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EDITOR'S NOTE

The Inside Scoop

By Matt Power
Editor-in-Chief

Big Ideas Begin on Your Street

Local efforts toward sustainability can yield social and ecological rewards.

A COUPLE OF WEEKS AGO, I received an appeal from my local neighborhood association (WENA) to volunteer to build affordable window inserts for my neighbors.

Like many of you, I'm wary of small homeowner organizations. They can too easily devolve into anti-change NIMBY groups, or become de facto-style police, controlling everything from mailbox colors to lawn length. But this endeavor seemed legit. So I signed up.

Doing so cost me very little—a day of my time. But the positive impacts went beyond my expectations. They deserve an accounting:

- **New connections.** First, I met about a dozen of my neighbors with whom I had never spoken. One was a retired engineer. Another an artist. A young woman named Heather asked me to attend an upcoming environmental education fair called, "Get Energized About Energy." Another volunteer introduced me to a local Climate Action Group and asked me to join.

- **New skills.** I'm an experienced carpenter but I'm always open to new tricks. The production of the window inserts involves



many clever and portable jigs, clamps and techniques. Perfected by a non-profit called Window Dressers, the whole process is brilliantly simple, with application to many other woodworking projects.

- **Eco-impact.** Over the course of the week of volunteerism, we collectively completed 500 winter window inserts for the city of Portland. Many will go to low-income residents. But here's the best part: These windows reduce heating costs (and CO₂ offgassing) by 20 percent to 40 percent per home or apartment.

Are temporary window inserts that last 10 years the solution to climate change woes? Of course not. But the ripple effects from this project go far beyond its physical output.

You're going to hear some big ideas in this issue, from some very smart people. But my experience with WENA has convinced me that policy, codes and smarter technology alone won't create a more sustainable future. We need buy-in and participation at the neighborhood level—along with more holistic, circular products and processes—to engineer a future that serves the many, yet makes room for the rest of life on Earth. **GB**



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STUDY: Working Green Means Making More Green

In most states, environmentally friendly jobs often pay more than regular ones.

ANYONE LOOKING FOR a green job should start in Texas. The Lone Star state is where five of the nation’s best regions for environmentally friendly work are located, according to a study by financial technology company SmartAsset.

Dallas is the overall No. 1 locale for sustainable occupations, while Houston, Fort Worth, San Antonio and Austin are fourth, fifth, eighth and 16th, respectively. Denver, Newark, N.J., and Oakland round out the top 5 at numbers 2, 3 and 4, the story notes.

The survey, which covers the top 80 cities in the nation, measures each area by number of green jobs available, average salary, green salary vs. everyday salary, and housing costs, according to SmartAsset Vice President of Financial Education A.J. Smith.

“Green jobs are becoming more popular

because of a growing desire by the public to do what they can to help to help the environment,” Smith says. “They tend to pay well, if you have the right education. Across our top 11 companions, the average worker in the green economy sector gets paid around 57 percent more than the average worker.”

Wages can be high—up to \$100,000 annually in San Francisco and San Jose—but the high cost of living in those locations offsets the better earnings. In contrast, Las Vegas, with an average green jobs salary of \$77,319, is in the top one-fourth of cities overall (No. 13). But its low housing cost makes it the best city overall for profitable green employment, according to the survey. **GB**

SmartAsset’s “Best Places for Green Jobs” report can be found at <https://smartasset.com>.

BY THE NUMBERS					
THE BEST PLACES FOR GREEN JOBS					
State	Metro	Percent of workforce in a green occupation	Average earnings for green workers	Ratio of Green Earnings to Avg. Job Earnings	Housing Costs Index
1	Dallas-Ft. Worth, TX	1.9%	\$ 83,236	1.60	\$ 954
2	Denver-Aurora-Lakewood, CO	2.2%	\$ 83,542	1.49	\$ 1,180
3	Newark, NJ-PA	2.3%	\$ 90,971	1.52	\$ 1,045
4	Oakland-Hayward-Berkeley, CA	2.2%	\$ 94,393	1.50	\$ 1,431
5	Houston-The Woodlands-Sugar Land, TX	2.2%	\$ 82,350	1.56	\$ 956
6	Fort Worth-Dallas, TX	1.6%	\$ 76,824	1.70	\$ 1,015
7	Philadelphia, PA	1.8%	\$ 84,866	1.56	\$ 922
8	San Antonio-New Braunfels, TX	1.8%	\$ 73,323	1.62	\$ 900
9	Tampa-St. Petersburg-Clearwater, FL	1.6%	\$ 75,151	1.65	\$ 1,006
10	San Francisco-Berkeley City-South San Francisco, CA	2.4%	\$ 100,717	1.32	\$ 1,840
11	Las Vegas-Henderson-Paradise, NV	2.1%	\$ 77,319	1.78	\$ 1,022
12	Washington-Arlington-Alexandria, DC-VA-MD-WV	4.1%	\$ 87,947	1.28	\$ 1,577
13	Kansas City, MO-KS	2.0%	\$ 72,562	1.48	\$ 885
14	Cincinnati, OH-KY-IN	1.9%	\$ 70,720	1.48	\$ 789
15	Louisville/Jefferson County, KY-IN	1.6%	\$ 72,447	1.64	\$ 940
16	Austin-Round Rock, TX	2.0%	\$ 76,228	1.46	\$ 1,244
17	San Jose-Sunnyvale-Santa Clara, CA	2.3%	\$ 99,700	1.26	\$ 1,930
18	Aradine Santa Ana-Irvine, CA	2.1%	\$ 65,113	1.52	\$ 1,474
19	Baltimore-Columbia-Towson, MD	2.1%	\$ 77,263	1.49	\$ 1,034
20	Pittsburgh, PA	1.9%	\$ 73,853	1.56	\$ 822
21	Cleveland-Steubenville, OH	1.8%	\$ 74,129	1.54	\$ 670
22	Oklahoma City, OK	1.8%	\$ 69,817	1.54	\$ 867
23	Sacramento-Roseville-Arden-Arcade, CA	2.4%	\$ 79,485	1.44	\$ 1,145
24	Portland-Vancouver-Hillsboro, OR-WA	2.5%	\$ 74,528	1.38	\$ 1,096
25	Detroit-Dearborn-Livonia, MI	1.8%	\$ 71,838	1.49	\$ 664

