for each component of this plan will be measured and tracked over time.

On a quarterly basis the management team will calculate the total weight of the building's waste stream – ongoing consumables, durable goods and facilities alterations and additions.

The management team will also assess the weight of those materials that have been successfully diverted from landfills.

The performance metric will be the percentage of the waste stream that is successfully diverted from landfills.

**GOALS**

The goal of this Policy is to reduce the environmental impacts of materials acquired for use in the operations and maintenance of the property.

**PROCESSES AND STRATEGIES****ONGOING CONSUMABLES – OVERVIEW**

The success of the building's source reduction program is dependent on tenant awareness of source reduction strategies. In an effort to maintain awareness of source reduction strategies, the Management Team meets with tenants to discuss source reduction strategies and provides tenant suggestions for source reduction techniques.

## SECTION 4.3

The success of the building's recycling program is dependent on tenant recycling awareness and ongoing tenant recycling incentives. In an effort to maintain awareness of recycling strategies, the Management Team holds disposal audits with an independent auditor and shares the results with tenants.

The success of the tenant recycling program is dependent on tenant accessibility to recycling bins and/or drop-off locations. The Management Team will continually monitor the placement of recycling facilities within the building and strive to integrate recycling bins and/or drop-off locations in locations that maximize recycling and minimizes waste.

### **ONGOING CONSUMABLES – PAPER/CARDBOARD RECYCLING**

The property maintains a comprehensive paper recycling program that accepts white paper, colored paper, fax paper, file folders, newspapers, magazines, catalogs, envelopes, and cardboard.

Each building employee is issued a small paper recycling bin, with larger paper recycling bins located in each of the building's copy rooms. For major office cleanouts, the Management Team provides oversized paper recycling bins.

Best management practices calls for recycling 100% of the paper/cardboard that is under direct control of building ownership.

### **ONGOING CONSUMABLES – GLASS/METAL/PLASTIC RECYCLING**

The property maintains a comprehensive glass/plastic/metal recycling program that accepts glass bottles and jars, metal food cans, aluminum beverage cans, aluminum trays/plates, plastic beverage containers, plastic detergent bottles, and all other plastic numbered 1 through 7.

**Solid Waste Policies will be limited by the availability of material recovery facilities in your area. Work with your recycling partner to identify those wastes that can be included**

At the building level plastic, metal and glass are placed into the traditional waste stream and these materials are then sorted at a transfer facility to ensure that they are recycled.

Best management practices calls for recycling 100% of the glass/metal/plastic that is under direct control of building ownership.

### **ONGOING CONSUMABLES – TONER CARTRIDGE RECYCLING**

The property maintains a toner recycling program that accepts inkjet cartridges and toner drums from all manufacturers.

Tenants have toner/e-waste recycling bins located in their office and as they become full tenants call Green Citizen for pickup.

Best management practices calls for recycling 100% of the toner cartridges that are under direct control of building ownership.

**ONGOING CONSUMABLES – BATTERY RECYCLING**

The property maintains a comprehensive battery recycling program that accepts all dry cell and wet cell batteries. This includes all single-use and/or rechargeable batteries used in radios, phones, cameras, computers, and other devices or equipment.

A battery collection bin is located in the building management office and tenants are encouraged to bring their batteries to the drop-off location.

Best management practices calls for recycling 100% of the batteries that are under direct control of building ownership. The success of this goal will be evaluated by an annual waste stream audit.

**ONGOING CONSUMABLES – MERCURY-CONTAINING LIGHT BULBS**

The property maintains a comprehensive fluorescent light bulb recycling program that accepts all mercury-containing light bulbs.

The building engineering staff changes 100% of the buildings lamps and as these lamps are collected they are stored on the 22nd Floor in a secure area. These lamps are removed from the building on an annual basis for recycling.

Best management practices calls for recycling 100% of the mercury-containing light bulbs that are under direct control of building ownership.

