

How to Succeed with the Living Building Challenge: 12 Teams Share Tips

The bar is high—that’s obvious—but watch out for some surprising pitfalls. Here’s how dedicated teams have tackled Living Building challenges.

By Paula Melton and Tristan Roberts

“If there were a LEED Titanium, we’d probably get it.”

But despite its super-greenness, homeowner Abel B’han’s Manhattan townhouse renovation is not going to get Living Building Challenge (LBC) certification. As the “petals”—LBC’s term for its major requirements—fall away one by one, he’s gradually giving up hope that he will get any recognition at all under LBC, or that the project will attain its other lofty goal—Passive House certification.

Yet B’han is hardly discouraged: “Failure to achieve the standard is not a failure,” he maintains. “We will at least make our contribution toward others getting it, and if we can push back against a couple of the New York regulations, we will have achieved something.” He also takes heart from the fact that “we will have achieved a home that is the most environmental possible in Manhattan.”

Not all building owners are open to the risk of aiming for a standard—a standard that can be really expensive—and not achieving it. At some point, the project team needs to go all in or potentially be asked to give up. So how do LBC projects ultimately succeed, despite the long odds?

We spoke to members of twelve trailblazing LBC project teams to find out how they’ve risen to the most difficult challenges of the Living Building Challenge, and we pulled together dozens of tips from these practitioners below.

This is part one in a two-part series and includes tips on Place, Water, and Energy as well as the overall LBC process. The second series will cover Materials.

Dissect the Flower

Be prepared. Be very prepared.

That’s the advice we got from almost every professional we spoke with about LBC, though not all of them had followed this dictum from the get-go. We heard stories about a consultant who’s still writing Red List advocacy letters two years into occupancy; an architect who



The Josey Pavilion in Decatur, Texas, has entered its one-year performance period in its pursuit of Living Building Challenge certification.

Photo Courtesy Lake|Flato Architects



Each Living Building Challenge petal can inspire project teams to new heights—or be a case of unrequited love. Our infographic looks at each petal and what project teams are saying about it.

wasted hours looking for lead-free brass door hardware, not realizing there was an exception; and a contractor who installed structural insulated panels before noticing the manufacturer had sent the Sustainable Forestry Initiative-certified version of the product (LBC requires that wood be certified to the Forest Stewardship Council standard). All preventable fumbles these pioneers hope others will learn from.

How to become an LBC botanist

The International Living Future Institute (ILFI), the organization behind LBC, prides itself on producing “the built environment’s most rigorous performance standard.” Through its seven-petal system, LBC attempts to emulate a flower by encouraging net-zero or net-positive impact on virtually everything the built environment touches. (“Petals” are broad categories like Water, and the “imperatives” nested within them are specific requirements; see the glossary.)

What may not be obvious when you look at ILFI’s pithy, visually compelling publications is that this system isn’t as sweet and simple as it appears. Some LBC imperatives are far more difficult to document than even the most frustrating LEED credits, and certain imperatives simply aren’t a good fit for all projects—but there’s no easy way to opt out of them and make the loss up in

another area, as there is with LEED credits. LBC imperatives are all-or-nothing.

At the same time, along the way to actually implementing a system to document LBC’s lofty imperatives, ILFI opted to grant exceptions on many requirements at its discretion, and projects typically rely on a number of these. Knowing what the blanket exceptions are and which exceptions might be considered for a specific project is all part of getting ready (see LBC Resources sidebar).

Align Goals and Values

Anecdotally, plenty of architects have told *EBN* that they’d love to do an LBC project—if only they had a client who would go for it. While the stories in this article demonstrate that where there’s a will there’s a way, the ranks of LBC project owners have so far been dominated by nonprofits with social, environmental, and educational missions.

“One of the projects that we started through the process decided not to do it,” says Shawn Hesse, RA, architect at Emersion Design in Cambridge, Massachusetts. “They couldn’t get past some of the requirements, and one of them was the requirement to grow food. It is a nonprofit, doing great work, and LBC is for the most part very much aligned with their mission, with the exception of the food emphasis. For them, it became a distraction from their mission” because it would have required diverting staff energy and donated resources for years to come.

SIDEBAR

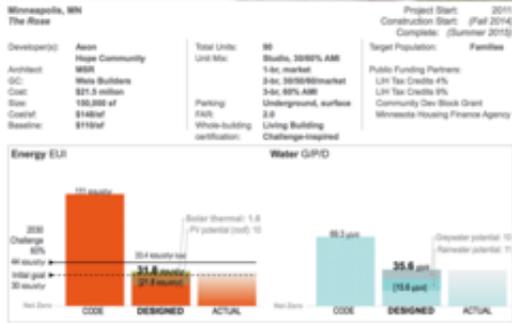
A Living Building Glossary

Declare—A voluntary labeling program for product manufacturers, who use the format to disclose 99% of ingredients to 100 parts per million. After disclosure, products can be recognized as Red List-compliant or Red List-free (see below). Many common products ...