Research: Translucent Solar Panels Can Also Grow Plants

Although greatly reduced in power output, translucent PV shows promise for indoor growers.

A GREENHOUSE BUILT WITH special, translucent solar panels can grow as many tomatoes and cucumbers as one with standard glazings, according to researchers at the University of California, Santa Cruz (UCSC). Studies have already shown that translucent solar panels in the kitchen can handle daylight and do “double duty” with solar glass. But this new research takes the idea to its natural next step: as a way to extend the growing season for certain crops, especially in colder climates. Although this research was fairly narrow in scope, looking primarily at the impact of the power-generating panels on plant growth, the implications are far broader, according to *Wavelength-Selective Solar Photovoltaic Systems: Powering Greenhouses for Plant Growth at the Food-Energy-Water Nexus*.

There’s a catch, however. These translucent panels do not have nearly the power output of conventional PV products, which tend to clock in at about 22 percent efficiency. The output of these prototype panels hovers around 5 percent.

In addition to the relatively low power output, the use of red dye to increase



Surprise growth. Plants germinated in a smart greenhouse under translucent solar panels fared as well or better than those cultivated in conventional greenhouses.

power generation could negatively affect growth of some plants, according to UCSC Professor of Environmental Studies and study lead author Michael Loik.

The study appears in a recent issue of the American Geophysical Union’s journal *Earth’s Future*. **GB**

United Way, Thrive Among Winners of DOE’s 2017 Innovation Awards

Recipients are helping to lead nation’s effort toward net-zero homes.



Bright spot. A solar-reflective metal roof and triple-pane windows helped make Alliance Green Builders’ Casa Aquila in Ramona, Calif., one of the winners of the Department of Energy’s 2017 Innovation Awards.

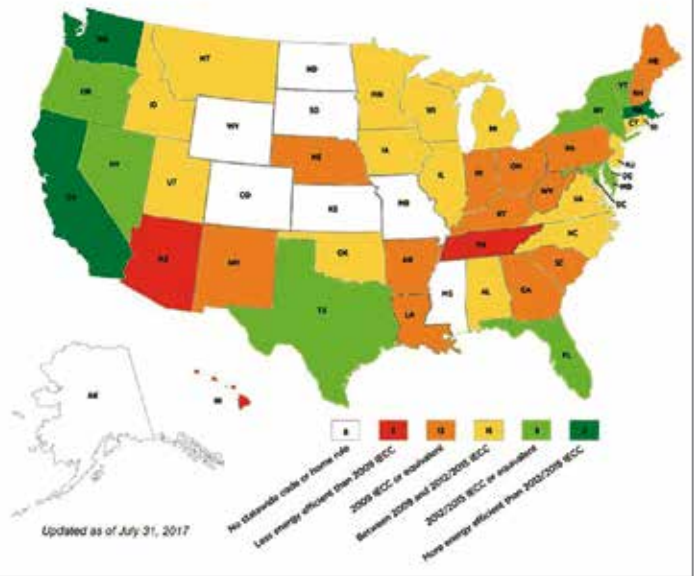
UNITED WAY OF LONG ISLAND, Alliance Green Builders of Ramona, Calif., Greenhill Contracting of Gardiner, N.Y., Thrive Home Builders of Lone Tree, Colo., and Thrive Home Builders of Denver were grand winners of the U.S. Department of Energy (DOE)’s 2017 Innovation Awards, the agency announced. The projects were among 26 winners in five categories: Affordable Homes, Multi-Family Homes, Production Homes, Custom Homes (Buyers) and Custom Homes (Spec).

