



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 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.



Photo Courtesy Lake|Flato Architects

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

The Living Building Challenge Loves Me... It Loves Me Not

Each Living Building Challenge petal can elevate project teams and owners to new heights—or at times be a case of unrequited love.

Let's look at each petal and what project teams are saying about them.



PLACE

♥ Loves Me

It understands me: requirements are looser or stricter based on the type of site and its location.

♥ Loves Me Not

The pro-urban system is restrictive of rural projects but hasn't laid very clear pathways for urban projects either.

WATER

♥ Loves Me

Embrace composting toilets: they wipe out a huge percentage of many projects' water needs.

♥ Loves Me Not

Meddlesome local regulations often make the Water Petal impossible to achieve, despite exceptions offered in LBC.

ENERGY

♥ Loves Me

Everybody's doing it: net-zero-energy strategies are well established in many regions.

♥ Loves Me Not

It's just not that into RECs: if you don't have space for energy production onsite, established market solutions are off-limits.

HEALTH

♥ Loves Me

Operable windows, low-emitting interiors ... you've danced this dance with LEED and are probably doing most of it anyway.

♥ Loves Me Not

Mysterious ways: documenting biophilia in design involves unfamiliar, vague terminology.

MATERIALS

♥ Loves Me

Cupid smiles: LBC 3.0 solves some of the most confounding issues with this petal.

♥ Loves Me Not

First-timers spend thousands of hours on research—and a contractor can crush them by ordering SFI wood instead of FSC.

EQUITY

♥ Loves Me

Spread the love: this petal requires owners to think about how the building affects non-occupants.

♥ Loves Me Not

Beware strict parking rules! Rural and urban projects alike could find themselves star-crossed.

BEAUTY

♥ Loves Me

Simple concepts we can all love, and not hard to document. As Marcus Aurelius wrote, "Dwell on the beauty of life. Watch the stars, and see yourself running with them."

Read more about how project teams are confronting the challenges of the Living Building Challenge—and loving the process. www2.buildinggreen.com/loveLBC



Artwork by Julia Jandrisits
Text by Tristan Roberts and Paula Melton
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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

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 and materials meet the Red List requirements but do not carry Declare labels.

Imperative—One of 20 (in LBC 3.0) specific requirements; these are grouped under “petals.” The Beauty petal, for example, contains two imperatives: Beauty + Spirit, and Inspiration + Education.

Net-zero—For the purposes of LBC, net-zero or net-positive performance requires that all needs be met or exceeded annually through resources available within the project boundary. Exceptions are possible only through “scale jumping” (see below). Uniquely, LBC does not permit energy production through any type of onsite combustion.

Net Zero Energy certification—Recognition offered for achieving net-zero energy (by LBC’s definition—see above). Imperatives 1 (Limits to Growth), 19 (Beauty + Spirit), and 20 (Inspiration + Education) must also be achieved.

Petal—One of seven categories of focus, comprising (in LBC 3.0) Place, Water, Energy, Health & Happiness, Materials, Equity, and Beauty.

Petal certification—Recognition offered for meeting the requirements of three LBC petals. One of the petals must be Water, Energy, or Materials, and imperatives 1 (Limits to Growth) and 20 (Inspiration + Education) must also be achieved.

Red List—A list of substances that must be avoided in all materials and products chosen for an LBC project. Project teams seek exceptions frequently, but before an exception is granted, the team must write an advocacy letter to the product manufacturer encouraging elimination of Red List chemicals.

Red List-compliant—A Declare designation for products that meet LBC Red List requirements but aren’t considered Red List-free (see below), usually because the manufacturer claims proprietary ingredients or because there is a temporary LBC exception for Red List substances used in the product.

Red List-free—A Declare designation for products with full ingredient disclosure and containing no Red List substances.

Scale jumping—The practice of sharing resources with a nearby site or building to achieve net-zero or net-positive performance. In the 3.0 version of LBC, scale jumping is allowed under six imperatives: Urban Agriculture, Habitat Exchange, Net-Positive Water, Net-Positive Energy, Embodied Carbon Footprint, and Equitable Investment.

Transect—Adapted from the New Urbanism “transect zones,” LBC uses “transect” as way of characterizing neighborhoods based on their density and use. The transect chosen for an LBC project determines how it must perform under a variety of imperatives. For example, a rural project will probably not need to incorporate onsite agriculture. The transects in LBC 3.0 are: Natural Habitat Preserve, Rural Agriculture Zone, Village or Campus Zone, General Urban Zone, Urban Center Zone, and Urban Core Zone.

Typology—Project type. LBC 3.0 includes three typologies: Building, Renovation, and Landscape + Infrastructure. The Neighborhood typology formerly included in LBC has become a separate Living Communities rating system.

The Rose: A Cold-Climate Energy Story



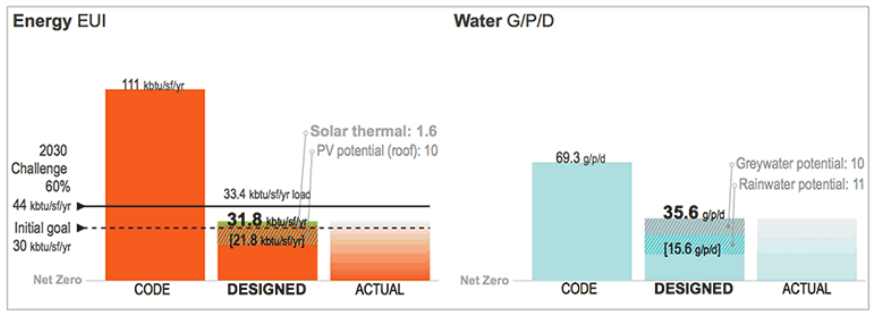
Minneapolis, MN
The Rose

Developer(s): Aeon
Hope Community
Architect: MSR
GC: Weis Builders
Cost: \$21.5 million
Size: 150,000 sf
Cost/sf: \$148/sf
Baseline: \$110/sf

Total Units: 90
Unit Mix: Studio, 30/60% AMI
1-br, market
2-br, 30/50/60/market
3-br, 60% AMI
Parking: Underground, surface
FAR: 2.0
Whole-building certification: Living Building Challenge-inspired

Project Start: 2011
Construction Start: (Fall 2014)
Complete: (Summer 2015)

Target Population: Families
Public Funding Partners:
LIH Tax Credits 4%
LIH Tax Credits 9%
Community Dev Block Grant
Minnesota Housing Finance Agency



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

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.