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In contrast, for another client, “the Living Building Challenge was essentially written around their mission, written around what they do, says Hesse. It’s a nature retreat center on an old farm.” Hesse has seen this play out with many project owners: they pursue LBC if it’s easy, aligns with their values, and doesn’t add burdensome ongoing costs for building features that don’t already mesh with the organization’s mission. Where that’s not the case, they see little point in spending the extra money to achieve the standard.

The Rose: A Cold-Climate Energy Story



The Rose, in Minneapolis, is helping pilot a new LBC Affordable Housing Framework. Though located in an extreme climate (both summer and winter) and low on solar resource, the project could still achieve net-zero energy. EUI has been reduced 70%, and the project cost is not far above market rates.

Images: MSR Design (rendering) and the International Living Future Institute (graph)

Though the Bullitt Foundation is a nonprofit focused on environmental issues, its president, Denis Hayes, wanted the six-story, 52,000 ft² building, which headquarters the foundation but has plenty of space left over, to serve as a replicable model for developer-driven projects. Part of that work was to push through regulatory hurdles and design challenges, paving the way for others. But Bullitt also wanted the project to pencil out.

According to Margaret Sprug, AIA, a principal with Miller Hull and the project architect, the project was built for \$340/ft², which she says is in line with what institutional clients pay in the region—\$350/ft²—for projects of similar quality, and with sustainable features. That’s a data point in favor of LBC’s affordability for those clients, but how about developers? Sprug says that \$265/ft² builds more basic Class A office space in Seattle. The Bullitt Center rents space for \$28–\$30/ft²—a premium for its Capitol Hill location, while less than the cost of space downtown.

According to Salley Anderson, CFO for the Bullitt Foundation, the center will add another “net positive” feature to its credentials next year when it is fully occupied: it will be cash-flow positive. She acknowledged “the cost of being a pioneer” made the Bullitt Center’s price tag higher than what the second or the third building in this mold would cost; reducing that cost was part of the project’s mission.

Yet it could still take years or decades to achieve cost parity with even a high-end LEED project, and upfront cash outlays—embodied carbon offsets, land purchases, and large donations to charities—aren’t likely to go away. ILFI has recognized that the cost premium of LBC will prevent uptake in communities that most need access to healthy buildings that cost very little to

operate and has responded by recently releasing its Affordable Housing Framework. The new framework is effectively an alternative compliance path for affordable housing that creates temporary exceptions for use of municipal sewers, encourages “net-positive-ready” projects if photovoltaics are not affordable, and clarifies exemptions from the Equity petal for nonprofit developers.

Own the Process

Consider the lilies of the field. Then consider the fact that photosynthesis has never once been disrupted by value engineering.

There’s a reason LBC projects don’t sprout up like weeds: they

TIPS: PREPARE THE PROJECT TEAM

How to Prepare Your Team

demand intensive, hands-on, proactive leadership and follow-through. “There are new roles and responsibilities, new scopes of work,” emphasizes Jason Packer, associate at Vancouver, British Columbia-based sustainability consultant Recollective. “You really need to shine a light on who’s going to do what—because in my experience, it’s very easy for people to become enthusiastic, but there’s a lot less enthusiasm for all the paperwork involved.”

How to prepare the project team

Packer continues, “I’m still suffering because we didn’t do as good a job [in project planning] as we should have.”

One important thing to keep in mind, he says, is that, although many architects, interior designers, and contractors are accustomed to things like waste and materials tracking from working on LEED projects, other disciplines “are not used to doing that kind of thing”—especially mechanical, electric, and plumbing (MEP) professionals. And even for those who are used to tracking materials, the level of detail and documentation required is unprecedented. The first design charrette for Okanagan College Centre of Excellence took place in 2009 (the team is pursuing certification under LBC 1.0). Even though the building opened two years ago, Packer is still writing advocacy letters—required documents the project team must send to product manufacturers in order to request a Red List or regional sourcing exception.

“We don’t have all those advocacy letters, well into operations,” Packer confesses. “People didn’t anticipate all of the work that needed to be done.” As one of the first projects to register for LBC, Packer hopes the Centre of Excellence will get some leeway with documentation. “There were no handbooks; it was a very rough standard with references to an upcoming user guide that never materialized. We had a bit of an extra challenge in that respect, aiming for the Challenge in the dark.”