Should mercury-containing lamps break, the engineering and cleaning staff shall follow the clean-up procedure outlined by the EPA to minimize occupant and environmental exposure to mercury. All staff has reviewed and agreed to the EPA guidelines which can be found at <http://www.epa.gov/mercury/spills/#fluorescent>.

**Be certain to determine and apply any local regulations for the proper disposal of lamps, batteries and ballast**

**DURABLE GOODS – FURNITURE**

Because most tenants choose to dispose of their furniture before it has reached the end of its useful life, the Management Team encourages tenants to donate used furniture to charitable organizations rather than discarding it. Building management encourages tenants to recycle furniture and maintains a list of charitable organizations that accept donations.

For those tenants who nevertheless choose to discard their furniture, the property maintains an ongoing “furniture reuse area.” Building Management may also arrange for larger amounts of furniture to be picked up by a charitable organization.

Best management practices calls for donating or recycling 100% of the furniture that is under direct control of building ownership.

**DURABLE GOODS – ELECTRONICS**

Because most tenants choose to dispose of their electronics before they have reached the end of their useful life, the Management Team encourages tenants to donate used electronics (computers, monitors, televisions, fax machines, copiers, printers, etc.) to charitable organizations. Tenants

## SECTION 4.3

have toner/e-waste recycling bins located in their office and as they become full tenants call Green Citizen for pickup.

Best management practices calls for donating or recycling 100% of the furniture that is under direct control of building ownership.

### **FACILITY ALTERATIONS AND ADDITIONS**

Best management practices calls for the reuse/recycling of at least 70% (by weight or volume) of the waste generated from the property's alterations and additions that are under the direct control of building ownership. This includes, but is not limited to, building components and structures (wall studs, insulation, doors, windows); panels, attached finishings (drywall, trim, ceilings); carpet and other flooring material; adhesives; sealants; paints and coatings.

### **RESPONSIBLE PARTY**

The Cleaning Manager and Chief Engineer shall be dually responsible for policy compliance.

### **TIME PERIOD**

This policy is in place and will continue indefinitely.

### **POLICY APPROVAL**

This policy was accepted, implemented and approved on September 30, 2009.

Manager's Name \_\_\_\_\_

Real Estate Manager \_\_\_\_\_

Green Street Plaza \_\_\_\_\_

# GREEN CLEANING POLICY

## Instructions for Plan Creation and Use

Following is a LEED for Existing Buildings: Operations and Maintenance (LEED-EBOM) compliant Green Cleaning Policy.

As with all Plans and Policies of the LEED rating systems, they must be customized to accommodate specific attributes and practices applicable to an individual project.

Areas of the document that must be reviewed and modified to contain property specific data include:

## PERFORMANCE METRIC

The site must establish a method of measuring performance over a period of time to validate the Policy and create identifiable outcomes.

## PROCESSES AND STRATEGIES

1. **Touch Point and Hand Sanitation** – Communication with occupants varies from site to site.
2. **Entryways** – Staffing, cleaning methods, and frequency of cleaning of entryway mats needs to be identified
3. **Products** – Location of chemical spill response equipment and equipment types must be specifically addressed

## STANDARD OPERATING PROCEDURES

Items under Carpet Maintenance and Hard Floor Maintenance must be revised and modified as necessary to describe the activities specific to the subject property

## STAFFING

The staffing plan must be reviewed with the building's janitorial contractor and presented to represent actual practices in place at the site.

## OCCUPANT FEEDBACK and CLEANING AUDITS

The frequency of cleaning audits, who is responsible for the audits and the method of occupants' communication of cleaning related issues to the site staff must be identified.

## RESPONSIBLE PARTY

The Policy must include identification of the party(ies) responsible for oversight of the Policy

## **POLICY APPROVAL**

The Policy must be executed by one of the responsible parties

In addition to the items listed-above, all parts of the Policy must be carefully reviewed to determine if they accurately reflect what is occurring at a site and to determine if the vendor(s) responsible for the activities detailed in the Policy can meet the requirements as set forth by the LEED rating system. Modifications can be made to language contained herein, however any edits must be reviewed to ensure that LEED requirements are still being met.