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.

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.

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 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 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

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.

- Join (or start) a regional [LBC collaborative](#). Sharing horror stories and comparing notes not only helps projects succeed, but also boosts mental health, stresses Packer. “It’s not just information; it acts as group therapy, knowing you’re not the only one going through these things,” he told *EBN*.
- Attend [LBC webcasts and workshops](#).
- Pursue [Living Future Accreditation](#). (You’ll need ILFI-accredited CEUs for that: [many EBN articles and BuildingGreen webcasts are qualified](#).)
- Read the [Petal Handbooks](#) and keep tabs on the [online dialogue](#) about program details.

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

TIPS: PREPARE THE PROJECT TEAM

How to Prepare Your Team

- 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.

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.)

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

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.



Photo: Studio Gang Architects

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

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 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 than the more obvious Transect 5 (Urban Center Zone). “The reason for that had more to do with what [the transect] ended up setting

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.



Photo: Charley Stevenson

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.

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 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,”

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

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 get legal permission to collect and treat rainwater in the first place. Many project teams are taking the plunge

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.

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.”

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.

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 non-profit, 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."

Next, the team found that local water-treatment monitoring requirements would 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 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;



Photo: Greg Mella, SmithGroupJJR

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: Alex Wilson

The basement composters at the Bullitt Centers serving six floors is probably unprecedented, but it's working smoothly so far.

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 gray-water.

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 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.

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

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.

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 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.

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.

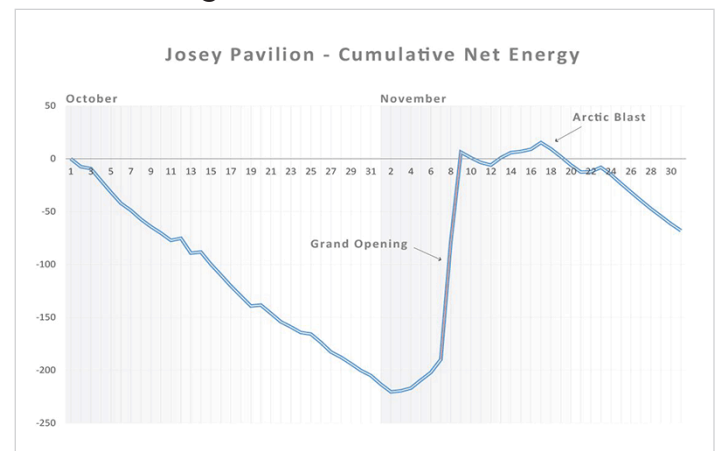
First-floor retail left out

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

Constant Vigilance!



Source: Corey Squire, Lake|Flato Architects

Don't assume a spottily occupied building will perform as expected. At its grand opening, the Josey Pavilion used up in one day all the energy it had harvested in the month of October.

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 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.



Photo: Alex Wilson

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.

“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 staring 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.”



NEWS

AIA Prioritizes Resilient Design, Product Transparency

New statements on resilience and healthy materials expand the AIA’s environmental advocacy.

By Paula Melton

The American Institute of Architects (AIA) has broadened its advocacy focus to include climate resilience and material health.

Released in December 2014, the group’s [revised position statements](#) on environmental responsibility—guiding declarations that help clarify which programs, activities, and government policies the AIA will support—reiterate the long-acknowledged importance of responsible stewardship of the Earth and carbon neutrality by 2030 while also adding two new sections.

Materials and the built environment

One of the new statements highlights the potential impact of building materials on human health and the environment and emphasizes that the material life cycle should be part of architects’ decision-making:

The AIA recognizes that building materials impact the environment and human health before, during, and after their use. Knowledge of the life-cycle impacts of building materials is integral to improving the craft, science, and art of architecture. The AIA encourages architects to promote transparency in materials’ contents and in their environmental and human health impacts.

Mary Ann Lazarus, FAIA, sustainability fellow with the AIA and leader of the group’s recent [Sustainability Leadership Scan](#), notes that the statement “encompasses the full range of what we do in our work” because it suggests that “the aesthetic has to be done in the context of the outcome.” She adds, “It emphasizes before, during, and after on purpose, making clear our selections do have an impact, not just *in situ*.”

Mike Davis, FAIA, who submitted comments on earlier drafts on behalf of the AIA Materials Knowledge Working Group, connects the environmental impacts of materials with something else that architects care about: beauty. “Beauty is not only related to things visual, lavish, and dazzling,” says Davis. “It’s a pretty bold statement on the Institute’s part to connect what we would consider to be purely scientific to design craft and art.”

The statement reflects a growing emphasis within the AIA on the integration of design and health. On the heels of the statements’ release, the AIA also announced the founding of a [Design and Health Research Consortium](#), which will fund scientific research on the interplay of architecture and human health. The first studies undertaken by the consortium will include research on everything from indoor microbial ecosystems to circadian disruption and noise to the health impact of urban parks.

New position statement on resilience

Also new is a position statement on resilience acknowledging that climate change is increasing pressures on the built environment and calling on architects to design buildings that can respond to these pressures:

Buildings and communities are subjected to destructive forces from fire, storms, earthquakes, flooding, and even intentional attack. The challenges facing the built environment are evolving with climate change, environmental degradation, and population growth. Architects have a responsibility to design a resilient environment that can more successfully adapt to natural conditions and that can more readily absorb and recover from adverse events. The AIA supports policies, programs, and practices that promote adaptable and resilient buildings and communities.

Davis notes that his group’s input on this statement made a difference to the outcome. “The first draft of this language didn’t say climate change, environmental degradation, or population growth,” he claims, speculating that “this is a big national organization with a lot of constituencies.” The group proposed some of the stronger language that eventually made it in the position statement.