Scott Kelly, AIA, principal at Re:Vision Architecture in Philadelphia, concurs that LBC-style material tracking is totally new territory for most project teams and will take extra time. (His firm has led one LBC team and has consulted on the Materials petal for several projects.) It’s not just that MEP designers and subcontractors are unaccustomed to asking questions and documenting the answers, Kelly notes; manufacturers of these products aren’t used to being asked. “No one before LBC has vetted MEP materials,” he says, pointing out that a single ball valve can have 32 parts. “Manufacturers were just beside themselves; they couldn’t figure out why we were asking those questions.”

Chris Lee, an architect and materials specialist at Re:Vision and an ILFI-designated Living Building Ambassador, acknowledges that the process was “very stressful at the beginning,” half-joking that LBC has turned his hair gray. “You’re waiting to get information back from the manufacturers as the construction schedule is going along. There’s all this anxiety. The contractor is frustrated with you because the submittal is not approved,” Lee relates. In

- Pursue an integrative process—the real thing, not lip service—that includes all members of the project team from day one.
- Take opportunities during design charrettes and other early meetings to prepare the team for the unique intensity of the commitment required.
- Be crystal clear—in contract language, if possible, and throughout the project management process—about any atypical scopes of work for each member of the team.

SIDEBAR

LBC Resources

A lot has changed since the Living Building Challenge was launched in 2006 with almost no supporting resources, and there are now several good ways to prepare and get educated for the challenges you might face. ...

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addition, “you’re finding out about all these toxic chemicals. I learned everything I didn’t want to know about buildings through doing the research.”

“The process doubled the construction time” on the firm’s first LBC projects, adds Kelly. Not only that, but the design team’s engagement typically continues well into operations, which is almost unheard of in the industry.

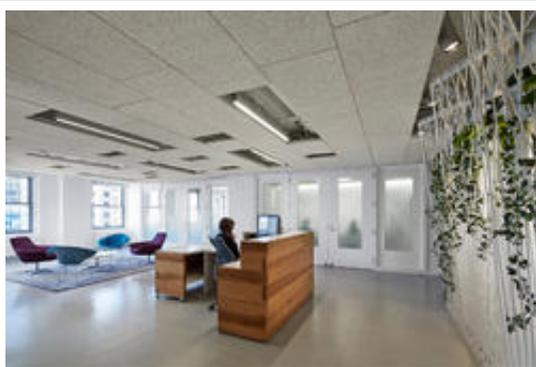
How to work with owners

“When I’m asked what’s the most difficult [about LBC], it’s usually moved into conversations about managing expectations, mine and others’,” says Bruce Coldham, FAIA, of Amherst, Massachusetts-based Coldham&Hartman Architects.

When working with Smith College on the LBC-certified Bechtel Environmental Classroom, he said, “On the one hand, we had to be clear that we’re not guaranteeing anything. On the other hand, we needed to galvanize our clients’ interest” because their engagement and commitment are essential to achieving net-zero or net-positive performance. This is a tricky balance, he notes, because the “brand value” of LBC is “very high for certain clients,” but many eventually find that it’s impossible to achieve. With LEED, he points out, “If you drop a ball here, you can pick one up over there. With the Living Building Challenge, if you drop a ball here, all that good work that you’ve done may not stand.”

Packer puts it this way: “It’s the building that’s the goal, not the Living Building Challenge. Everyone can be proud of what they’ve done. I think it’s important to define success as the greenest building you can possibly get.”

Another key strategy is to engage future building occupants throughout the process, from pre-design into occupancy. “We didn’t have to, but we chose to work with [our clients’] staff,” notes Eileen Quigley, senior sustainability consultant at Closed Loop Advisors, referring to two tenant fit-outs her firm helped complete for the Natural Resources Defense Council (NRDC)—one in Chicago and one in Beijing. (The Chicago project has achieved petal certification, focusing on materials, and the Beijing project is pending petal certification.)



Staff members at the Chicago office of the Natural Resources Defense Council are pleased at how much the plants and

TIPS: KEEP OWNERS INVOLVED

How to Work with Owners

- Keep owners and occupants excited and deeply engaged.
- At the same time, encourage a spirit of striving for the greenest building possible—not a plaque.
- Teach occupants and building operators their role in optimizing building performance.