# **GREEN STREET PLAZA GREEN CLEANING POLICY**

## **SCOPE**

This Policy is applicable to all of the building's interior spaces – occupied, unoccupied and mechanical – as well as the building exterior as described below.

## **PERFORMANCE METRIC**

The building has established numeric performance metrics to assess how actual outcomes and sustainability performance for each component of this plan will be measured and tracked over time.

On a quarterly basis the management team will calculate the total product and labor dollars spent on cleaning. The management team will also assess the portion of these expenditures that meet acceptable sustainability criteria, as outlined below.

The performance metric will be the percentage of building expenditures that are compliant with the policy.

## **GOALS**

The goal of this policy is to reduce exposure of building occupants and maintenance personnel to potentially hazardous chemical, biological and particle contaminants, which adversely impact air quality, health, building finishes, building systems and the environment. Specifically, the building's goal is 100% compliance with the processes and strategies outlined below.

## **PROCESSES AND STRATEGIES**

### **OVERVIEW**

Green cleaning strategies minimize potentially harmful compounds and contaminants in an effort to promote indoor environmental quality. The foundations of an effective green cleaning program are:

- \_\_\_ Containment of soil and contaminants at entryways
- \_\_\_ Ongoing touch point and hand sanitation

- \_\_\_ Products with low environmental impact
- \_\_\_ Equipment with low environmental impact
- \_\_\_ Techniques with low environmental impact
- \_\_\_ Appropriate staffing
- \_\_\_ Appropriate training
- \_\_\_ Cleaning audits and occupant feedback
- \_\_\_ Ongoing process improvement

## TOUCH POINT AND HAND SANITATION

Best management practices call for focused touch point sanitation in locations such as faucets, door handles, drinking fountains, elevator buttons and trash bins to reduce the transmission of germs.

The Management Team recognizes the importance of hand hygiene as it reduces the potential spread of illness within the building. Each lavatory is equipped with hand soap that does not contain antimicrobial agents in addition to a separate alcohol-based waterless hand sanitizer.

To promote hand hygiene among building occupants, the Management Team posts signage in each lavatory and issues a newsletter during cold and flu season.

## ENTRYWAYS

Best management practices call for a 10' entryway system (grill, grate or mat) to be permanently installed at all public entryways. Entryway systems reduce occupant exposure to potentially hazardous chemical biological and particulate contaminants, which adversely affect air quality, human health, building finishes, building systems and the environment.

The cleanliness of the building's entryways is a top priority, as containment minimizes the introduction of soil and other contaminants. During business hours, the property employs a staff of one full-time day porter to maintain appropriate cleanliness standards at the building's entryways and lobbies. At least three times each day during business hours, entryways are vacuumed. At least once/week entryway matting is shampooed. At least once/month entryway matting is removed and the bottom of the mat is cleaned to reduce the potential for moisture and bacterial and fungal growth.

## PRODUCTS

Best management practices call for the use of cleaning products that minimize environmental impacts but maintain acceptable cleaning standards. Although more specific procurement guidelines are outlined below, cleaning products shall generally meet the following characteristics:

- \_\_\_ A more neutral pH as compared to similar product types
- \_\_\_ A lower volatile organic content (VOC) as compared to similar product types
- \_\_\_ Biodegradable
- \_\_\_ Free of dyes

The standards utilized will need to be adapted within the LEED Credit guidelines to suit the materials and processes utilized in the property



## SECTION 4.4

- \_\_\_ Free of fragrances
- \_\_\_ Minimal use of packaging materials
- \_\_\_ Manufactured from renewable resources
- \_\_\_ Free from antimicrobial agents (exceptions are made for the targeted application of disinfectants)

Although more specific procurement guidelines are outlined below, janitorial paper products and trash bags shall minimize the property's use of virgin materials.