Core and Emerging Priorities for Architects

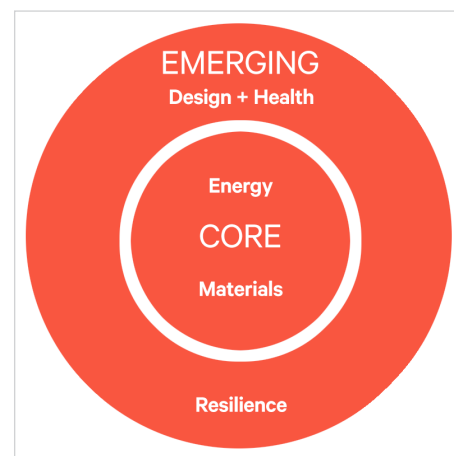


Image: The American Institute of Architects

The specifics do not appear to have affected the outcome; Zachary Hart, director of policy at the AIA, says that 90% of members who responded to the statements gave them a thumbs-up.

Do position statements matter? Definitely, argues Hart. "This really guides our activities. We won't pursue something if the AIA doesn't have a position on it."

Lazarus echoed that: "The position statements turn out to be really important. They become the backbone for advocacy and policy decisions. I'm excited about the next steps resulting from these."



USGBC, Chemical Industry Begin Talks

You say "risk" and I say "hazard," but we can't call the whole thing off. So the Supply Chain Optimization Working Group is set to begin its work.

By Paula Melton

After years of wrangling between health advocates and the chemical industry on the issue of material transparency and health, a new working group of the U.S. Green Building Council (USGBC) has commenced talks aimed at working out these differences. As previously reported in *EBN* ([Chemical Industry, USGBC Announce Ceasefire](#)), the new Supply Chain Optimization Working group's major task will be to help finalize the details of a highly controversial LEED version 4 credit, [Building Product Disclosure & Optimization—Material Ingredients](#). In keeping with its name, the group's first task will be to look at Option 3 of that credit, "Product Manufacturer Supply Chain Optimization."

USGBC recently released the names of all 31 working group participants, who include Nadav Malin, president of BuildingGreen, as the group's facilitator, and the group had its first meeting in December 2014. Group members include representatives of



Image is in the public domain.

Agreement between risk-focused and hazard-focused groups appears as unattainable as the Holy Grail to some, but many parties have come to the table.

manufacturers, trade associations, certifying and testing bodies, building owners, architecture firms, environmental groups, and government agencies.

Optimism from all sides

Heather Gadonniex, director of business development at life-cycle and supply-chain consulting and software firm PE International, told *EBN* she's "excited that this initiative is under way. It's causing collaboration to really be pushed forward from all sides of the industry." Gadonniex argues that working together is critical to bringing sustainability into the mainstream.

In an email to *EBN*, Bill Freeman, technical consultant to the Resilient Floor Covering Institute, wrote that the first meeting of the group "was very refreshing," adding that "there is a wealth of knowledge" among the members of the group and that everyone seems to share the same goals—"to provide building materials which have reduced impact on the environment and to consider the health impacts on building occupants where these materials are installed in a building."

... Plus a dose of realism

Whether the group will be able to agree on appropriate ways for LEED to help achieve these goals is another

matter, and participants acknowledge that their differences run deep.

One central reason the credit was so controversial to begin with has to do with the way that building professionals make decisions about the ingredients in the materials they choose for projects (see [Building Products and Health: A Look at Risk Versus Hazard](#)). Options 1 and 2 of the credit look exclusively at the inherent hazards of material ingredients, while Option 3 focuses on the risk of exposure along the supply chain. The working group will likely take a look at new approaches to all the options, including the more hazard-focused ones, though any substantive changes will require a member ballot before implementation.

Freeman expressed hope that the current standards referenced in the credit would receive further scrutiny. "The MR credit should be improved to include scientifically based programs which have been established using a true consensus process and not confined to programs which are proprietary in nature and non-consensus," he said. Asked how he would respond to those who are wary of including risk-assessment frameworks in LEED, he replied, "How can you be wary of risk assessments if this subject is at the heart of not providing finished building materials which will be harmful to building occupants?"

Members of the Supply Chain Optimization Working Group

Facilitator: Nadav Malin, BuildingGreen

Steve Baer, PRB Connect

Michael Banks, DuPont

Annie Bevan, GreenCircle Certified

William Carroll, Occidental Chemical

James Ewell, GreenBlue

Paul Firth, UL

Bill Freeman, Resilient Floor Covering Institute

Heather Gadonniex, PE International

Brad Grams, U.S. Environmental Protection Agency

David Green, BASF

Martin Grohman, GAF

Keith Lindemulder, Nucor Corporation

Ann Mason, American Chemistry Council

Paula McEvoy, Perkins + Will

Paul Murray, Shaw Industries

Priya Premchandran, Google

Barry Reid, Georgia-Pacific LLC

Joseph Rinkevich, SciVera LLC

Jane Rohde, JSR Associates, Inc

Lorraine Ross, Intech Consulting Inc.

Rochelle Routman, Mohawk Industries

Rita Schenck, Institute for Environmental Research and Education

Andrew Shimko, Seaman Corporation

Alicia Silva, Revitaliza Consultores

Richard Skorpenske, Bayer Material Science

Wes Sullens, StopWaste of Alameda County

Blandine Trouille, Department of Commerce, International Trade Administration

Denise Van Valkenburg, Herman Miller

Jennifer Wagner, Carbon Cure

Howard Williams, Construction Specialties

... And a dash of 'cautious pessimism'

When news of the working group first broke, Bill Walsh, executive director of the Healthy Building Network, declared it "Groundhog Day" and cautioned that the motives of the ACC hadn't changed since the group started attacking USGBC in 2011.

Asked more recently to comment on the makeup of the group and its charter, Walsh softened his stance, but only slightly. He expressed in an email that "the charter opens up the possibility to move forward new and innovative ideas for reducing the use of toxic chemicals in building products" and "move us beyond the failed risk-assessment framework that makes existing chemical laws so ineffective." At the same time, Walsh added, "To date, the chemical industry has aggressively fought against these new ideas in LEED and in Congress, and the history of the LEED v4 credits suggests that they will resume their attacks on LEED if they don't get their way. Call me cautiously pessimistic about this process."

Gadonniex was more decidedly positive, opining that collaboration is the only realistic path; she called on the green building industry to get on board.

"If we are going to move the industry forward and really scale sustainability in the built environment with the data that we need and the tools that we need and the context and knowledge that we need in order to transform our built environment, we need to sit down and have this conversation. And it has to include those on the deeper-green side of the spectrum to listen and collaborate."