In addition to its environmental mission, “NRDC is good about open communication,” Quigley says. “We got a lot of input on how they work. This is the first time we decided to try to go completely open plan” on an NRDC office. Although open offices minimize material use and help with strategies like daylighting and natural ventilation, they can be an acoustical nightmare and are not always popular with employees. “That was challenging for the staff,” Quigley admits. “They really appreciated that we brought them into conversation.” Now that they’re using the office space, surveys suggest high levels of satisfaction. “People are surprised at how receptive they are,” even to things “they never thought were really important to their work environment,” she notes, such as plants, daylight, and cleaner indoor air.

Now a second phase of construction has begun, and the team is working to ensure that the new space works equally well. “We’re continuing to keep communication open,” and staff members

daylight improve their workday. They are lobbying to use similar elements in phase two of construction. The interior fit-out achieved petal certification under LBC for Materials.

Photo: Studio Gang Architects

are stressing the need to include these elements of the original open office design in the new space.

Another advantage of engaging the owner and occupants throughout the process is that energy and water performance depend heavily on how the building is used and operated. Notes Packer, “On a lot of our other projects, we’ve found plug loads or other occupant behavior has had a negative effect [on energy

performance] compared to what we expected.” But with the Centre of Excellence, “that hasn’t been the case so much. We were very careful about trying to dig into what would be expected. There weren’t too many surprises on that side.”

Bloom Where You’re Planted

Although Materials, Water, and Energy get all the attention as the most difficult petals in LBC, there are other issues that can intimidate owners and even be deal-breakers on the road to certification.

“I don’t know that I would say any one particular thing is easy,” notes Casey Cullen. Now sustainability coordinator at Cosentini Associates in New York, Cullen previously consulted on a classroom building at The Willow School in New Jersey, which is pursuing LBC certification in addition to LEED Platinum. “The whole process needs to be quite intentional. They want you to think about everything and its connection to everything else.” That said, she adds, “The metrics for things like beauty and education are a little softer than hard data to show you produced 100% of energy or produced 100% of water.”

But don’t get so distracted by the harder petals that you ignore some of the trickier details, warns Jim Newman, owner and managing partner at Linnean Solutions and a consultant on Kellogg House in Williamstown, Massachusetts, and the Hitchcock Center for the Environment in Amherst, Massachusetts, both pursuing full LBC certification. “There are a couple of site things that sneak up on you,” he says.

How to negotiate a transect

“The first thing you stumble into is figuring out what transect you’re in, which seems obvious but is not at all obvious,” says Newman. Based on the density specifications of LBC 2.1, Kellogg House, which is part of the Williams College campus—located in a dense New England town—belongs in Living Transect 2 (Rural Agriculture Zone), Newman notes. But because it of its educational mission housing the college’s Center for Environmental Studies, it gets treated as a Living Transect 1 (Natural Habitat Preserve) project.

Getting sorted into the proper transect is no trivial matter: it creates site-based exceptions for land use, transportation and parking, onsite agriculture, stormwater flow, and daylighting.

LBC’s strict ban on combustion is even relaxed for the most rural projects on a cultural basis, with a single woodstove or fireplace allowed.

Virtually every project Newman mentioned ended up in a different transect than the one a strict floor-area-ratio (FAR) calculation would suggest. “When you get to more urban ones, the transect is very tricky,” he says, noting that one project in the historic Jamaica Plain neighborhood in Boston ended up in Transect 4 (General Urban Zone) rather

TIPS: CHOOSE A TRANSECT

How to Negotiate a Transect

- Consider the uses of your building, not just the surrounding density.
- Make your case for the chosen transect based on how your project will appropriately fulfill the intent of the related imperatives.



Because of its mission, Kellogg House, on the Williams College campus, is classified in a different transect from what you might expect. If it achieves LBC certification, this renovation/addition project will be the first historic building to do so.

Photo: Charley Stevenson

than the more obvious Transect 5 (Urban Center Zone). “The reason for that had more to do with what [the transect] ended up setting them up to do than the actual density of the location. That transect was a negotiated process,” he says.

A related but non-negotiable requirement, part of the Car Free Living imperative in LBC 2.1, prevents new projects from contributing to a dominant neighborhood use (encouraging mixed use, instead) beyond a certain threshold. In other words, you may not be able to build an LBC home in a predominantly residential area, a requirement that Newman says has pushed more than one project out of the running for LBC. That requirement has been removed from LBC 3.0, where Imperative 4 is now called Human Powered Living and emphasizes transportation and active design.

Return to Your Roots

Like many projects, the Kellogg House renovation—which, if it achieves LBC, will be the first historic building to do so—nearly gave up on net-zero water near the beginning of design. For many projects, the idea is just too daunting, but for Kellogg House, the exercise did not seem relevant to its setting.