According to Sam Rashkin, chief architect at DOE’s Building Technologies Office, Housing Innovation Award winners represent the top 1 percent of builders nationwide. These builders “successfully demonstrate they can meet the federal government’s most-rigorous specifications for high-performance homes,” Rashkin says. Those specifications include ways to achieve ultra-low utility bills, ensured comfort, comprehensive water protection, whole-house fresh air delivery, high-capture filtration, contaminant control and enhanced durability.

“These winners are leading a national movement to zero-energy-ready homes,” Rashkin says. “[They provide] better places for Americans to live, stronger communities, and a more economically and environmentally resilient nation.” **GB**

The list of winners may be found at <http://bit.ly/2hPCqgj>.

RESIDENTIAL BUILDINGS



A substandard effort. Nearly one-fourth of all states lack residential building energy efficiency codes that meet 2009 IECC standards, while only three exceed the 2012/2015 IECC requirements.

‘Stretch’ Codes Offer Fast-Track Energy Savings in Slow-to-Adopt States

Local building requirements can now exceed environmental standards of national building codes. THE 20 PERCENT STRETCH CODE, developed by New Buildings Institute (NBI), is the first of two such stretch codes being introduced by the organization in coming months. These codes provide building strategies that work to squeeze every bit of waste out of building energy performance, even to the point of making them zero-energy-ready, according to NBI. In essence, buildings could be so energy efficient that power needs could be met with on-site or nearby renewable energy resources, the institute reports.

Current building codes experience slow or erratic adoption by states, NBI notes. In such cases, new buildings will be locked in to a lifetime of underperformance. These structures are constructed to meet only minimal energy efficiency requirements set forth by state or local building codes, ones that are often based on national model building codes (the International Energy Conservation Code and ASHRAE 90.1).

National building codes, which establish baseline standards for energy efficiency and other construction practices, are only updated every three years and can easily fall behind best practice, NBI adds. Meanwhile, many local jurisdictions have set carbon emissions reduction and energy efficiency goals that exceed the national pace.

NBI’s 20 Percent Stretch Code acts as an overlay to existing national codes, to make it easier for states and cities to adopt them. They can also be adopted as voluntary codes or policies. Cities and states, when working with local utilities, can often offer designers and builders incentives to abide by the codes.

So far, the effort is catching on. As of October 2017, 214 municipalities have adopted the stretch code, NBI notes. For more information: New Buildings Institute (<http://bit.ly/2zv8gzp>) Building Codes Assistance Project (<http://bit.ly/2iFtnag>). **GB**



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HERE’S A SAMPLE OF WHAT’S INSIDE

“Europeans are at least coming to grips with the reality that the fossil fuel era is dying, and they are beginning to chart a course into a green future. Unfortunately, Americans, for the most part, continue to be in a state of denial.” (p.26)

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CHOSING ABUNDANCE

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CHAMPIONS OF CHANGE

CHOOSING ABUNDANCE

Change is coming, not just for the housing industry, but for the planet. We still have time to make regenerative choices.

AS THIS ISSUE GOES TO PRINT, our second annual Sustainability Summit is fast approaching. We're hosting some big thinkers in Orlando in January, to really dig in to the challenges—and opportunities facing Americans, and the world. Will we embrace the "Third Industrial Revolution," and use renewable energy and technology to make life better for all? How can we green and strengthen our cities? What kind of economy can make our lives peaceful and full, without wiping out other species? We've touched on these questions in this special issue. Join us in Orlando in January, and add your voice to the conversation.

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The right path. Chicago's City Hall, with its living walls and path-derived gardens, is a prime example of how a green roof can look like more than just a building with plants on top.

Photo-Synergy

Green roofs are becoming a red-hot way to promote sustainable development.

BY PAUL HAWKEN

FROM AN AERIAL VIEW, most cities are a patchwork of gray, brown and black rooftops. But look down over some parts of Stuttgart, Germany, or Linz, Austria, and many rooftops are easily mistaken for small parks or grassy squares. They are affirmation of the modern movement for green or "living" roofs, which has taken off in the past 50 years. They also evoke a much longer history, back to the heyday of the

Viking Age, when such roofs first became popular in Scandinavia. Rewind modern-day Norway to the ninth or 10th century, and you would find a landscape dotted with sod-roofed homes, now called torvtak.

Today, the conventional rooftop is a brutal, lifeless terrain, typically serving a sole purpose: protecting the building and inhabitants beneath from the elements. In fulfilling that role, roofs take a beating from sun, wind, rain and snow. They can endure temperatures up to 90 degrees higher than the air around them on a hot day, making it harder to cool the floors below and contributing to the urban heat island effect. This phenomenon of cities being measurably hotter than nearby rural and suburban areas is particularly harmful for residents who are young, elderly or ill.

Green roofs, on the other hand, are veritable ecosystems in the sky, designed to harness the moderating forces of natural ecosystems and

curtail a building's carbon emissions in the process. Living roofscapes depend on a series of carefully designed layers that ensure the roof itself is protected, rainwater is filtered and drained, and plants can thrive. If aiming for performance with minimal inputs, they may have shallow soil to support a simple carpet of hearty, self-sufficient groundcover such as sedum. Often called stonecrops, these flowering succulents cover more than 10 acres atop Ford's truck plant in Dearborn, Mich.

