The Total Cost of Building Green and LEED Certification

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Greenwash

LEED Certification adds to project costs. The Green Movement has distributed a substantial quantity of "data" into the market that under-reports and underestimates the true and total cost of sustainable design and LEED certification. Enthusiasm for sustainable design is understandable and good. But incorrect and misleading 'information' is bad. If end users are to make informed decisions about their commitment to sustainability, the design, engineering and development communities need to be more informative, candid and forthcoming with useful information and facts, and less hype and greenwash.

There is no question but that a more responsible method of design and construction is needed, and that we must drastically improve our stewardship of the earth – and we must be quick about it.

Climate Change

If you read coverage of climate change in the popular press prior to 2008, it was possible to get the impression that scientists have been unsure about what is happening with our planet's climate and that we consequently know too little to take coherent and responsible action. This was incorrect within the scientific community, yet special interests with vested interests in keeping current destructive behaviors in place kept the popular press dancing with spin.

The basic facts of climate change, including the contribution to global warming made by humans, have been widely reported in and accepted by the scientific community for a decade or more. Moreover, the last five years have seen substantial breakthroughs in climate science so that the climate models projecting scenarios into the future increasingly agree. Additionally, data from the earth's surface and atmosphere indicate dramatic warming over the past 30 years, exactly as predicted by the models, and credible models are now also capable of generating fine-scale predictions about the impacts of climate change on local areas and how climate change will affect storm frequency and severity.

The Earth's climate is changing rapidly, and we are the cause. Throughout our planet's history, the climate has changed in dramatic ways. What makes this point in time different from the past is the human influence on this change, and the rate at which this change is occurring. Scientific evidence shows us that carbon dioxide concentrations in the atmosphere have increased substantially since industrialization because of our reliance on fossil fuels for everything from driving our cars to heating our homes, to producing the products that we have come to rely on in our daily lives. As a result, carbon dioxide concentrations have increased approximately 30% since pre-industrial times. This has resulted in a strengthening of the greenhouse effect, which has played a critical role in warming our planet.

Humans are also causing changes to our planet through other means, such as land use change. Trees, a valuable carbon sink, are being cleared at increasing rates to make room for urban/ suburban development, human settlement and agricultural purposes. By removing these valuable carbon sinks, we are accelerating

warming even further. Methane concentration in the atmosphere resulting from intensive livestock operations, decomposing garbage in our landfills, decomposing organic matter and burning biomass has increased approximately 150% since pre-industrial times, which plays a role in the warming that we are currently observing.

We are also consuming more and more: our recreational shopping culture and the convenient products and services that we have come to expect as a necessary part of our daily lives are causing profound changes to our world. Our lives have become easier since industrialization, but this ease has come at a great cost. Current scientific evidence has shown us the scope of the changes that our activities and lifestyles have caused, as well as what our future could look like should we choose to continue on the same path.

Our planet is warning us that it can not support our current way of life. Knowledge, however, is our greatest defense in light of these changes. By understanding how we fit into the overall climate change equation, we can opt to make changes to the way we live our lives. These changes will help us leave behind a home for future generations of all living things.

Key climate change facts:

- Average global temperatures increased by about 1 degree Fahrenheit over the 20th century.
- The United States contains only 5 percent of the world's population, but contributes 22 percent of the world's carbon emissions.
- Between 20 and 25 percent of carbon emissions come from deforestation and land use change.
- The Golden Toad *(Bufo periglenes)* is thought to be the first species to go extinct because of climate change.
- Personal cars and trucks in the United States emit 20 percent of the United States' carbon emissions.
- Air conditioning and heating account for almost half of electricity use in the average American home.
- Climate change is linked to stronger hurricanes, more drought and increased coral deaths from bleaching.
- Climate change is linked to an increase in disease-carrying pests that lead to the increased spread of diseases such as dengue fever, malaria, lyme disease and West Nile virus.

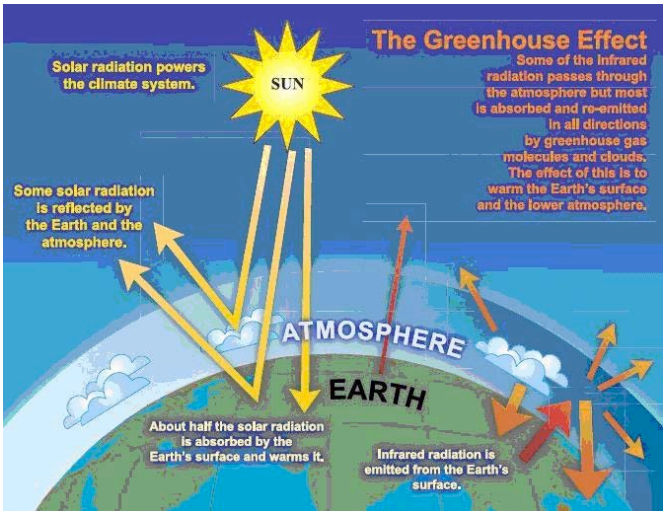
Climate change is already beginning to transform life on Earth. Around the globe, seasons are shifting, temperatures are climbing and sea levels are rising. If we fail to change behaviors in the immediate future, climate change will permanently alter the lands and waters we all depend upon for survival.

Some of the most dangerous consequences of climate change are:

- Impact: Higher temperatures
- Impact: Changing landscapes
- Impact: Wildlife at risk
- Impact: Rising seas
- Impact: Increased risk of drought, fire and floods
- Impact: Stronger storms and increased storm damage

- Impact: More heat-related illness and disease
- Impact: Economic losses

The Greenhouse Effect



The Earth's atmosphere is composed of a variety of gases, some constant and some variable. Variable gases, such as water vapor and carbon dioxide, play an important role in influencing the Earth's average temperature. These gases are referred to as greenhouse gases (GHG), because they act like the glass on a greenhouse: they allow solar radiation in through the atmosphere, but prevent the escape of all of the counter radiation back out into space. These greenhouse gases absorb counter radiation and emit it back towards the Earth, causing a warming of the lower atmosphere.

Incoming solar radiation passes through the atmosphere, where some of it is reflected back into space, and some is absorbed by the Earth's surface. The Earth emits longwave counter radiation, some of which is dissipated out through space, while some of it is absorbed by greenhouse gases and emitted back to Earth, causing an enhanced degree of warming. This process is what we are currently observing today: humans are producing increased amounts of greenhouse gases, which in turn are causing the surface and lower atmosphere to warm.

This naturally occurring process is an important part of the planet's ability to maintain an average temperature that is capable of supporting life on Earth as we know it. Without this process, the Earth would be a very different place: the average temperature of the atmosphere near the surface would be approximately -18°C, as opposed to the average temperature of approximately 14°C observed today. The Greenhouse Effect is thus critical to maintaining life on our planet.

What is not natural is the rate at which humans are adding additional greenhouse gases to the atmosphere. This process is referred to as the Enhanced Greenhouse Effect, and is responsible for triggering and enhancing the current warming trend.

The Role of the Built Environment

In the U.S., buildings are responsible each year for 39% of all carbon dioxide emissions, consume 71% of the nation's electricity and account for 70% of all landfill waste. A typical US commercial construction project generates 2.5 pounds of solid waster per square foot. These behaviors are not sustainable on economic, social or environmental levels.

Developers, Architects, Designers and consumers must become informed on decisions and behaviors that can make significant impacts in greening our environments.

Buildings consume one-quarter of the global wood harvest, one-sixth of its fresh water, and two-fifths of material and energy flows. Since most Americans spend 90 percent of their lives indoors, there is growing concern about indoor environmental quality, a contributor to the childhood asthma pandemic and other health problems. In a provocative essay, Ed Mazria recently noted that buildings are "the most long-lived

physical artifacts society produces." Since energy use in buildings is responsible for nearly half of the nation's greenhouse-gas emissions, Mazria believes architects are primarily responsible for addressing and resolving the climate challenge.

USGBC and LEED: What Is LEED?

LEED is both a point-based certification system hatched by the U. S. Green Building Coalition (USGBC) where buildings accumulate points in several categories to gain different levels of certification and a how-to guide for professionals and users new to green construction. The LEED scorecard prompts designers to reduce impacts in five categories ranging from site planning to energy consumption, water usage, indoor environmental quality, and building materials. Pay a modest fee, satisfy the prerequisites, acquire the appropriate number of possible points, and your building can become "LEED Certified."

Once a building is completed, a developer submits documentation to the USGBC, where a third-party evaluator determines whether to award a Certified, Silver, Gold, or Platinum rating. It is difficult to grab the Platinum ring: there were only 70 such buildings in the U.S. at the beginning of 2010.

Transformative? Not exactly.

In November of 2009, on a warm night in Phoenix, 28,000 architects, engineers, and real estate developers crowded into Chase Field for the opening session of the USGBC's annual Greenbuild conference. A giant screen at the front of the stadium displayed cheerful animations of solar panels curving toward the sun and green skyscrapers shooting up like flowers. As the euphoric soundtrack reached a crescendo with the Black Eyed Peas' "Let's Get It Started," Rick Fedrezzi, the founder and president of the U.S. Green Building Council, bounded onstage. "Our movement has reached not just a tipping point but a leverage point," he called out jubilantly. "And we finally have one long enough to move the world."

In America, homes and offices account for 40 percent of carbon emissions. And as they choke the atmosphere, buildings drain the economy: each year, companies spend billions of dollars on energy bills instead of using that money to fuel growth and investments. It's no surprise that the stimulus package expanded the tax credit for insulation, HVAC upgrades, geothermal heat pumps, and wind turbines. All of this is good news for the green building movement. Venture capitalists, anticipating the end of fossil fuels, have poured 27 percent of their investments into clean energy technologies during the second quarter of 2009. And Hollywood has joined the crusade, with a growing list of celebrities—including Brad Pitt, Edward Norton, and Cate Blanchett—launching their own green building initiatives.

But two studies released in the fall of 2009 added a sour note to Fedrezzi's clarion call. At the beginning of November, Greener World Media issued a report by Rob Watson, editor of GreenerBuildings.com, who is renowned for developing the USGBC's Leadership in Energy and Environmental Design rating system (popularly known as LEED). Watson's report included impressive data on market trends, land impact, and water efficiency for LEED projects. When it came to energy savings, though, the numbers were discouraging. "Some LEED buildings are not performing as expected given their design and technology elements," Watson stated bluntly. "This is an area of controversy and a source of great attention by the U.S. Green Building Council."

Another report—released at the end of October by the USGBC's Chicago chapter and its partners—put a finer point on the problem. The study looked at the median efficiency of LEED-certified buildings in Illinois and found that they were performing only 5 percent better than their non-LEED counterparts throughout the region. Fewer than 30 percent of the buildings were eligible for the government's ENERGY STAR label. And the Platinum and Gold LEED buildings were no more efficient than those that had Silver or basic LEED certifications.

Given all the buzz and optimism surrounding green buildings—and the meticulous detail of the LEED rating system—these findings might seem puzzling. But they make more sense up close. Anyone seeking LEED certification can choose from a menu of eco-friendly credits. Instead of selecting energy-minded features like efficient mechanical systems, developers often reach for the low-hanging fruit. They might use paints that have low levels of volatile organic compounds or install cabinets made from rapidly renewable wood. They may opt to recycle their construction waste or increase airflow throughout the building. All of these choices fulfill the "Environmental Design" half of the LEED bargain, saving trees and improving the quality of human life, and many of them help minimize pollution during the construction phase. But none of them prevents an occupied building from guzzling fuel and pouring greenhouse gases into the atmosphere for years to come.