“There was some question about whether the Water petal was worth it,” notes Charley Stevenson, principal at Integrated Eco Strategy and a consultant on the project. “New England has water; water scarcity isn’t the issue.” The team ended up deciding “it was still an opportunity for the building to teach us about water and its role,” he says. “Just because we are water-rich here doesn’t mean people shouldn’t become familiar with the principles.”

Stevenson adds, “I wouldn’t say it’s technically harder” to do net-zero water than it is to achieve some of the other LBC goals, but “I think it requires very different thinking”—not only on the part of the project team but also from facilities personnel, regulators, and occupants.

How to be “flush” with water

While most people’s minds go straight to rainwater catchment tanks and constructed wetlands, there are less exotic ways to meet the Net-Zero Water imperative (Net-Positive Water in LBC 3.0). The Bechtel Environmental Classroom, for example, has a well and a conventional septic system.

Most LBC projects use composting toilets. Although this is a well-established technology, composting toilets are uncommon and can present cultural as well as regulatory barriers for project teams. “A lot of thinking and discussion went into the decision to use composting toilets in the buildings,” says Stevenson, discussing the Hitchcock Center for the Environment and the nearby R.W. Kern Center (also pursuing full LBC certification) in addition to Kellogg House. “The vast majority of the water goes away as soon as you make that

TIPS: ACHIEVE NET-ZERO WATER

How to Get Water to Pencil Out

- Choose composting toilets. This is possible at a much larger scale than you might expect. (But check LBC requirements for beneficial uses of the compost.)
- Engage with owners, operators, and occupants throughout the process to prepare them for the cultural changes necessary to achieve minimal water

decision,” but although it’s a no-brainer, the technology is “a bit of a leap” for most occupants, he explains. “You’re using different bathroom fixtures in order to meet the water goal. We embraced it as a learning opportunity.”

Sunshine Mathon, design and development director at Austin, Texas-based affordable housing developer Foundation Communities, has worked with ILFI to help pilot an LBC framework specific to affordable housing projects. The group has decided to pursue full LBC certification for a single building—a community learning center—on a new multifamily project. The learning center provides after-school programming for children as well as adult-focused support services and even college courses. “They become the communal hub and central focus of every property,” Mathon explains.

Mathon hopes the use of composting toilets and graywater and blackwater treatment on the building site will be a teaching tool not only for occupants but also for facilities personnel as well as the organization as a whole. “We need to prove that they can work and don’t necessarily cost a huge amount of money, and that they are feasible,” he says. “Because the learning center is this educationally focused hub in the center of the community, all the residents and all the children will be educated and exposed to the technology and ideas and reasons but without the cost, the risks, and the challenges” of attempting net-zero water at scale in multiple residences.

How to manage wastewater onsite

Treating blackwater—and sometimes even graywater—on the project site can meet with regulatory issues (see below for how to navigate the regulatory landscape for net-zero water), but there can be other barriers as well. And some project teams question the sustainability of onsite wastewater treatment at a small scale.

“We are utilizing a water treatment facility that is across the street from the college campus,” explains Packer of the Centre of Excellence project. Packer says this municipal treatment facility meets the requirement of a chemical-free biological process and that the project owner has agreed to “pay” for the energy required out of its energy budget; spending the embodied carbon on a separate system just didn’t make sense environmentally, he argues. But “as we go through the certification process, there were some questions about that; we made our case, and we’re waiting to see if they’re satisfied.”

(For more about onsite wastewater treatment in multiple LBC projects, see *Waste Water, Want Water*.)

How to grow along with regulators

Achieving net-zero water is far simpler in most regions technically than it is legally. Public health regulations and LBC requirements are frequently at odds: regulations often require disinfection with chlorine, for example, which LBC specifically forbids. Project teams must seek an exception under one or the other—assuming they

consumption.

- Monitor water collection and consumption frequently during occupancy to troubleshoot issues early.

TIPS: MANAGE WASTEWATER ONSITE

Treat Your Water Right

- Use composting toilets to avoid having to treat blackwater (but check LBC requirements for beneficial uses of the compost).
- Plan for extra troubleshooting and maintenance of systems over the first few years of operations.
- Consider jumping scale to save first costs, embodied carbon, and considerable ongoing energy and labor costs.

get legal permission to collect and treat rainwater in the first place. Many project teams are taking the plunge anyway, and some are achieving surprising successes.

“We’ve never issued a permit for a rooftop public water supply—and certainly not one without chlorine treatment,” warned one Massachusetts Department of Environmental Protection (DEP) official in a meeting with the Kellogg House project team, according to Charley Stevenson. But before their sinking hearts could hit rock bottom, the official added, “You’ll need to fill out Form WS 37.” And that was that.