Green roofs can also have intensive systems to sustain full-fledged gardens, parks or farms—places where people can rest, recreate, and raise flowers or food. That is how once-unused rooftops across Brooklyn have become a mecca of urban agriculture.

Different Shades of Green

The intensity of investment, structural requirements, installation and upkeep depends on the level of greenery chosen. Though upfront costs for green roofs are higher than those of their conventional cousins and some maintenance is required, returns are compelling and long-term costs are comparable, sometimes lower. The soil and vegetation function as living insulation, moderating building temperatures year-round—cooler in summer, warmer in winter.

Because the energy required for heating and air-conditioning is curbed, greenhouse gas emissions are lower, as are costs. On the floor below a living roof, energy use for cooling can drop by 50 percent. Green roofs also sequester carbon in their soil and biomass, filter air pollutants, reduce rainwater runoff, support biodiversity within cityscapes, and address urban heat islands—benefiting not just the floors beneath but nearby buildings as well. Because vegetation protects the roof itself from the elements and UV rays, green roofs

CHAMPIONS OF CHANGE

have double the life span of conventional ones.

People who live, work or play near green roofs enjoy more natural beauty and greater well-being—the result of biophilia, humanity's innate affinity for the natural world. At the same time, building developers, owners and operators enjoy increased property appeal and value. Green roofs bring what people love to encounter on the ground to elevated yet often wasted spaces. Land is generally the most limited urban resource, but green roofs can create acres and acres of opportunity for green space and the climate benefits that come with it.

To see the green roof on Chicago's City Hall or Singapore's Nanyang Technological University is to imagine the breadth of the opportunity atop buildings. These signature projects and other demonstration efforts—such as those atop bus stops, visible to pedestrians and passing cars—inspire wider public support. Hot spots of implementation, such as Germany, offer a key lesson: Construction incentives for green roofs and building policy that encourages or mandates their use are twin drivers of proliferation. They are the stimulus for scaling—from oddity to ordinary.

To raise the ratio of green in Singapore, for example, the government covers half the cost of green roof installation. Chicago fast-tracks permits for buildings with green roofs. Regulations around storm water control and retention also can encourage adoption of green roofs. In addition, clear and consistent industry standards and capable architects, engineers and builders can ensure quality.



Another round, please. The City of San Francisco's green roof mandate is expected to make projects such as this domed development at the California Academy of Sciences a common site among new residential and commercial construction.



CREDIT: GRAMICIN/FILCKR

Singapore special. Nanyang Technological University's School of Art, Design and Media features a five-story green roof sloped at a 45-degree angle. The roof doubles as a scenic outdoor communal space and keeps the building's ambient temperature low.

In October 2016, San Francisco became the first U.S. city to adopt a green roof mandate. As of this year, 15 percent to 30 percent of roof space on new buildings must be green, use solar power or both. Other cities should follow suit.

A Perfect Patchwork

By attending to the life both within buildings and on top of them, the world's current patchwork of barren roofs can flower, transforming cities into life-supporting systems. Cool roofs are kith and kin to green roofs, achieving similar impact but doing so with different methods, hurdles and boons. "Reflection" is from the Latin for "bending back," and cool roofs do just that. When solar energy hits a conventional dark roof on a 99-degree day, just 5 percent of it is reflected back into space. The rest remains, heating the building and surrounding air.

A cool roof, on the other hand, reflects up to 80 percent of that solar energy back into space. Cool roofs take a variety of forms: light-colored metal, shingles, tiles, coatings, membranes and more being developed.

Whatever technology is used, in an increasingly urban and warming world, sending solar energy back to where it came from, rather than absorbing it, is essential. Not only do cool roofs reduce heat taken on by buildings, driving down energy use for cooling, they also reduce the temperature in cities. Recent studies have shown that

the capacity of cool roofs to relieve the urban heat island effect is more pronounced during heat waves, when heat islands are particularly intense, sometimes deadly.

The growth of cities continues, so making them cleaner, more livable and better for well-being is essential. Where green roofs struggle with the high costs and special skills needed for implementation, cool roofs are cheaper, simpler and more like conventional installs. They are eminently doable. Though regular cleaning is needed to sustain top-notch reflection, maintenance needs are much lower as well. Despite this ease, it is necessary to consider context. Cool roofs can create glare for their neighbors, and their impact depends on local climate. Hotter places benefit more from their cooling effect, while suffering less from their reduced heat retention in cold months. In colder climates, the insulation of green roofs may be more optimal year-round.

Cool roofs are not a new concept, but have been slow to take root worldwide. They are on the rise in the United States and European

Union, while getting increasing attention, and occasionally official commitment, elsewhere. California has been their greatest champion, integrating cool roofs into the state's building efficiency standards, Title 24, a decade ago. The success there shows the way forward, including the importance of regulations, rebates and incentive programs.