Cleaning products shall meet one or more of the following standards for the appropriate category:

- \_\_\_ Green Seal GS-37, for general-purpose, bathroom, glass and carpet cleaners used for industrial and institutional purposes
- \_\_\_ Environmental Choice CCD-110, for cleaning and decreasing compounds
- \_\_\_ Environmental Choice CCD-146, for hard surface cleaners
- \_\_\_ Environmental Choice CCD-148, for carpet and upholstery care.

Disinfectants, metal polish, floor finishes, strippers or other products not addressed by the above standards meet one or more of the following standards for the appropriate category:

- \_\_\_ Green Seal GS-40, for industrial and institutional floor care products
- \_\_\_ Environmental Choice CCD-112, for digestion additives for cleaning and odor control
- \_\_\_ Environmental Choice CCD-113, for drain or grease traps additives
- \_\_\_ Environmental Choice CCD-115, for odor control additives
- \_\_\_ Environmental Choice CCD-147, for hard floor care
- \_\_\_ California Code of Regulations maximum allowable VOC levels for the specific product category

Disposable janitorial paper products and trash bags meet the minimum requirements of one or more of the following programs for the applicable product category:

- \_\_\_ US EPA Comprehensive Procurement Guidelines for Janitorial Paper and Plastic Trash Can Liners
- \_\_\_ Plastic Trash Can Liners no thicker than 0.70 mils (17.78 microns)
- \_\_\_ Green Seal GS-09, for paper towels and napkins
- \_\_\_ Green Seal GS-01, for tissue paper
- \_\_\_ Environmental Choice CCD-082, for toilet tissue
- \_\_\_ Environmental Choice CCD-086, for hand towels
- \_\_\_ Janitorial paper products derived from rapidly renewable resources or made from tree-free fibers

Hand soaps meet one or more of the following standards:

- \_\_\_ No antimicrobial agents (other than as a preservative) except where required by health codes and other regulations (i.e. food service and health care requirements)
- \_\_\_ Green Seal GS-41, for industrial and institutional hand cleaners
- \_\_\_ Environmental Choice CCD-104, for hand cleaners and hand soaps

As a best management practice, chemical storage shall be located in a secure area that is separately vented or otherwise separated from the building air supply. As a best management practice the cleaning staff maintains the smallest possible inventory of chemicals. Storage areas shall be checked daily to ensure that they are free from spills. Stock chemicals shall be reviewed periodically to ensure that none are leaking and that the expiration dates are not passed.

As a best management practice, flammable liquids, acids, bases and reactives shall be stored separately at all times. The separation of solid and liquid chemicals shall similarly reduce the possibility of unwanted chemical reactions.

As a best practice, each chemical container shall be labeled at all times and no improperly labeled chemicals shall be used. The property maintains a current (less than 3 years old) MSDS on file for each hazardous chemical used on-site and maintains the MSDS in a location that is readily accessible to all employees.

As a best management practice, the property minimizes product packaging through the use of concentrated cleaning products and dispensing equipment. Dispensing systems shall be outfitted with a backflow preventer and product dilution rates shall be regularly verified.

In the unlikely event of a chemical spill, the property maintains spill response equipment located in the building engineering shop. This equipment consists of 6 – 3”x10’ absorbent sock, 5 – 16 1/2 “x20” absorbent sheets, 4 – 16”x20” absorbent pillows, 1 – 22 pound bag of Lite Dri absorbent and 8 – temporary disposal bags.