Why did Kellogg have it so easy? Stevenson credits the Bechtel Environmental Classroom—despite its conventional combination of well water and a leach field. “They arrived at the conclusion that it was very responsible to use the aquifer as a reservoir for water and put it back in through a pretty standard septic system,” he explains. “But in doing so, they asked a lot of interesting questions of ILFI and Massachusetts. They paved the way for other projects.” Because of this, Stevenson continues, “The conversation [with the Commonwealth] was very productive and focused on how to have a durable, resilient, low-energy water supply. DEP is now very comfortable with what it takes to design a safe rooftop water system.” He adds, “This is exactly what Living Building is trying to do— create a culture of innovation at every level.”

Most projects don’t have it so easy. “The regulatory hurdles that we had to go through really exceeded what I expected,” recalls Greg Mella, FAIA, vice president at SmithGroupJJR. That’s in part because the project, the Chesapeake Bay Foundation’s Brock Environmental Center, is subject not only to local and state water-treatment regulations but also to federal Clean Water Act rules. Additionally, Mella had a tough act to follow—his own, as project manager of the foundation’s Merrill Center, the world’s first LEED Platinum building and one of the first in the U.S. to use rainwater for hand-washing. “We couldn’t do less than we did at the Merrill Center,” he insisted.

The process of getting approval to treat rainwater for drinking began very early. “At first, you just have to figure out what regulatory agencies need to be involved in the conversation,” he cautions. “There might be four different agencies that own a piece of the water puzzle” (not including the feds). “We quickly learned that hand-washing water needs to be the same [quality] as drinking water,” and since the team was very clear that it wanted to achieve at least as much as Merrill had way back in 2001, “we doubled down and said we want to drink rain.”

As in Massachusetts and most other states, he explains, “The only way you can do this is if you become a public waterworks. That doesn’t make a whole lot of sense for a 10,000 ft² building and an environmental nonprofit, but we can’t point to another building and say, ‘They did it!’ So let’s be the first so the second will have an easier time at this.”

TIPS: WORK WITH REGULATORS

How to Navigate Water Regulations

- If you’re part of the first net-zero-water project in your state or municipality, expect an extended, frustrating process that may not ultimately succeed for your own project.
- Work with LBC veterans to come up with a water treatment proposal that addresses the health and environmental concerns of officials.
- Seek out other local organizations to share personnel who have the expertise to test the water treated on the site.
- Get buy-in from product manufacturers on what you’re doing; it might be outside the norm for them.



The Brock Environmental Center is the first building under the jurisdiction of the U.S. Environmental Protection Agency to have rainwater coming out of its drinking water taps.

Photo: Greg Mella, SmithGroupJJR

be outrageously expensive for the foundation—requiring the hire of a full-time person to be onsite just to test the water. “We ultimately partnered with the sanitation department,” he says. A pre-treatment cistern and a post-treatment tank allow the system to treat the water in batches; the certified sanitation staffer only needs to be onsite during the treatment, while the regular facility manager will be certified at a more affordable level. “We literally got the approval on the rainwater system the day before the dedication,” says Mella, who notes that Brock is the first building in the U.S. that is under the jurisdiction of the federal Clean Water Act and has rainwater coming from its taps.

In addition to treating rainwater, groundwater, or other onsite water for potable use, there’s also the issue of treating blackwater and graywater in buildings that have access to a municipal sewer system—one of the many requirements that makes LBC extremely difficult to achieve in urban areas. Municipalities almost universally require hooking the building into the public sewer, but LBC won’t allow projects to use the sewer. That can feel a little ridiculous in an area where water is abundant, argues Thomas Hartman, AIA, of Coldham&Hartman

Architects. The Hitchcock Center for the Environment and the nearby R.W. Kern Center are “literally a stone’s throw from a sewer system and public water supply. It’s rather absurd to create a complicated system to create what is already a closed loop here in our region.”

Stevenson isn’t sure the three projects he’s consulting on will be allowed to forego the sewer and still achieve the Water petal (exceptions for using municipal potable water are typical for LBC projects, but exceptions for hooking into the sewer are not). “You can’t bypass the municipal facility,” according to local regulations, and that actually makes some sense, he admits. “It’s regulated and monitored; someone is taking responsibility for the water quality coming out as effluent from these plants,” he points out. The project team is considering applying to become a pilot project for their jurisdiction in order to demonstrate that the system they develop “can do better than that plant and better than a standard septic system.”