The evolution of cool roof technology is also promising. Traditional building aesthetics have worked against so-called "white roofs," but cool roof materials now come in an array of colors, and adjustable levels of reflection may ultimately address their downside in winter. In the interest of "bending back" not just solar energy and air temperature but also emissions, cool roofs hold considerable promise. **GB**

Note: This article is taken from *Drawdown: The Most Comprehensive Plan Ever Proposed to Reverse Global Warming*, which describes the 100 most substantive solutions to climate change, as well as their financial histories, the carbon impacts they provide, the relative cost and savings and each solution's path to adoption.



Paul Hawken is an author and executive director of climate research coalition Project Drawdown. He is a keynote speaker at Sustainability Symposium: Champions of Change on Jan. 8 in Orlando, Fla. To register, visit www.greenbuildermedia.com/champions-of-change-2018.

Clearing the Air

Selling the concept of a green roof sometimes requires shattering a few myths.

BY GREEN BUILDER STAFF

SUSTAINABILITY HAS BEEN a strong selling point for residential homes for about a decade. Between increased and improved enviro-friendly building standards and a general desire by homebuyers to "do right" by the environment, it's good to go green—and even better to quietly brag about it.

But while consumer literature, building competitions and on-site home tours gleefully point out obvious green components—such as low-flow showerheads, LED lights, Energy Star-rated appliances—and the less obvious, such as triple-pane glass, ultra-efficient insulation and recirculating heat pumps—there's an item that presents itself nicely to the crowd and is more likely to get visitors to at least snap a photo of the house, if not flat-out beg for a key to the front door.

You might say that item—the green, vegetated or "living" roof—is a bit over the buyer's head... and that's a good thing.

To help remove, or at least clarify, some of the buyers' and builders' preconceived notions about green roofs, here's a look at a few common myths and how to work around them with customers.

1. All green roofs are the same, no matter what they're called. There's some truth here: By definition, a green roof is one that promotes plant growth as a tool for climate control and better air quality. But aside from that, there are three types of living roofs: "intensive" green roofs or roof gardens, which are accessible and may include larger plants and water features; "extensive" roofs, which are thinner, lighter and closer in appearance to a standard roof; and "semi-intensive," which contain numerous different plant species, mostly native grasses and flowers.

2. Green roofs are a new environmental trend. Contrary to this belief, green roofs have existed in some form since the era of Ancient Greece. The modern vision of living roof appeared in mid-1940s Europe. Like so many items in the early baby boomer years, homes with green roofs became popular, but were in short supply.

3. Green roofs cause structural problems. If a roof is going to leak, it's going to leak no matter if there is grass or tile shingles up there. A properly designed living roof—one with a solid waterproofing member (something all roofs are supposed to have)—will be just as reliable as a regular roof. It may even better protect the structure, because the plants act as an extra barrier to wood-destroying ultraviolet light. The

key problem could lie with the age of the roof when the garden goes in. Building codes for a new home take into account the impact of a green roof upon the structure's designed load. But retrofitted green roofs are subject to varying requirements based on geography and the home's original load capability.

4. Only succulents can be used on a green roof. Water-storing plants are popular because they look good and can withstand fairly harsh conditions while up on the roof. But many types of vegetation can survive, particularly native grasses, if the right conditions exist. Irrigation is the key, as all plants need water (to some degree).

5. A green roof is just some dirt on the top of the house. Strange how illogical this sounds, but for some builders and buyers, it makes perfect sense. A regular, ground-based garden is more than a couple shovels of dirt. There are times when a green roof doesn't even need soil. It's not as



CREDIT: PHOTOTOURING/FILCKR

Time tested. Contrary to popular belief, green roofs and their air-cleansing capabilities have literally been on the scene for centuries.

simple as mere potting soil—perlite or other porous materials are typical components. But it's not an impossible task, either.

6. Once a green roof is installed, the owner is on their own. Because they use various under-warranty building products, the same protections apply to green roofs as for any covered component inside the home. Every roof handled by a professional installer, green or otherwise, should have a service contract available for annual maintenance. How much it covers depend on exactly what the owner has planned for the roof. **GB**



Bon appétit. A well-maintained urban garden can typically result in hundreds of pounds of fruits or vegetables every year—and add a few hundred dollars to the value of your home.

FARM FINESSE

Homeowners have a new approach to going green: using a green thumb.

BY LARA HERMANSON

WHEN LOOKING TO BUY OR RENT a new home, there are many items on the future occupants' standard wish lists: a state-of-the-art kitchen, two-car garage or a full gym space. But there's a new green item among the residents' most-wanted: urban farms.

Individuals and families are flocking to new homes that include raised vegetable beds, an orchard and—space permitting—a vineyard. Buyers not only want to enjoy the produce these gardens give; they want to take advantage of

a fun way to reduce stress after work, digging and weeding with local farmers that maintain the beds. Decades after air conditioning drove urban and suburban dwellers indoors, the outdoors has now become as attractive as a stunning interior.

Vegetable gardens, once a far-fetched concept to homeowners obsessed with lawn and manicured hedges, have become a focal point in many urban and suburban homes. This booming edible garden scene has already captured the West Coast and is starting to expand east, attracting the masses before they even step foot inside a potential new home.

