A Green Era for the University of North Florida

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Abstract

Building "green" is not a new concept to the construction and design arena but, the introduction of the latest building trend has just begun to catch on to the general public. Sustainable or 'green building' design and construction is the concept of using the resources we have more efficiently and blending them with new technologies and ideas to create a healthier and more energy-efficient building and environment. Success comes in the form of leaving a lighter footprint on the environment through conservation of resources, while at the same time balancing energy-efficiency, cost-effectiveness, and low-maintenance products for our construction needs. LEED (Leadership in Energy and Environmental Design) developed by the USGBC (United States Green Building Council), has provided a score sheet and rating system that can be applied to construction projects to determine if in fact a project can be LEED certified. The scoring sheet is the buildings report card, and the 'grades' on that report card are assessed and delivered from a third-party who is not initially involved in the construction of the project. This paper will discuss the process which was implemented in constructing the Social Science building on the campus of the University of North Florida, and the differences in costs savings by having a LEED certification.

Keywords: green construction, sustainable construction, sustainable environment, LEED, USGBC

1. Importance of Sustainable Construction

Sustainability is defined in dictionaries as "the ability to carry forward, support or maintain for a prolonged period approaching eternity" (Building Research Establishment, 2001). Sustainable or 'green building' design and construction is the tool used to use our assets more resourcefully, in order to produce a healthier and more energy-efficient building. This approach includes the reprocessing and recycling of existing building materials, jobsite waste management, choosing and educating suppliers and subcontractors the environmental purposes of this methodology, and monitoring the results. In other words, green building design involves finding the delicate balance between construction and a sustainable environment.

2. LEED Certification

Since its origination in 1998, LEED has grown to include projects all over the 50 US States and numerous countries around the world, covering billions of square feet of development area (USGBC, 2012). LEED certification is done through a third-party confirmation of a building's performance. Green design focuses on the impact, the construction methods will have on the new building and its occupants in five broad areas. Sustainable site planning, Water efficiency, Energy efficiency and Renewable energy, Conservation of materials and resources, and Indoor environmental quality constitute the major categories in which the "grading" of the building is evaluated (USGBC, 2007).

Different LEED versions have varied scoring systems based on a set of required "prerequisites" and a variety of "credits". According to the USGBC LEED, for new construction and major renovations for commercial buildings reference guide, there are 69 possible points and buildings can qualify for four levels of certification (USGBC, 2007):

- **Certified:** 26 – 32 points
- **Silver:** 33 – 38 points
- **Gold:** 39 – 51 points
- **Platinum:** 52 – 69 points

Since not all construction projects offer the same set of circumstances or building conditions, various levels of certification have been established. A "certified" project would have to earn a minimum of 26 points, with silver, gold and platinum certifications being awarded as the project became more sustainable or "green" as confirmed by the number of points being earned.

2.1 Benefits of LEED Certification

LEED certified projects blend the needs of the environment, the economy, and the occupants to deliver the best possible performance. These projects cost less to operate and maintain, they are energy- and water-efficient, have higher lease-up rates than conventional buildings in their markets, and are "a physical demonstration of the values of the organizations that own and occupy them" (NuWire Investor, 2007). On the long term, benefits from building Green are substantial. Environmentally alone, building green can save and protect ecosystems, and conserve our already depleted natural resources. From an economic standpoint it can improve a building's life cycle as well as reduce the cost of operating a building. Green buildings use key resources more efficiently when compared to conventional buildings, which are simply built to code (Kats, 2011). LEED creates healthier work and living environments, contributes to higher productivity and improved employee health and comfort. The USGBC has also compiled a long list of benefits of implementing a LEED strategy which ranges from improving air and water quality to reducing solid waste (USGBC, 2007). These benefits are picked up by anyone who comes into contact with the project, which includes owners, designers, occupants, and society as a whole.

2.2 The Cost Benefits Associated with LEED

The perception that Green buildings have been viewed as more expensive and less profitable by owners (Kats, 2011) is justified to a certain extent. The investor or developer pays more initially, but saves through lower operating costs over the life cycle of the building. Some financial benefits from a LEED certified building can be easily pinpointed. For example, energy and water efficient appliance will cut costs on utility bills. Other benefits are more subtle and difficult to quantify, such as the profits incurred from extra productivity in a work place with better air quality, as attested in a study by the USGBC, (NuWire Investor, 2007). Analysis of several studies on green buildings show that the additional first costs are around 2 percent more on average (Kats, 2011), to construct a green building compared to using conventional methods (Muto, 2010). But that cost premium yields savings of a multiplicity of the initial investment, or during the life of a building, conservatively assuming to be around 20 years (Muto, 2010). These studies show that the initial costs and fees associated with the initial start-up of a LEED project are 2% of the entire project (NuWire Investor, 2007). With different levels of certification come different initial costs. The lowest level of LEED certification is associated with a 0.8% higher initial cost, LEED Silver cost 3.5% more initially, LEED Gold cost 4.5% more, and LEED Platinum have 11.5% higher initial costs (NuWire Investor, 2007). Owners and investors are usually interested in LEED projects and consent on the higher initial cost when they recognize the long term benefits on the investment if the building is to have a life cycle that allows the paybacks to be incurred. The cost benefits associated with LEED certification are not exclusively monetary. Some owners and developers appreciate the social and humanitarian aspects for having a building that is LEED certified. However, the most contributing benefit to LEED certified buildings is the cost savings over the life of the building. Energy and water use savings could be viewed as incalculable numbers. On average, green buildings use 30% less energy than conventional buildings (Kats, 2011).