## CLEANING EQUIPMENT

Best management practices calls for the use of cleaning equipment that minimizes environmental impact in regards to dust control, energy use and noise pollution. Although more specific procurement guidelines are outlined below, cleaning equipment shall generally meet the following characteristics:

- \_\_\_ Protects indoor air quality
- \_\_\_ Prevents noise pollution
- \_\_\_ Reduces water use
- \_\_\_ Reduces energy use
- \_\_\_ Ergonomically designed
- \_\_\_ Minimizes damage to the building

Managers should adapt their policy to the specific equipment in use at their facility

## SECTION 4.4

As a best management practice, all future equipment purchases shall meet one of the following standards:

- \_\_\_ Vacuum cleaners certified by the Carpet and Rug Institute “Green Label” Testing Program for vacuum cleaners operating with a sound level of less than 70 dBA
- \_\_\_ Carpet extraction equipment used for restorative deep cleaning certified by the Carpet and Rug Institute’s “Seal of Approval” Testing Program for deep-cleaning extractors
- \_\_\_ Powered floor maintenance equipment, including electric and battery-powered floor buffers and burnishers, equipped with vacuums, guards and/or other devices for capturing fine particulates and operates with a sound level of less than 70 dBA
- \_\_\_ Propane-powered floor equipment with high-efficiency, low-emissions engines with catalytic converters and mufflers that meet the California Air Resources Board (CARB) or EPA standards for the specific engine size and operate with a sound level less than 90 dBA
- \_\_\_ Automated scrubbing machines equipped with variable-speed feed pumps and on-board chemical metering to optimize the use of cleaning fluids
- \_\_\_ Battery-powered equipment equipped with environmentally preferable gel batteries
- \_\_\_ Powered equipment ergonomically designed to minimize vibration, noise and user fatigue
- \_\_\_ Equipment designed with safeguards, such as rollers or rubber bumpers, to reduce potential damage to building surfaces.

Equipment shall be selected on the basis of performance and durability in an effort to minimize future equipment purchases. An equipment log shall be maintained to document the date of equipment purchase and to track all repair and maintenance activities.

### STANDARD OPERATING PROCEDURES

#### MEASURING/DILUTING CHEMICALS

Cleaning staff shall follow the manufacturer’s directions and wear appropriate personal protective equipment at all times. All secondary containers shall be properly labeled. Cleaning products shall be diluted with the appropriate amount of water, and two or more chemicals shall never be mixed together.

#### TOUCH POINT SANITATION

Best management practices call for concentrated sanitation at all “touch points” – areas such as faucets, door handles, drinking fountains, elevator buttons and trash bins – which commonly act as a transfer medium for germ transmission. Touch point sanitation shall be a primary training focus for both dayporters and night cleaners.

#### DUSTING

Best management practices call for the use of microfiber cloths to regularly dust all horizontal and vertical surfaces. When a cleaning chemical is used for dusting, it shall always be applied to the

cloth rather than the surface to be dusted. As a general rule, dusting shall be completed from top to bottom and high dusting shall be followed by vacuuming.

### **GLASS CLEANING**

Best management practices call for the use of microfiber cloths to clean mirrors, window interiors and other interior glass. When a cleaning chemical is used for glass cleaning, its use shall be limited by applying the chemical to the cloth rather than the surface to be cleaned.

### **DISPOSAL OF MERCURY CONTAINING LAMPS**

Staff shall recycle all mercury-containing lamps through the building's comprehensive fluorescent light bulb recycling program.

Should mercury-containing lamps break, staff shall follow the clean-up procedure outlined by the EPA to minimize the release of mercury into the environment. Staff has reviewed and agreed to the EPA guidelines which can be found at <http://www.epa.gov/mercury/spills/#fluorescent>.

## **HARD FLOOR AND CARPET MAINTENANCE**

### **OVERVIEW**

Best management practices call for an effective hard floor and carpet maintenance program to minimize the need to strip and recoat a floor or to extract a carpet. An effective hard floor and carpet maintenance program is also designed to extend the life of floor materials – reducing waste at the source and minimizing the impact on landfills.

