

Engineering Management  
Field Project

**Green Buildings: Construction Design  
Firms' Implementation of Sustainable  
Design Standards**

By

Nathan Malone

Fall Semester, 2008

An EMGT Field Project report submitted to the Engineering Management Program and the Faculty of the Graduate School of The University of Kansas in partial fulfillment of the requirements for the degree of Master's of Science.

---

Tom Bowlin  
Committee Chairperson

---

Herbert Tuttle  
Committee Member

---

Kevin Lewis  
Committee Member

Date accepted: \_\_\_\_\_

This page intentionally left blank

## **Acknowledgements**

I would like to thank my committee members Tom Bowlin, Herb Tuttle, and Kevin Lewis for taking the time to be on my Field Project Committee. Their comments and suggestions were instrumental in the completion of this field project.

I also would like to thank Shane Lutz, Drew Rimmer, and Anthony Martin for their time and personal knowledge of sustainable design and how firms are integrating these design standards. Without the information gained from their interviews I would not have been able to complete the implementation sections of this field project.

And last but certainly not least I want to thank my family. The sacrifice my family has endured during this process is greatly appreciated. I want to give a special thanks to my wife, Staci. Without her love and support it would not have been possible for me to fulfill the requirements needed to complete this paper and therefore this degree.

## **Executive Summary**

This paper is written to show the importance of green buildings and therefore the need for sustainable design. The paper describes why a construction design firm must take the steps necessary to properly integrate these sustainable design standards in order to stay competitive in the construction design industry.

The paper starts by describing the parts of the current industry standard green building rating system, Leadership in Energy and Environmental Design (LEED), and explaining whom uses LEED and how it was developed by the United States Green Building Council (USGBC). Both benefits and criticisms of LEED are given and the need for such green building systems becoming more widely used in the construction industry is established. After determining the importance of sustainable design and LEED the paper goes on to show why construction design firms must have the ability to design sustainable projects to stay relevant in the future market.

After establishing the need for sustainable design standards the paper then gives a step by step outline on how to implement such design standards into a construction design firm. The last chapter of the paper gives suggestions where further research could be focused to aid construction design firms in the green building area of the market.

# TABLE OF CONTENTS

<b>Acknowledgements .....</b>	<b>i</b>
<b>Executive Summary.....</b>	<b>ii</b>
<b>Chapter 1 – Introduction .....</b>	<b>1</b>
USGBC and LEED Overview .....	2
The LEED Green Building Rating System .....	9
The Green Building Certification Institute .....	13
<b>Chapter 2 – Literature Review .....</b>	<b>15</b>
Background of Sustainable Design Guidelines .....	15
Criticism of LEED and the USGBC.....	17
Benefits of the USGBC and LEED .....	19
Need for Sustainable Design.....	21
Architecture 2030, the 2010 Imperative and the 2030 Challenge .....	23
<b>Chapter 3 – Business Case for Sustainable Design and LEED.....</b>	<b>25</b>
<b>Chapter 4 –Implementation of Sustainable Design Standards .....</b>	<b>30</b>
Step 1 – Create a Sense of Urgency .....	31
Step 2 – Form a Powerful Coalition .....	33
Step 3 – Create a Vision .....	34
Step 4 – Communicate the Vision .....	35
Step 5 – Remove Obstacles.....	36
Step 6 – Create Short-term Wins .....	39
Step 7 – Build on the Change .....	40
Step 8 – Anchor the Changes in Corporate Culture.....	41
<b>Chapter 5 – Conclusion and Recommendation .....</b>	<b>42</b>
<b>Chapter 6 – Suggestions for Further Research .....</b>	<b>44</b>
<b>References .....</b>	<b>46</b>
<b>Bibliography.....</b>	<b>49</b>

## List of Figures

Figure 1: Certified & Registered Commercial LEED Projects by State .....	5
Figure 2: Commercial LEED Registered Projects (per year) .....	6

## Chapter 1 – Introduction

The term “Green” is jargon associated with anything considered environmentally friendly and has been flung about for years in nearly every conceivable consumer context. Green buildings are designed and constructed with consideration for the environment and the health of the building occupants. Although green buildings are not completely sustainable they are certainly a step toward achieving sustainability. Sustainable design is a ubiquitous state of blending with nature; the capacity to maintain a certain process or state indefinitely. Sustainable design in the construction industry is often used to describe green building design and although this is not entirely correct for the purpose of this paper the two terms are interchangeable.

Most people associate being green with trying to prevent global warming or trying to simply save the forest. This paper does not attempt to validate global warming or any other theory dealing with the state of the earth’s environment. This paper shows that no matter what stance is taken with the ecological condition of our planet there are several reasons to get behind the green building concept. The green building concept is associated with any structure designed, built, renovated, operated, or reused with objectives to: (1) Protect occupant health; (2) Improve employee productivity; (3) Wisely use natural resources; and (4) Reduce the environmental impact (Curtatone 2008).

The industry standard rating system for green buildings is the Leadership in Energy and Environmental Design system which is more commonly referred

to as LEED. LEED was created by the United States Green Building Council (USGBC). LEED is a relatively new rating system and as such inherently still has some issues to work out. The positives and negatives of this system are detailed in the second chapter of this paper.

This paper discusses the many aspects of sustainable design including the intricacies of the USGBC and LEED, the reasons why a construction design firm needs to have the ability to design sustainable projects, and how to integrate such design standards into a construction design firm.

### **USGBC and LEED Overview**

The USGBC is a non-profit organization committed to expanding sustainable building practices. USGBC is composed of more than 13,500 organizations from across the building industry that are working to advance structures that are environmentally responsible, profitable, and healthy places to live and work. Members include building owners and end-users, real estate developers, facility managers, architects, designers, engineers, general contractors, subcontractors, product and building system manufacturers, and government agencies (About USGBC 2008).

The USGBC's mission is to transform the way buildings and communities are designed, built and operated, enabling an environmentally and socially responsible, healthy, and prosperous environment that improves the quality of life. The USGBC's Board of Directors has articulated "guiding principles" that will help with the decisions made every day about USGBC and its programs. In an industry predicated on innovation, the principles provide

clarity and continuity, while also giving the flexibility to grow and respond to a rapidly changing market.

To better understand the LEED green building rating system is to first learn about how the USGBC started. The USGBC started with an unlikely alliance between a real-estate developer, David Gottfried, and a senior scientist for the Natural Resources Defense Council, Rob Watson. “The great majority of environmental organizations had invested in keeping companies on the other side of a fence,” says Richard Fedrizzi, the CEO of the council. “David [Gottfried] thought that things could be done differently. If the USGBC could invite business to the table, they could develop standards relative to building performance, buy-in at the very top, and be able to transform the marketplace toward sustainable buildings” (Kamenetz 2007).

The USGBC officially was started in 1993 and spent almost three years working on the LEED standard before releasing it to the public. The LEED rating system is simple in concept. Architects and engineers attempt to accumulate points in six different categories. Once a building is complete a representative from the Green Building Council reviews the documentation – plans, engineers’ calculations – and awards points out of a possible 69 point. The points are totaled and if enough points have been gathered the project is then awarded one of four levels; certified, silver, gold, or platinum.