When the Illinois study looked at cases where engineers had taken the time to labor over sophisticated energy models, it found that 75 percent of those buildings fell short of expectations. The fault presumably lay with building managers who made numerous small mistakes—overheating, overcooling, misusing timers, miscalibrating equipment. The buildings' owners, with their LEED plaques already hanging in their lobbies, had little incentive to demand better day-to-day performance. At a the Westford (MA) Symposium of Building Science XII, former heating systems contractor Henry Gifford roundly criticized the USGBC for letting LEED recipients rest on their laurels once they achieve certification in this way. "They don't have to do a good job," he noted, "because nothing they do will screw up the (perceived) greenness of that building."

This underscores one of the most fairly leveled criticisms of LEED certification and the USGBC: There is a big difference between tweaking a project to earn LEED points with an idiosyncratic and point-based system and living green and sustainable behaviors that reduce energy consumption and effectively mitigate environmental impact.

It has been argued by USGBC that the greatest contribution that LEED Certified buildings may have for the planet is in reducing the level of greenhouse gas that is currently produced by the inefficient building stock. The reduction of ghg is hypothetically caused by the improved building performance of LEED buildings - more efficiently managing inputs and outputs, and by innovating to do more with less - energy and electricity.

However, in 2009, serious doubts were raised about the actual efficiency of LEED buildings. The most prominent and vocal critics were well known engineers Joseph Lstiburek and Henry Gifford. Mr. Gifford has over 25 years of experience making buildings more energy efficient, using common sense approaches. Mr. Lstiburek, B.A.Sc., M.Eng., Ph.D., P.Eng., is a principal of Building Science Corporation and is a building scientist who investigates building failures and is internationally recognized as an authority on moisture related building problems and indoor air quality.

Among other things, Messrs. Gifford and Lstiburek called out the US Green Building Council on a New Buildings Institute (NBI) report, originally released in 2007 and updated in 2008 during the 2009 USGBC Greenbuild conference that stated that LEED buildings in various occupancy categories saved 25% to 30% of measured energy compared to average commercial energy consumption figures, as reported by the U.S. Department of Energy. Gifford found in examining the data that USGBC had excluded poorly performing buildings from the sample, deliberately creating a false portrait of LEED-certified building performance.

Mr. Lstiburek's article in the ASHRAE journal shamed architects and the engineers that support them for chasing "points" for superfluous "green" motives that have nothing whatsoever to do with saving energy once in place. Mr. Gifford also wrote a thoughtful piece criticizing the NBI report. Indeed, Mr. Gifford continues to make his arguments in pugilistic public forums, inviting all comers to debate him on his findings that LEED buildings actually use more energy than non-LEED buildings. USGBC has instead run and hid. So it was of concern, to say the least, for fervent LEED APs, members of the USGBC tribe and green building true believers, that LEED could be considered greenwash.

Shortly after Gifford's presentation of his findings, USGBC released its new LEED system which instead of awarding points based on calculations, requires all buildings to submit water and energy bills for a full year after earning LEED certification to keep their plaques. The council has not yet threatened to revoke LEED status for projects that miss the mark. But if they are at all concerned with attempting to recover credibility, they will. The new emphasis on follow-up evidence brings the USGBC more closely in line with other environmentally conscious agencies. The USDA, for instance, requires growers and processors to submit records for five years after they receive organic certification.

Newer LEED applicants will also find it more difficult to sidestep efficiency during the design phase. As Wilson's report notes, half of the projects certified after October 2005 acquired the LEED seal of approval without earning any energy points at all. The rules have now changed: All projects registered after June 2007 must achieve at least two energy-related credits before they can be granted LEED certification.

In October, 2010, Gifford filed a $100 million class action lawsuit against USGBC, going after them for Sherman Act Monopolization through fraud, unfair competition, deceptive trade practices, false advertising, wire fraud and unjust enrichment.

Environmental lawyer Shari Shapiro at Green Building Law describes the suit in plain language: "The allegations are essentially fraud and false advertising, an anti-trust claim and a RICO claim thrown in for good measure. His theory is that the USGBC has falsely claimed that its rating system makes buildings save energy, and that building owners have spent more money to have their buildings certified, that professionals have gotten worthless professional credentials and people in general have been duped into thinking LEED has meaning." Among other allegations, the suit argues that USGBC is fraudulently misleading consumers and fraudulently misrepresenting energy performance of buildings certified under its LEED rating systems, and that LEED is harming the environment by leading consumers away from using proven energy-saving strategies.

Alleged Fraud and Deceptive Practices

The suit alleges that USGBC's claim that it verifies efficient design and construction is "false and intended to mislead the consumer and monopolize the market for energy-efficient building design." To support this allegation Gifford relies heavily on his critique of a 2008 study from New Buildings Institute (NBI) and USGBC that is, to date, the most comprehensive look at the actual energy performance of buildings certified under LEED for New Construction and Major Renovations (LEED-NC). While the NBI study makes the case that LEED buildings are, on average, 25%–30% more efficient than the national average, Gifford published his own analysis in 2008 concluding that LEED buildings are, on average, 29% *less* efficient. A subsequent analysis of the NBI data by National Research Council Canada supported NBI's findings, if not its methods.

Using that study and USGBC's promotion of it, the suit alleges fraud under the Sherman Anti-Trust Act, among other statutes. Gifford's suit demands that USGBC cease deceptive practices and pay $100 million in compensation to victims, in addition to legal fees. Under the Lanham Act, the suit repeats the same concerns in alleging deceptive marketing and unfair competition. Other allegations include deceptive business practices and false advertising under New York State law, as well as wire fraud and unjust enrichment.

Class-Action Suit

By having his lawyer, Norah Hart of Treuhaft and Zakarin, file a class-action lawsuit, Gifford is not only claiming that he has been harmed by USGBC, but that he is one of a class of plaintiffs that have been harmed. According to the suit, those plaintiffs include owners who paid for LEED certification on false premises, professionals like Gifford whose livelihoods have allegedly been harmed by LEED, and

taxpayers whose money has subsidized LEED buildings.

The class action approach may be technically difficult to pursue in this case, says lawyer Shari Shapiro in an article on her green building law blog. Among other things, Shapiro notes that in a class action suit it is relevant whether, among other things, "the plaintiffs are enough alike so that their claims can be adjudicated together" and "whether the lead plaintiffs adequately represent members of the class." Given the variety of plaintiffs Gifford is trying to represent, that may be hard, she says.

Shapiro, assuming that Gifford has benefited from the green building wave, even questions whether Gifford has even been harmed, as he would have to be to take part in the lawsuit. However, Gifford told *EBN* that there's no question about that. "Nobody hires me to fix their buildings," he said. Though not an engineer, Gifford is respected in energy efficiency circles for his technical knowledge. He told *EBN* that he has lost out because owners are fixated on earning LEED points, and he doesn't participate: "Unless you're a LEED AP you're not going to get work." That's unfair, he claims, because while USGBC says that its product saves energy, it doesn't. Gifford says that his services actually save energy, and he's prepared to prove it by sharing energy bills from buildings he has worked on.

Whether many other building professionals feel the way Gifford does, and whether they're willing to go on the record, will be one aspect of this case to watch. Gifford indicated that the response so far has been mixed. As he told *EBN*, "Everybody has the same response: thank you, thank you… let me know how it goes."

Gifford's paper is especially critical of the primary finding that LEED buildings were shown to be, on average, 25% to 30% more efficient than the national average. He provides an alternate analysis of the data that concludes that the LEED buildings are, on average, 29% *less* efficient than average U.S. buildings. The differences between Gifford's analysis and those of USGBC and NBI are based on two areas of disagreement:

1) First, the LEED buildings are compared to the CBECS data set of all existing buildings, regardless of year of construction. Gifford argues that they should have been compared only to new buildings. The 2006 CBECS summary shows that buildings built between 2000 and 2003 use, on average, about 10% less energy than the complete data set for all existing buildings.

NBI's Mark Frankel disagrees, noting that some of the LEED buildings are actually renovations of older buildings, so it may not be fair to compare them to new buildings. Further, he notes that CBECS generally groups its buildings by decade, and those three years don't represent enough of a trend to rely on. Historically, he points out, when CBECS published data for just a few years it looked better, only to worsen when the full decade's data were compiled. And the trend for full decades or more since 1920 shows that new buildings use just as much energy as old ones.

2) Gifford's second adjustment is to use the mean of the LEED data set instead of the median used by NBI. (The LEED mean was not published, but NBI provided it to Gifford upon his request.) Depending on who you choose to believe, NBI used the median because it made the LEED data look better (Gifford's contention), or because it was statistically the more meaningful approach (more on this below).

Interestingly, the distinction between mean and median isn't all that significant if you omit the "high energy use" building types (labs and data centers, primarily) that constitute 13% of the LEED data set. Omitting these makes some sense, because the CBECS data has a negligible number of such high energy using buildings. But if you include those buildings, the difference between mean and median is huge:

- All buildings in the LEED data set, in kBtu/ft2/year: Median: 69; Mean: 105
- Without the high energy building types: Median: 62; Mean: 68

The CBECS numbers are means, so, Gifford argues, the LEED data should be analyzed based on means. By including all buildings in the LEED data set, and comparing based on mean instead of median, and

comparing them to the CBECS 2000-2003 mean, Gifford shows that the LEED buildings' energy use exceed the CBECS baseline by 29% (105 divided by 81.6).

Even without the labs and data centers the LEED buildings may be unfairly handicapped, because CBECS includes a lot of warehouses and vacant buildings, which use relatively little energy. But NBI chose not to adjust for that difference.

Gifford raises some other questions about the study, most notably the suggestion that the buildings for which actual data was provided likely performed better than those who couldn't or chose not to provide data. Given that 552 projects were contacted but data was only included from 121, this skepticism appears justified.

Meanwhile, the USGBC is widely touting LEED for Existing Buildings (LEED-EB), a program that might inspire more owners of LEED-certified properties to walk their talk. Instead of rewarding owners for getting their buildings off to a good start, LEED-EB looks at where they are along the track. A LEED Platinum office building might have earned points for having public transportation options near the office, but the LEED-EB equivalent requires that employees actually *take* the bus or subway to work. May predict "low traffic" for these additional initiatives due to their administrative costs and the lack of marketable benefit in attaining net additional LEED certification. Many have also questioned if this initiative as well as the separation of new buildings into "Core and Shell" and "Interiors" certifications separately is not just another way for USGBC to generate more fee income for itself.

LEED Rating Systems

Prior to April, 2009, the LEED certification process involved a 69-point system. Shortly after being confronted by Gifford, USGBC changed the LEED certification and rating process. LEED points are now awarded on a 100-point scale, and credits are weighted to reflect their potential environmental impacts. Additionally, 10 bonus credits are available, four of which address regionally specific environmental issues. A project must satisfy all prerequisites and earn a minimum number of points to be certified.