### **CARPET MAINTENANCE – Vacuuming**

Best practices call for spills to be cleaned as quickly as possible as an effective pollution prevention strategy. Best practices call for vacuuming from the area of the room farthest from the entry door and continuing toward the door. In open areas a V or W pattern shall be followed. Extra care shall be taken along walls and baseboard edges. As a best management practice, vacuum bags should be emptied when half full and disposed of properly. Specifically, the building's carpets are vacuumed nightly and/or by a dayporter in response to a reported spill.

### **CARPET MAINTENANCE – Extraction**

As a best management practice, carpet extraction is conducted with the minimum amount of least toxic products and using the least amount of water in a well-ventilated unoccupied space. Solution should be applied from a sprayer in a stream or through a coarse spray. Subject areas should be ventilated during and after extraction. Extra care should be taken to remove water to prohibit future mold growth. Specifically, the building's carpets are subject to extraction monthly or as-needed.

### **HARD FLOOR MAINTENANCE – Dust Mopping**

Best practices call for the use of a microfiber dust mop, which may be treated, used, laundered and re-treated as necessary. Sweeping shall begin in the area of the room farthest from the entry door and continue toward the door. In open areas an overlapping pattern shall be used. Extra care shall be taken along walls and baseboard edges. Specifically, the building's hard floors are mopped daily.

## SECTION 4.4

### **HARD FLOOR MAINTENANCE – Wet Mopping**

Best practices calls for a two-bucket system to include one bucket of properly diluted cleaner and one bucket of clear water. Mopping shall use side-to-side strokes beginning in the area of the room farthest from the entry door and continuing toward the door. Once complete, the floor should be mopped again with a clean rinse mop and clean rinse water. The rinse water should remain clear and may need to be changed frequently. Extra care shall be taken along walls and baseboard edges. Specifically, the building's hard floors are wet mopped nightly and/or by a dayporter in response to a reported spill.

### **HARD FLOOR MAINTENANCE – Stripping**

As a best management practice, floor stripping should be conducted with the least toxic products available in a well-ventilated unoccupied space. The appropriate personal protective equipment should be worn at all times; this typically includes gloves, goggles and non-slip footwear. Subject areas should be ventilated during and after stripping. Stripper should never be applied via spray or aerosol. Specifically, the building's hard floors are stripped quarterly or as-needed.

### **HARD FLOOR MAINTENANCE – Restoration**

As a best management practice, a solid foundation of low VOC and/or water-based floor finish should be carefully reapplied in a manner that maximizes the longevity of the coatings. The appropriate personal protective equipment should be worn at all times; this typically includes gloves, goggles and non-slip footwear. Coatings should never be applied via spray or aerosol.

## **TRAINING**

While specific training varies by job function, all cleaners receive training in the hazards of use, disposal, recycling of cleaning chemicals, dispensing equipment and packaging. Training emphasizes proper use of chemicals and equipment in addition to various site specific green cleaning techniques. Seemingly minor techniques, such as applying a cleaning agent to a cloth rather than spraying it on a surface, are important and can have an enormous impact on exposures to building occupants and the environment. Cleaning personnel must also understand that adding extra concentrated cleaning product does not make the cleaner work better or faster.

As a best practice, the property's cleaning manager maintains an employee training log.

**Specific Staffing will vary with the occupancy of the building. A Manager should routinely revisit the current staffing levels to ensure that the policy is adequate**

## **STAFFING**

As a best management practice, the property relies upon the building's cleaning contractors to dictate the cleaners' staffing plan.

The current staff plan for daily cleaning services includes one account manager and one full-time night supervisor. A night supervisor and one night foreman are on-site at all times. During regular business hours, the building employs one full-time day porters. This porter is assigned to the building entrances, lobby and elevators, as well as the building's bathrooms and tenant service requests.

At night, the property employs 10 full-time cleaners between the hours of 6 PM and 2 AM. An assigned cleaner services each tenant space, bathroom and common area on a daily basis.

Exterior window cleaning is performed two times/year by a separate contractor. Window washing teams generally consist of two cleaners and one window washing supervisor.

