# beyond sustainability

PERFORMANCE-BASED DESIGN

BY: EMERSION DESIGN


Sustainability, by its very definition, is an overwhelmingly broad term. It can refer to anything from building and construction improvements to financial resilience to corporate social responsibility. The U.S. Green Building Council (USGBC) was established in 1993 by a culmination of 60+ firms and non-profit groups, including the American Institute of Architects (AIA), with the vision of mandating and measuring sustainable practices in the built environment.

After 5 years of development, and 3 years of pilot testing, the USGBC introduced the first codified standard for sustainability, the Leadership for Energy and Environmental Design (LEED) for New Construction. Since its inception in March of 2000, LEED has been updated several times, with each edition utilizing a checklist approach of items to be incorporated into a building design that improve its sustainability and performance.

Overall, the checklist approach is very useful and successful. But in some cases, the checklist can include add-ons that are required for certification but are not necessary for the client. These unplanned and unneeded items, such as bike racks and showers, add unforeseen costs and are a source of frustration to the client. A good designer will find ways to maneuver through the checklist and incorporate the "hidden" costs into the allotted budget of the project. However, these are still dollars that could have been saved or applied towards other desired features. Because not every client "fits" the traditional checklist approach, LEED certification requirements are responding to the increasing need for clients to understand how their building performs beyond the certification plaque.

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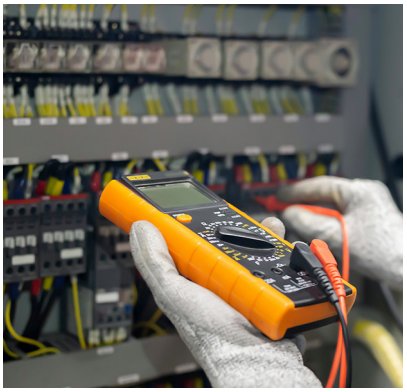

In the age of data, the future of the sustainable building industry will be based on performance requirements, goals, and targets. Familiarity with the various certification standards allows designers to look beyond the rating system specifics to the core commonalities of building performance to achieve a client's goals. By working with clients to determine goals and the resulting project requirements, designers will be held accountable to a measurable outcome. The questions of "How much?" "How good?" and "To what level?" enables designers to convert a client's goals and objectives into measurable performance criteria.

There are countless tools that allow designers to simulate building performance, ranging from energy modeling to daylight simulations. Although simulations are useful during the design phase of a project, one crucial question remains: "Does the building actually meet the client's performance targets?"

Answering this question requires post-occupancy evidence. This evidence can come in many forms. One of the best ways to collect and analyze actual performance data is from the monitors and sensors in the building. Without evidence-based performance, owners can only hope that their buildings perform as expected. Only by comparing simulated and actual performance, can an owner determine whether a building has achieved the goals set forth at the start of the project.

In recent years, sensors and technology have improved in quality and decreased in cost, making them a more appealing addition to the architectural design. Mechanical systems throughout the building depend on these sensors for notification of when to heat and cool. To assist with the analytics, a Building Automation System (BAS) can serve as a central "brain" that houses the collected data and provides useful dashboards that readily convey the information back to building owners and managers. The BAS can also be used in the final commissioning process.


Commissioning, the process of assuring that all systems and components of a building are designed, installed, tested, and maintained in accordance with operational requirements, is crucial in verifying that the client's performance goals have been met. Additionally, with the integration of more sophisticated sensors, building owners and managers have access to a plethora of real-time data which helps reduce operational and maintenance costs by detecting issues before they become problems. When sensors and monitors are linked to a Building Automation System (BAS), commissioning occurs throughout the operational life of the building.

The information provided by sensors and monitors can also be used to improve employee productivity. One Harvard research study investigated various ventilation rates and CO2 levels and their effect on human cognition and productivity. The results of this study showed that cognitive scores were over 60% higher in building environments with low volatile organic compounds and even higher in environments with improved ventilation rates. (Allen et al. #1)


If building systems are capable of early detection of elevated CO2 levels, they can react by increasing ventilation to these spaces, thereby assisting in the productivity of these employees. Imagine having the ability to detect increases of CO2 in mission-critical workplaces where alertness and crisis response are essential, such as hospitals or 911 response centers. This is a triple win for employee health, operational stability, and business revenue.

**references**

1. Allen, Joseph G., et al. "The impact of green buildings on cognitive function." p. 3.
2. Eckenrode, Beth. "Evidence-based Performance Requires the Integration of Real and Virtual Data." AUROS Group, 08 01 2021.
3. U.S. Green Building Council. "Our Story." About Brand, U.S. GBC, 2021.