The Green Building Certification Institute (GBCI) assumes administration of LEED certification for all commercial and institutional projects registered under any LEED Rating System. In April 2009, the newly updated LEED V3 model was brought into use. This new version of LEED was designed to better address energy efficiency and CO2 emissions, two areas that have been identified as the most important sectors of green building. The point system has been revamped and some credits are now weighted more heavily than others based upon their overall environmental impacts.

The certification is facilitated by LEED Accredited Professionals (APs) who are tested and certified by the Green Building Certification Institute. With V3 comes a new certification process and three levels of certification for LEED AP's. The AP's are responsible for keeping a project on task and moving through the certification process. Assessment categories range from site selection to energy efficiency to the kinds of materials a project uses. Four levels of certification are given based on the number of points accumulated by a project.

"Certified" = 40-49 points
"Silver" = 50-59 points
"Gold" = 60-79 points
"Platinum" = 80-110 points

The Point System can be summarized as follows:

Sustainable site = 26 points
Water efficiency = 10 points

Energy and atmosphere = 35 points
Materials and resources = 14 points
Indoor environmental quality = 15 points
Total = 100 base points

Innovation and design = 6 points
Regional priority = 4 points
Bonus Total = 10 innovation and regional points

Materials used in the structure and design aspects that help increase the efficiency and overall sustainability of the structure are well accounted for by LEED, with special consideration for more sustainable energy use and lower CO2 emissions. Points are gained in these categories by selecting sustainable materials such as fast-growing woods or recycled products, non-toxic paint, energy- efficient windows and appliances, and energy-efficient designs such as passive solar heating.

There are also 26 points given for what is called "sustainable sites." Many of these points are geared toward the attributes of a selected site, such as distance from town centers, number of parking spaces, efficient transportation, storm water control, and construction pollution prevention. It is these points that most directly affect biodiversity in an area. However, with the new V3 model, actual site selection has become even less important; it is only worth 1 point out of 110 possible points. On the other hand, the 5 points awarded for community connectivity can play an important role in keeping a new building near a city center and away from important habitats.

The LEED rating systems are now grouped into five main categories: Building Design & Construction, Interior Design and Construction, Operations & Maintenance, Homes, and Neighborhood Development.

The first category, Building Design and Construction, contains five LEED rating systems. These rating systems are guidelines for new buildings and old buildings undergoing major renovations. Schools, Hospitals, Office Buildings, and Apartment Buildings are all examples of buildings that would fall into this category. The second category is Green Interior Design and Construction, which includes LEED Commercial Interiors and LEED Retail Interiors. These rating systems were designed specifically for tenants leasing a portion of a larger building. For example, they could be used for a company leasing commercial office space or for a Starbucks in a strip center.

The third category is Green Building Operations and Maintenance, which includes LEED for Existing Buildings and LEED for Existing Schools. The rating systems for existing buildings can be used by building owners and operators to measure operations and maintenance as well as make minor improvements.

The fourth category is LEED for Homes, which was specifically designed for single and multi-family residential structures that are three stories or less. LEED for Homes is modeled after the Environmental Protection Agency's successful Energy Star for Homes program and became available to the public in 2008. It applies to single and multi-family residential units up to three stories tall. The fifth and final category is LEED for Neighborhood Development, which integrates the principles of smart growth, urbanism and green building into the first national program for neighborhood design.

LEED Criticism

The LEED program has encountered criticism on a number of levels, particularly regarding its lack of emphasis on region-specific environmental concerns. Buildings in Florida, for instance, should be given different consideration than buildings in northern Michigan. Architects need to work with other stakeholders and experts to discuss what is best for a building with respect to its surrounding climate and environmental concerns. Each region of the country has distinct environmental challenges as well as differing renewable resources. Drought warnings and water rationing in the southeast and southwest should

create a stronger emphasis on water conservation and reclamation. Building in areas where viable renewable energy sources exist should be strongly encouraged to harness this energy. Still many simply follow the standard checklist without such considerations.

Another criticism related to the LEED program relates to decisions by organizations and political subdivisions to mandate LEED certification. According to the USGBC, 43 states, 190 localities and 12 federal agencies or departments have policies or initiatives that include LEED certification. Though LEED's one-size-fits-all approach makes a good business case for some, the standards were not designed to be mandates. As an example, the City of Charlotte, North Carolina is currently debating the implementation of a new sustainable building policy for municipal facilities and city officials disagree about whether to require LEED certification. In a recent article from the *Mecklenberg Times*, opponents to the mandate discuss the LEED system and why it does not address all the issues Charlotte's officials are concerned about: preserving land and trees, conserving clean water resources, reducing energy use and maximizing transportation alternatives. Council member Warren Cooksey doesn't want to avoid LEED, but wants buildings to be more energy efficient and not just chase a point system. He states "The quickest way to fail to be a leader is to adopt someone else's standard and follow it blindly."

Prior to the unveiling of LEED V3, the LEED system was criticized for its oversimplified points system in which including a bike storage room was awarded with the same 1 point credit as building on a grayfield, including photovoltaics, or incorporating a $1.3 million eco-friendly heating system. LEED V3 has attempted to address this problem by weighing the more influential credits more heavily. However, these new changes still do not adequately address biodiversity conservation.

The "site selection" category which is worth one point forbids the use of "land specifically identified as habitat for any species on federal or state threatened or endangered lists," but provides no standard for assessing whether a particular area is being used by one of these species. Who makes the judgment? A trained ecologist? An engineer? An "environmental consultant"? Is a field survey required? Does the field worker know how to assess habitat or conduct a rare species survey?

Because LEED sets forth no standard for assessment, this credit could be easily exploited. Furthermore, LEED takes no account of habitats that are critical to certain rare species during limited parts of the year such as for drought refuge or overwatering sites. On top of these shortcomings, the site selection credit is only worth one point.

Destroying the habitat of a threatened species scarcely affects your chances of gaining a platinum rating. Indeed, ecological health seems to be treated as a side effect rather than an intended result. Credits such as those awarded for community connectivity or availability of public transportation may help ease the strain on open spaces, though only indirectly.

The USGBC's fees for LEED registration range from $750 to $3,750, and certification fees run from $1,500 to $7,500 or more depending on the size of the project. Also, LEED certification can take months to complete. Many developers decide to spend this cash on more eco-friendly features such as photovoltaics or other special components. For instance the Mayor of Park City, UT, stated "On the Park City Ice Arena [$4.8 million project cost], we built it according to LEED criteria, but then we realized that [certification] was going to cost $27,500. So we ordered three small wind turbines instead that will power the arena's Zamboni."

Other criticism of USGBC and the LEED system comes from credible sources in the trenches with high credibility. Auden Schendler is executive director of sustainability at Aspen Skiing Company and the author of *Getting Green Done: Hard Truths From the Front Lines of the Sustainability Revolution*. In an article for Grist magazine entitled, "Top Green-Building System is in Desperate Need of Repair," Schendler noted, "Green building was once all in the eye of the claimant, but LEED changed that, creating a national standard for green buildings where none existed before, meeting pent-up demand for reliable information with a rigorous rating system and a checklist for going green. The USGBC has been enormously successful at publicizing the need for, and benefits of, greener buildings. Interest in green building is exploding, with some municipalities, states, and corporations adopting LEED as a standard.

Thanks to the USGBC and LEED, we now have momentum, media attention, motivated clients, and a broad understanding of green building."

"LEED is a design process that should, in theory, produce buildings that conserve resources, reduce operating costs and pollution, help address global warming, improve marketability and durability, preserve the ozone layer, protect occupant health, and improve worker productivity. When the program was launched, the hope was that it would transform the design and construction of commercial buildings."

"But LEED's early bloom is fading. Green building has a robust future, but this certification system may not. LEED is broken. The program's results thus far have been sorely disappointing."

From 2000 - 2005, USGBC certified only 285 buildings. By contrast, over the same time period, the U.S. Department of Energy's Building America program helped builders design and erect more than 20,000 new homes, with a minimum 30 percent reduction in energy use for heating, cooling, and hot water at no net cost. Schendler contends that LEED has become expensive, slow, confusing, and unwieldy, a death march for applicants administered by a soviet-style bureaucracy that makes green building more difficult than it needs to be.

The results:

- mediocre "green" buildings where certification, not environmental responsibility, is the primary goal;
- a few super-high-level eco-structures built by ultra-motivated (and wealthy) owners that stand like the Taj Mahal as beacons of impossibility;
- an explosion of LEED-accredited architects and engineers chasing lots of money but designing few buildings; and
- a discouraged cadre of professionals who want to build green, but can't afford to certify their buildings.

Schendler also contends that an "avalanche of reports" falsely insist that green building -- and LEED certification in particular -- doesn't cost more than conventional building. "These reports are wrong. The second you start a green-building project, it costs more than conventional construction… The myth that going green costs nothing is damaging to clients who discover the reality deep into the process. Instead of using fuzzy math to show that green building doesn't add costs, let's acknowledge that these buildings cost more and are worth it."

Schendler adds, "The danger is that LEED certification will cannibalize funds that otherwise could be used to improve a building. Developers face a choice: pursue LEED -- or purchase a photovoltaic system, daylighting, or efficiency upgrades."

Chris Field, director of the Carnegie Institution's Department of Global Ecology, which recently built a new facility on the campus of Stanford University, said, "We decided we would rather take money required for LEED certification and spend it on other sustainability features. ... Investing in LEED certification would have meant that we wouldn't have been able to invest in heat-rejecting windows."

Milwaukee's new Urban Ecology Center is one of the greenest buildings in the upper Midwest. Certified? No, "because it could have added as much as $75,000 to the cost, just for the paperwork," said Ken Leinbach, the center's executive director.

In LEED, all points are weighted equally, even though some have far greater environmental benefits than others. Point-mongering is what happens when a design team becomes obsessively focused on getting credits, regardless of whether they add environmental value. And "LEED brain" is a term for what happens when the potential PR benefits of certification begin driving the design process. Unfortunately, if you know how to scam LEED points, you can get the PR benefits without doing much at all - other than mountains of paperwork - to make a project green.

A perfect example of LEED brain comes from Boulder, Colo., where a recreation center received one point for installing an electric-vehicle recharging station. Only problem: there are about six electric vehicles in Boulder that could be charged at that site, and the charging station gets used less than once a year.

Said a respondent to a 2004 survey on LEED conducted by the Green Building Alliance, "In a recent building, we received one point for spending an extra $1.3 million for a heat-recovery system that will save about $500,000 in energy costs per year. We also got one point for installing a $395 bicycle rack." While this is an extreme case, it points to a real problem: Why install new HVAC equipment for a few extra points when you could get the same points by changing the color of your shingles at no cost?

One solution would be to make more critical credits mandatory. That way, credit-mongering would be played with the cheap cards like low-VOC paints or sealants, not the face cards like energy and water conservation and sustainably harvested wood.

Problems with LEED

The LEED system is the most well known green building certifications in the world, and USGBC has played a big role in turning green development into an internationally recognized movement. The LEED certification is supposed to signify that a certified building is more sustainable than a non-certified building. However, a LEED certification does not necessarily mean that a building's impact on the local environment has even been assessed. A LEED building placed with no consideration for the natural setting could be as harmful for local biodiversity as any conventional building. A building placed in an upland forest/vernal pool habitat complex, for example, could extinguish the local pool-breeding amphibian populations, regardless of the LEED certification level. LEED was not designed to reduce damage to local ecosystems, and is no substitute for knowledge of local biodiversity and good conservation planning.