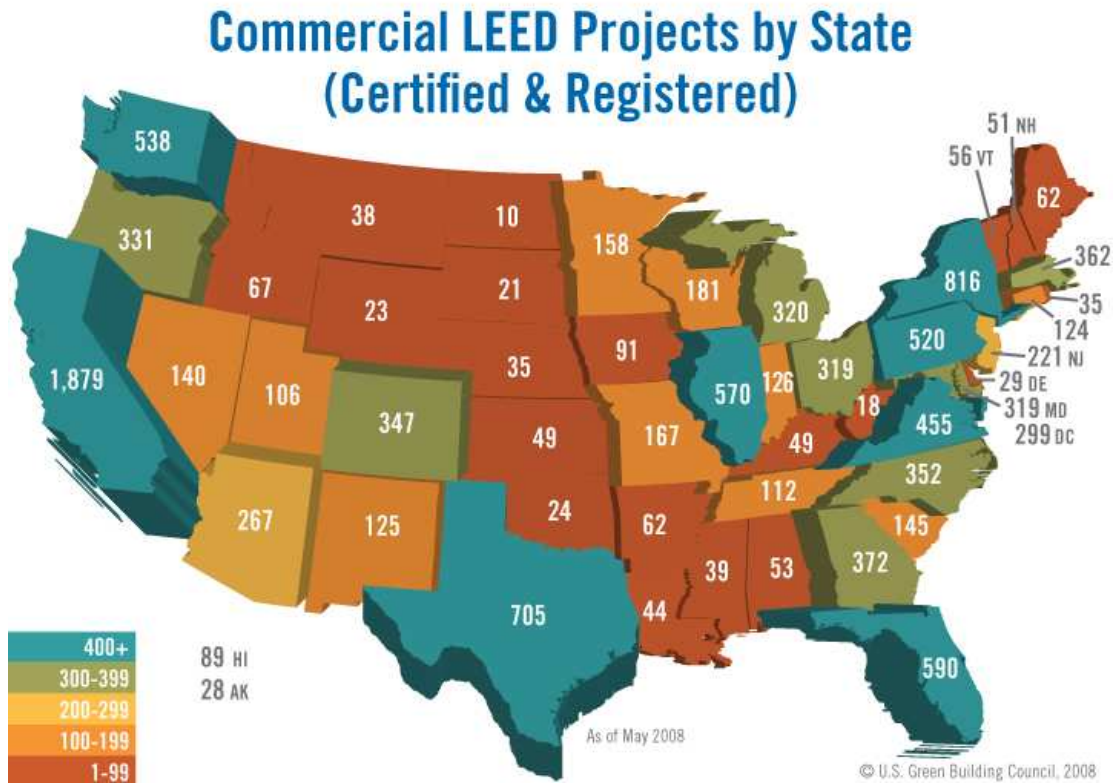
Watson says the point system was specifically constructed to entice builders and drive the market in a green direction. “One definable action equals one point,” he says. Bike racks, one point; recycling room, one point. “The



USGBC threw a few gimmies in there so people could get into the low 20s ... and say, 'We can do this'" (Kamenetz 2007).

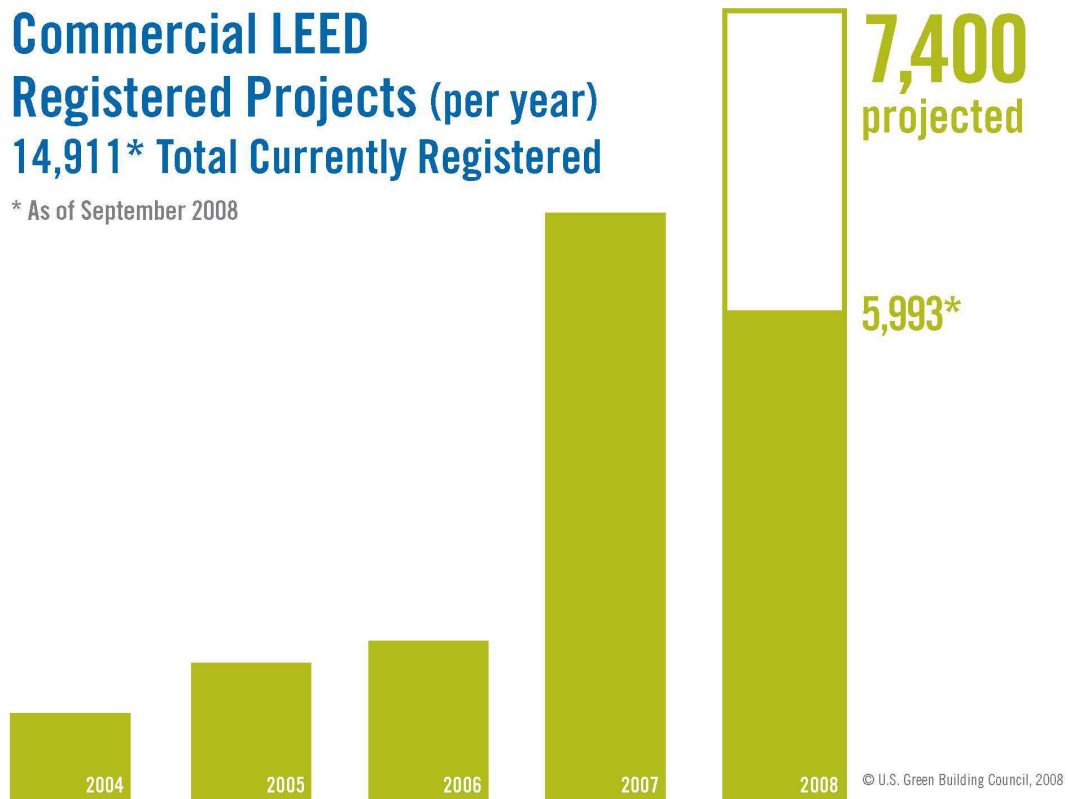
LEED is not the only green building rating system. Other countries have their own versions of green building rating systems. The U.K. benchmark for assessing environmental performance is BREEAM (Building Research Establishment Environment Assessment Method). This system was the first environmental certification system and was developed by the British Research Establishment in 1990. Korea, Italy and Brazil are developing their national green building rating tools based on a spreadsheet tool called GBtool. GBtool was developed by a collaboration of more than twenty countries in 1998. Australia utilizes a system called Green Star Certification and Canada developed a variation of BREEAM called Green Globes. Green Globes is used both in Canada and in the United States although LEED is more established in the United States.

The following two figures show the extent of LEED certification and registration in the United States. Figure 1 shows how every state has certified commercial LEED projects. As of September 2008 there are 1,819 certified commercial LEED projects.



**Figure 1: Certified & Registered Commercial LEED Projects by State**  
(U.S. Green Building Council, 2008)

Figure 2 shows the growth of LEED projects being registered.



**Figure 2: Commercial LEED Registered Projects (per year)**  
(U.S. Green Building Council, 2008)

The LEED Green Building Rating System encourages and accelerates global adoption of sustainable green building and development practices through the creation and implementation of universally understood and accepted tools and performance criteria (LEED Rating Systems 2008). LEED gives building owners and operators the tools they need to have immediate and measurable impacts on their buildings' performance. LEED promotes a whole-building approach to sustainability by recognizing performance in five key areas of human and environmental health: sustainable site development,

water savings, energy efficiency, materials selection and indoor environmental quality. LEED provides a road map for measuring and documenting success for every building type and phase of a building lifecycle (What is LEED, USGBC 2008).

The USGBC maintains 75 regional chapters and all chapters have a common purpose of transforming the way buildings are designed and built with an emphasis on preserving the environment (Granger 2007). In addition to recommending policies to the USGBC Board, LEED Committees have primary responsibility for the development, implementation and revisions of LEED.

LEED rating system committees are responsible for the development and implementation of LEED rating systems either in development or undergoing revisions. They remain in existence until their rating system is fully implemented. In an effort to harmonize and align credits across LEED, the LEED committee structure is transitioning to include three core committees to oversee the certification process, market responsiveness, and technical rigor of LEED.

All LEED core committees have associated corresponding committees made up of USGBC members. Any interested member may join the corresponding committee to receive regular updates and minutes from the core committee and may submit questions or comments to the core committee. Core committee members are elected from the corresponding committee member body. Only corresponding committee members are eligible to vote in core committee elections.

There are seven different committees, including:

- LEED Steering Committee

This governing body of all LEED committees is responsible for direction and decisions for the LEED program in both the U.S. and internationally.

- Certification Committee

Ensures that the LEED certification process continues to be technically rigorous, consistent and responsive to the needs of LEED customers.

- Market Sector Committee

Oversees market transformation through LEED and ensures that LEED continues to be responsive to the markets that it addresses.