The knowledge to implement great crop rotation on a small residential scale has been honed over 17 seasons and via more than 700 projects so during maintenance, farmers can educate the residents about seasonal crop cycles.

DESIGNING THE GARDEN

Just as how a customer would seek out a landscaper to remake their yard, urban farming ventures like Farmscape—the nation's largest—works with the homeowners, views the site and begins to develop a design for a dream home edible garden. Many factors go into developing the perfect design.

Location is key. A vegetable garden requires eight hours of sun, year round, for maximum success. To confirm this, sun measurements are taken to ensure the eaves of the home and trees will not block the space.

The same goes for the trees' location: The garden needs to be placed 10 to 20 feet away from major root systems. Otherwise, tree roots could invade a heavily composted garden and suck out all the water and nutrients, especially in the drought-parched southwestern United States.

Also, designers must take into account the specific microclimate of each property. What works on the East Coast will not work in California's central valley. Proper garden design is a huge contributor to the success of any project, and there are many environmental factors to consider.

How big should the garden be? Among the questions that homeowners must consider when it comes to design: How much food do they want to eat? Farmscape's raised beds generally bear 2.5 pounds per square foot annually, meaning a 100-square-foot garden will yield 250 pounds a year, or roughly five pounds per week. This could be a lot of food for a one- or two-person household, but for a vegan family of four, this barely scratches the surface.

Budget is a huge factor. Raised beds, with organic soil, drip irrigation, trellising and untreated wood frames, are \$70 to \$100 per square foot, and hardscape (decomposed granite, flagstone, etc.) starts at \$10 per square foot. Having a realistic budget going into the visual process helps the design team create a vision within [a specific] price range.

One of the most affordable design elements are dwarf fruit trees, which max out at eight to 10 feet but can be pruned much smaller. Bare root trees, which are less than one year old, are great to dot through a landscape, as they provide much beauty and visual interest on their way to delivering 100 to 200 pounds of produce a year. And, they are extremely cost effective. Generally, purchasing, planting and irrigating a bare root tree will cost around \$150. Once the tree is mature (year two to four), it will pump out hundreds of dollars of organic fruit.

After considering all these factors, Farmscape draws the design plans with crop suggestions for all viable seasons. The time to build the gardens varies on the size they're working with, as well as whether additional accents such as orchards or vineyards can be included. The same goes for price: Even though the fees are comparable to a landscape gardener, the long-term cost benefits are higher. As with

a landscaper that regularly prunes and preens the land, Farmscape's urban farmers will maintain the crops. But instead of just watching the gardener while they work away, residents are encouraged to nurture their crops.

BUILDING THE GARDEN

After a design is complete, a licensed landscape contractor (such as Farmscape) can install each project. Installation can include demolishing an existing landscape, heavily pruning overgrown trees and shrubs, and retrofitting or replacing the irrigation system.

Responsible landscapers unanimously agree that drip irrigation is the appropriate method for environmental purposes and plant health. Drip emitters deliver water deep into the soil, protecting it from the evaporation that overhead spraying incurs. Also, drip emitters don't spray the sides of houses or sidewalks. Finally, drip irrigating encourages tree roots to grow deep into the soil, producing sturdier, longer-lived plants.

Another key factor of installations is choosing an appropriate soil blend. For raised beds, a good mix of organic planting compost and potting soil will help create a loamy soil that delicate root tips can push through. Every month, it is wise to amend this blend with a balanced organic vegetable fertilizer. On a seasonal basis, this is to be topped off with fresh compost to feed next season's plants.

Finally, good structure has to be employed to support vines and stalks to grow tall and spread out. For example, tomatoes can grow to be five feet tall and produce until October in California, if they are properly supported. Peppers and eggplants must be staked to keep them from getting top-heavy and falling over. Beans and peas need 5-by-5 trellises to reach their full potential. Without proper support structures, plants will contract diseases from laying in a jumble on the soil, and all the hard work put into producing them will be for naught.

ORGANIC MAINTENANCE

Homeowners and property managers (for multi-family dwellings) work with Farmscape's team to determine the crops for each season. Every few months, residents can expect to see lettuce beds replaced with tomatoes or carrots taking over the cabbage section. The knowledge to implement great crop rotation on a small residential scale has been honed over 17 seasons and via more than 700 projects so during maintenance, farmers can educate the residents about seasonal crop cycles.

In addition, farmers and homeowners will trellis, prune, harvest and handle pest issues without using chemicals. Doing so requires a lot of hand-removal of damaging insects like aphids, use of beneficial plants like marigolds which repel insects, and organic pest control items like *Sluggo* (iron pellets) or *B.T.* (a naturally occurring soil bacteria that decimates larval insect populations).

Mature trees will always be the focus of a home's foundation. They keep properties cool during the heat and create windbreak barriers in the cold weather. They filter pollutants out of the air.