The idea behind LEED is laudable. The actual accomplishments have been disappointing to date for many. Observes Schendler, "In the final analysis, the world needs green buildings a lot more than green buildings need LEED certification. If LEED continues to cost too much in dollars, time, and effort, we are not going to stop building green projects, we'll just stop certifying them."

Says Schendler, "When LEED was launched, the hope was that it would transform the design and construction of commercial buildings. But today, for many reasons, LEED is fast becoming its own worst enemy. The program's early bloom is fading. Green building has a robust future, but LEED may not."

"Within the green building orbit, everyone worth their low-VOC paint has heard about LEED, but the early results have been sorely disappointing. Since 1995, the Energy Star program, for example, has been embraced by office-equipment and home-appliance manufacturers. It has been so widely adopted that it has, effectively, flipped the market for computers, monitors, printers, copiers, clothes washers, and dishwashers. Over 360,000 of the nation's new homes have earned the Energy Star label, saving homeowners an estimated $200 million and eliminating approximately 4 billion pounds of greenhouse-gas emissions. This sort of market transformation is what LEED aspires to."

“Since 2000, however, LEED has certified fewer than 300 buildings (as of 2009), with 2,184 projects registered but not certified. Manufactured goods aren't buildings, obviously, so here's a more telling comparison: while LEED was ploddingly certifying a few dozen projects each year, the U.S. Department of Energy's Building America program helped production builders design and erect more than 20,000 new homes. Although interest in green building seems to be exploding -- with some municipalities, states, and corporations adopting LEED as a standard -- the reality is that LEED is deeply troubled. There is great interest, but there are few certified buildings. If LEED doesn't change, it will collapse of its own weight, with more and more potential users saying "No thanks," as some colleges, and many builders, already have.”

Schendler, who has built a passive solar home, designed the world's first renewable-energy mitigation program, participated in the pioneer program that developed LEED 1.0, built two LEED-rated buildings (with half a dozen more planned), and played a consulting role on numerous other green-building projects, including a high-performance affordable-housing project, has grown concerned that LEED has become “costly, slow, brutal, confusing, and unwieldy, a death march for applicants administered by a soviet-style bureaucracy that makes green building more difficult than it needs to be, yet has everyone genuflecting at the door to prove their credentials.”

“The result: mediocre "green" buildings where certification, not environmental responsibility, is the primary goal; a few super-high-level eco-structures built by ultra-motivated (and wealthy) owners that stand like the Taj Mahal as beacons of impossibility; an explosion of LEED-accredited architects and engineers chasing lots of money but designing few buildings; and a discouraged cadre of professionals who want to build green, but can't afford to certify their buildings. A growing number of LEED veterans have, or soon will, throw in the towel. LEED is broken.”

Jay Stein and Rachel Reiss's *E Source* papers share Schendler’s concern that a LEED rating doesn't necessarily reflect a building's greenness, and that techniques encouraged by LEED are not always the best way to reduce environmental impacts.

Notes LEED and USGBC Critic Henry Gifford, “LEED is based on a compelling idea: that anyone can take an 8 hour class, pass a test to become an accredited professional, and use a checklist or points system to profoundly improve the way buildings are designed, built, and operated. Sorry, life isn't that simple, and neither are buildings. The point is not that LEED isn't being used properly, but that LEED creates the image of energy efficiency, but not actual energy saving.”

“Any study that omits the worst-performing 16% or so buildings from one dataset and compares that dataset to another which hasn't had any buildings removed is like a tobacco company study that removes the people who died of lung cancer before doing an analysis. The office buildings studied only look 33% better after doing this, and by comparing the median to the mean.”

“And, nobody has anything to say about the 30% part of the 25 - 30% average saving claim, which is not supported by anything in the study - they just made it up.”

It cannot be argued that USGBC has created a buzz around green building, and formalized, standardized, even Oprah-ized green building, just what the field needed. It has enlisted the eager participation of many thousands of building professionals. Its website has compiled a tremendous amount of information and expertise. USGBC deserves endless credit for wrestling with the complex question of what makes a building green, and expanding the answer beyond energy to encompass water efficiency, site issues, resource efficiency, and indoor environmental quality.

LEED created a national standard for green buildings where none existed before. If used as a cookbook, it

provides a means for novices to create, understand, and certify buildings. LEED made green building somewhat understandable – albeit in an uneven manner - to the masses. LEED includes biases that reflect the interests of its funding partners at inception. It has not helped reduce the troubling plague of greenwashing. An informal survey of LEED critics suggests that the U.S. Green Building Council has been less than receptive to criticism. Some authors have been greeted with rage from LEED proponents, which only emphasizes the program's near cult-like nature. What's needed is a rational discussion, not a war.

Problem No. 1: LEED Costs Too Much

An avalanche of reports insist that green building and LEED certification does not cost more than conventional building. These reports are wrong. The second you start a green building project, it costs more than conventional construction. But the word on the street still seems to be that LEED is cheap, and green building pays for itself. In 2008, a report compared the costs of LEED and non-LEED buildings and found "no statistically significant difference." It is true that other factors have more influence on building cost than whether one chooses to pursue LEED. But the fact remains that LEED certification costs extra. And not necessarily just a little extra.

Too many consultants, think tanks, and architects are pitching this "no-pain, no pain" line to sell their services. Some of the studies they cite are reminiscent of the Bush Administration's "sound-science," "Healthy Forests," and "Clear Skies" initiatives. For example, a well-publicized study done for the U.S. General Services Administration which requires LEED certification for its new buildings failed to account for the costs associated with commissioning, which is a LEED prerequisite. That's like getting a new car price quote without the engine. This study also didn't account for the cost of obtaining other expensive credits, discounted because they were already required by the GSA. In the real world, LEED certification typically adds 5%+ to the budget – on a large project. A nonprofit group in our area recently figured their added costs at $50,000 to certify a 10,000-square-foot building.

The myth that going green costs nothing is damaging to clients who discover the reality deep in the process. Instead of using fuzzy math to show that green building doesn't add costs, we must all acknowledge that these buildings cost more - and prove that they are worth it. There are many reasons for added expense. First, green building is a deviation from business as usual.

Green design substitutes intelligence and ingenuity for energy. But brainpower isn't free; we routinely pay $125 to $200 an hour for it. LEED pancakes additional costs on the consultant fees. First, properly commissioning a new building to make sure its mechanical systems are performing as designed, a LEED requirement, costs on the order of $25,000 - for a small building. Granted, commissioning *should* be part of business as usual, but it is not. To get LEED's energy points you have to computer model your building's performance. For something under 20,000 square feet, $15,000 would be a steal. Next, there's a LEED registration and certification cost of $2,250 plus USGBC membership of $1,200, the latter not required but politically expedient. Adding the sophisticated energy management controls you may need can be at least $5,000 and up.

Then you've got to gather and collate the information you'll need to prove your case to the USGBC, which some have compared to preparing a brief for the Supreme Court. If you outsource the documentation, only a saint, novice or a fool would do it for less than $20,000, in which case it probably will not be done properly, placing your certification at risk, which you will not know about until after your checks have long since cleared. So you're already in the hole $68,450 - for a small building. Then, near the project end, when you realize you are a few credits short of a full LEED load, come the unanticipated expenses of upgrading the air handlers or eliminating HCFCs from the chillers or purchasing green power from your local utility. At the conclusion of Schendler's Aspen Skiing Company's most recent LEED odyssey, they were hemorrhaging cash; "Our V.P. of real estate development was frustrated to the point of sarcasm: "I spent extra to bring in certified wood but it was certified by the wrong agency so I didn't get credits for it. We

thought our energy modeling would give us the points we needed, but that didn't work out either, so we spent a lot of money to not get Gold, but it was the right thing to do.""

The danger is that the cost of LEED certification will cannibalize funds that otherwise could be used to improve the building's performance.

At today's price point, developers face a choice: pursue LEED -- or purchase a photovoltaic system, daylighting, or efficiency upgrades that make the building's cost of operation and carbon footprint lower over time – exactly the results LEED should be facilitating. Chris Field, director of the Carnegie Institution's Department of Global Ecology, which recently built a new facility on the campus of Stanford University, said, "We decided we would rather take money required for LEED certification and spend it on other sustainability features." Field was uncertain what that cost would have been but called it "substantial," saying, "investing in LEED certification would have meant that we wouldn't have been able to invest in heat rejecting windows." If a global ecologist doesn't find value in LEED, will Donald Trump? Milwaukee's new Urban Ecology Center is one of the greenest buildings in the upper Midwest. Certified? No, "because it could have added as much as $75,000 to the cost, just for the paperwork," says Executive Director Ken Leinbach.

In "The Cost of Green: A Closer Look at State of California Sustainable Building Claims," the authors note that "Our literature review indicates many developers in the industry are leery of the costs of adopting the LEED standard." Erik Roberts, one of the developers interviewed for the report, says, "People are starting to think that it's enough to use the U.S. Green Building Council guidance strictly as that because the certification is too expensive and time consuming." Roberts built the first LEED-registered office project in San Francisco, but never bothered to finish the application process. It is not good for the USGBC when a LEED-built structure doesn't get certified because it's too expensive.

Problem No. 2: Point Mongering & LEED Brain

"I'm sick of the hype. I'm sick of meetings where you spend endless hours debating a LEED point instead of focusing on good design." -- respondent to the Green Building Alliance Survey

Point mongering happens when the design team becomes obsessively focused on getting credits, regardless of whether they add genuine environmental value. This happens because USGBC has been effective at making LEED attractive and newsworthy so there is perceived prestige in getting a high LEED rating; it can make your reputation as a green company, and there is not much of a downside to being perceived as being a responsible environmental steward. Since LEED certification is costly and time consuming, gaining a final few credits can be worth its weight in LEED Gold.

Schendler confesses, "Guilty as charged. On one project we considered installing a reflective roof. LEED encourages this because black roofs contribute to the "heat island" effect that raises urban air-conditioning bills. Reflective roofs and parking surfaces address this problem, saving energy. But at 8,000 feet in the Rockies, heat islands are not an issue. Still, if we can get the credit, we'd have a better shot at a higher LEED rating, so why not try? Disingenuous? Absolutely. Fair? Not to anyone, and here's why. If we point out that we don't really need the high albedo roof, we'd lose our shot at the credit, shrinking the pool of possible points we can get. If we go for the credit knowing it's irrelevant, we're corrupt. Do you play the game, or not?"

Cleveland has very different portrait for 'heating degree days' that Los Angeles or Phoenix. The 'cooling degree day' portrait is similarly widely variant. Yet I had an educated well-meaning architect on a client committee recently ask me to make certain that we were specifying a white roof membrane for the roof

replacement so we would qualify for LEED points, though they could not afford to pursue certification.

LEED is also blind to the variation in fuel costs; currently in the U.S., natural gas ranges from $0.07 to $0.26 per Therm and electricity is $0.0075 to $0.02533 per kilowatt hour. Yet LEED pushes one to treat roofs the same everywhere to mitigate cooling loads, which in Cleveland, OH, is not as economically worthwhile as the heat gain benefit from a black roof in winter.