- Technical Committee

Ensures that all LEED standards are technically rigorous, scientifically valid and cost-effective. Also manages the Technical Advisory Groups (TAGs).

- Technical Advisory Groups

Advise on credit interpretation requests, credit rulings and credit ruling appeals. Assure consistency and technical rigor in the development of LEED.

- Technical and Scientific Advisory Committee (TSAC)

Provides advice and support for all LEED projects, serving as an independent and impartial forum for vetting technical issues when they are potentially difficult to resolve or involve significant controversy.

- Rating System Committees

These committees are responsible for the direction and decisions of LEED rating systems currently undergoing development or major revisions (LEED Committees 2008).

LEED addresses all building types and emphasizes state-of-the-art strategies for sustainable site development, water savings, energy efficiency, materials and resources selection, and indoor environmental quality. LEED is a practical rating tool for green building design and construction that provides immediate and measurable results for building owners and occupants (About USGBC 2008).

### **The LEED Green Building Rating System**

LEED certification is based on the number of “points” that a building is able to achieve in each of six areas. The breakdown of how points are distributed is based on the city and/or USGBC chapter, but important features common in LEED-certified buildings include items like low-flow toilets and nontoxic paint on the walls.

As mentioned earlier there are four levels of certification, including:

- **Certified**—40-50 percent of non-innovation points attained
- **Silver**—50-60 percent
- **Gold**—60-80 percent
- **Platinum**—over 80 percent

The LEED certification process is not complex, though there are prerequisites that need to be met and procedures that need to be followed. Guidelines for specific programs can be found in the LEED section of the USGBC's website. It is important to start early when thinking about LEED. Design and construction can be done much more cost effectively when LEED is considered from the onset of the project.

Prior to beginning the certification process, a firm must first determine under which LEED program the project is eligible (LEED Certification 2008). Below is a list of the current LEED programs:

- New construction

LEED for new construction and major renovations is designed to guide and distinguish high-performance commercial and institutional projects.

- Existing buildings

LEED for existing buildings: operations and maintenance provides a benchmark for building owners and operators to measure operations, improvements and maintenance.

- Commercial interiors

LEED for commercial interiors is a benchmark for the tenant improvement market that gives the power to make sustainable choices to tenants and designers.

- Core and shell

LEED for core and shell aids designers, builders, developers and new building owners in implementing sustainable design for new core and shell construction.

- Schools

LEED for schools recognizes the unique nature of the design and construction of K-12 schools and addresses the specific needs of school spaces.
- Retail

LEED for retail recognizes the unique nature of retail design and construction projects and addresses the specific needs of retail spaces.
- Healthcare

LEED for healthcare promotes sustainable planning, design and construction for high-performance healthcare facilities.
- Homes

LEED for homes promotes the design and construction of high-performance green homes.
- Neighborhood development

LEED for neighborhood development integrates the principles of smart growth, urbanism and green building into the first national standard for neighborhood design (LEED Rating Systems 2008).

Once the construction design firm has determined that the project is a viable candidate for a specific program, the certification process involves four steps:

1. Project registration: The first step towards earning LEED certification is registering the project. Registration establishes the project's contact with the USGBC and gives the construction design firm access to LEED-Online and the LEED Credit Interpretations



Database, which provides essential information, software tools and communications. There is a standard fee for project registration – which is lower for USGBC members – as well as a fee for certification; certification fee structure is based upon specific programs applied to and project square footage. Note that the USGBC fully refunds certification fees for any project awarded a LEED Platinum rating.

2. Documentation submittal: Once the project is registered, the project team must prepare documentation and calculations to satisfy the prerequisite and credit requirements as of the registration date. This can be done online with user-friendly templates developed by USGBC.
3. LEED technical reviews: Once all documentation has been completed and submitted, the USGBC LEED Certification Team will review the projects application. During this period, the construction design firm may be asked to supply additional supporting documentation. The review process can be expedited for an additional fee.
4. Certification award: The Certification Team delivers a final LEED review, and if certification is granted, the project team is given 25 days to appeal the rating. If the rating is appealed, an appeal LEED review will be issued. After acceptance of the rating, LEED certification is final, and the project team receives an award letter, certification and LEED plaque indicating the certification level - Certified, Silver, Gold or Platinum (LEED Certification 2008).

## **The Green Building Certification Institute**

Founded by the USGBC in 2008, the Green Building Certification Institute (GBCI) develops and administers programs aimed at improving green building practice. GBCI administers the LEED Professional Accreditation exam. The USGBC is leading a national consensus for producing a new generation of buildings that deliver high performance inside and out.

GBCI was formed to allow for balanced, objective management of the LEED Professional Accreditation program, including exam development, registration and delivery. This separation into two organizational entities brings the credentialing program closer toward meeting standards for programmatic excellence put forth by ANSI/ISO/IEC 17024. ISO 17024 is a standard which evaluates the validity, credibility and on-going programmatic improvement of professional credentialing programs. Throughout this transition, the LEED Accredited Professional (LEED AP) credential was not affected. LEED APs continue to represent knowledge of the LEED Rating System and competency in the LEED Certification process.

A LEED AP is an individual who has passed the exam and possesses the knowledge and skills necessary to participate in the design process, to support and encourage integrated design, and to streamline the application and certification process. The exam was launched in 2001 to recognize, through accreditation, individuals' understanding of green building practices and principles, and familiarity with LEED requirements, resources, and processes.

GBCI contracts with a test development firm to develop and deliver the exam. The development of a valid exam begins with a clear and concise definition of the knowledge, skills and abilities needed in order to successfully serve as a LEED AP. GBCI will work with experts in the green building industry to identify critical components of the roles and responsibilities of an individual supporting the LEED certification process.

The LEED Professional Accreditation exam is valid and reliable. Validity means that the exam is able to measure that which it is supposed to measure. Reliability is an index of how accurately the exam measures a candidate's skills. A test must be both valid and reliable to be considered a well-developed exam. The LEED Professional Accreditation exam accurately assesses each candidate's ability to carry out the required responsibilities of a LEED AP (LEED Accredited Professional Candidate Handbook 2008).

## **Chapter 2 – Literature Review**

The many debates about global warming have made the conditions of the environment a repeatedly discussed topic in the media. This has resulted in several articles being written on the topic of sustainable design. The vast majority of the articles are web-based but with the help of a University of Kansas librarian more scholarly journals were found. The one setback was that most the literature was saying the same thing. Almost every piece of literature pointed out the same benefits and disadvantages of sustainable design and the USGBC. This chapter describes the sustainable design guidelines and then goes through the good and the bad of the USGBC and LEED along with describing why there is a need for sustainable design.

### **Background of Sustainable Design Guidelines**

The industry of building design and construction has long been subject to various forms of control (codes, regulations, and requirements) offering minimum standards for occupant health and safety. Sustainable design guidelines constitute a set of rules deemed significant by green building standards (energy use, atmospheric pollutants, water quality, material resources, and occupant health). These design guidelines typically fall outside of the bounds of codified building law. Stepping in to fill that regulatory void are the mandates of green building guidelines. The recurrent and voluntary adoption of socially produced and agreed upon standards (which have taken the form of design guidelines such as LEED) potentially serve as a form of codification not unlike formal building law.

With the current array of codes, concerns, and complexity construction design firms deal with every day it is almost surprising that a vast number of professional are embracing yet another layer of building control through the voluntary adoption of these sustainable design guidelines. The extent to which the LEED guidelines have been adopted however, has caused the USGBC's system to be viewed as synonymous with green building, creating not only a base of LEED accredited practitioners, but equally, a client base that increasingly request LEED certified projects (not unlike what Energy Star did for appliances). There is a question as to what inspires practitioners to embrace the USGBC's certification standards and equally, to become LEED accredited. The majority of the building profession is starting to either openly embrace, or at least consider, the notion of sustainability, while simultaneously contributing to the bounds of its definition. It could very well be that LEED presents at least the possibility, if not the opportunity, for practitioners to undertake meaningful work (to positively affect and shape human and environmental health) in an industry that for centuries has presented few avenues of this kind.