Major cleaning operations are scheduled on the weekend to minimize effects on building occupants.

## OCCUPANT FEEDBACK AND CLEANING AUDITS

The Management Team values occupant feedback as it relates to the building's green cleaning program. Building Management performs weekly cleaning audits, but also meets with tenant contacts on a periodic basis in regards to cleaning. Once a year, the Management Team administers a formal web-based tenant survey in regards to cleaning on an annual basis.

More specific tenant feedback may be submitted to the building management team at any time through use of the property's web-based tenant work order system.

The property's Cleaning Manager is available to respond to tenant cleaning concerns during all business hours.

Establishing a notification method to sensitive populations within a building or by scheduling activities such that building air supply can be adequately purged prior to working hours.

## VULNERABLE BUILDING OCCUPANTS

The management team recognizes that some occupants will be disproportionately affected by the building's cleaning practices. Occupant reaction to the cleaning program schedule, chemicals or methods may vary due to oversensitivity to odors, pre-existing health conditions, reduced immune system function or other factors.

Understanding occupant sensitivities is essential to accommodating vulnerable building occupants. When building management is aware of a vulnerable building occupant, the management team may alter or otherwise minimize a cleaning product in a certain area of the building, alter the time and day that cleaning takes place and/or propose the occupant's relocation to a different area of the building.

Any occupant may raise concerns about indoor environmental quality through the methods described in the property's Pollutant Source Management Policy.

## ONGOING PROCESS IMPROVEMENT

The property recognizes the need to continuously improve the building's cleaning program in response to new products, equipment and techniques. The team will convene quarterly to discuss the continued efficacy of this policy and to discuss any necessary changes to the policy.

## RESPONSIBLE PARTY

The building's Green Cleaning Policy will be directed by the property's Cleaning Manager and Property Manager.

## SECTION 4.4

### TIME PERIOD

This policy is in place and will continue indefinitely.

### POLICY APPROVAL

This policy was accepted, implemented and approved on December 30, 2009.