Problem No. 3: Energy Modeling Is Complicated

At his Golf Clubhouse in Snowmass, Schendler thought he had a LEED Gold building nailed; “Early on, we hired one of the best engineers in the country. He encouraged us to install a geothermal system that would capture heat and cooling from a pond on the course. Slick. We assumed we'd get eight to 10 energy credits, and breeze in for Gold. In the end, we only got four points, good only for Silver, and our reputation was tarnished.”

“What happened? Due to some bizarre assumptions in the modeling protocol, it initially appeared that we couldn't get credit for the huge improvement the geothermal offered. When we first modeled the geothermal system, we compared its energy consumption to that of a code-compliant building we could otherwise build. We soon learned, however, that the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) required us to model our innovative heating system against a "like system." In other words, although our proposed geothermal solution was far superior to a gas-fired boiler, ASHRAE forced us to compare it to *another geothermal system*. Confused? So were we. Here's an automotive analogy: Shopping for a new car, you might consider a Toyota Prius rather than a SUV. If you bought the Prius, however, LEED would evaluate its performance against a Honda hybrid, not the guzzler alternative.”

“LEED, like pig Latin, can be arcane. In this case, connections to the green mafia uncovered an architect fluent in LEED credit interpretations. Our contact described an exemption to this "like system" rule for cooling loads less than 150 tons. We felt like we had received a dispensation from the Vatican. But we instantly hit another computer modeling pothole. In order to achieve any of the energy credits, you have to measure building performance following ASHRAE guidelines, *except as modified* by LEED's protocols. As our engineer pointed out, "You have ASHRAE 90.1 dog-eared on one side of the desk, and the LEED book open on the other side, and you're trying to follow both procedures, and it's extremely complicated."

“The crux is selecting your budget system, which is a confusing matrix with exceptions and caveats involving single vs. multizone buildings and other obscure requirements. On the Clubhouse, we had multiple single-zone systems -- so was it multizone or single zone? You don't need to follow the lingo to know things were out of control. We love engineers, even if they are an odd breed. Some engineers are idiot savants, some are graceless in social situations, but all of them are valuable assets. That both our engineers *and* the USGBC engineers were confused is telling.”

“We went back and forth with the USGBC on how to define our building systems. Ultimately, we were told to model the building in a certain way. Months later, during the final review, we found that the papal dictate had changed. To appeal the ruling would have cost $2,000. Over budget and under fire for the costs of LEED certification, we folded, ending up with half the energy points we'd strived for, killing Gold. Our long-suffering engineer had the final word: "The more work I do with LEED, the more distasteful it becomes."”

No Credit for Butchering the Energy Hog

“Sometimes getting LEED points is too easy, other times too hard or simply impossible. At the Clubhouse we couldn't get credit for two innovative efficiency solutions because LEED excludes electrical plug loads from its analysis. We spent enormous time and effort to install a variable speed drive in the kitchen hood vent after our modeling suggested it would otherwise be an energy hog. The VSD will save lots of money and tens of thousands of pounds of greenhouse gases. The garage, meanwhile, was designed to house electric golf carts, whose batteries emit explosive hydrogen gas. Instead of inefficiently venting heated air 24-7, we installed multiple, redundant hydrogen sensors creating radical energy savings while safely venting the garage. It was a green design coup. But since neither the garage nor the kitchen hood ventilation systems were "regulated loads," we got no credit for our innovative work, because we'd already used up all four of LEED's innovation credits.”

“From an operating-cost and climate-impact perspective, building energy performance is critical. That's why hardwired "plug loads" like the ventilation fans described above matter. In all its energy calculations, LEED relies heavily on ASHRAE 90.1. But the 1999 version of this standard fails to provide credit for a number of critical strategies, including: building orientation and shape, efficient fan systems, low-energy pumping systems, low-energy office equipment, efficient exterior lighting, water-cooled chillers, daylight controls, demand controlled ventilation (using CO2 sensors), and high thermal mass. Some, but not all, of these problems are addressed in ASHRAE's 2001 version.” These shortcoming are thoroughly described in a must-read article by Jason Mclennan and Peter Rumsey.

Problem No. 4: Crippling Bureaucracy

"How long will I have to wait before I can go in to see the major?" -- "Just until he goes out to lunch," Sergeant Towser replied. -- "But he won't be there then, will he?" -- "No, sir. Major Major won't be back until after lunch." -- Joseph Heller, *Catch-22*

USGBC seems to take its administrative oversight seriously. Very seriously. After all, everyone complains about the costs of certification. Schendler again; “Energy points weren't the only ones we lost due to LEED's *Catch-22*-like rules. When we built our first LEED building high above the city of Aspen at 11,000 feet, we took extreme measures to reduce nighttime light pollution, and received an innovation credit for our labors. This light pollution credit was later incorporated into LEED 2.0.”

“We assumed that achieving the same credit at the Golf Clubhouse a few years later would be a no-brainer. But despite the fact that we used the same lighting designer who helped us achieve our Sundeck credit, we didn't get it. Why? In part because the form our lighting designer used was outdated. LEED certification takes a long time. It took us two years to ready all the information for submission. By the time we submitted, the form we had used was obsolete, a new credit interpretation rule had been issued, and our lighting guy had switched firms. As they say in Pac-Man, "Game Over." We had not minimized exterior lighting at the Golf Clubhouse, we had *eliminated* it, but we still couldn't get a point we had *invented*.”

“Reform the Review Process”

The best green buildings don't just have fresh air and daylight - they have heart, soul, humanity -- palpable qualities you can feel. In contrast, interactions with the LEED rating system tend to be rigid and soulless, as stark and clinical as a colonoscopy.

The review process is too onerous. A respondent to the Green Building Alliance survey noted: "It's as if the review contractors are trying to impress the USGBC with their thoroughness and nitpicking. ... Review comments are brief and impersonal, without the slightest hint of support -- and always by email of course." Read closely, this hints of the applicant's existential angst: "Does anyone at the USGBC give a damn about me, this building, the process I have gone through?"

LEED reviews feel like Navy SEAL boot camp, where the goal is to fail as many applicants as possible. Credit reviews are humorless, severe, and confrontational. Green building is hard, and the USGBC should be aiding and abetting green projects, not crushing them with a faceless technocracy. Credit interpretations should be constructive, not infer that the applicant is a criminal violating parole.

Better yet, instead of our FedExing 30 pounds of old-growth to Washington, D.C., then enduring months of electronic quibbling and water torture, why don't the LEED evaluators come out and spend a few days looking at the Clubhouse themselves? They can personally verify the dual-flush toilets, examine the HVAC controls, meet our design team, down a sustainably brewed Fat Tire, maybe even play a round of golf. (No mulligans allowed -- that might be considered bribery.) If there are questions, let's resolve them on the spot.

The LEED specifications are fast taking on the complexity of the federal tax code. Why not give reviewers more discretion, some latitude for subjective decision? This would add a level of humanity to credit review and interpretation. *Catch-22* is a funny book, but the blind adherence to nonsensical orders Joseph Heller satirized was, and remains, a real problem in military bureaucracy, and, it seems, at the USGBC.

Members of the Delta Force are given wide decision-making ability in the field. They are much more effective than the average G.I., precisely because they don't have to clear every decision with a superior. USGBC consulting engineers are as well-trained and should be given broader latitude. Eliminate LEED's confusing Credit Interpretation Request program, and give more power to the reviewer.

Enough didactic quibbling. Decisions about what's green should be based on human (not Vulcan) logic. Does the application meet the spirit of the credit? If so, allocate the point. For example, LEED awards one point for providing employees in non-perimeter areas an ability to control temperature, airflow, and lighting. We did one better at the Clubhouse, designing it so that there were *no* non-perimeter workspaces, thus providing every employee with access to views, daylight, and fresh air. But by eliminating non-perimeter workspaces, we didn't get extra credit, we lost our shot at the credit entirely. Ouch!"

"And please, stop the nitpicking! After submitting a huge binder full of documentation for the Clubhouse, ASC was asked to resubmit follow-up information for 31 out of 44 credits. A reviewer noted that a letter from our wind-energy provider had "been dated six months prior to the estimated project completion date. Please clarify." Sweet baby Jesus! ASC had done one of the first 10 LEED buildings in the world. What must the newbies experience? The review process needs to be dramatically streamlined, and injected with a serious dose of humility and humanity."

Problem No 5: Overblown Claims of Green Building Benefits Are Misleading

Since the 1994 publication of Joe Romm's and Bill Browning's "Greening the Building and the Bottom Line," the industry has been rife with endlessly repeated claims of worker productivity, reduced personnel churn rates, and lower absenteeism. You know the argument: "energy bills are a few percent of operating costs. Your big expense is labor. So if green building improves worker productivity or reduces absenteeism, those benefits will dwarf the energy savings."

It's not that these studies aren't seminal, or that the claims are not true. The point is that they are difficult to quantify and vary according to building type. Different sorts of developers will value them, or not, depending on their perspective and investment horizon. Furthermore, these benefits *don't* impact first costs, and they *don't* help builders meet budget, two real-world barriers that often severely hamper green building.

A synopsis of Greg Katz' widely cited study "The Costs and Financial Benefits of Green Buildings" notes that "Many of the financial benefits estimated in this report are general financial benefits, rather than benefits that accrue to a specific building tenant or owner." Unfortunately, many of Katz' claims and calculations are flawed. While a government entity should care about the benefits its buildings may have for society, a private commercial entity may not – not because they do not care, but because they are in competition with other developers who compete on price – the cost of occupancy. Private-sector building owners, for example, are less likely to care about health and environmental impacts, and hence might perceive significantly lower financial benefits.

In short, societal gains don't profit builders on a budget. Such benefits must not be misstated or oversold inasmuch as the legitimacy of the causal relationship between the environment and productivity is still regrettably weak. The overspin does not help when, as it the case of the Katz study, it is a lie. Then the whole green initiative loses credibility.

The majority of green building activity has occurred in the public sector: federal, state and local government. Public entities can mandate green building for their own buildings. This is evidenced through dozens of new ordinances, guidelines, policies and demonstration buildings. The cost of funds for government bonds are low, and the time horizon for the average life of a public building is long - likely to be more than 50 years – longer, sadly, than the financing and design life cycles of commercial buildings. The majority of LEED buildings are typically owned, financed, maintained and occupied by the governmental entity. Wearing these multiple hats makes it easier for governmental owners to design buildings to maximize their performance on a long-term perspective. Green building is also consistent with their mandate to maximize public health, safety and welfare.

As a result, the literature on the costs of green design has focused almost exclusively on public sector facilities, and particularly high-cost federal facilities where detailed cost information is available. And generally, the literature reports that the cost premiums for green buildings are low – 1.7% - 7%. However, the private sectors standards and different in many areas than those of the public sector, and when attempting to identify the cost of green design over a more conventional standard of design and construction, the costs of green design are not as insignificant as current literature routinely suggests.

In 2007, Dennis Langdon issue a new analysis (*Cost of Green Revisited*, 2007) of 221 buildings, 83 of which had a goal of sustainable design. The analysis included no LEED Platinum-rated projects. Langdon concluded that because many of the non-LEED projects in his survey cost more than the LEED-certified projects that there is no premium paid for green design.