It would be difficult to argue with the fact that sustainable design guidelines have made significant strides in the building industry over the past decade moving from a peripheral fringe interest, towards the mainstream. As awareness of demand for better performing, more environmentally sensitive buildings grows, construction design firms are called upon (in various ways) to participate in this expanding industry. Standard construction design protocol has practitioners versed in designing for comfort, economy, and aesthetics, while design for sustainability, energy efficiency, or high performance are viewed anywhere from a marketing strategy to a

professional ethic. Lacking true codified control measures that outline prescriptive or performance standards for environmentally responsible design, practitioners turn to green building guidelines to facilitate their design and development processes. More often than not, that guideline is LEED (Zukowski 2005).

### **Criticism of the USGBC and LEED**

One of the facts of sustainable design is that it adds costs to the construction budget. This creates opportunities for anyone in the construction industry from designers to contractors to cash in on green building projects. Because of this opportunity there are few within the construction industry out there that will be openly critical of the USGBC and LEED. With that being said it is not as if LEED is perfect. First, the process for applying for LEED certification is not an inexpensive one. It has been argued that the money spent on attaining this recognition comes at the expense of adding additional environment-friendly features (Granger 2007).

Some of the limitations of LEED proceed from its design. The categories are not weighted, meaning that adding a bike rack, to use an oft-cited example, will earn the same point as buying 50% of the project's energy from renewable sources. And there are no regional adjustments; saving water earns a point in Seattle just as it does in Tucson (Kamenetz 2007).

How much LEED is a measure of effective public relations and how much it assesses a building's true green performance is a subject of growing debate in the building field. "There's a huge initiative under way right now to look at

what is the next generation of LEED," said Rebecca Flora, executive director of Pittsburgh's Green Building Alliance. While Rebecca agreed strongly with the need to measure the performance of LEED buildings, she said the dilemma was how to pay for it. The ongoing adoption of LEED has come so quickly that improvements to it often fall behind the perception of the problems.

"Unfortunately, people are still focused on where LEED was four years ago and not what LEED is now," she added. A program originally established for office buildings, LEED faces the challenge of adapting its standards now for everything from neighborhoods and retailers to casinos and polar bear exhibitions.

Marc Mondor, principal of friendship-based architecture firm Evolve EA, which has worked to certify a half-dozen LEED projects, has seen the challenges that come from certifying very different projects first-hand. "There are parts of LEED itself within the documentation wherein a project might have something related to energy-efficiency that goes against environmental quality," said Mondor. For instance, LEED can grant an extra point for over-ventilating a building even though it takes more energy to do so, Mondor said (Schooley 2007).

Lastly, the LEED standard has become so popular in recent years that it has been difficult for the USGBC to keep up with the demand. As stated earlier the LEED program is being expanded to rate everything from neighborhoods to schools to retail developments, and because of this is forced to constantly

play catch-up instead of taking the needed time to redefine the system for the future (Granger 2007).

And these are just some of the criticisms of the USGBC and LEED. There are many more critics that question the entire global warming concept, since the existence of global warming is such a sensitive topic and is a paper within itself this paper will just mention the price and availability of fossil fuels. Some critics of the sustainability movement assert that the issue will be rendered moot when fossil fuel prices revert to previous low levels. The historical pattern, such critics assert, is for fuel prices to settle back to affordability. For that and other reasons, several leading institutions, including some full university systems, have yet to adopt sustainability resolutions (Marthers and Rahnamay-Azar 2006).

### **Benefits of the USGBC and LEED**

By using the guidelines in the LEED Green Building Rating System a construction design firm could create several environmental, health, and community benefits, such as:

Environmental benefits:

- Enhance and protect ecosystems and biodiversity
- Improve air and water quality
- Reduce solid waste
- Conserve natural resources



Health and community benefits:

- Improve air, thermal, and acoustic environments
- Enhance occupant comfort and health
- Minimize strain on local infrastructure
- Contribute to overall quality of life (Green Building Research 2008)

The LEED AP accreditation represents the individual's knowledge of the LEED Rating System and its application in practice. LEED APs facilitate the integrated design process and streamline LEED certification.

Benefits for LEED APs include:

- Valuable and marketable credentials for employers, prospective employers, or clients
- Listing on USGBC website directory of LEED APs
- LEED AP certificate recognition for involvement in LEED projects

Benefits for Employers include:

- Eligibility for projects on which owners are mandating the participation of a LEED AP
- Strengthened qualifications when responding to RFPs requiring LEED APs
- Encourages employees to continue increasing their knowledge and understanding of green building and LEED (Professional Accreditation 2008)

## **Need for Sustainable Design**

There are many different opinions about the state of earth's ecological system. Many believe, as Paul Marthers and Amir Rahnamay-Azar, that there is mounting evidence corroborated by the world's leading scientists, that planet earth is on fire, that global warming is an inexorable reality, and that there is scant need for further studies (Marthers and Rahnamay-Azar 2006). Others believe the earth is in a normal cycle and that the warmer temperatures are not being caused by human intervention. And others have even different beliefs. Although the questions about the issue of global warming may never be answered it is a know fact that the built environment has a profound impact on the natural environment, economy, health, and productivity.

In the United States alone, buildings account for:

- 72 percent of electricity consumption
- 39 percent of energy use
- 38 percent of greenhouse gas emissions
- 40 percent of raw materials use
- 30 percent of waste output (136 million tons annually)
- 14 percent of potable water consumption (Green Building Research 2008)

These statistics alone should show a need for sustainable designs for our buildings.

A chief obstacle to sustainable green building design is cost. There is a perception that environmentally friendly means bottom line unfriendly. That is not true. There is a compelling market rationale for green practices. Going green can save money. Green projects are often misunderstood as more costly due to tensions between short-term and long-term thinking. Opponents of green projects commonly cite the higher initial costs of implementation. But dismissing green projects on an initial cost basis is shortsighted.

Sustainable buildings and energy systems may be more costly initially but have been shown repeatedly to save money when evaluated from life span and cost-to-maintain perspectives. While it took a substantial investment to construct a windmill on a college campus, for example, Carleton College now derives 40 percent of its electricity from it. Bellevue Community College's geothermal-powered, naturally-ventilated classroom building and Cornell University's geothermal cooling system were more expensive to construct than conventional coal-fired heating and chilling plants, but both projects will pay for themselves with savings generated by ten years of efficiencies and energy reductions (Marthers and Rahnamay-Azar 2006).

So even though the initial cost of a sustainable designed project would be higher the payoff of using more efficient systems will payoff in the long run. This gives building owners several different reasons to look at building LEED buildings. As Rich Smith, executive vice-president for a large consulting engineering firm, states. "The energy costs are really astronomical in today's larger office and commercial buildings, and in some of the major civic complexes. So, any savings, even a small percentage, amounts to a great

deal of money in absolute dollars. But, it's not just money. It's also energy saved, and reduced emissions. That's the beauty of LEED. Some are motivated to design more efficient and responsible buildings because of a moral obligation to do so. Others are motivated by the economics. It makes sense from multiple perspectives" (Worgul 2008).

### **Architecture 2030, the 2010 Imperative and the 2030 Challenge**

The need for sustainable design has enticed several people in the construction industry to take action. These groups of professionals started campaigns such as Architecture 2030, the 2010 imperative, and the 2030 challenge. Architecture 2030 is a non-profit, non-partisan, and independent organization founded by Architect Edward Mazria in 2002. It aims to rapidly transform the US and global building sector from the major contributor of greenhouse gas emissions to a central part of the solution to the global-warming crisis. The 2010 Imperative has been introduced to ensure ecological literacy in design education. As of February 2008, architectural schools including the School of Architecture at University of Southern California, Arizona State University, the School of Architecture at Northeastern University, the College of Architecture and Design at the University of Tennessee (UT), Knoxville are now committed to adopt and implement this imperative. Also joining the imperative are all the colleges of the Los Angeles Community College District. Numerous other students, faculty and staff have personally adopted the 2010 Imperative.

