Commentary by Rip Rapson:

Practicing What We Preach: Measuring the Performance of Our Green Building

Kresge's grantmaking commitment to environmental conservation begins at home.

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When we chose to renovate our headquarters some eight years ago, we were committed to creating a green building that would connect with our historic farmstead properties through thoughtful site planning, distinguished design and the highest possible environmental performance. The result is a gorgeous, light-filled facility with superb attention to architectural detail, a native landscape that both contributes to environmental stewardship and conveys a sense of tranquility within a bustling suburban surround, and one of the state's first LEED (Leadership in Energy and Environmental Design) platinum-certified buildings. It is a wondrous place to work, and we are privileged to do so.

But we also realized that none of these qualities automatically translated into efficient building performance. Given the foundation's commitment to energy conservation and renewable energy through our Environment Program, we thought it important to explore that proposition – to what extent and in what ways does our building conserve energy and resources and how might we improve its functioning? We hoped to learn something in the process that we might share with others in the field – whether the field of green buildings, philanthropy or commercial real estate generally.

We accordingly commissioned the Center for the Built Environment at the University of California at Berkeley to conduct an assessment of the environmental performance of our headquarters. What follows is a brief overview of what they found. I also invite you to take a look at the full report as well.

Performance Successes

The report identified two areas of significant success: reduction of water usage and high occupant satisfaction.

Water

Most striking of all the findings were those associated with water usage – the resource most at risk in the 21st century. The CBE scientists found a dramatic drop in Kresge's potable water use – a 90 percent decrease from prerenovation levels.

Before the renovation, in 2006, water consumption at Kresge's headquarters was 1.2 million gallons, carrying an annual price tag of $8,500. By 2008, water usage had decreased to 134,600 gallons per year, at an annual cost of $1,200. A portion of these savings was achieved by high-efficiency fixtures, such as dual-flush commodes, waterless urinals and low-flow sinks.

A larger part of the savings is due to a system of engineered wetlands and permeable pavers in the parking area. These features enable the complex to handle stormwater more like a natural woodland than a built site, reducing – and in many instances eliminating – load on the city's stormwater system. Although this does not result in a direct cost savings for Kresge, it does benefit the Troy community.

The CBE team evaluated not only the way the site handled rainwater, but also the maintenance impact of our landscape choices and our use of potable water outdoors. Taken together, the system is performing well above the LEED standard, and has become a prototype for the American Society of Landscape Architect's Sustainable Sites Initiative, the nation's first rating system for green landscape design, construction and maintenance.

This summer, we developed a customized technology that allows us to use the rainwater collected from our cistern to flush commodes in all but the winter months (when it is snowing rather than raining). The modification has the potential of reducing our water consumption an additional 28 percent.

Occupant satisfaction

Not all green buildings are appreciated by the people who use them. Ours is. The CBE survey found that 89 percent of Kresge employees are satisfied with our headquarters. The survey measured seven environmental factors: office layout, office furnishings, air quality, acoustic quality, lighting, thermal comfort and cleanliness. Employees' level of satisfaction for all but acoustic quality (48 percent) and thermal comfort

(51 percent) placed Kresge in the top quartile of the more than 500 buildings in the CBE database.

The staff singled out three features for particular praise:

- Abundant natural light
- Connection to nature
- Attention to indoor air quality

Based on these findings, Kresge was chosen as one of three buildings in the United States and Canada to receive a Livable Buildings Award (honorable mention) in a competition sponsored by CBE.

Performance Challenges

Electrical energy usage

Not everything emerging from the study was quite so rosy. Electrical energy usage was a particular area in which we still have to make progress.

First the good news: CBE found that the building was performing near the original projections of the kinds of energy performance we hoped to attain. The less-than-good news, however, was that these projections were based on buildings of a type that are inherently energy *inefficient* – a rather narrowly constructed universe of buildings with large window-to-wall ratios (ours is 83 percent glass), buildings that are constructed of similar materials and other considerations.

When we instead hold ourselves up against the mirror of more broadly comparable buildings in the same climate, Kresge's Energy Star rating (a performance measure developed by the Environmental Protection Agency and the U.S. Department of Energy) is surprisingly low. On a 100-point scale, we received a rating of 31. The threshold score for energy efficiency for an existing building such as ours is 69.