Aside from the obvious flaw in logic, Langdon's analysis includes primarily large-scale, high cost projects, with building costs ranging from $225 - $725/sf.

Additionally, most surveys of LEED costs need well documented cost segregations and invariably rely on public sector projects where the standards present are atypical from commercial developments. As a result, these higher standards of sustainability are not identified and isolated as LEED costs on the argument that these elements would have been included in the project anyway due to various standards, such as sustainable design in compliance with the Federal Leadership in High Performance and Sustainable Buildings Memorandum of Understanding, the Energy Policy Act of 2005 (EPAct) (Winters, 2004; Kats et al., 2003, Matthiessen & Morris, 2004).

As a result, these analyses begin with a bias that presents a distorted portrait that added costs associated with LEED certification are minimal. In fact, many analyses will summarize findings by asserting that a low level LEED certification will cost as little as $0.50/sf and 0.2% of construction costs, while acknowledging that soft costs alone add far more. The July, 2008 LEED Cost Survey published by the GSA Public Buildings service reported that a study of 12 sustainably designed projects (a conspicuously small sample) throughout the US indicated that the average added cost for "green" was less that 2% - yet soft costs alone added an average of 2.3%. Few efforts have attempted to present a comprehensive analysis that

can been synopsized responsibly to serve as a basis for objective decision-making by design professionals and owners in planning projects and maintaining stewardship of financial resources.

An analysis by Northbridge Environmental Management Consultants in 2003 determined that obtaining LEED certification added 4% - 11% of a project's construction costs. The GSA LEED Cost Study created by Steven Winter Associates, Inc. in October 2004 was commissioned by GSA to estimate the costs of greening federal facilities, focusing on new mid-rise courthouse facilities atop structured parking and mid-rise office building atop structured parking. Costs were categorized into five categories and 12 LEED rating scenarios were created (hi-cost and low-cost each for LEED certified, LEED Silver, LEED Gold). LEED construction cost impacts for the new courthouse occupancy were identified as being from 1% to 8.1%, while the office building modernization were identified as running from 1.4% ($1.78) to 7.8% ($10.22/sf). When including soft costs for the green initiative, the new courthouse project costs supposedly increased from between $0.41/gsf to $0.80/gsf with a 262,000 gsf program. This equates to $107k - $210k. For the office building modernization, added green soft costs ranged from $0.35/gsf to $0.69/gsf on a 306,600 gsf program, which equates to $107k to $212k.

As a comparative tool, it must be noted that these numbers are unrealistically low inasmuch as federal standards embed many features and elements that market-driven commercial developments do not normally include, which were therefore noted in the GSA analysis as not adding to the project's costs since they were already required by other standards.

The GSA model indicates that LEED credits costs vary significantly between the courthouse and office building models because of the different occupancy types and also because of different strategies or tactics to earn LEED points. In commercial development, competition between developers induces dimensions of economy to permit the effective marketing of a development with rent rates that attract and retain tenants. While "quality" and "sustainable" attributes may offer a given property and advantage, that advantage may relate more to the speed with which beneficial occupancy is achieved rather than premium rents achieved to fund green initiatives.

In a recent California study of 33 green projects, on average, the premium for green buildings has been reported at about 2%. The eight rated Bronze level buildings had an average cost premium of less than 1%. Eighteen Silver-level buildings averaged a 2.1% cost premium. The six Gold buildings had an average premium of 1.8%, and the one Platinum building was at 6.5%. The average reported cost premium for all 33 buildings is somewhat less than 2%. (*A Report to California's Sustainable Building Task Force – October 2003).* Based on soft costs issue alone (Reed, 2007), these projections are simply not credible.

As noted elsewhere, in March 2009, at the Building Energy '09 conference of the Northeast Sustainable Energy Association in Boston, New York mechanical systems specialist Henry Gifford spoke out, calling the LEED rating system is "a tragedy," resulting in buildings that use more energy, not less, and "a fraud perpetrated on U.S. consumers trying their best to achieve true environmental friendliness." Gifford is a vocal critic of the U.S. Green Building Council's Leadership in Energy and Environmental Design program, who was seated next to Brendan Owens, USGBC's vice president of technical development. The source of the debate is a USGBC study that compared the energy performance of LEED-certified buildings with that of existing, non-certified buildings. The USGBC claims that the study shows LEED buildings to be 25% to 30% more efficient. Gifford labeled USGBC's methodology as flawed.

Gifford's analysis indicates that the LEED buildings actually use 29% *more* energy than other buildings. Gifford also thinks that "green" buildings ought to be certified based on their performance after a year or two of service and that the energy use for buildings ought to be available to the public on utility Web sites. Gifford is joined in his criticism by Joe Lstiburek, B.A.Sc., M.Eng., Ph.D., P.Eng., who is a principal of Building Science Corporation, a building scientist who investigates building failures and is internationally recognized as an authority on moisture related building problems and indoor air quality.

Messrs. Gifford and Lstiburek called out the US Green Building Council on a New Buildings Institute (NBI) report, originally released in 2007 and updated in 2008 during the Greenbuild conference, which is run by the USGBC, that stated that LEED buildings in various occupancy categories saved 25% to 30% of measured energy compared to average commercial energy consumption figures, as reported by the U.S. Department of Energy.

In a January, 2009 interview, Gifford observed, “I had hoped that as soon as it became widely known that LEED buildings average higher energy use than comparable buildings, LEED would get their act together and change. But, sad to say, they have instead circled the wagons and keep insisting that LEED buildings save energy, and say the solution is more of what they are already doing. So, I doubt LEED buildings will become significantly energy efficient, especially now that there are 70,000 people certified to do something they don't know how to do. The USGBC has promised multi peer-reviewed studies showing LEED buildings do save energy, and with their multimillion dollar research budget, I don't doubt those studies will appear, but they should be viewed with all the skepticism due any study whose results are announced in advance.”

When asked about LEED biases against vinyl, particle board and OSB, Gifford remarked, “My biggest fear is that a few years from now, LEED will have convinced people that large numbers of buildings are as efficient as they can be, and therefore the only choices are to give up our creature comforts or have more wars [over oil].”

So prominent scientists and engineers are now presenting technical data which places responsibility with the USGBC for the publication of false and misleading data. The Green Movement will not be helped by fraud. Misrepresenting the costs of LEED is one thing. Misrepresenting performance attributes is further out of bounds.

Problem No. 6: The Conspiracy of Silence:

It is essentially impossible at present to find accurate, verified data on the performance of green buildings – LEED or otherwise. The green movement has a problem with candor. Initial results have not always met expectations or projections, and the design professionals and owners involved with these projects do not want their shortcomings and failures known for fear it will negatively impact their individual credibility and the efficacy of the green movement in general.

But if we are going to get it right, we need to share the truth - in all of its glory and misery. If we care about the planet and want to raise all boats in the harbor, we have to raise the water by sharing actual and verified data with one another to be able to deliver better results - now. I recently had one end user project manager explain away the fact that their LEED Gold building has fallen far short of its performance objectives since it opened by telling me that their maintenance personnel did not know what their role was in maintaining the building. For a LEED Gold project with a fully funded commissioning initiative that passed the LEED sniff test, this is most probably simply untrue – unless the USGBC looked the other way on the commissioning documentation and analysis, which we would all like to imagine is unlikely.

But we must all admit our failures is we are going to impact climate change in a positive way. It appears that we do not have time to hide the monkey. If the outcomes of our most noble efforts are greenwashed, then scores of subsequent projects are doomed to fail. Schendler lambasts books like *Green to Gold* -- touting case studies of profitable environmental programs -- along with most major media and their "It's Easy Being Green" feature articles. The "cream-skimming" projects can be quite profitable, but they can't bring about the depth of change we need. To complement our roadmap to sustainability, Schendler advises, we also need the catalog of wrong turns. His own book is volume one. Stakeholders perpetuate the myth that being environmentally responsible is simple, obvious, ethically correct -- and profitable. Once a project is held up as a model and the owners are getting publicity, it's impossible to point out that it uses more energy, not less. Schendler's first project -- retrofitting lights in the Little Nell Hotel -- was a case in point, and one of this latest book's many excellent stories.

Overview of Added Costs Due to LEED Certification:

Green design can be accomplished without LEED certification.

The LEED certification process attracts participants to the LEED mix of credits and performance measures. The LEED certification process entails substantial documentation which adds soft costs to the project cost. Many clients committed to sustainability and green design see little or no value in a LEED certification process and plaque. They are comfortable achieving a level of stewardship comparable to that entailed in a LEED certified project without the hassle, red tape and added costs.

Soft Costs:

Soft costs increase with LEED certification and green design. Maryland's Green Building Council estimates that soft costs alone for projects attempting LEED Silver certification add 3% - 5% to construction costs. The Jean Vollum Natural Capital Center in Portland, OR attained LEED gold certification for its 70,000 sf building, with added soft costs defined as $322k, or 3.2% of the construction cost. R. S. Means, the most prominent national source of cost data for the construction industry estimates that additional design costs for greening represent 5% of the project's design costs. A summary of the elements of these added costs reflects:

1. ***Research & Additional Specifications:*** Design firms must invest time and energy to stay abreast of product and system developments, LEED certification changes, perform cost-benefit/ life cycle cost analyses and participate in green design events to be capable of performing green design and executing LEED-certifiable projects. While a measure of the efforts maybe billable as project-specific, many such efforts are not and contribute to a higher overhead burden that must be remunerated in some manner for the design professions and the green initiative to be sustainable.

2. ***LEED Certification Documentation & Application Services:*** A significant burden of the LEED system is the need to document compliance with the various criteria in order to submit a package to the GBC for review and a decision on certification. This requires the establishment of a tracking and reporting system and the tracking down of information that otherwise is still not standard practice in specifying or sourcing systems and materials.

   Surveys and articles report that documentation is the largest obstacle that project teams have encountered in working with the LEED process. In one survey, an average of 226 work hours was required in order to complete all of the proper LEED documentation necessary for certification. Documentation is required from both Architect and Contractor. It might therefore be noted that a baseline threshold cost of LEED documentation is $20,000 - $35,000.

   Despite great gains in green design and the certification of LEED professionals, architects and contractors are still learning how to provide proper documentation and many of their costs are going unreported, undocumented and unbilled. Northbridge's research identified documentation costs between $8,000 and $70,000 per project, with the range highly dependent on the experience of the team documenting the LEED process. Northbridge has stated its conviction that the size of the building does not appear to influence the amount of money being spent on documentation.

3. ***LEED Certification & Approval:*** There are fees required by GBC to register and then certify a project. These fees to GBC vary with the size of the project and range from $2,250 to $11,250. This cost pays for the GBC's efforts to review, pass judgment on and certify compliant projects. Northridge derived an estimate of documentation and application fees as a percentage of total construction costs by applying these estimates to a database of currently certified LEED projects. Northridge found that these certification costs averaged 0.7 percent of

construction costs with a range from 0.05 percent for a very large project to 3.8 percent for a small one.

4. ***Commissioning:*** Commissioning is a prerequisite of the LEED process. Commissioning involves an outside team of individuals that is not part of the design and construction team. Their primary area of responsibility is to ensure compliance of "fundamental building elements and systems" with the LEED guidelines. LEED also awards an extra point for additional commissioning.