3. Case Study - University of North Florida Social Sciences Building

In 2007, the University of North Florida (UNF) opened a new Social Sciences Building, which was the first LEED registered building in Jacksonville and achieved LEED Certification. This building has been used as a template and model on which for the subsequent LEED buildings at UNF.

In an effort to preserve the environment, UNF made the commitment that all new constructions consist of eco-friendly buildings that reduce energy use and qualify for being environmentally harmless. The 63,000-square-foot building houses the departments of sociology, anthropology, psychology, criminal justice, political sciences, and public administration. Built on 3.1 acres of land, the footprint of the building is less than one-third of the total size at 21,000-square-feet (McCrary, 2007). Designed by Smith McCrary Architects, the project utilized environmentally friendly construction methods and systems such as waterless urinals and low-flow fixtures to conserve water and low-energy lighting and lighting controls to reduce the overall utility consumption of the building. These efforts translated into ongoing savings for the life of the building.

The project made LEED certification at 26 total points. Water and energy efficiency, throughout the building, are the most important category for future savings. Water efficiency credits when tallied up total water savings of 2,882,000 gallons per year (McCrary, 2007). Outdoor potable water contributes the majority of that savings with waterless urinals, and urinal and sensor faucets to limit the use of indoor water. Energy and atmosphere credits require more prerequisites than any other LEED category. The purpose is to verify that the buildings energy related systems are installed, calibrated and perform according to the specifications and manufacturers intent.

Materials & Resources credits are in place to facilitate the reduction of waste generated by building occupants that is hauled to and disposed of in landfills. Through the rigid recycling program they diverted more than 800 tons of concrete, asphalt, and steel away from landfills (Birkelbach, 2008). Approximately 65% of all materials used in the building were manufactured locally, within 500 miles of the project site (McCrary, 2007). Construction and demolition materials were separated on site and recycled wherever and whenever possible, achieving over 75% of construction and demolition waste being recycled. For the old Social Science building that was demolished as part of the project, that number is approximately 98% (McCrary, 2007). These products were sent to a recycling center where they will eventually be used in the manufacturing of other products. This was not only advantageous for the environment, but also saved the project more than $23,000 in disposal fees (Birkelbach, 2008). Finally, the Indoor Environmental Quality establishes good indoor air quality while eliminating, reducing, and managing the sources of indoor pollutants. It also ensures that the thermal comfort and system controllability is stable. It controls and measures the chemical and pollutant sources, through its carbon dioxide sensors.

The building is estimated to utilize 20% less energy than the minimum energy performance required by ASHRAE 90.1 2001. However, since ASHRAE 90.1 was much more stringent than the local energy code at the time the building was designed, we estimate that the Social Sciences Building is approximately 30% more efficient than a minimally code compliant building. Estimated annual energy savings: $28,210/year. The building also uses 31% less water than a standard building and uses no potable water for irrigation. Based on recent water and sewer rates ($0.0095/cuft and $0.0308/cuft) estimated annual potable water savings is $15,526/year. The savings of these items alone is estimated to be $43,727/year ($28,201/year energy + 15,526/year potable water), giving the LEED features of the building a payback of 2.3 years (McCrary, 2007).

The final construction cost was $10,204,176. The “premium” hard and soft costs for green building items required for LEED certification was identified to be $101,507 (see figure below), or just below 1% of construction cost (Birkelbach, 2008).

4. Discussion

Sustainable “green” construction has been developing and flourishing for several years. It is now an emancipated construction system that is growing facing a fierce resistance but persisted to progress and to advance, drawing its strength from the long term profitable savings and from its ecological sound approach. This process induces many companies to modify their culture and practices, particularly in the area of construction waste management. There is both a moral and financial responsibility to become a part of the green building trend. Society in its entirety is becoming more conscious of the effect of sustainable construction on the environment.

Based on the prior assessment of green buildings and LEED certified projects, it is clear that the investment and additional upfront cost will be recuperated and will incur a net profit. The investor and developer will acquire financial and social benefits as demonstrated by the actual example discussed in this paper.

Figures:

LEED CERTIFICATION ACTUAL COST ALLOCATED TO CREDITS ATTAINED
WASTE MANAGEMENT
($23,703.00)
Materials & Resources - Credit 2.1Construction Waste Management, Divert 50%
Materials & Resources - Credit 2.2 Construction Waste Management, Divert 75%
PAINTING
$750.00
Indoor Environmental Quality - Credit 4.2 Low Emitting Materials, Paint
MECHANICAL - HVAC AND PLUMBING
$18,460.00
Energy & Atmosphere - Credit 5 Measurement & Verification
Indoor Environmental Quality - Credit 3.1 Construction IAQ Management Plan, During Construction
Indoor Environmental Quality - Credit 7.2 Permanent Monitoring System
ELECTRICAL
$35,000.00
Energy & Atmosphere - Credit 5 Measurement & Verification
Indoor Environmental Quality - Credit 3.1 Construction IAQ Management Plan, During Construction
Indoor Environmental Quality - Credit 7.2 Permanent Monitoring System
Cx, Energy Modeling, and LEED Consulting Fees
$67,500.00
USGBC Registration and Certification Fees
$3,500.00
Total Hard and Soft Costs of LEED Certification
$101,507.00

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