For more information

U.S. Green Building Council
usgbc.org



Material Health Tools Harmonize

Manufacturers should get more consistent signals as Cradle to Cradle, GreenScreen, Pharos, and other tools align, while staking out niches.

By Candace Pearson

Material health organizations have been all been pushing hard to get more manufacturers to disclose and optimize the ingredients in their products, but with multiple platforms like Health Product Declarations (HPD), Cradle to Cradle (C2C), GreenScreen, and Pharos all getting traction, the leaders of those organizations have realized in some ways they are competing with each other in the same race.

As a part of an effort to harmonize the various disclosure options, Cradle to Cradle has indicated it would like to see the scene resemble more of a relay, recently announcing that it is considering aligning the hazard-assessment portion of its standard with GreenScreen in an effort to reduce duplicated efforts. C2C has also introduced a new Material Health Certificate that will help a manufacturer get set up for C2C certification so that it is more prepared to take the baton.

C2C aligning with GreenScreen

According to Stacy Glass, vice president of the built environment for Cradle to Cradle Products Innovation Institute (C2CPII), C2C Version 4.0, which recently entered a public revision process, proposes incorporating GreenScreen as a part of the standard's hazard assessment portion (the first component of a C2C assessment). C2C only recently made its material health assessment methodology available to the public with version 3.0, finally releasing hold of its Chemical Profiles Knowledge Database as proprietary; but now that it is open for scrutiny, some have critiqued how its chemical profiling treats chemicals with unknown hazards (see [Cradle to Cradle Gains Independence: A First Look at the 3.0 Launch](#)). GreenScreen is essentially a tool to do the same thing but

takes a more comprehensive approach to assigning degrees of hazard based on human and environmental endpoints.

An analysis showed the two methodologies produce the same result 80% of the time, according to Glass, so even if the two do not merge, further alignment would still be needed to ensure they both consistently “come to the same answer” and don't confuse manufacturers.

Other organizations are also working toward aligning with C2C: the Health Product Declaration Collaborative (HPDC) specifically sought input from C2CPII in the revision process of HPD version 2.0, which was recently approved by its board and is set to launch in 2015, so as to more closely align with C2C nomenclature; and the Pharos building materials library, a tool revealing the hazards associated with various chemicals, now flags chemicals on the C2C banned list and gives users access to HPDs and publicly published GreenScreen assessments. Although these organizations—along with the International Living Future Institute's [Declare database](#)—push for constituent disclosure, which is not required for C2C certification, they see value in agreeing to use consistent language and to enable crossover.

“We owe the manufacturer community a clear pathway for disclosure and transparency as we move toward transformation” of the building materials market, said John Knott, executive director of HPDC, at an October 2014 Greenbuild event featuring principals of several key groups.

GreenScreen addresses problem chemicals

For its part, GreenScreen is working to address concerns from some users that some common chemicals used in building materials—Lauren Heine, director of the GreenScreen program, cites carbon black, silica, and titanium dioxide—were not being accurately assessed by its “list translator” tool. The organization has now gotten funding to subsidize full, “form-specific” GreenScreen assessments for

these materials so that the list translator does not raise red flags about potential occupational impacts that are unlikely except under very limited circumstances.

New C2C Material Health Certificate

C2C has also decided to make material health—one of the five categories that the standard evaluates—into its own certificate program to encourage more manufacturers to start on the path to material optimization even if they can't yet achieve a full C2C certification. The new certificate program has the exact same requirements as the material health portion in the full product certification and will likewise be subject to the requirements for a site visit and the framework for continuous improvement. Several companies, including Owens Corning and ThyssenKrupp Elevator Americas, are already in the process of pursuing the certificate.

And if even that is out of reach, UL will be offering an even more basic “Materials Health Assessment” which will verify compliance with C2C chemical lists and demonstrate alignment with C2C methodologies, according to Paul Firth of UL Environment. These assessments won't come with any C2C seal of approval, but they will help a product start on that path.



NEWSBRIEFS

Greenwash Getting Easier to Spot, But Still Confusing

A survey shows consumers generally find value in third-party product certifications but can be confused by less credible claims if not provided enough context.

By Candace Pearson

A recent study commissioned by UL Environment, “[Under the Lens: Claiming Green](#),” examines which types of

green claims—third-party validated, legitimate but not independently verified, or just plain greenwash—today’s consumers buy into.

The picture shows that people largely get it: given the choice between a product with a green claim that has been certified by a third party and one with a problematic claim (defined as not meeting the [standards set by the U.S. Federal Trade Commission](#)), problematic claims were preferred only 22% of the time. Consumers were less able to distinguish, however, between legitimate claims and problematic claims, and in the category of building products, one problematic claim—a manufacturer-created label promoting a “clean air formula”—beat out third-party certifications in rankings of importance and reliability.

Some legitimate and certified claims prompted a negative response if they used technical language or used logos with only the certification body’s name, which respondents found confusing, according to the report. A label advertising a VOC limit of 50g/L, for example, was ranked among building products as the most misleading or confusing and the most likely to negatively affect perception of the brand, with respondents citing that they did not know what VOCs (volatile organic compounds) were.

In contrast, certifications that verify low VOCs, like the Carpet & Rug Institute’s Green Label Plus and the UL Greenguard label, were among the top seven most trusted claims in the

home improvement category. This suggests that certifications bring context that tell consumers VOCs are an important issue, according to the report.

UL Environment, one of the largest certifiers of green claims and the provider of the Greenguard certification, commissioned the report, but the survey was conducted by the Shelton Group, and, with a survey sample of more than 1,000 respondents, the authors say they have a confidence level of 95%.