   This requirement comes at a significant cost. Various sources estimate commissioning costs to be in the range of 0.5% - 3% of construction costs. R.S. Means estimates commissioning costs at between 0.5% - 0.75% of construction costs. A study on LEED projects conducted by the Weidt Group found that commissioning costs ranged between 0.75% - 1.5% of total construction costs. Reed (2007) and D'Antiono (2007) have identified soft cost impacts from a study of 11 LEED-certified buildings where the average square footage was 98,365, with the largest project being 288,685 sf and the smallest at 10,000 square feet, all of which were commercial or institutional projects. Overall:

   - The cost premium for LEED NC certification ranged from 1% to 6% of construction costs.
   - Two of the 11 projects (18%) were able to achieve LEED certification on schedule and under budget.
   - Soft costs, including LEED registration and certification, documentation, energy modeling and commissioning averaged 0.8% of the total construction costs, or average $1 per square foot.
   - Documentation was difficult to quantify as the basis for reporting was inconsistent across the projects and ranged from $3000 to $35,000.
   - Energy modeling averaged around $10,000 across nine of the eleven projects. Eight projects fell at or below the $10,000 and one was $35,000.

   A recent report (Dorgan, Cox & Dorgan, 2002) found that costs of commissioning, including travel expenses, range from 2% to 4% for buildings costing less than $5 million, down to 0.5 % to 1% for buildings costing over $50 million. The study used nine case studies to illustrate why savings from commissioning exceeded the cost of commissioning even before the projects were complete.

A case study of a middle school in The Dalles, Oregon found that commissioning costs were 0.55 percent of construction costs, but the Oregon Office of Energy stated that a typical range for commissioning was 0.5 percent to 1.5 percent of total design and construction costs *(Green Building: Project Planning & Cost Estimating,* R.S. Means Company, 2002.; "Introducing Comparative Analysis to the LEED System: A Case for Rational and Regional Application," The Weidt Group *et al.*, submitted for publication at ACEEE 2002 Summer Study on Energy Efficiency in Buildings).

Commissioning costs depend in large part on the size of the building and on its complexity. These costs typically represent a much higher fraction of construction costs for smaller buildings and for more complex buildings such as laboratories.

Increasingly, we believe that dealing with these tasks requires that they be budgeted as a lump sum or manhour-based value based on the project's scope, rather than as a percentage of costs. Obviously, with larger projects, commissioning tasks become a smaller cost as a percentage of the project's construction. But on medium and small projects, commissioning costs might be viewed as a lump sum minimum, where the percentage becomes disproportionately high due to the tasks that must still be undertaken, with their cost amortized over a smaller budget. It is on small and medium projects that commissioning tasks (as well as most other soft cost tasks) can represent a substantial added expense.

Green buildings are expected to achieve better performance (e.g., low energy use, better air quality) than conventional buildings. LEED requires "Fundamental Building Systems Commissioning," which entails hiring a commissioning expert, developing a commissioning plan and completing a commissioning report. In addition, LEED provides credits for *additional* commissioning and for including a building performance measurement and verification program. The measurement protocol referenced in LEED, the International Performance Measurement and Verification Protocol is also used internationally as a way to demonstrate CO2 reductions benefits, providing a potentially helpful way to secure financial value through sale of CO2 reductions associated with green buildings (Vine, Kats, Sathaye, Joshi., 2003).

5. Energy Modeling

As with commissioning, energy modeling was a prerequisite for LEED certification, but it accounts for a much smaller part of the soft costs we identified. Means estimates a cost of $0.05 to $0.45 per square foot, depending on project size. Natural Logic, an environmental consulting and design firm that has assisted on LEED projects, estimates energy modeling costs of $15,000 to $30,000 per project.

With the reformulated LEED system, energy consumption informatiomn must be submitted in lieu of the prior modeling metrics where points were awarded if the modellimng implied consumption would be less than the norm.

6. Total Soft Cost Estimates: Northbridge's "best estimate" of soft costs of obtaining LEED certification is 2.3 percent of total construction costs with a range of 1.5 percent to 3.1 percent (Exhibit 1). Northridge also acknowledges that this estimate "falls in the lower end of the overall range" of 1% - 5%. With actual costs of 4% to 5 percent), we believe the higher values are indicative of atypical projects (higher levels of certification, limited experience with the process, and small scale projects) and are therefore not appropriate for use in the extrapolation we developed to assess nationwide impacts.

It is important to distinguish here between the experience of a "typical" project and a weighted average of costs on large, high-cost projects. Much research to date has simply taken a list of projects, and derived a sample average of values to estimate what the typical project experience was with respect to these costs. The different manner in which costs are summarized and soft costs segregated (or not) by various and unrelated project sources make this sort of blind averaging potentially misleading.

Green Hard Costs:

Besides soft costs, the main incremental cost component of LEED certified buildings is the cost to actually "green" the building. This cost is the premium incurred over traditional construction that a green building would have imbedded in its construction costs.

The elements of these costs vary as widely as the LEED certification criteria. They may include additional site work and structures; additional infrastructure costs related to transportation; different heating, cooling, and ventilation systems; roofing; lighting; water use; recycling services at the site; and sourcing specific construction materials (from regional sources, recycled content, or certified forests).

While this is potentially the larger area of incremental costs (sources we consulted variously estimated these additional costs at up to 30 percent of construction costs), many of the available examples do not isolate these costs and for those that do the data vary across a large range. We believe a reasonable estimate is that greening adds between three and eight percent to the cost of a "typically" constructed building.

Greening is one area where it is particularly difficult to isolate the true incremental costs of LEED *versus* other practices and guidelines followed by designers and contractors. Compliance with local codes may lead builders to exactly the same specifications and practices that the LEED guidelines do, so in that case we should not attribute any incremental cost to the LEED process. And where detailed data does exist, the projects are generally larger high-quality federal projects which bear little relevant to more typical

commercial projects.

Steelcase Wood Furniture built a manufacturing facility in Grand Rapids, Michigan. The company estimated that its LEED Silver certification cost them a three percent premium above the normal costs of the $26 million building. In lump sum terms, the company estimates that its green initiative added only $780,000 to the project's cost.

A high-end example is the Chesapeake Bay Foundation's Philip Merrill Environmental Center in Annapolis, Maryland. This 32,000 square foot commercial office building houses the headquarters of the Chesapeake Bay Foundation and is considered on of the "greenest" buildings ever constructed. Premiums spent for green measures in the building represented a 30% increase in the construction costs, or $46 per square foot of the final $199 per square foot construction cost. In lump sum terms, the green aspects added $1,472,000 to the project's $4,895,000 cost, resulting in a $6,368,000 project cost.

While Northbridge admitted that they "lacked adequate data to develop a statistically based value for greening costs," they felt compelled to project "that an appropriate range for greening costs is three to eight percent of construction costs." We believe that statistics like this are dangerous and irresponsible in their potential for misinterpretation, particularly on small and moderately sized commercial projects. Additionally, these costs are particularly susceptible to increases as the LEED criteria become more stringent in future versions of the program.

Northridge stated, "We do not think it is realistic to assume no incremental costs for greening. Our range of greening cost impacts has no statistical backing, however, and, cognizant of that, we have chosen to define the range at the conservative end of the spectrum…We are confident that the lower end of the cost ranges (*e.g.*, $900 million annualized cost for public projects currently seeking certification) defines a conservative, lower-end estimate of the incremental costs of LEED. At 4.5 percent of construction costs, however, this is not a particularly large impact, and the impact would diminish if we compared the cost to total *project* costs. At the higher end of the range, the costs are more significant at 11% percent of construction costs."

An attempt by Bruce Haxton, AIA, LEED AP, Senior Project Manager/Design Architect, MHTN Architects, Inc. and Glen Beckstead, ASPE, Chief Cost Estimator, MHTN Architects, Inc., Salt Lake City, Utah, to develop a database using an Excel spreadsheet system, customized for different building types proposes to define prospective LEED costs to permit informed decision-making by owners at the bginning of the planning and design process. Haxton and Beckstead developed two simple 25- and 28-parameter spreadsheets to organize the LEED design attributes, including costs and savings. The authors consulted with laboratory consultants, mechanical, plumbing, electrical, civil engineers, interior designers and landscape architects to verify cost per square foot figures, as well as the basis for estimating costs of professional fees.

As the system was developed, various sources were consulted and each line item was repeatedly analyzed to ensure that the costs were realistic and defendable. Not only were the costs developed for each credit, the costs were also developed for each option under each credit. LEED credits vary from a net $10,000 savings to $250,000. If, on the other hand, the design team is working with a client whose goal is to obtain the highest LEED rating possible, then, theoretically, the design team will investigate all possible LEED credits to identify the maximum number of LEED credits that can be achieved.

A recent project for a laboratory project (LEED Certification level is still undetermined.) illustrates the authors' system findings to further understand the relative cost between Certified, Silver, Gold, and Platinum accreditation levels. The lowest-cost credits with the fastest payback were used to generate the following figures:

• **Certified Level** (26 – 32 points):

Credits pursued 28;
Total lowest additional cost (approximately); $1,699,670 (**3.01%** of the cost of the facility);

$11,182 average cost per credit;
Annual savings per year $438,511.; 3.88 years payback;
Added cost per square foot $11.29;
20 years savings $8,770,220 and inflation rated $14,499,784.

• **Silver Level** (33 – 38 points):

Credits pursued 35;
Total lowest additional cost (approximately) $2,472,297 (**4.38%** of the cost of the facility);
$13,081 average cost per credit;
Annual savings per year $484,099; 5.11 years payback;
Added cost per square foot $16.42;
20 years savings $9,681,972 and inflation rated $16,007,183.

• **Gold Level** (39-51 points):

Credits pursued 41;
Total lowest additional cost (approximately) $3,635,902. (**6.45%** of the cost of the facility);
$16,232 average cost per credit;
Annual savings per year $572,940; 6.35 years payback;
Added cost per square foot $24.15;
20 years savings $11,458,798 and inflation rated $18,944,805.

• **Platinum Level** (52 – 69 points):

Credits pursued 54;
Total lowest additional cost (approximately) $6,309,105 (**11.19%** of the cost of the facility);
$21,030 average cost per credit;
Annual savings per year $786,159; 8.03 years payback;
Added cost per square foot $41.90;
20 year savings $15,723,180 and inflation rated $25,995,098.

THE BENEFITS OF GREEN DESIGN:

The benefits of building green are multi-faceted. But much of the 'data' presented to date is soft and overstates financial attributes, which creates a misleading and unreliable framework for cogent decision-making. Organizations in and around the green movement have contributed to green washing whereby unsubstantiated and false information id offered as fact. This undermines the efficacy of green initiatives and must be seen in a balanced and honest context.

The California Sustainable Building Task Force asserts that the benefits of building green include cost savings from reduced energy, water, and waste; lower operations and maintenance costs; and enhanced occupant productivity and health. As Figure ES-1 which follows shows, analysis of these areas indicates that total financial benefits of green buildings are over ten times the average initial investment required to design and construct a green building. Energy savings alone exceed the average increased cost associated with building green.