Native plants that are self-sustaining can be cost effective to maintain. They also provide a sensational aesthetic to a home's line of sight. Lose the greenery, and property heating and cooling systems tend to be higher, validating that the pleasant appearance of a great garden is also a natural cost reduction to the homeowners. Additionally, large trees and perennial native plants sequester carbon into the soil, literally pulling pollutants out of the air and storing them in the ground.

BRINGING COMMUNITIES TOGETHER

Urban gardens are also resulting in a natural gravitational pull for busy, tech-dependent urbanites. Edible beds can turn a home into

a vibrant farmhouse ripe for entertaining. They can also produce a particular strain of "garden envy." Once one neighbor gets the outdoor bed bug, it tends to spread through the community like wildfire.

Because city dwellers are glued to their devices and pretty much only see the sun when they're racing from A to B, good old-fashioned fresh air is usually now taken for granted as its own healthy attribute. Making a conscious effort to head to the gym or put on those sneakers for a run can be rebutted by any excuse to reject real exercise. But regular nurturing of an edible garden offers a way to get outside and burn calories while connecting mentally and physically with the land.

It's common for homeowners to work side by side with the farmers, and learn a thing or two about radish picking. An hour later, they are savvier on seasonal crop changes and the positive environmental effects of urban farming, and they have done something good for

THE LIVING WALL GROWS UP

BY GREEN BUILDER STAFF

For some gardens, "onward" means "upward." The Phipps Conservatory and Botanical Gardens in Pittsburgh has unveiled a display of living walls to demonstrate how vertical gardening can be a viable way to grow produce in urban areas.

According to Michael Bechtel, Phipps' display horticulturist, limited space poses a significant challenge for urban gardening. The green walls also provide the conservatory—an environmental vanguard in Pittsburgh since 1893—with a way to study, evaluate and learn about growing edibles on space-efficient vertical gardens. "We'll be able to offer education and assistance to homeowners, schools and community organizations on the planning, installing and maintenance of their own green walls so that they can benefit from fresh produce," Bechtel says.

The 10-piece display was created by Spring Lake, Mich.-based LiveWall, which specializes in practical and sustainable living wall system solutions for vertical gardening.

Phipps tested the first LiveWall Inspire Living Wall Panel in 2015 on the south-facing wall of its production greenhouse facility. It has since installed nine more. Each panel is 4' wide by 7'4" tall and has 24 molded plastic modular planter boxes.

There's a two-season planting cycle. In the spring, beets, carrots, collard greens, kale and kohlrabi grow on the green walls. Summer plantings include basil, rosemary, thyme, celery root and various peppers.

Bechtel notes that the display correlates with Phipps' various adult and youth programs, classes and events to educate visitors about the benefits of greener gardening and healthy eating. In addition, Phipps sponsors



Looking on up. Green walls transform existing structures into vertical gardens that families and community groups can use to grow their own fresh produce.

Homegrown, its outreach program dedicated to increasing community access to fresh produce, promoting better food choices, and improving the overall health of families. Since 2013, the program has established more than 200 vegetable gardens in urban and underserved neighborhoods. **GB**

- The Phipps Conservatory and Botanical Gardens, www.phippsconservatory.org
- LiveWall LLC, <http://livewall.com>



Standouts. Basket-like wattle beds, made from all-organic compounds, allow for easy management of various urban gardens within the overall residential landscape.

their minds, bodies and hearts. The neighbors pop over to help out, decide they'd also like an edible garden and the seed is planted.

As a result, it's not uncommon for the maintenance farmers to witness neighbors chatting away while harvesting the beds together. This also helps urbanites learn more about who lives on their street, instead of the interaction being a quick wave and hello every few days.

There's one more neighborhood bonus: The National Association of Realtors *HouseLogic* magazine notes that excellent landscaping can boost property values by up to 28 percent. A typical large oak can also add \$410 to a home's property value, according to the National Tree Benefit calculator. Silver maples can increase home values by \$2,500, according to *HouseLogic*. It's all under the same rationale that a better-maintained home will sell faster and at a higher price

on the market than a rundown, tired-looking property.

A garden can be a dated, maintenance-heavy space that's stressful, toxic and expensive to maintain. Or, it can be easily transformed into Narnia by using native plants, fruit trees and a couple of vegetable beds. Homeowners will scoot friends and family right through the front door and into the garden, where they'll then actively pump energy back into their bodies knowing that every cucumber growing is adding value to their nest egg. **GB**

Lara Hermanson is co-founder and principal at Farmscape (<http://farmscapedgardens.com>), the nation's largest urban-farming company. Farmscape has worked on more than 700 urban farming projects, including agri-hoods, individual homes and corporate clients such as Levi's Stadium, AT&T Park and Oracle.



Fore plan. Environmental conditions and outside-the-box thinking are turning a Southern California subdivision's golf course into an eco-convenient olive garden.

It's a Beautiful Day in the Agri-hood

There's a new day on the green as golf balls are replaced by olive groves.