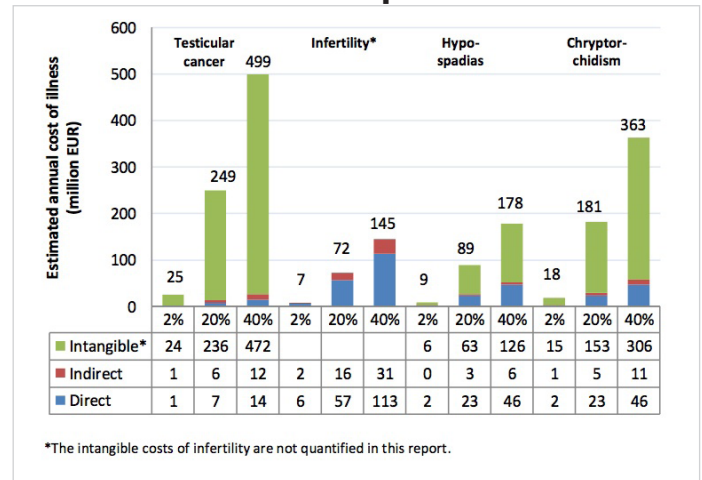
Endocrine Disruptors Cost Society Millions, Says Report

Europe could be losing 1,300 million euros a year dealing with male reproductive illnesses caused by endocrine disruptors. And that’s just the tip of the iceberg.

By Candace Pearson

Chemicals ubiquitous in consumer products that interfere with human

Cost of endocrine disruptors in EU



Credit: Ing-Marie Olsson

Making different assumptions about the number of incidents of reproductive illnesses that endocrine disruptors are actually responsible for, researchers estimate that health costs could amount to up to €1,200 million, and the same chemicals likely play a part in other illnesses as well.

hormones are costing millions of dollars in direct and intangible health costs, according to an economic analysis—and that’s just based on estimates of the havoc they wreak on the male reproductive system.

A report funded by the Nordic Council of Ministers estimates that endocrine disruptors cost Nordic countries (Denmark, Finland, Iceland, Norway and Sweden) €36 million per year of exposure, assuming that they cause 20% of incidents of certain illnesses in the male reproductive system: testicular cancer, the birth defects hypospadias and cryptorchidism, and infertility due to low semen quality. If present costs caused by past exposure are included, that number jumps to €77 million. These amounts build up through hospital bills, lost wages, and intangible costs, such as loss of life-years or pain and suffering (intangible costs were not calculated for infertility).

Extrapolated to the whole EU, the price could amount to nearly €1,267 million per year, including present spending to mitigate past exposure. But that number is small, researchers say, considering that research suggests these chemicals may have other health impacts, too, such as hormone disruptions in females and metabolic disorders like obesity and diabetes (see [Obesogens: A Fatty Issue](#)).

Consumers’ Choices Between Green Claims

	CERTIFIED CLAIMS VS. PROBLEMATIC CLAIMS			LEGITIMATE CLAIMS VS. PROBLEMATIC CLAIMS		
	Certified Claims Chosen	Problematic Claims Chosen	Neither Chosen	Legitimate Claims Chosen	Problematic Claims Chosen	Neither Chosen
Home Improvement	63%	19%	18%	39%	40%	21%
Cleaning	54%	23%	23%	39%	34%	27%
Electronics	54%	23%	23%	43%	27%	30%
Personal Care	50%	27%	23%	37%	38%	25%
Total	54%	24%	22%	39%	35%	26%

Source: The Shelton Group

Certified claims beat problematic claims by a large margin, but the gap is not so wide between legitimate claims and problematic ones.

The report recommends that the EU pass legislation to screen substances for endocrine-disrupting properties and to minimize exposure to substances that are identified. The U.S. Environmental Protection Agency has been screening certain chemicals for their effects on the endocrine system [since 2009](#), but many of these substances—like bisphenol-A (BPA), polybrominated diphenyl ethers (PBDEs), and certain phthalates—are still not regulated, even after [coming close to being listed as chemicals of concern](#).



IgCC Opens Compliance Pathway Based on Actual Energy Use

An outcome-based approach assures that buildings actually achieve energy targets, while relieving technical pressures on code departments.

By Candace Pearson

The 2015 International Green Construction Code (IgCC) will have a compliance option based on an outcome-based approach, officials announced recently.

Previously, building energy codes relied on two main pathways to demonstrate compliance: prescriptive measures, where individual building components met the code-defined parameters, or performance projections based on modeled energy consumption. But once people occupy a building, they often act differently than the code setters and energy modelers assumed.

The new pathway will require a building to meet baseline requirements in the International Energy Conservation Code (IECC), and the owner will be issued a temporary certificate of occupancy. Within three years, the owner must provide the jurisdiction with 12 months of energy use data showing the building meets code targets—and only then will the code official issue the final certificate of occupancy.

Jim Edelson, director of codes and policy at the New Buildings Institute, which advocated for the revisions, stated in a press release, “The adoption of the outcome-based pathway presents a sea change in the way building codes can be met. Cities can now effectively drive better policies in their building sector, design teams gain flexibility to innovate, and building code officials have a streamlined process for validating that a building is operating to code.”

A major benefit of the new pathway is that it could relieve some of the pressure on resource-strapped code departments that are tasked with interpreting sophisticated building models and enforcing a myriad of code requirements. Instead, they essentially have to just check the energy bill. (Design teams should still use energy modeling—[early and often](#)—to iteratively move projects to higher levels of performance.)



Colleges Making Progress—and Money—on Their Carbon Commitments

Schools that have signed the Presidents’ Climate Commitment have had some success but still need to cut emissions in half by 2031.

By Candace Pearson

Progress is being made at the 675 colleges and universities that have signed the American College & University Presidents’ Climate Commitment since its [launch in 2007](#), according to an update from the organization. The pledge sets interim reduction targets to cut gross greenhouse gas emissions 14.4 million metric tons by 2031.

Cumulative reductions to date total 1.9 million metric tons of CO₂-equivalent, according to inventory reports from 520 institutions, with top runners reducing their emissions on average by 19%. However, even with that progress, signatories will have to collectively reduce their total emissions



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In its progress report, the College for the Holy Cross reported a 41% decrease in gross greenhouse gas emissions from 2007—mostly due to purchasing electricity from hydropower sources and building new construction to LEED specifications.

from today’s rate by 51% if they are to meet their goal.

Of the schools that have submitted a formal progress statement, 66% reported that their emissions cap has saved them money, and it is clear that sustainability is influencing other aspects of their institutions as well. 15,527 faculty members pursue sustainability research at 198 of the signatory schools, and 86 schools consider sustainability such a core knowledge area that they have included it in their general education requirements.

For more information

[ACUPCC Progress Summary](#)



Industry-Average Impacts of Concrete Revealed in EPD

The industry-wide EPD for concrete shows impacts by U.S. region and meets LEED v4 requirements for a new material credit.