In January 2006, Architecture 2030 issued the 2030 Challenge, a global initiative stating that all new buildings and major renovations reduce their

fossil-fuel GHG-emitting consumption by 50% by 2010, incrementally increasing the reduction for new buildings to carbon neutral by 2030. Since then, numerous groups including AIA, USGBC, LEED, EPA, and many others have joined this initiative and are now trying to execute its target.

It is necessary to point out that this chronology of events and initiatives taken is far from complete. Many more organizations, institutions, individuals and researchers have worked relentlessly on sharing energy efficient, green, and sustainable design philosophies (Marathe 2008).

## **Chapter 3 – Business Case for Sustainable Design and LEED**

One of the biggest problems the green building movement faces is trying to get construction design firms to change the way they are designing buildings. The design standards for buildings have not changed for a long time. For the most part, buildings use only a handful of systems and for a consulting design firm the task of designing a new building typically just entails incorporating a tried and true system that has been utilized many times before. The sustainable design movement is trying to change that strategy by utilizing new design standards. A sustainable design forces a design professional to think outside the box and to consider more than what they know would work. This movement forces the design professional to incorporate other design issues like the environment or the health of the occupants of the building. This is forcing construction design firms to put innovation back into building design. But construction design firms are not going to spend the capital to implement these new design standards just because it might be the right thing to do; a very persuadable business case must be made for sustainable design and green buildings.

The business case for green building is not just that green building saves money on energy. LEED certification sells buildings to high-end clients and governments, gets architects and builders sparkling free publicity, and creates a hook for selling new products, materials, and systems to builders. According to a DC architect, Russell Perry, “for a speculative developer to go out and advertise their property as being Class A [the highest-quality commercial building], they’ve got to have a LEED rating. The brokers need that as part of their pitch. People who would have been ambivalent about

that as a moral issue are finding that it's a commercial necessity." (Kamenetz 2007)

If the environmental or marketing aspects of sustainable design and LEED are not enough to persuade a construction design firm to implement sustainable design standards the firm should take a look at how the building codes are changing. Green building standards are quickly penetrating zoning, tax, and building laws and ordinances nationwide. What was once only pleasant leadership rhetoric by the federal government and a handful of states, to build their largest new construction projects "green," is now more and more either a mandate or an incentive to the masses. Green carrots are rapidly making their way into federal executive orders, state laws, and local codes and ordinances. When a client approaches a firm with a development or construction project, the firm is missing out on an opportunity if they do not bring up sustainable design options. Ignoring sustainable design might also get the firm in trouble down the line if the client finds out about the benefits sustainable design could provide and forces the firm to implement design changes.

The USGBC, American Institute of Architects, American Society of Heating and Air Conditioning Engineers and Illuminating Engineering Society of North America has very recently collaborated on Standard 189.1P, *Standard for the Design of High-Performance Green Buildings except Low-Rise Residential Buildings*. Standard 189.1P will essentially define high-performing building in code-intended language. This will be an ANSI-certified standard for baseline design, construction, and operations performance for new construction and major renovations of commercial buildings. Unlike voluntary green building

certifications, this standard is intended to affect mainstream construction, green or not. Once published, it is expected to be incorporated into U.S. building codes and to become a threshold standard to obtain a certificate of occupancy for an affected building. It will likely also become a prerequisite for LEED certification. Standard 189.1P is currently going through public review, and depending upon public response, it could be published as early as 2009.

Below is a sampling of other green building provisions a firm may see as they look at applicable zoning, tax and building laws nationwide:

- A requirement that certain government-funded projects comply with specific certification levels under national green building standards (e.g. LEED Silver).
- Local ordinances requiring new construction or renovations of a certain type or size of building (currently often a 5,000 or 10,000 square foot threshold, and sometimes commercial buildings only) to comply with their own or a national green building standard.
- Local ordinances requiring permit applicants, in connection with new construction or renovations of a certain type and/or size of building, to complete green building checklists and/or to have a green building consultant on the project (whether or not applicants actually plan to seek green building certification).
- State or local laws requiring construction to quantify and meet greenhouse gas or emission standards.
- State or local mandatory fees financing green building funding and education (Lewis 2008).



The push for sustainable design is not only coming from government mandates. The largest developer in the Dallas-Fort Worth area recently made a remarkable statement. The CEO for Trademark Property Group made a public statement declaring that all of their one billion dollars worth of mixed-use development will be LEED certified. So if a construction design firm does not have the experience or knowhow to design a LEED rated project they just lost out on this section of the market.

As it has been shown there are many reasons why understanding sustainable design and LEED is a smart decision for building owners. But there is much more to it for a construction design firm. As sustainable design and LEED becomes more of a standard in the construction industry, companies unable to accommodate this trend could be forced out of this sector of the market. The following statistics show how the green building market is increasing exponentially in the U.S.:

- **\$7 billion:** Annual market for green building products and services in 2005
- **\$12 billion:** Annual market for green building products and services in 2007
- **\$60 billion:** Projected annual market for green building products and services in 2010 (About USGBC 2008)

The size of the green building market will soon be so large a construction design firm will not be able to ignore the green building movement.

All of these factors add up to one conclusion: in order to stay relevant in today's marketplace, a construction design firm needs to have the knowledge and ability to design sustainable, LEED certified, projects.

## Chapter 4 – Implementation of Sustainable Design Standards

Knowing there is a need to have the ability to design sustainable projects and being able to implement the sustainable design standards into a firm are two completely different things. How does a construction design firm go about starting the process? Who is involved? How can it be seen through to the end?

There are many theories about the best way to implement new processes. This paper will follow the process developed by management guru, John Kotter. A professor at Harvard Business School and world-renowned change expert, Kotter introduced his eight-step change process in his 1995 book, *Leading Change*. This method was selected for two reasons; first this is the method taught in the management classes at the University of Kansas, and second it closely follows the plan successfully implemented at large construction design firm on the forefront in this industry. This firm unsuccessfully tried to implement these design standards in their first attempt, after reviewing what failed, changes were made to their implementation processes and they were successful in their second attempt. The lessons learned from this firm were incorporated into the implementation process detailed in this chapter.

Below are the eight steps for implementing sustainable design standards:

1. Create a Sense of Urgency
2. Form a Powerful Coalition
3. Create a Vision
4. Communicate the Vision

5. Remove Obstacles
6. Create Short-term Wins
7. Build on the Change
8. Anchor the Changes in Corporate Culture

Implementing change into any firm is not an easy proposition and will take a considerable amount of effort to be successful. The following sections of this chapter takes Kotter's Eight-Step Change Model and applies it to implementing sustainable design standards into a construction design firm. Each step describes what needs to be accomplished but intentionally does not give exact directions. Each construction design firm is different and this process would need to be adapted to accommodate the specific characteristics of the firm. Many pointers and suggestions are given that have worked in other firms, but before starting this process be sure to understand the culture of the firm and what drives the management and employees.

### **Step One: Create Urgency**

The first step in this process is quite possibly the hardest and most important. To implement a change of this magnitude around 75 percent of the firm's management needs to agree with the change. For this to happen a significant amount of time and energy needs to be spent building urgency, before moving onto the next step. This will help establish the initial motivations to get things started.

This cannot be accomplished by simply emailing the firm's management the statistics provided in earlier chapters of this paper. A dialog must be opened between the top management explaining the changes in the marketplace and the need for this change. Several of the points discussed earlier in this paper can be used to make this argument. The local USGBC chapter can also help by giving presentations on LEED and the green building movement. Utilize the USGBC's website, [www.usgbc.org](http://www.usgbc.org), for helpful information and to locate contact information for local USGBC Chapters. These contacts can help with the implementation process.