Even manufacturers have qualms

Another trailblazer on water regulations is the Bullitt Center; like others, Sprug notes that its strategy took “meetings, meetings, and more meetings”—getting in touch with various regulators, and getting them familiar with what the project was trying to do while respecting their mandate to protect public safety.

Bullitt’s rainwater harvesting system is allowed by Washington State, but the building is being treated by the federal government like its own small municipality and is still awaiting federal approval to drink rainwater. Sprug notes that LBC has exceptions to accommodate projects that can’t get regulatory approval for such schemes, but Bullitt continues to push ahead in order to be a model for other projects. It also worked closely with the City on its stormwater infiltration system, which also infiltrates treated graywater.

Aside from the usual regulatory suspects, resistance to the project’s approach on wastewater also came from an unexpected source: the toilet companies.

“I don’t think six stories of composting toilets had every been done before,” says Sprug, and the wastewater engineers from 2020 Engineering wanted to use a “microflush” toilet that uses



The basement composters at the Bullitt Centers serving six floors is probably

three tablespoons of water (0.01 gallons) mixed with biodegradable soap to smooth the path of waste down the pipes. However, most composting toilet systems, including the Phoenix composter that the project chose, eschew any added water.

According to Sprug, neither the company making the toilet nor Phoenix wanted their product to be hooked up with the other. Bullitt bought 10 Phoenix composters anyway, and the engineers commissioned their own microflush toilet—“which is not rocket science”—to be made in Mexico. By all accounts, the system is doing fine as it awaits the first harvest of composted waste.

unprecedented, but it's working smoothly so far.

Photo: Alex Wilson

Grow Toward the Sun

Projects pushing to net-zero energy are integrating that goal with the DNA of the building: Exhibit A in this trend is arguably the Bullitt Center.

EUI in the teens

Designed by the Miller Hull Partnership in Seattle, the Bullitt Center was modeled to have an energy-use intensity (EUI) of 16 kBtu per square foot per year—83% more efficient than a typical office building in Seattle. According to Sprug, the project is currently operating with about 10 EUI.

Once the last of its six floors is occupied—with a tenant signed for spring 2015, she says—that could go up a bit, but along with PV panels producing as expected, the project is clearly staying within its tight energy budget.

It has achieved that largely through passive design measures like the following:

- A well-insulated building envelope, including triple-glazed low-e windows with automated exterior shades. The Schüco windows pop out, with all four sides opening to maximize natural ventilation, and automated shades on the exterior can be deployed simultaneously.
- Twenty-six 400-foot wells provide the basis for ground-source heating and cooling, with both delivered through efficient radiant systems.
- With heating and cooling using only about 5% of the building's electricity, energy devoted to lighting and plug loads takes on increased importance. Most spaces in the building use daylighting, and the building management gives energy budgets to the tenants to keep their usage in check (they can trade with other tenants if they go over their allotment or have extra power to spare).

LBC and the goals that it represents played an integral role in how the building is shaped and will be used. While the floorplate of the building isn't that deep, LBC requirements for health ensure that offices will be on the perimeter—where they can also take advantage of daylight. Ensuring that the daylight would be there for the building was a central struggle, according to Sprug.

Under its “Rights to Nature” imperative, LBC 2.1 requires that buildings not block solar access to adjacent

TIPS: ACHIEVE NET-ZERO ENERGY

How to Get Energy to Pencil Out

- Focus on a high-performing building envelope with effective passive design. Use simulation early and often to refine designs.
- Use your best assets: in the case of Bullitt, good solar exposure on a hill (the site was picked for this reason).
- Seek integrated solutions.
- Track energy harvesting and consumption frequently to ensure the project is on target for net zero.

buildings, as measured on the winter solstice. Seattle has its own program with a similar requirement, and both proved a challenge. Seattle’s zoning would have given the building a 65-foot height limit, which would either have shortened every floor and blunted the natural daylighting, or it would have taken away a floor of the building.



The Bullitt Center is aiming to be a model for how urban, commercial projects might achieve LBC, but not everything about it is replicable—such as the choice to forego ground-floor retail to meet energy goals, and its careful selection of a sunny hillside—as sunny as possible for Seattle, at least.

Photo: Alex Wilson

In the end, the project earned a 10-foot bonus from Seattle. That was based on multiple mitigating factors, according to Sprug; a key was the building’s footprint being smaller than the base building code allowance for floor-area ratio (FAR).

It initially appeared that LBC would not be as flexible, even though the building it was shading was only affected during a tiny sliver of time in December—a cloudy month in Seattle. According to Sprug, however, while the project was in design, the criteria for its transect were more clearly defined to focus on shading “adjacent” façades and rooftops. The building being shaded was across the street, making it non-adjacent in the eyes of LBC.