Manager's Name \_\_\_\_\_

Real Estate Manager \_\_\_\_\_

Green Street Plaza \_\_\_\_\_



## Endnotes

- 1 U.S. Department of Energy, Buildings Energy Data Book, October 2009, Chart 6.1.1.
- 2 U.S. Department of Energy, Buildings Energy Data Book, October 2009, Chart 6.1.2.
- 3 [http://www.architecture2030.org/current\\_situation/stop\\_coal.html](http://www.architecture2030.org/current_situation/stop_coal.html), accessed May 9, 2009.
- 4 [http://www.mckinsey.com/mgi/publications/Investing\\_Energy\\_Productivity/](http://www.mckinsey.com/mgi/publications/Investing_Energy_Productivity/), accessed May 9, 2009.
- 5 U.S. figures from U.S. Department of Energy, Buildings Energy Data Book, <http://buildingsdatabook.eren.doe.gov/ChapterView.aspx?chap=3#4>, accessed May 8, 2009.
- 6 C-Series Reports, Manufacturing and Construction Division (Washington, DC: Census Bureau, U.S. Department of Commerce, 1995).
- 7 Data from U.S. Green Building Council, LEED Matrix, October 2009.
- 8 U.S. Green Building Council, Making the Business Case for High-Performance Green Buildings (Washington, D.C.: U.S. Green Building Council, 2002), available at [https://www.usgbc.org/Docs/Member\\_Resource\\_Docs/makingthebusinesscase.pdf](https://www.usgbc.org/Docs/Member_Resource_Docs/makingthebusinesscase.pdf), accessed May 6, 2007. See also Environmental Building News 14(4) (April 2005), available at [www.buildinggreen.com](http://www.buildinggreen.com), accessed May 6, 2007.
- 9 Jerry Yudelson, Greening Existing Buildings, (New York: McGraw-Hill, 2009), Chapter 5.
- 10 The recession that began in 2008 has depressed rents and reduced occupancy in most commercial buildings, but a comparison of LEED buildings with similar non-LEED buildings still shows an advantage for the former in these metrics. Doing Well by Doing Good, (UC Berkley, 2009).
- 11 See [www.dsireusa.org](http://www.dsireusa.org) for an up-to-date list of tax and utility incentives for energy conservation retrofits.
- 12 CBRE/USD study, released 2009, <http://www.cbre.com/NR/rdonlyres/BDFE965C-10DF-455A-82BC-4CD5A14F938A/794420/DoGreenBuildingsMakeDollarsandSensedraftNov102009.pdf>.
- 13 Ibid.
- 14 Interview with Behringer Harvard Management team, January 2010.
- 15 Interview with Andrew McAllan, April 2009, cited in Yudelson, Greening Existing Buildings, p. 70.
- 16 <http://www.fmlink.com/News/Articles/news.cgi?display=article&id=25121>, accessed May 24, 2009.
- 17 Lawrence Berkeley National Laboratory, "The Cost-Effectiveness of Commercial-Buildings Commissioning," 2004, <http://eetd.lbl.gov/emills/PUBS/Cx-Costs-Benefits.html>. This research reviewed 224 studies of the benefits of building commissioning and concluded that based on energy savings alone, such investments have a payback of five years or less.
- 18 BOMA Experience Exchange Report 2009, [www.boma.org](http://www.boma.org), store section
- 19 <http://www.dec.ny.gov/energy/1540.html>, accessed July 6, 2009.
- 20 U.S. Department of Energy, [www.energy.gov/taxbreaks.htm](http://www.energy.gov/taxbreaks.htm), accessed March 6, 2007.
- 21 [www.dsireusa.org](http://www.dsireusa.org), accessed May 23, 2009.
- 22 For a list of state tax incentives for renewable energy, see the Directory of State Incentives for Renewable Energy, [www.dsireusa.org](http://www.dsireusa.org); other local government incentive programs can be found at <https://www.usgbc.org/ShowFile.aspx?DocumentID=691>.
- 23 "Do Green Buildings Make Dollars and Sense for Investors?" USD/CBRE study, November 2009.

- 24 See the many studies from CoStar, at <http://www.costar.com/News/Article.aspx?ID=D968F1E0DCF73712B03a099e0e99c679>, accessed April 27, 2010.
- 25 Interview with Denis Blackburne, February 2008. See also Scott Doksansky, "Existing Buildings: The Green-Headed Stepchild of the Sustainability Movement," pp. 167–98 in *The Green Building Bottom Line*, McGraw Hill, 2008.
- 26 Interview with Jerrold Lea, Hines, Houston, May 2007.
- 27 Eleven case studies strongly suggest that innovative daylighting systems can pay for themselves in less than one year because of energy and productivity benefits. Vivian Loftness et al., "Building Investment Decision Support (BIDS)" (Pittsburgh: Center for Building Performance and Diagnostics, Carnegie Mellon University, n.d.), available at <http://cbpd.arc.cmu.edu/ebids>, accessed March 6, 2007.
- 28 Carnegie Mellon University, <http://cbpd.arc.cmu.edu/ebids/images/group/cases/lighting.pdf>, accessed March 6, 2007.
- 29 [www.cbe.berkeley.edu/research/pdf\\_files/Abbaszadeh\\_HB2006.pdf](http://www.cbe.berkeley.edu/research/pdf_files/Abbaszadeh_HB2006.pdf), accessed May 27, 2007.
- 30 Researchers at the University of San Diego's Burnham-Moores Center for Real Estate and CB Richard Ellis find that people who work in green buildings are more productive and call in sick less often than employees who work in conventional buildings; [http://www.sandiego.edu/business/centers/real\\_estate](http://www.sandiego.edu/business/centers/real_estate), accessed April 27, 2010.
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ISBN: 978-1-932444-59-9



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