Trying to protect the environment is a great reason for implementing green design standards. And the recent media coverage does bring the environmental aspect to the forefront, but for most companies it will take more than pushing to do the right thing to create urgency for a change like this. The design practices programs like LEED are trying to change have been in existence for many years. For most, if not all the upper management of a construction design firm these design standards are all they have ever known. The firm has been successful for many years with these standards and some members of management could be reluctant to risk a change like this. For people like this it is better when trying to create the urgency to focus on the market direction and the mandates and government actions that will force the use of these new sustainable design standards.

To help create urgency identify potential threats, and develop scenarios showing what could happen in the future if this change is not implemented. Also, examine opportunities that should be, or could be, exploited.

One of the reasons change does not happen is that there is too much complacency in the firm. When discussing this change, avoid the firm's past success and instead focus on the firm's future.

### **Step Two: Form a Powerful Coalition**

Once the seed has been planted with the top management and a positive response has been given, a coalition needs to be created. Before going on to this step, make sure at least 75% of the firm's management is at least entertaining the idea for this change. Jumping to this step too fast would risk a set back that could be extremely detrimental to accomplishing the goal.

To convince people that change is necessary takes strong leadership and visible support from key people within the firm. The members of the coalition need to be influential people whose power comes from many different areas including; job title, expertise, and political importance. It is important to note that although top management involvement is a necessity, it is also important to have members from all levels of the firm's hierarchy. It will be the task of this coalition to continue building urgency and creating momentum for this change throughout the firm. There is a large amount of work to do in order to be successful with this implementation process. Being able to delegate responsibilities is essential to accomplishing this eight step process.

A rule of thumb when determining the size of this coalition is aim for a team of around eight to ten percent of the firm's size. When selecting members for this coalition, be sure to search out people that are highly motivated in learning about the green building process and LEED. If the members do not

have the desire to implement this change they will not be a contributing member of the coalition. Identify true leaders in the firm and ask for emotional commitment from these key people.

Understand that everyone, including probable members of this coalition, might not buy in at first. Make sure the coalition is strong and united before going on to the next step. It takes more than one individual to overcome the tradition and inertia of the existing systems.

### **Step Three: Create a Vision for Change**

One of the first tasks of the coalition is to create a vision for this change. A good vision is clear and precise with a purpose of helping everyone understand why this change is happening. The vision should be able to be communicated in five minutes or less; and the person or group needs to be able to understand and remember it. The vision also needs to be tailored to the firm's culture.

Having created a strong coalition the group should have many strong ideas on this change. Determine the values that are central to the change and link these concepts together to form an overall vision. Make sure to incorporate the entire firm in the vision; do not just concentrate on the design professionals.

It is important during this process to have the firm's management conform to the intentions of the vision. What the management does when trying to implement this change is far more important, and believable, than what they

say. Demonstrating the kind of behavior that sustainable design is built around is key to the success of this process. Since this change involves green ideals it would be beneficial to the cause if the firm could implement other green programs. Programs the coalition could try to implement are:

- Utilizing recycled products
  - Given the amount of paper used in a construction design firm there is a big opportunity for the firm to use recycled paper.
- Recycling programs
  - Paper waste is the obvious recycling product, but also look into recycling aluminum, cardboard and glass.
- Do not provide styrofoam cups or paper plates
  - In an effort to reduce waste as a firm, purchase mugs for the company and promote utilizing washable dishes.

After the vision has been created the coalition should then develop a strategy to execute the vision. To properly execute the vision assign the tasks developed to the different coalition member and monitor the progress. As with executing any strategy, make sure to create measures for each task that can be monitored. What is measured and what is rewarded is what is accomplished. Do not simply assign a task and assume it gets accomplished.

#### **Step Four: Communicate the Vision**

The level of success executing the vision will determine the success of the implementation. One of the main reasons implementing change fails is under communicating the vision. Effective communication is a two way



street. Newsletters and speeches alone do not get it done. Communication comes in both words and deeds. Decisions, such as resource allocations or rewards, must match the communicated vision. This is why following through with some, if not all, the programs described in the third step is so important. Others ideas to help communicate the vision include:

- Bi-weekly emails giving green tips
  - These emails not only can give the employees tips on how to be more environmentally friendly, they also are a reminder of the green building stance their firm is taking.
- Show movies dealing with environmental issues
  - Most employees would love to take a break from work to watch a movie. This event also gives the coalition a great opportunity to explain what they are trying to accomplish.
- Present seminars
  - Provide the opportunity for employee to learn more about the sustainable design process.
- Talk often about the change vision
  - Have everyone in the coalition start up water cooler talk to try and integrate the vision on a personal one-on-one level.

### **Step Five: Remove Obstacles**

By this point in the implementation process the vision has been heavily discussed throughout the firm and the coalition has been building buy-in from all levels of the firm. It is now time to start trying to achieve the benefits that

have been promoted. This step is to remove any current road blocks and try to eliminate any problems that can be foreseen in the near future. These obstacles could be built into the firm's processes and policies, or it could be an individual who thinks they are doing the right thing. A well placed blocker can stop a whole implementation program and needs to be addressed.

To alleviate these obstacles have the coalition put in place the structure for change, and continually check for barriers. Look at the firm's job descriptions, and performance and compensation systems to ensure they are in line with the vision. When an obstacle is found, act quickly to empower certain members of the coalition to address the issue and help the implementation process move forward. If an individual is resisting the change take them aside and help them see what is trying to be accomplished. If needed, identify or hire change leaders whose main roles are to deliver the change.

Given the green building process history, one of the biggest obstacles could be getting individuals to separate the green building issue at hand from politics. It has long been thought that if someone has green ideals they must be tree-huggers or democrats. This is far from true. If protecting the environment is a sticky issue, point out the several other benefits and needs identified in earlier chapters of this paper.

Another large issue at hand is getting the firm's work force LEED accredited. Although it is not a necessary goal to have the entire firm obtain their accreditation, a large enough group would need to become LEED accredited if the firm is to have success at landing LEED projects. The exam takes a

considerate amount of time to properly prepare for along with costing a few hundred dollars. It is imperative that some kind of incentive plan be put in place to persuade employees to obtain their LEED accreditation. If need be, to save money, this could be a short-term plan that only applies until a target goal of employees have obtained their accreditation. The coalition can help with this task by setting up study groups. These study groups are typically led by a LEED accredited individual who can walk the group through the several aspects of LEED in preparation for the exam. The USGBC can also aid in providing someone to help lead these classes. It is also a good idea to make sure the management of the firm gets their LEED accreditation to show that the firm is indeed behind this movement.

The capital needed to implement any of the process described in this chapter is always an issue. This is why the first step of creating urgency and getting management on board early is so important. As with any large change, it could cost considerable amounts of money to implement this process. Besides the costs associated with incentive plans and firm meetings / presentation / movies there is the basic salary cost for all the man-hours the coalition is using. The coalition should meet weekly for a couple of hours and given that this process could take over a year to fully implement, the man-hours will add up. Although there is little that can be done to lessen the impacts of this cost it is important to make sure to fully inform the firm's management upfront. This way there is not a surprise down the road that could derail this process.

## **Step Six: Create Short-term Wins**

At this point in the process the coalition works to generate and maintain momentum. This is done by creating several short-term goals to meet and then celebrate those goals when accomplished. Look for sure-fire projects that could be implemented without help from any strong critics of the change. It is important to try and remove the rational that big change takes time and that the firm must be patient and move slowly. The urgency for this change must continue to be pushed.

The coalition may have to work hard to find good initial goals. Since each goal reached creates a winning atmosphere, it is important to make sure the first goals are easily obtainable. Do not choose goals that are expensive or highly time intensive. Without early victories where the expense is easily justified critics and negative thinkers might hinder the process.

When selecting potential goals analyze the pros and cons and always put the firm's best people on the key projects. Once obtained, reward the individuals who helped meet the goal.

