

## Turning Green into Gold

# Proper Metrics Key to Measuring Performance of Green Buildings

by B. Alan Whitson, RPA

In January, I traversed the country presenting to more than 1,000 architects, contractors, engineers, facility managers and public officials in Boston, Northeast Florida, Philadelphia, and Waco, TX. Along the way, I met with manufacturers in Boston, Providence, and Atlanta. No matter the stop or audience, the topic always turned to “How do you measure the performance of a green building?”

A wave of press releases in recent weeks also indicates that the marketplace is having a hard time finding good answers to this multi-million dollar question. In this column, we'll give you some metrics to tackle the subject. These metrics are based on 30+ years of best practices in commercial real estate.

Let's start with a couple presentations given at **Green Build 2007**, as there's some relevant data on how well green buildings are performing compared to conventional building. Moreover, some glaring shortcomings show up too.

First, **The Energy Performance of LEED Buildings** presented by **Cathy Turner** and **Mark Frankel** of the New Buildings Institute, and **Brendan Owens**, USGBC. Here's some of the good news:

- ▶The median LEED-NC office building has an Energy Star rating of 67.
- ▶On average, LEED buildings are 25-30% more efficient than non-LEED buildings.
- ▶Gold and Platinum buildings are 45% better than non-LEED buildings.
- ▶30% of LEED buildings perform significantly better than expected.

On the other hand:

- ▶About 25% of LEED buildings perform worse than expected.
- ▶A handful of LEED buildings have serious energy consumption problems.

▶For high-energy intensity buildings such as hospitals, labs and data centers, energy modeling falls short in accurately predicting energy use for these buildings types.

The second presentation is **Occupant Indoor Environmental Quality Survey** by **John Goins, III** of the Center for the Built Environment. The CBE benchmarking database includes 349 buildings, over 43,000 respondents and 3 million data points. The CBE Occupant IEQ Survey is a great POE tool (Post Occupancy Evaluation) that measures building occupants' response in nine categories using a seven-point scale of minus three to plus three. For the LEED buildings in the database, 4,210 people participated in the survey. In two of the categories, the average score was in negative territory, Thermal Comfort  $-0.04$  and Acoustic Quality  $-0.50$ . For the other seven categories, none of the average scores exceeded  $+1.08$  on a scale of  $-3$  to  $+3$ .

The LEED rating systems were developed to encourage the incorporation of environmentally responsible strategies, techniques and materials into the design, construction and operations of a building. However, the LEED rating systems as currently designed fails to measure execution.

This leads us back to the topic, everyone wanted to talk about — “How does someone measure the performance of a green building?” At one event, lunch was served following my presentation. An architect, two engineers, a school board member, and the facility director for a college were seated at my table.

During my presentation I said, “We don't pay enough money for architectural and engineering services.” This got a nice round of applause from the A&E crowd. Then I said, “Clients fail to hold their architects and engineers to a



high enough standard.” This got a bigger round of applause. Over lunch, the school board member quizzed me about those remarks. I think he was in the, “Our costs are too high – Let's slash the A&E fees” camp. I mentioned that by the time a client had spent half of his design fees, 95-percent of the buildings operating costs for the next 50-years are locked in place. Then I explained that if clients spent just a little more money on A&E fees and pushed their design team to move beyond what is the norm with measurable metrics, the return on investment would be huge. Moreover, his buildings would cost no more to build, maybe less and perform better. He was stunned when everybody at the table agreed. Then the architect and engineers penciled out some numbers on a napkin based on an example of an energy performance metric I used during my presentation. As I left the table to go to the airport, the school board member was stuffing the napkin into his pocket along with the business cards of the architect and engineers.

There are hundreds of performance metrics that can be applied to the design, construction, operations and occupancy of a green building. While many of them are referred to either directly or indirectly in the LEED rating system, many more are not. Here are a few metrics that could be beneficial in benchmarking any building's performance:

Space effectiveness of a building or space is very important. As Bill Reed of Regenesys Group frequently teaches, “The most sustainable space you can build is the space you don't build.” When I was at Bank of America, we did a study and found the amount of space required to fit a specific project program could vary as much as 30-percent, depending upon the building selected. According to the BOMA 2006 Experience Exchange Report, the average square feet per office worker was 366 square feet. In 1999, the average was 320 square feet per office worker. This is 14.4-percent increase! To see how that space is used, contemplate using these metrics on your projects:

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- ▶ANSI/BOMA Rentable Sq Ft/Person
- ▶ANSI/BOMA Usable Sq Ft/ Person
- ▶Percentage of Sq Ft for Individual Workspace
- ▶Percentage of Sq Ft for Team Space
- ▶Percentage of Sq Ft for Support Areas
- ▶Percentage of Sq Ft for Circulation
- ▶Sq Ft of Work Surface for a Worker
- ▶Cubic Ft of Storage
- ▶Lineal Ft of File Storage

Acoustic quality, specifically speech privacy in many buildings including green buildings is poor. This is inexcusable since we can accurately model speech privacy and very little money is needed to provide effective speech privacy. Yet according to Dynasound, a leading sound masking firm, many design approaches result in making speech privacy worse at a cost higher than needed. Consider using Privacy Index (PI) as a metric.

PI is a measure of speech privacy, as a percentage of unintelligible speech, in a given area. PI values above 95% represent confidential privacy, where a listener cannot understand enough speech to establish conversational content. Good for private offices, conference rooms, and interview rooms, pay special attention to the hallways outside of offices and conference rooms – you never know who is listening.

PI values between 80 and 95% correspond to normal speech privacy. For open plan office areas, shoot for a PI of 85%. People nearby will know someone is talking but not understand enough of the conversation to be distracted and have a negative impact their productivity

Since about 39-percent of the points for LEED are energy related, try these metrics to benchmark design and operations:

- ▶Watts/ Sq Ft – Lighting
- ▶Watts/ Sq Ft – Plug Load
- ▶Watts/ Sq Ft – Total
- ▶Sq Ft /Ton of Air Conditioning
- ▶Peak Demand Load – Watts/ Sq Ft
- ▶kWhr/ Sq Ft/ Year and by Month
- ▶Systems Operating Hours/Day, Week & Month
- ▶kBtus/ Sq Ft/Year and by Month
- ▶Energy Star Rating

Owens Corning moved into its Toledo, OH world headquarters in 1997. Last year it was awarded LEED-EB Silver. Energy use is 40-percent less than it was during its first year of occupancy. This building, which also houses Owens Corning's data center, has an Energy Star rating of 65, with an energy use intensity of 70.3 kBtus/Sq Ft/Year – better than 65-percent of the office buildings in the United States.

So how does your new building measure up? Do you know? Are you afraid to find out? That's the power of metrics and benchmarking. Higher performance goals generally lead to higher levels of achievement. Without metrics, it is impossible to improve.

*This column is published in conjunction with the Corporate Realty, Design & Management Institute and the Center for Sustainable Real Estate. Click on [www.squarefootage.net](http://www.squarefootage.net) for a seminar schedule, books, CDs, software, and white papers on high performance and sustainable buildings. More than 30 educational seminars and webinars are planned in 2008. You can contact Alan Whitson at [awhitson@squarefootage.net](mailto:awhitson@squarefootage.net)*



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