By Paula Melton and Candace Pearson

The National Ready-Mix Concrete Association [has released an](#)



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The industry-wide EPD does account for the energy used by concrete mixer trucks—the model for more than 85% of concrete operations.

[environmental product declaration \(EPD\)](#) showing average cradle-to-gate impacts of a variety of concrete mixes nationwide and by region. The document makes it easier for project teams to assess the environmental impact of one of the most common building materials and also paves the way for individual manufacturers to release product-specific EPDs for comparison with the industry average—a step incentivized under a [new Materials and Resources credit](#) in LEED version 4.

The EPD covers 48 ready-mix concrete products that are used in residential, commercial, and public construction. The products range from a compressive strength of 2,500 pounds per square inch (psi) through 8,000 psi and contain different mix components, including fly ash, slag cement, natural and crushed aggregates, admixtures, and batch water.

A user can see, for example, that the average global warming potential per cubic meter for concrete within the range of 2501 to 3000 psi with limited or no fly ash or slag content is 337 kg of CO₂-equivalent, while concrete with the same compressive strength containing 30% to 39% fly ash has a significantly lower impact—265 kgCO₂. (For more background, see [Reducing Environmental Impacts of Cement and Concrete](#)).

The EPD does not take into account environmental consequences from transportation to the construction site, onsite processes and components, or end-of-life disposal. However, since more than 85% of North American concrete plants use trucks that mix

concrete after they are loaded at the project site, a portion of the trucks' energy use is factored into the manufacturing impact calculations.



Water Scarcity Means Higher ROI for Water Retrofits

Market pricing doesn't predict when water will become scarce. A new tool calculates realistic payback scenarios for efficiency projects based on local conditions.

By Candace Pearson

The price isn't always right, at least when it comes to water: for a variety of reasons, water is priced at a premium in relatively wet locations (\$3.42 per m³ in Amsterdam) and cheaply in dry ones (\$0.28 m³ in desert-like Mumbai). Mispricing has the potential to misguide the market, incentivizing businesses to locate water-intensive facilities in precisely the wrong places.

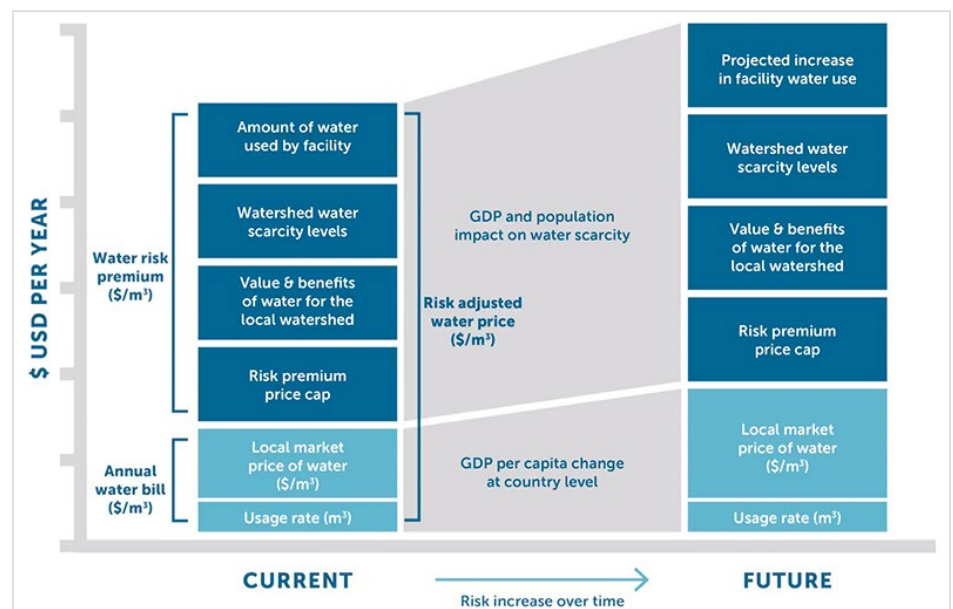
The [Water Risk Monetizer](#), developed by Ecolab and Trucost, now helps calculate a risk premium using local factors that affect water supply—such as

groundwater recharge, waste assimilation, wildlife habitat, and recreational activities—and weighed alongside a country's purchasing power, population growth, and gross domestic product forecast. The groups hope that this information will help businesses avoid areas where current or projected water insecurity could threaten operations and bottom lines.

But the tool is also a useful resource to make the case for water projects or programs that—due to the undervaluation of water—register deceptively low rates of return. Water scarcity could result in surprise hikes in operating costs, stranded assets, and lower investor confidence, which, once accounted for, make water-efficiency retrofits much more cost effective. For a beverage plant in Dallas, Texas, the tool calculates a risk-adjusted rate of \$6.33 per m³—more than triple the going market rate of \$1.85 per m³.

The tool addresses only how the price of incoming water purchased by a facility may be affected by scarcity, regulatory risk, and reputational risk—not the costs and risks associated with the condition of the water leaving the facility. However, the granularity down to the local water-basin level and

Factors Contributing to Water Risk



Source: The Water Risk Monetizer

The Water Risk Monetizer models the financial value of water scarcity risk using local watershed conditions and projected population and GDP growth.

automatic translation into monetized values distinguish this tool from other resources, such as the World Resource Institute's Aqueduct Tool and the World Wildlife Fund's Water Risk Filter, according to the creators.



PRODUCT NEWS & REVIEWS

Heat-Pump Clothes Dryers Finally Reach U.S.

Whirlpool's ventless hybrid heat-pump dryer technology promises substantial energy savings along with increased capacity and fast drying times.

By Brent Ehrlich

Even as other household appliances have become more efficient, residential clothes dryers have been stuck in the past, with their decades-old electric-resistance heat and tumble-dry technology mostly unchanged for the last 40-plus years. Dryers are now the largest energy-consuming standard appliance in most U.S. homes, and they account for 6% of residential electricity use, according to the U.S. Department of Energy (DOE).

The most energy-efficient dryers available today—ventless, heat-pump models—have been available in Europe since the late 1990s, but the U.S. has been slow to adopt the technology. That is finally changing, with Whirlpool now offering the U.S. EPA Emerging Technology Award-winning HybridCare ventless heat-pump dryers in North America.