For implementing LEED an early goal should be getting employees LEED accredited. As mentioned in the previous section, for this to be successful an incentive plan should be used, and management should take the lead by also obtaining their LEED accreditation. When developing the incentive plan create a results-oriented system. Tie incentive compensation to outcomes, not for activities. This could simply be achieved by rewarding those who

pass the exam with a monetary reward. Announcing that a large percentage of the company has acquired their accreditation is a good short-term win.

After some smaller goals have been achieved it is time to go after its first LEED project. The firm will need to competitively bid the first couple of projects due to its lack of experience, but the gain in experience will be well worth the loss absorbed by the firm. The success of the first LEED project is important in taking the firm to that next step in the green building process.

### **Step Seven: Build on the Change**

In several reengineering efforts victory was declared and expensive processes were stopped when the first major project was completed, despite little evidence the original goals were accomplished or new approaches were accepted by employees. Many implementation processes fail because victory is simply declared too early. Real change runs deep. Quick wins are only the beginning of what needs to be done to achieve long-term change.

After each project is successfully completed, analyze what went right and what needs improving. Continue to set goals and build on the momentum that has been achieved.

As different areas of the firm gain experience with sustainable design, a process needs to be developed to share the knowledge with the rest of the firm. This process needs to be simple and quick for both the inputting of information and the retrieving of the information. If the process is too cumbersome then no one will utilize the tool. Sharing knowledge throughout

the firm is one of the best ways to advance the overall sustainable design skills of the firm.

### **Step Eight: Anchor the Changes in Corporate Culture**

Change sticks only when it becomes ‘the way things are done around here.’ The green building process should become a core part of the firm. The firm’s culture often determines what gets accomplished, so the values behind the vision must show in day-to-day work.

Poor succession planning can doom change. Do not ignore the firm’s culture. The coalition needs to make continuous efforts to ensure that the green building ideals are seen in every aspect of the firm. This will help give it a solid place in the firm’s culture. The firm’s management leaders need to continue to publically support the green building initiative. This can be accomplished through discussing the progress of the green building initiative and by telling success stories about the process and the successful projects the firm has completed. When training new staff the green building ideals and values should be emphasized.

To make sure the changes created in the firm stick, the firm needs to create a plan to replace key leaders of the coalition as inevitably some are going to move on. This plan will help ensure that the changes the firm worked hard to implement will not be lost or forgotten if one or more of the key leaders of the change leave the firm.

## **Chapter 5 – Conclusion and Recommendation**

This paper has explained the green building concept, sustainable design, and how the USGBC is using LEED to promote construction of environmentally friendly buildings. As described the benefits of sustainable design extend well past the environment, as shown in this paper sustainable design can have just as many financial benefits as environmental benefits.

Over the course of less than 10 years, green building in the United States has gone from a nice colloquialism to an intriguing and accepted standard among community leaders. It has spurred significant changes in construction practices, building and landscape design, available building products, and owner's expectations for buildings. Industry observers predict that green building will soon be the rule rather than the exception – a demanded retrofit, much like wiring for information technology in the 1980s and 1990s. That prediction is not much of a stretch with the planned release of Standard 189.1P, an ANSI-accredited green building standard developed as a greening threshold for building codes nationwide (Lewis 2008).

Even with all the information out there about LEED there are still critics. But, critics seeking to stall green initiatives are playing a dangerous game. Not only is our environment something that should not be taken for granted, it is risky to try and predict energy cost based the past history of fuel costs. Several researchers, for example, believe that the world has reached peak oil production, which means that wider recognition of a finite supply could lead to stockpiling, hoarding, even wars. Also, China's booming economy will require an amount of fossil fuel that is hard to predict, because all

indications suggest that demand from its billion-plus citizens will be unprecedented (Marthers and Rahnamay-Azar 2006).

When implementing these sustainable design standards the construction design firm will have to work hard to change the culture and habits of the firm. But when the firm plans carefully and builds the proper foundation it will improve the chances of success. If the firm is too impatient, and if they expect too many results too soon, the plans for change are more likely to fail.

It is the recommendation of this paper for all construction design firms to implement sustainable design standards into their firm. Even if the firm does not believe the signs of global warming or the research done on the LEED benefits to human health there is enough momentum behind the green building concept that firms in the building industry can ill afford to ignore the green building movement. If construction design firms do not fully embrace and implement the sustainable design standards they risk being left behind when everyone else does.



## **Chapter 6 – Suggestions for Further Research**

Breaking into the green building market will take more than just implementing the sustainable design standards and becoming LEED accredited. Although these first steps are essential in getting the process started a firm will also need to research the market and create a marketing plan before they could really establish themselves in the industry as a green building leader. This marketing plan will help the firm decide where best to utilize their resources to maximize the return and cement the firms place in the green building industry.

The USGBC is introducing a new LEED accreditation called LEED 2009. There are rumors that this new test is different than the previous versions and a professional that passes this test will be classified differently than a professional that passes a previous version. Nothing has been published but there are questions as to how this new test will affect design professionals already LEED accredited. One theory is that the USGBC will require all currently LEED accredited professionals that want to keep their accreditation to retake the new test. This issue will need to be researched and resolved before a construction design firm spends the capital to get their design professionals LEED accredited.

It would also be beneficial to the construction design firm to research how construction law is handling LEED type cases. With the added money required for these types of projects the risk associated with them also increases. A question that has yet to be completely answered is if an owner spends the extra money on a project to become LEED platinum certified

what happens if that goal is not reached? If, when everything is completed, the project fails to reach a certain level of certification who is a fault? Are the construction design firms on the hook?

## References

- "About USGBC." U.S. Green Building Council. 2008. U.S. Green Building Council. 9 Mar. 2008  
<<http://www.usgbc.org/DisplayPage.aspx?CMSPageID=124>>.
- Curtatone, Joseph A. "SOMERVILLE GREEN BUILDING PROJECT." Mayor of Somerville. 6 Apr. 2008  
<[http://www.ci.somerville.ma.us/CoS\\_Content/documents/GreenBldg\\_Poster.pdf](http://www.ci.somerville.ma.us/CoS_Content/documents/GreenBldg_Poster.pdf)>.
- Granger, Trey. "LEEDer of the Pack." Earth911. 16 Oct. 2007. Global Alerts. 9 Mar. 2008 <<http://earth911.org/blog/2007/10/16/leeder-of-the-pack/>>.
- "Green Building Research." U.S. Green Building Council. U.S. Green Building Council. 18 Sept. 2008  
<<http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1718>>.
- Kamenetz, Anya. "THE GREEN STANDARD?" Oct. 2007. Fast Company. Boston: Oct 2007. Iss. 119, p. 128-130, 132 (4 pp.)
- "LEED Accredited Professional Candidate Handbook." Green Building Certification Institute. Aug. 2008
- "LEED Certification." GREENDEPOT. 9 Mar. 2008  
<[http://www.greendepot.com/leed\\_tabs/leed\\_certification](http://www.greendepot.com/leed_tabs/leed_certification)>.
- "LEED Committees." U.S. Green Building Council. 2008. U.S. Green Building Council. 9 Mar. 2008  
<<http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1750>>.

"LEED Rating Systems." U.S. Green Building Council. 2008. U.S. Green Building Council. 9 Mar. 2008  
<<http://www.usgbc.org/DisplayPage.aspx?CMSPageID=222>>.

Lewis, Leslee M. "Green Building Basics For Real Property Lawyers" March 2008. The Practical Real Estate Lawyer. Philadelphia:Mar 2008. Vol. 24, Iss. 2, p. 31-38 (8 pp.)

Marathe, Shraddha R. 2008. Design2sustain---A web based resource suite for sustainability designed for undergraduate architecture programs. M.B.S. diss., University of Southern California. In Dissertations & Theses: Full Text [database on-line]; available from <http://www.proquest.com.www2.lib.ku.edu:2048/> (publication number AAT 1454076; accessed October 19, 2008).