There is no dressing up the fact that this is disappointing. Part of the reason for our showing is our design – long and slender, with the high window-to-wall ratios. Part of it is that the building was designed for 40 employees and we now have more than 70.

The question becomes: What lessons can we draw from this and what do we intend to do about it? Let me start with the latter.

What We've Done to Improve Performance

We've worked hard since receiving the CBE report to identify and implement ways to improve our energy efficiency.

The first measure – our most creative change yielding the greatest cost savings – involves how we heat and cool our computer server room. We installed an exhaust fan that recirculates cool air trapped underneath the server room's raised floor. This enables us to more efficiently meet the temperature requirements of our electronics. In addition, we've adjusted the overall geothermal heating and cooling system, recalibrated the lighting system, introduced new water-saving measures and taken other, smaller steps.

We've probably refined the building's operations about as far as we can. Indeed, we hired a local engineering firm to reassess Kresge's Energy Star score given these modifications. We've risen from 31 to 54. Better, but not good enough.

Second is a reduction in our nighttime energy costs. This involves, in effect, shutting the building down at night, which will generate savings in heating and cooling as well as savings in the indoor and outdoor lighting systems. This practice is in place; we're gathering data on the actual outcomes.

And third, we're working as a staff to modify our behaviors. Almost half of our employees told CBE that they were dissatisfied with office temperatures, suggesting the building was overheating in winter and overcooling in summer. People have sought to adjust their individual offices in a wide variety of ways to fit the temperature to their personal comfort levels. This has complicated the thermostat settings, preventing the system from achieving an efficient equilibrium. We've identified a host of ways to address this. But we must bear in mind that – unlike machines – recalibrating human action is easier said than done.

Lessons We've Learned

So what have we learned from the CBE survey? Certainly, a lot about our own circumstances. But also a good deal that may be of more general interest. Some of this is painfully obvious and straightforward. Some of it is less so.

First, a high-performing green building in the second decade of the 21st century consists of construction materials and processes *and* ongoing operational performance.

Second, a LEED rating is not an end in and of itself, but is instead a means to a larger end. If energy performance is that end, you have to pull that objective forward to the beginning of a project and construct a multifaceted analysis and a tool kit to get you there – one that includes LEED factors, but doesn't end there.

Third, the design and construction teams have to agree on specific environmental requirements at the outset and then work in an integrated manner for the duration of the project to achieve them. Architecture can't be divorced from systems or the way people will use a building.

Fourth, building codes, benchmarking data and rating systems influence one another and must be aligned – also at the outset of a project. Requirements (listed above) are different from actual data points that will be used to measure and evaluate systems once the building is operational. These, too, must be factored into project design and construction.

Fifth, all equipment requires regular calibration and periodic adjustment because of the sophistication and sensitivity of the systems. The fees associated with regular maintenance checks have to be factored into cost-benefit ratios. For example, just two degrees of variance in an incorrect sensor can significantly affect our ability here at Kresge to cool our building at maximum efficiency, thereby wasting electricity.

Sixth, human beings don't automatically act with efficiency in mind. It's vital, therefore, to make education a priority and engage employees in not only how the building works but also what they can do to facilitate optimal operation.

Seventh, the pace of change in the green-building industry and associated green technology makes "state of the art" an ephemeral construct. Were the Kresge renovation to begin tomorrow, it could undoubtedly achieve higher performance at less cost.

Conclusion

We consider our building and the surrounding landscape a demonstration site for green construction, renovation and maintenance. We devoted several pages to *Our Green Headquarters* in the *About Us* section of the website. Please take a look. And feel free to send us your reactions and comments.

At the end of the day, the Kresge headquarters is an architectural gem, tucked onto a verdant landscape and welcomed by our employees as a wonderful place to work. The self-reflection occasioned by the CBE survey has made our connection to this place even more meaningful by identifying the ways in which the building and the plants and the work environment can all contribute more positively to the foundation's obligation to be a diligent steward of our natural environment.