Introduction of this technology in the U.S. could be a game-changer for multifamily projects. This dryer's energy efficiency and lack of venting should make it easier for those attempting net-zero-energy performance, normally a difficult achievement given the wide variation in residential energy use and the building envelope challenges posed by vented dryers.

Heat-pump dryer basics

Standard clothes dryers use electricity or a gas burner to heat clothes,

drawing off moisture and venting it—along with conditioned air from the living space—outside. Condensing dryers are more efficient, but they add moisture and heat to a room.

Ventless heat-pump dryers don't have a significant impact on either a room's humidity or its temperature. A refrigeration loop condenses moisture from the drum (which goes down the same drain used by the washer), while excess heat energy from the process is added back into the drum—and the cycle is repeated.

Additionally, ventless dryers save energy in themselves: the U.S. Environmental Protection Agency estimates that 20%–25% of the total heat input energy for a dryer is lost through the dryer vent. In a highly insulated home or apartment, such as one certified to Passive House standards, the air leakage through the dryer vent can account for a large percentage of total air leakage.

Heat-pump tradeoffs

Heat-pump dryers have been “one of our Holy Grails” said Ron Voglewede, Whirlpool's global sustainability director, who claims the company spent more than ten years engineering them to work for the U.S. market.

Whirlpool had to overcome two fundamental flaws with European heat-pump dryers, said Voglewede: one was small capacity (they are around 4 ft³, compared to the 7 ft³ that's more typical in the U.S.), and the other was the long drying cycle of two hours or more. In order to improve the drying time to match U.S. wash-cycle times and capacity, Whirlpool added a 1,300-watt booster heater to its 7.3 ft³ HybridCare.

Whirlpool's HybridCare operates in three modes: Speed mode (50–60 minutes/cycle), Balance mode (60–70 minutes/cycle), and Eco mode (70–85 minutes/cycle), with the drying time decreasing when the heating element kicks in to a greater degree.

“Even in Speed mode, it does not use as much power as a standard dryer,”



Photo: Whirlpool

HybridCare offers energy-efficient heat-pump technology at the same size, capacity, and cycle times as Whirlpool washers, making adoption easier for the U.S. market.

says Voglewede, and even “Eco mode is way faster than a compact European model.” Voglewede told *EBN* that the element draws about 2,500 watts in Speed mode and 1,200 watts in Eco. For comparison, a typical electric-resistance element draws 5,000 to 5,500 watts, according to DOE. Whirlpool claims the HybridCare in Eco mode provides 40% energy savings over a conventional dryer, while current Energy Star standards require 20% energy savings, and European heat-pump models are estimated to offer about 40% to 50% savings.

Important side benefits

The heat-pump technology has additional benefits that would be particularly useful for multifamily or retrofit applications. Noting that HybridCare draws half the power of a conventional dryer, Voglewede argues that widespread use of the technology would “have a huge impact on the national grid.”

More to the point for individual projects, Voglewede says, “It gives you all kind of flexibility when you talk about overall design of the electrical system down to placement of the washer and dryer.” The ventless system can be placed in almost any

room, and though it requires drainage, it is designed to pump directly into the washer drain line. And noise should not be a problem—unlike with some [heat-pump water heaters](#)—because the fan is enclosed within the unit. Voglewede claims the HybridCare is no noisier than a standard dryer and is easy to clean via its primary and secondary lint filters.

Other appliance manufacturers are starting to offer heat-pump dryers to suit the U.S. market. LG's EcoHybrid hybrid heat-pump dryer, for instance, contains a heat pump that can be operated without heating elements, but it also contains two 1,500-watt booster heaters and requires venting, lowering the overall energy performance of the technology.

HybridCare will be available in the first quarter of 2015 at a manufacturer suggested retail price of \$1,699. Unlike simple electric-resistance dryers, HybridCare is a complex piece of engineering, so hopefully Whirlpool's years of design will pay off, and the unit will be as durable as the energy hogs they could replace.



ECOS Challenges Paint Industry to Disclose Ingredients

ECOS Paints ignored “trade secret” complaints made by other manufacturers and now makes the first paints designated Red List Free for the Living Building Challenge.

By Brent Ehrlich

For a little while, zero-VOC paint was good enough for most green projects. Now, designers concerned about healthy products and trying to meet Living Building Challenge and LEED disclosure requirements are demanding deeper information on paint ingredients, and at least one manufacturer is providing it.

Gleaning ingredient information beyond the high-level ingredients appearing on a material safety data

sheet (MSDS) is almost impossible. Companies typically say they can't divulge their trade secrets, so we can't know what “proprietary”—and potentially toxic—ingredients are in paints. ECOS Paints is out to change this mindset. The company's interior paints now list all of their ingredients via a Health Product Declaration and sport a Declare label validating that they are free of Living Building Challenge Red List chemicals. While only sold as residential for now, the paints have a commercial track record, and the company is working to get the necessary testing to verify their quality and sustainability for the commercial market.

Made for the chemically sensitive

Originally formulated by a paint chemist who was chemically sensitive, ECOS Paints was founded in the U.K. 25 years ago, according to Julian Crawford, the CEO of Imperial Paints, an independent company that now makes ECOS, Lullaby Paints, Air Pure Paints, and other coatings in South Carolina (the U.K. parent company is still a minor partner and provides technical assistance). ECOS is a zero-VOC acrylic interior paint, but the company claims it is different from other zero-VOC paints. “It is not a

modified traditional paint”—these can still be considered zero-VOC if they have 5 g/L VOC—but was formulated for, and is sold primarily to, those with chemical sensitivities, he said. The company claims it contains no VOCs in its solids, emissions, or tints.

“Our business is 95% direct to consumer,” said Crawford. Because of the company's residential focus, it hasn't been motivated to pursue common commercial paint emissions certifications such as Greenguard Gold, but the company is beginning to explore the commercial market and has embraced material transparency.

James Connelly, manager of the Declare program for the International Living Future Institute (ILFI), confirmed, “Imperial has gone through and done full declaration [of ingredients] to 100 ppm for both normal and ECOS lines.” For context, manufacturers must disclose ingredients only down to 10,000 ppm, or 1,000 ppm for carcinogens, on material safety data sheets (MSDS), so it's easy for common hazardous compounds to slip through the cracks.