Marthers, Paul, and Amir Rahnamay-Azar. "A Green Future." U.S. Green Building Council. 11 Nov. 2006. Inside Higher Ed (Washington, DC). 9 Mar. 2008

"Professional Accreditation." USGBC. 5 Apr. 2008  
<<http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1584>>.

Schooley, Tim. "Eight Years After Green Start, Industry Awaits LEED's Successor." Business Times. 6 July 2007. 9 Mar. 2008

U.S. GREEN BUILDING COUNCIL. 2008. PRESENTATIONS.  
<<http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1720>>

"What is LEED." GREENDEPOT. 9 Mar. 2008  
<[http://www.greendepot.com/leed\\_tabs/what\\_is\\_leed](http://www.greendepot.com/leed_tabs/what_is_leed)>.

"What is LEED." USGBC. 12 Apr. 2008 <[http://www.usgbc-ncc.org/index.php?option=com\\_content&task=view&id=34&Itemid=78](http://www.usgbc-ncc.org/index.php?option=com_content&task=view&id=34&Itemid=78)>.

"Why Build LEED." GREENDEPOT. 9 Mar. 2008

<[http://www.greendepot.com/leed\\_tabs/why\\_build\\_leed](http://www.greendepot.com/leed_tabs/why_build_leed)>.

Worgul, Doug. Kansas City LEEDS the Way. Ingrams online. 2007. 5 Apr.

2008

<[http://www.ingramsonline.com/September\\_2007/LEED/LEED.html](http://www.ingramsonline.com/September_2007/LEED/LEED.html)>.

Zukowski, Suzanne M. 2005. From green to platinum: LEED in professional practice. Ph.D. diss., The University of Wisconsin - Milwaukee. In Dissertations & Theses: Full Text [database on-line]; available from <http://www.proquest.com.www2.lib.ku.edu:2048/> (publication number AAT 3185621; accessed October 19, 2008).

## Bibliography

- "About USGBC." U.S. Green Building Council. 2008. U.S. Green Building Council. 9 Mar. 2008  
<<http://www.usgbc.org/DisplayPage.aspx?CMSPageID=124>>.
- Bronx Library Center - Project Profile. USGBC. USGBC, 2007. 9 Mar. 2008  
<<https://www.usgbc.org/ShowFile.aspx?DocumentID=3941>>.
- Curtatone, Joseph A. "SOMERVILLE GREEN BUILDING PROJECT." Mayor of Somerville. 6 Apr. 2008  
<[http://www.ci.somerville.ma.us/CoS\\_Content/documents/GreenBldg\\_Poster.pdf](http://www.ci.somerville.ma.us/CoS_Content/documents/GreenBldg_Poster.pdf)>.
- Granger, Trey. "LEEDer of the Pack." Earth911. 16 Oct. 2007. Global Alerts. 9 Mar. 2008 <<http://earth911.org/blog/2007/10/16/leeder-of-the-pack/>>.
- "Green Building Research." U.S. Green Building Council. U.S. Green Building Council. 18 Sept. 2008  
<<http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1718>>.
- Kamenetz, Anya. "THE GREEN STANDARD?" Oct. 2007. Fast Company. Boston: Oct 2007. Iss. 119, p. 128-130, 132 (4 pp.)
- "Kotter's 8-Step Change Model." Mind Tools. 22 Sept. 2008.  
[http://www.mindtools.com/pages/article/newPPM\\_82](http://www.mindtools.com/pages/article/newPPM_82).
- "LEED Accredited Professional Candidate Handbook." Green Building Certification Institute. Aug. 2008
- "LEED Certification." GREENDEPOT. 9 Mar. 2008  
<[http://www.greendepot.com/leed\\_tabs/leed\\_certification](http://www.greendepot.com/leed_tabs/leed_certification)>.

- "LEED Committees." U.S. Green Building Council. 2008. U.S. Green Building Council. 9 Mar. 2008  
<<http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1750>>.
- "LEED Rating Systems." U.S. Green Building Council. 2008. U.S. Green Building Council. 9 Mar. 2008  
<<http://www.usgbc.org/DisplayPage.aspx?CMSPageID=222>>.
- Lewis, Leslee M. "Green Building Basics For Real Property Lawyers" March 2008. The Practical Real Estate Lawyer. Philadelphia: Mar 2008. Vol. 24, Iss. 2, p. 31-38 (8 pp.)
- Lutz, Shane. 2008. Interviewed by author. Senior Vice President of large construction design firm. September 30.
- "Managing the Cost of Green Buildings." Environmental Valuation & Cost-Benefit News. 10 Oct. 2003. 5 Apr. 2008  
<<http://envirovaluation.org/index.php/2003/10/>>.
- Marathe, Shraddha R. 2008. Design2sustain---A web based resource suite for sustainability designed for undergraduate architecture programs. M.B.S. diss., University of Southern California. In Dissertations & Theses: Full Text [database on-line]; available from <http://www.proquest.com.www2.lib.ku.edu:2048/> (publication number AAT 1454076; accessed October 19, 2008).
- Marthers, Paul, and Amir Rahnamay-Azar. "A Green Future." U.S. Green Building Council. 11 Nov. 2006. Inside Higher Ed (Washington, DC). 9 Mar. 2008
- Martin, Anthony. 2008. Interviewed by author. Associate of large construction design firm. USGBC committee member. September 25.
- "Professional Accreditation." USGBC. 5 Apr. 2008  
<<http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1584>>.

Project Profile - Toyota Motor Sales, South Campus Office Development, Torrance, CA. US Green Building Council. 2006. 9 Mar. 2008

Project Profile for Bronx Library Center, New York, NY. US Green Building Council. 2007. 9 Mar. 2008

Rimmer, Drew. 2008. Interviewed by author. Senior Vice President of large construction design firm. President of local USGBC chapter. September 30.

Schooley, Tim. "Eight Years After Green Start, Industry Awaits LEED's Successor." Business Times. 6 July 2007. 9 Mar. 2008

Toyota Motor Sales South Campus - Project Profile. USGBC. USGBC, 2006. 3 Mar. 2008  
<<http://www.usgbc.org/ShowFile.aspx?DocumentID=3382>>.

U.S. GREEN BUILDING COUNCIL. 2008. PRESENTATIONS.  
<<http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1720>>

"Welcome to USGBC." U.S. Green Building Council. 2008. U.S. Green Building Council. 9 Mar. 2008 <<http://www.usgbc.org/>>.

"What is LEED." GREENDEPOT. 9 Mar. 2008  
<[http://www.greendepot.com/leed\\_tabs/what\\_is\\_leed](http://www.greendepot.com/leed_tabs/what_is_leed)>.

"What is LEED." USGBC. 12 Apr. 2008 <[http://www.usgbc-ncc.org/index.php?option=com\\_content&task=view&id=34&Itemid=78](http://www.usgbc-ncc.org/index.php?option=com_content&task=view&id=34&Itemid=78)>.

"What is LEED." USGBC NORTHERN CALIFORNIA. U.S. Green Building Council. 9 Mar. 2008 <[http://www.usgbc-ncc.org/index.php?option=com\\_content&task=view&id=34&Itemid=78](http://www.usgbc-ncc.org/index.php?option=com_content&task=view&id=34&Itemid=78)>.

"Why Build LEED." GREENDEPOT. 9 Mar. 2008  
<[http://www.greendepot.com/leed\\_tabs/why\\_build\\_leed](http://www.greendepot.com/leed_tabs/why_build_leed)>.



Worgul, Doug. Kansas City LEEDS the Way. In gramsonline. 2007. 5 Apr.

2008

<[http://www.ingramsonline.com/September\\_2007/LEED/LEED.html](http://www.ingramsonline.com/September_2007/LEED/LEED.html)>.

Zukowski, Suzanne M. 2005. From green to platinum: LEED in professional practice. Ph.D. diss., The University of Wisconsin - Milwaukee. In Dissertations & Theses: Full Text [database on-line]; available from <http://www.proquest.com.www2.lib.ku.edu:2048/> (publication number AAT 3185621; accessed October 19, 2008).