

Net Zero in Real Life: Optimizing After Occupancy

NET ZERO BUILDINGS are among the most ambitious design projects our industry delivers. They demand rigorous energy modeling, deep coordination across disciplines, and highly integrated systems that leave little margin for error.

But one of the most common misconceptions about net zero projects is that the work is finished when construction wraps up and the building is occupied.

In reality, a net zero project isn't done just because the owner has taken over the building. In many ways, occupancy marks the beginning of a critical final phase: translating design intent into real-world performance.

From an engineering perspective, there are three post-occupancy areas that require attention to ensure the project meets its net zero goals.

1. Responding to Reality

Energy models are essential to net zero design, but they are still predictions. Once a building is occupied, measured performance introduces nuance that no model can fully anticipate. Post-occupancy is when teams begin to:

- *Put the building's system data collection and monitoring plan into action* [see sidebar, page 2]

- *Compare modeled assumptions against actual performance*
- *Identify discrepancies early, before they become persistent issues*

This is where real-world challenges surface. Control behavior may differ under actual loads. Equipment may operate near limits that were not apparent during design. Flow constraints or response times may affect comfort, efficiency, or system stability. These will need to be addressed in real time.

And remember, data only becomes valuable when teams are prepared to act on what it reveals.

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EP served as the electrical and mechanical engineer for the new Welcome Center at Lakewood Cemetery in Minneapolis, which features a sustainable, net-zero design. Completed in 2024, the project incorporates a geothermal heating and cooling system, a high-performance building envelope, and solar arrays.



2. Commissioning: The Bridge Between Intent and Operation

Commissioning provides the structure needed to verify that systems are operating as intended under real conditions. It helps identify gaps between design intent and actual performance and creates a disciplined framework for resolving issues as they arise.

Commissioning does not end at turnover, especially in high-performance buildings. Instead, it continues into occupancy, supporting:

- *Verification of control sequences under real loads*
- *Validation of system integration*
- *Prioritization of corrective actions based on performance impact*

Successful net zero projects require that engineers, commissioning agents, and controls contractors remain involved after occupancy. Fine-tuning a complex system takes time, iteration, and collaboration.

Commissioning is not a ceremonial close-out step – it is the mechanism that turns design intent into operational reality.

3. Training the Building Operators

Net zero buildings are not conventional buildings with better equipment. They are highly integrated systems that combine aggressive energy efficiency, advanced controls, and on-site renewable strategies.

Facilities teams need to understand how systems are intended to work together, how control strategies respond to changing conditions, and what normal operation actually looks like over time.

Without that understanding, performance will drift – often gradually and without obvious warning signs.

Effective post-occupancy support includes:

- *Hands-on, role-specific training for facilities and operations staff*
- *Clear explanation of system interactions and dependencies*



DATA COLLECTION AND MONITORING

Having a data collection and monitoring plan in place cannot be emphasized enough. This should be developed early in the design process, and should include details about meter location, what data will be collected, how long it will be stored, how it will be output and compiled, and who is responsible for ensuring the proper setup during construction and early occupancy.



Without a robust plan, data might be collected, but may not be able to be accessed and used in a way to either prove net zero performance or identify performance gaps.

- *Guidance on seasonal operation and expected variability*
- *Ongoing access to engineering support as operators learn the building*

Training is an ongoing process that evolves as the building and its operators encounter real operating conditions.

Net-Zero Performance in the Wild is Achievable

It is absolutely possible for a building to perform in operation the way it was modeled. But that outcome does not happen automatically at turnover. It requires:

- *Post-occupancy time and attention*
- *Continued engineering involvement*
- *Strong commissioning*
- *Supported and informed operators*
- *Owners who understand performance as an ongoing process*

Net zero is not a finish line. It is a commitment that continues well after the doors open.

On the mind of **Benjamin Bahr**
PE, LEED AP BD+C, BEMP
Director of Sustainability





MEP Design for Healthy Spaces

WHEN PEOPLE TALK about healthy buildings, the conversation often drifts toward certifications, features, or buzzwords. From an engineering standpoint, however, healthy spaces are built on a set of core principles – and they don't happen by accident.

Indoor air quality: the foundation of healthy spaces

Healthy spaces demand clean, well-managed air. From a mechanical standpoint, this typically includes:

- *High-efficiency filtration (often MERV 13 or higher)*
- *CO₂ monitoring tied to ventilation rates*
- *Occupancy-based controls that increase outdoor air when spaces are in use and scale back when they're not*

These strategies improve air quality while still balancing energy use. Once systems are operating, maintaining high indoor air quality is often straightforward – typically requiring consistent filter replacement and routine system checks.