Additionally, the relatively large impact of productivity and health gains reflects the fact that the direct and indirect cost of employees is far larger than the cost of construction or energy. Consequently, even small changes in productivity and health translate into large financial benefits. Despite data limitations and the need for additional research in various areas, the findings of this report point to a clear conclusion: building green can be cost-effective and can make financial sense today.

Energy Use

Energy is a substantial and widely recognized cost of building operations that can be reduced through energy efficiency and related measures that are part of green building design. Therefore, the value of lower energy bills in green buildings can be significant. The average annual cost of energy in state buildings is approximately $1.47/sf. On average, published reports allege green buildings use 30% less energy than conventional buildings – a reduction, for a 100,000 sf state office building, worth $44,000 per year, with the 20-year present value of expected energy savings worth over half a million dollars.

A detailed review of 60 LEED rated buildings, including 5 LEED rated buildings in California, clearly demonstrates that green buildings, when compared to conventional buildings, are:

- On average 25-30% more energy efficient (compared with ASHRAE 90.1-1999 and, for California buildings, Title 24 baselines);
- Characterized by even lower electricity peak consumption;
- More likely to generate renewable energy on-site; and
- More likely to purchase grid power generated from renewable energy sources (green power and/or tradable renewable certificates.

Although the environmental and health costs associated with air pollution caused by non-renewable electric power generation and on-site fossil fuel use are generally externalized (not considered) when making investment decisions, the energy reductions realized through the design and construction of green buildings reduce pollution and lower the environmental impact of conventional power generation.

Benefit-Cost Tradeoffs

With our traditional focus on first costs in the U.S., it is easy to lose sight of the fact that many of the investments made to earn points under the LEED system or to 'green a building' pay for themselves over time.

There is not a quality database yet available to permit the cogent analysis of the benefits of LEED certification. It is vitally important to begin the discussion of costs with an understanding of the benefits, particularly in a context where advocacy and greenwash is pushing for mandating LEED certification in public works and related public policy changes.

As we have described, obtaining LEED certification triggers many different costs.

Contrary to the greenwash of the Green Press and USGBC, LEED certification soft costs burdens are significant. While many of these costs do not yield any direct benefits, they represent the price that must be paid to get into the LEED system and to fulfill its requirements. These costs have been under-reported in virtually every case study and report to date. Even in Northridge's analysis, they state, "We excluded design costs from these overhead items…." Yet additional design costs and the costs of certification can be substantial financial burdens, particularly on small and moderately sized projects.

Secondarily, there are project components that yield economic returns such as avoided maintenance costs and lower energy usage. These investments are most likely to be made where the building owner and operator are affiliated so the longer-term benefits help repay the initial investment. Building owners are not likely to invest in these components if they have no way of recouping the benefits over time. This is a particularly significant distinction in commercial and retail construction where operating expenses are passed through to tenants, and the landlord/ developer has no incentive, save his hope for an increasingly savvy customer base (willing to pay extra for the cost of sustainability), that may appreciate the added costs to reduce operating expenses with high-performance systems and components, albeit at higher base rents. To date, there is little

evidence of such a market shift.

That is why LEED use has not grown in the private sector the way it has on the public side. It is also worth noting that these kinds of public policy objectives (lower energy use, greater efficiency) have historically been addressed through state and local building codes that are tailored to regional conditions.

Figure ES-1. Financial Benefits of Green Buildings Summary of Findings (per ft^2)

Category	20-year NPV
Energy Value	$5.79
Emissions Value	$1.18
Water Value	$0.51
Waste Value (construction only) - 1 year	$0.03
Commissioning O&M Value	$8.47
Productivity and Health Value (Certified and Silver)	$36.89
Productivity and Health Value (Gold and Platinum)	$55.33
Less Green Cost Premium	($4.00)
Total 20-year NPV (Certified and Silver)	**$48.87**
Total 20-year NPV (Gold and Platinum)	**$67.31**

Source: Capital E Analysis

Green building improvements are also credited with enhanced working conditions and productivity for building occupants. Promoters of green buildings attribute massive benefits to projected reductions in sick time and improved productivity resulting from better office conditions such as lighting and air quality. These have no significant fact base, so they provide an inadequate justification for mandating LEED or similar systems.

In the third category are expenses for project elements that produce non-market environmental benefits. Reducing runoff or using recycled inputs may provide natural resource benefits, but these are not captured by the market and cannot be recovered by building investors.

"THE BENEFITS"

The GSA 2004 analysis concluded that the benefits delivered by the green buildings surveyed were, in net present value dollars, worth $49/sf over 20 years for Certified and LEED Silver ratings, and $67.31/sf over 20 years for LEED Gold and LEED Platinum ratings – all for an allegedly initial cost of only $4.00/sf. Too good to be true? Yup.

It merits noting that the bulk of these "benefits" ($36.89/sf - $55.33/sf) were associated with "productivity and health value" enhancements, which were largely empirical conclusions, not in any way supported by historical or verifiable cause and effect linkages. The energy value of the green investment had a 20-year NPV of $5.79/sf, with an Emission Value of $1.18/sf.

No banker would loan $4 today for a 20-year return of $5.79. They would not have made such a loan before the financial crisis of Fall 2008 either.

Water savings were exaggerated due to water supply issues and costs unique to California. The $0.54/sf 20-year NPV benefit is therefore likely zero in any state without significant water supply issues and costs.

The study's perspective on the relationship between "property" and "productivity" is reflected by the following:

"The cost to the state of California for state employees is ten times larger than the cost of property. The following chart and supporting data represent state costs for 27,428 state employees in 38 state-owned buildings. Note that operations and maintenance (O&M) costs are allocated 44% for labor and 56% for property related expenses. Average annual employee costs ($66,478 in salary and benefits - $65,141 - plus allocated operations and maintenance costs - $1,337), are 10.25 times larger than the cost of space per employee ($6,477). Thus, measures that increase employee costs by 1% are equivalent, from a state cost

perspective, to an increase in property related costs of about 10%. *In other words, if green design measures can increase productivity by 1%, this would, over time, have a fiscal impact roughly equal to reducing property costs by 10%."*

"One approach to address this complexity is offered by comprehensive building performance scoring tools for evaluating building design and operation benefits. One example of this type of scoring methodology is called the Balanced Scorecard. This approach evaluates four categories of building performance: Financial Results (cost of absenteeism, turnover, etc), Business Processes (innovation, product quality, etc), Customer Satisfaction (stakeholder relations - including public image and local economic impact), and Learning and Growth (human capital development - including work satisfaction and productivity). These kinds of broad systems approaches are valuable for explicitly demonstrating how green buildings support health, productivity and other benefits and meeting larger corporate objectives. However, these types of approaches are less helpful for quantifying the benefits of green building design."

A tactical flaw in the CA survey is that it draws incorrect conclusions from the study, *What Office Tenants Want: 1999 BOMA/ULI Office Tenant Survey Report*, which is based on questionnaires from 1800 office tenant surveys in 126 metropolitan areas conducted by the Building Owners and Managers Association (BOMA) and the Urban Land Institute. The study affirms that office tenants highly value comfort in office buildings. Survey respondents attributed the highest importance to tenant comfort features, including comfortable air temperature (95%) and indoor air quality (94%). Office temperature and the ability to control temperature are the only features that were both "most important" and also on the list of things with which tenants are least satisfied. The CA study concluded that because respondents indicated that they were most concerned with thermal comfort that "a high percentage of office tenants are dissatisfied with the indoor air quality."

But thermal comfort and IAQ are not the same.

An additional tactical flaw is that the CA study relies on a level of proposed "potential productivity gains" from the study *Health and Productivity Gains From Better Indoor Environments* (William Fisk, 1997, 2002) that are completely hypothetical. The CA study takes a proposed "benefit" of $43 - $235 billion annually and by weighting and allocation, asserts a $385 "direct health improvement potential for each of the 65 million full time office workers and teachers in the US. If one third of these benefits can be achieved in a green building, this translates into about $130 per year in health-related financial benefits. With 225 sf in average space per worker, this suggests a potential annual productivity gain of $0.58/sf."

Beyond the hypothetical nature of Fisk's projections, the flawed inclusion that assumes half of all military personnel are office workers, a productivity gain should be defined in terms of additional GNP. Further, the CA study simply assumes that $46.7 billion annually would be "achieved from respiratory health benefits and thermal and lighting improvements in green buildings, this translates into about $718 per worker per year. This suggests potential annual productivity gain of $3.19/sf per worker, or slightly over 1% per year."

The lack of specific fact-based analysis with any quantitative mass makes these types of projections so hypothetical as to be meaningless. This is not to suggest that thermal comfort, adequate lighting, effective ventilation and appropriate indoor air quality do not contribute to effective performance.

However, they do not guarantee improved performance.

Additionally, they are not green initiatives. So claiming them as cost benefits associated with sustainability is specious and out of bounds.

There are hundreds of millions of square feet of office buildings in the world that provide a baseline of adequate thermal comfort, effective ventilation and adequate lighting that are not green. The co-mingling of these issues does not, as the CA study alleges, establish a direct and "positive correlation between measures common to green buildings and productivity, absenteeism, and related issues."

This is not to suggest that the National Science and Technology Council project entitled *Indoor Health &*

Productivity, established to collect and communicate research findings relating workplace attributes – including lighting, thermal comfort, air quality and ventilation – to human health and productivity, does not have significance. The database contains over 900 papers from more than 100 journals and conferences. The abstracts of 700 articles establish that there is a there is a linking of health and productivity with certain building design operation attributes – e.g., indoor air quality and tenant control over work environment, including lighting levels, air flow, humidity and temperature. However, the quantitative nature of this link and its relationships and influences is not defined in any comprehensive manner as to permit responsible projections of productivity gains or specific financial benefits.

The conceptual assertion of benefits of reduced illness symptoms, reduced absenteeism and increases in hypothetical productivity over workers in groups that lack worker-controlled temperature and ventilation is simply not enough to create a database reliable for the modeling of potential benefits. And again, these attributes are not inherently green. We eagerly await studies in progress that establish such causative links.

Vivian Loftness at Carnegie-Mellon University ("Building Investment Decisions Support (BIDS)," *ABSIC Research 2001-2002 Year End report)* has attempted to calculate the economic value added of investing in high performance building systems, based on the findings of building owners and researchers around the world. The work is important and in progress, though the samples in each area are not sufficiently large to be conclusive at present.

Conclusion:

The greenwash published to date overstates the economic benefits of LEED certification and under-reports both the cost of LEED initiatives and the soft costs associated with LEED certification.

These shortcomings do not mean that the green movement or that LEED certification are not worthwhile initiatives. These failures indicate that forces within the design and construction industries are sufficiently enthused with the green movement that they have rushed to press before appropriate and legitimate benchmarks for measuring costs and benefits have been put in place to deliver useful information that can reliably enable design professionals, developers, and end users to make informed decisions with confidence to enhance our stewardship and environmental responsibilities in ways that are significant, substantial and sustainable.

It is our hope that by addressing green initiatives with candor and full disclosure of costs and benefits and looking beyond the limitations of LEED certification, we will improve our stewardship beyond what LEED certification entails.

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This paper is a synopsized version of Eberhard's white paper which identified probable costs for each LEED point on for LEED V2, completed in 2009.