Why Declare?

Imperial Paints is the first paint company *EBN* could find that discloses



Photo: Imperial Paints

Though relatively new to the U.S. commercial market, ECOS Paints have divulged their ingredients down to 100 parts per million and have earned Red List Free designation, making them eligible for Living Building Challenge projects.

all ingredients down to 100 ppm. According to Connelly, nearly every formulated-product company has told ILFI there is no way to disclose product formulation to those levels because it would give away trade secrets, but Crawford says it was not a problem. “Clearly there are many industries that can do this with more complex products than our little paint products.”

Whether ECOS is an outlier or the first in a wave of paint companies offering greater transparency remains to be seen, but this may hinge in part on whether larger Living Building Challenge and other green projects embrace it. For that to happen, ECOS may have to step up its game regarding performance testing and verification.

Will it hold up to commercial use?

Paints for commercial applications are typically certified for performance through the Master Painters Institute (MPI), but again, ECOS has not had its products certified—yet—due to its residential focus.

Crawford is confident ECOS would pass performance tests, however. He claims that ECOS was formulated so there would be no performance tradeoffs, and he says there is a history of commercial use. “British rails uses our paints for lines on their platforms because it is so durable,” claimed Crawford, and he says it has been used in the Louvre, Westminster Abbey, the London Olympic Village, and Google’s corporate headquarters. “We just need to get to the stage where [testing] is the logical next step” from a business perspective, he says.

In 2013, Lockhart Power, in Lockhart, South Carolina, used ECOS in its 6,600 ft² headquarters, which included administration offices, customer service center, kitchen, and a large meeting room. According to Bryan Stone, chief operating officer at Lockhart, the company has strong sustainability values, and “we were looking at ways to minimize the environmental impact of the building.” Purchasing a zero-VOC paint from a local company

met its goals. Stone claimed it went on just like any other paint and that there were no complaints or change orders from the painters. “The main thing that stood out,” he said, is that “as soon as it was applied, the lack of odor was really impressive.”

So what is in it?

Although the company claims its paint is “nontoxic,” that’s not a meaningful term; virtually any compound is toxic at high enough concentrations or volumes. ECOS is acrylic-based, and although high-quality acrylic paints are known for their durability, some acrylics can be respiratory sensitizers.

Many of ECOS’s ingredients, such as titanium dioxide, calcium carbonate, and others, are found in similar concentrations in other high-end acrylic paints and are labeled on MSDSes. But ECOS also lists other ingredients, such as 0.13% methylchloroisothiazolone (CIT), a common preservative in waterborne paints and other consumer goods. CIT is an allergen that is hazardous to aquatic life at higher concentrations (cosmetics in Europe can contain up to 0.14%), but it does not have to be listed on an MSDS at low concentrations, and usually isn’t.

ECOS is available in eggshell, satin, and matte in 1,300 standard colors, but the company can match any color. In fact, according to Crawford, “60% of our business is matching other people’s colors.”

All of this care comes at cost, but it may not be as much as you think. At \$53.95 per gallon from the company’s website, it is less expensive than premium paints from many companies, and each gallon covers 560 square feet (Benjamin Moore’s Aura costs \$67.99 and covers 350–400 ft²). ECOS can be shipped anywhere in the U.S.

For more information

ECOS Paints
www.ecospaints.net



BACKPAGE PRIMER

Net-Positive, Regenerative Design, and Other Ways Buildings Can Do Good

Instead of making a big fat net-zero your goal, regenerative design encourages whole-systems thinking and projects that actually add benefit to the environment.

By Tristan Roberts and Paula Melton

Use less energy and less water. Produce less waste. Avoid toxic chemicals.

Green building often sounds like a checklist of things *not* to do, which is not particularly inspiring, especially for creative professionals like architects, engineers, and interior designers. Often, the people who are talking about doing “more good” rather than “less bad” are advocating for *regenerative design*.

Another term that’s come into fashion is *net-positive*—but whatever you call it, the idea is that projects should create a surplus of energy, water, materials, habitat, or other outputs that benefit human society and nature, instead of merely aiming to cancel out the negative impacts of development.

Some green building programs that use the language of regenerative design include Cradle to Cradle, a product certification and the trademarked philosophy of William McDonough and Michael Braungart, Ph.D., popularized in a book of the same name. The term describes a circular economy in which materials are reused or returned at the end of their useful lives to either the natural cycle or the cycle of manufactured goods. Ideally, products created in a cradle-to-cradle cycle could clean the water and the air as they are made, adding value to the environment.

Although LEED is sometimes the poster child for complaints about checklist programs filled with proscriptions, the U.S. Green Building Council (USGBC) tackled this issue in LEED version 4 by describing the benefits that its credits



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Though a scourge of homogeneity in lawns, the dandelion is strong, collaborative, enduring, simple, curative, elegantly spreading, and not wasteful; for these reasons, it's closely associated with the Living Building Challenge, which encourages regenerative design.

are supposed to create for society and the environment, and by giving more weight to the credits that create more benefits. Although most LEED-certified buildings are currently measured against their code-compliant peers in terms of offering a percentage improvement over the status quo, LEED could eventually push buildings to be net-positive.

But can a building really add more to nature and society than it takes away?

The Living Building Challenge (LBC) is blazing that trail: released in 2014, LBC 3.0 includes requirements for projects to produce:

- positive contributions to nature through preservation of habitat beyond the site
- net-positive energy by generating more energy than the project uses
- net-positive water through treatment and beneficial use of all the water available on the site (and only the water available on the site)
- net-positive waste by including salvaged materials

- greater happiness through integration of elements that connect people with nature
- increased social equity by providing public outdoor space and contributing to charity
- education and inspiration through education of occupants and visitors and the addition of features that have no purpose except to be beautiful

To really add more than you're taking away, you set aside the excavator and take time to deeply understand the systems you're working with. One field that's trying to help is biomimicry; using the concept of [ecosystem services](#), Janine Benyus, Ph.D., has proposed carefully inventorying all of the pre-development benefits that a site provides to the planet and then maintaining or improving those after development.

This is just a sampling of thinking on regenerative design: it's a field that promises to keep on giving for years to come.