First-floor retail left out

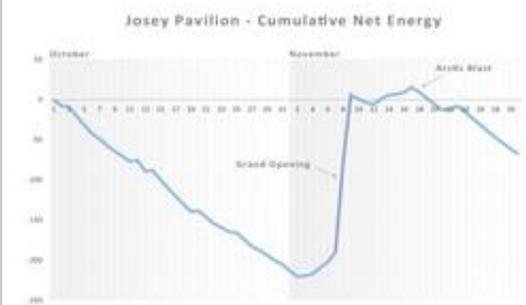
The push to net-zero energy not only shaped the building and its famous solar canopy but also influenced who’s in it. According to Sprug, the project considered building the first floor for retail space—as would be typical for many urban office buildings—but EUI played a role in keeping a coffee shop out of the building. “Their numbers would not have worked,” says Sprug, who adds that the team did research and found that potential tenants and their espresso machines would have brought EUIs of about 900 kBtu/ft²—demanding more energy than the building could produce.

“There’s a lot of value in the district solutions” where the building could have developed off-site solar to meet increased needs, says Sprug, but “Bullitt really wanted to understand what it would take to do it on a site.” And it wasn’t all about energy: retail tenants come with oodles of specific needs, and without a specific tenant to design to, the project team didn’t want the complication of designing such a space on spec.

Even with a known tenant in mind, and even with a small, mostly unconditioned building, net-zero energy may not be as simple as it sounds. Fluctuations in occupancy and hiccups in operations can cause consumption spikes that no one anticipated, notes Corey Squire of Lake|Flato, based in San Antonio, Texas.

The 5,400 ft² Josey Pavillion, an educational site that headquarters the Dixon Water Foundation in Decatur, Texas, includes a heater in the pump room to prevent pipe freezes—so small it wasn’t incorporated into energy models, yet large enough to wreak havoc on the energy numbers. When temperatures got a little cool at night, the heater kicked on—and stayed on. For some reason, it had been set to come on when temperatures were in the 50s instead of the 30s. Because Squire

Constant Vigilance!



Don't assume a spottily occupied building will perform as expected. At its

tracks energy consumption daily using a tool called e-Monitor, he was able to call the owners and ask them to check the setpoint and turn it down. “If you don’t know how your building is performing, it’s not performing well,” cautions Squire.

grand opening, the Josey Pavilion used up in one day all the energy it had harvested in the month of October.

Source: Corey Squire, Lake|Flato Architects

“Absolute Goals”

In a statement about the Bullitt Center’s approach to water savings that could apply equally to various facets of LBC, Sprug said, “When we were starting down this road we had no idea how we were going to do this—but we knew it was in the realm of possibility.” She says, “At the end of the day it was a lot easier than I thought it was going to be.”

For Sprug, LBC marks a clear path: “If you have absolute goals you can structure your process and achieve those goals. If you have nebulous goals, it’s easier to let them go in the process.”

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Learning Objectives

Upon completing this course, participants will be able to:

1. Prepare for LBC imperatives.
2. Structure an LBC process around absolute goals, with proactive leadership and follow-through.
3. List tips to choose a transect, prepare the project team, keep owners involved, engage future building occupants, and work with regulators.
4. List tips to achieve net-zero energy and net-zero water, and manage wastewater onsite.

To earn continuing education credit, make sure you are logged into your personal BuildingGreen account, then read this article and pass **this quiz**.

Discussion Questions

Use the following questions to inform class discussions or homework assignments.

1. Sustainability consultant Jason Packer says, “It’s the building that’s the goal, not the Living Building Challenge.” What do you think constitutes “success” in a project striving for LBC certification? Achievement of the full certification? Achievement of three of the seven petals for Petal Certification? Achievement of what’s most feasible? Pushing back on regulations? Other?
2. If a project team initially considers an imperative to be “a distraction from their mission,” does the standard lose clout... or gain it by helping teams develop broader missions?
3. Download LBC’s framework for affordable housing. What temporary exceptions are available to achieve net-positive water?
4. Compared to a traditional design process, how might an integrative design process confront LBC’s lofty imperatives and high standards for detailed documentation? How would you “prepare your project team” and foster “enthusiasm for all the paperwork involved”?
5. “The process doubled the construction time” on Re:Vision Architecture’s *first* LBC projects. What do you think they did to reduce construction time on subsequent projects?
6. Find an LBC Collaborative in your area of choice (see LBC Resources sidebar). What challenges and solutions are those members discussing?

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