The key is designing systems that are both effective and manageable for facilities teams over the long term.

Thermal comfort: more than a thermostat setting

Thermal comfort is one of the most underestimated aspects of healthy space design. Comfort depends on more than air temperature alone. Two major contributors to thermal discomfort are:

- *Drafts and air leakage*
- *Mean radiant temperature, which is influenced by the surface temperatures of walls, floors, roofs, and windows*

Cold exterior conditions lower interior surface temperatures, causing occupants to lose heat through radiation – even when the thermostat reads correctly. This is why spaces can feel uncomfortable despite “ideal” air temperatures.

Thermal comfort is achieved through a combination of:

- *Passive strategies, such as insulation, airtightness, and glazing*
- *Active strategies, including HVAC systems and controls*

Successful projects strike a balance between the two. When the envelope performs well, mechanical systems can be simpler, more efficient, and easier to operate.

Acoustics: a quieter contributor to wellness

Acoustics are often led by specialized consultants, but MEP systems still play an important supporting role. Equipment selection, duct design, vibration isolation, and system layout all influence background noise and sound transmission.

Even modest reductions in noise can significantly improve how spaces feel and function – making acoustics an important, if sometimes overlooked, component of healthy building design.



EP provided MEP engineering and energy modeling services on the Carleton College Class of 1974 Student Health and Counseling (SHAC) Center. The project creates a student-centered facility that holistically meets student medical, counseling, and wellness needs while providing a safe and healthy work environment.

Lighting and daylight: supporting comfort and focus

On the electrical side, lighting plays a central role in healthy spaces. Access to daylight, paired with well-designed artificial lighting, affects comfort, focus, and overall experience. Common strategies include:

- *Daylight-responsive lighting controls*
- *Thoughtful fixture selection and placement*
- *Reducing glare and visual discomfort*

While more advanced lighting systems exist, they are not always necessary. In many cases, thoughtful daylighting and responsive controls deliver meaningful benefits without added complexity.



Healthy spaces are built through coordination

The most important takeaway is that healthy spaces rarely result from a single system or feature. They are the product of intentional coordination between architecture, mechanical systems, electrical design, and long-term operations.

Early collaboration — including energy modeling, envelope studies, and system comparisons — helps guide decisions that support indoor air quality, comfort, and usability over time.

Healthy buildings don't happen by default. They are designed deliberately, collaboratively, and with a clear understanding of how people experience space.

On the mind of **John Nordstrom**
PE, Mechanical Engineer and
Managing Partner



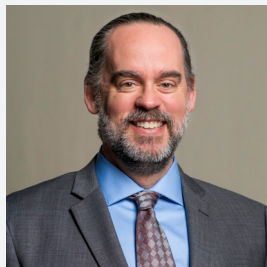
Making High Performance Measurable

HIGH PERFORMANCE BUILDINGS start with good intentions — and increasingly, with detailed energy modeling that predicts how a building should perform. But as anyone involved in building operations knows, design intent and real-world performance don't always line up automatically. The real question becomes: how do you know if the building is actually performing the way it was designed?

Energy models establish performance expectations early in the design process. They help teams evaluate system options, understand energy impacts, and make informed decisions about everything from HVAC strategies to lighting and envelope performance. But modeling alone doesn't guarantee outcomes. Buildings are complex, and even well-designed systems require careful installation, calibration, and verification to confirm that predicted performance translates into measurable results.

Through systematic testing and verification, commissioning confirms that mechanical, electrical, and control systems function according to design intent. It validates sequences of operation, identifies installation issues, and ensures

On the mind of **Mat Lindquist**
PE, Director of Commissioning



EP was part of the design team for the sustainable 15,000-square-foot Gateway Center, a newly constructed visitor hub at Mississippi Gateway Regional Park in Brooklyn Park, Minn.

that systems communicate properly with one another. When energy modeling and commissioning work together — rather than as isolated steps — the result is a building whose performance can actually be measured against the expectations established during design.

We've seen firsthand how aligning modeling, design, and commissioning leads to better-performing buildings and fewer surprises after occupancy.

This intersection of modeling and real-world performance is the focus of EP's new AIA-approved lunch-and-learn session titled "From Concept to Reality: Making High Performance Measurable." The course explores how energy modeling sets performance targets and how commissioning validates the systems that drive results, helping project teams deliver buildings that perform as intended once occupied. Interested? Reach out and we'll bring it to you.



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