BY GREEN BUILDER STAFF

AFTER MORE THAN A DECADE IN LIMBO, an 18-hole golf course at a Palm Springs subdivision is being transformed into 70 acres of olive groves and other drought-tolerant fixtures. The switch is being made as part of the project's development into an "agri-hood."

According to Brad Shuckhart, president of the California division of Freehold Communities, when complete the 300-acre Miralon subdivision will be one of the nation's largest agricultural neighborhoods, a locale where new homes are built in close proximity to community farms. Miralon, which breaks ground in early 2018,

is master planned for 1,150 moderately priced single-family homes, townhouses and condominiums, and will draw in about 2,500 new residents to Palm Springs.

Miralon's original developer, SunCal, halted the project in 2005 after its financier, Lehman Brothers, foreclosed on the property. SunCal had completed about half of the project, including the professional-grade golf course. When Freehold bought the land in 2016, it had to decide what to do with those 18 holes. "We considered revitalizing the golf course," Shuckhart says. "But we wanted a broader appeal. There are a lot of championship golf courses out here. We wanted something that would attract as many different factions of buyer as possible."

More than 150 agri-hoods exist across the U.S., about half of which have taken shape in the past five years, according to the Urban Land Institute.



Planning ahead. Miralon's 300-plus acres will include nearly 50 acres of heat-resistant olive trees to beautify the area for 1,150 homes.

The booming demand for agri-hoods—coupled with a general decline in golf course profitability—made the changeover an attractive prospect, according to Shuckhart. More than 150 agri-hoods exist across the U.S., about half of which have taken shape in the past five years, according to the Urban Land Institute (ULI). In contrast, more than 100 golf courses have closed since 2012, ULI reports.

California's drought—at that point, four years old—sealed the deal. "Golf courses take a lot of water and other resources to maintain," Shuckhart says. "On the other hand, an olive grove loves hot weather, can withstand a drought and isn't attractive to animals."

Freehold has partnered with the Temecula Olive Oil Company, which will harvest the olives and press oil on site. Other produce from common gardens will provide homeowners with a farm-to-fork lifestyle, Shuckhart notes.

Amenities will include an outdoor demonstration kitchen, dog parks,

exercise stations and fire pits. Roads built for golf carts will become 6.5 miles of hiking paths. All homes will have solar panels as a standard feature.

Shuckhart says Miralon should attract buyers from throughout Southern California. That should include a mix of retiring baby boomers, people who want a weekend getaway home, and even the younger millennial generation.

Millennials will arrive because of Miralon's agri-hood element, according to Los Angeles real estate investor Paul Habibi. "Agri-hoods combine economic profits, environmental good and social benefit," he says. "Millennials find that appealing, because they usually want to do more than just buy something. They want that purchase to somehow benefit society." **GB**

- Freehold Communities, www.freeholdcommunities.com
- Miralon, www.miralonplanning.com

CHAMPIONS OF CHANGE

Sustainability's Third Act



Power play. Great economic revolutions in history occur when new communication technologies converge with new energy systems.

When 'new' communication meets even newer energy systems, a green economic revolution is inevitable.

BY JEREMY RIFKIN

OUR INDUSTRIAL CIVILIZATION is at a crossroads. Oil and the other fossil fuel energies that make up the industrial way of life are sunsetting, and the technologies made from and propelled by these energies are antiquated. The entire industrial infrastructure built off of fossil fuels is aging and in disrepair. The result is that unemployment is rising to dangerous levels all over the world. Governments, businesses and consumers are awash in



CREDIT: PHONNAPHOTO/ISTOCK

Blessing or curse? Technology offers the potential to ease our lives, but only if the benefits are shared.

debt, and living standards are plummeting everywhere. A record 1 billion human beings—nearly one-seventh of the human race—face hunger and starvation.

Worse, climate change from fossil fuel-based industrial activity looms on the horizon. Our scientists warn that we face a potentially cataclysmic change in the temperature and chemistry of the planet, which threatens to destabilize ecosystems around the world. Scientists worry that we may be on the brink of a mass extinction of plant and animal life by the end of the century, imperiling our own species' ability to survive. It is becoming increasingly clear that we need a new economic narrative that can take us into a more equitable and sustainable future.

PROLOGUE

By the 1980s, the evidence was mounting that the fossil fuel-driven industrial revolution was peaking, and that human-induced climate change was forcing a planetary crisis of untold proportions. For [more than] 30 years, I have been searching for a new paradigm that could usher in a post-carbon era. In my explorations, I came to realize that the great economic revolutions in history occur when new communication technologies converge with new energy systems. New energy regimes make possible the creation of more interdependent economic activity and expanded commercial exchange, as well as facilitate denser and inclusive social relationships. The accompanying communication revolutions become the means to organize and manage the new temporal and spatial dynamics that arise from new energy systems.

In the 19th century, steam-powered print technology became the communication medium to manage the coal-fired rail infrastructure and the incipient national markets of the First Industrial Revolution. In the 20th century, electronic communications—the telephone and

Scientists worry that we may be on the brink of a mass extinction of plant and animal life by the end of the century, imperiling our own species' ability to survive.

later, radio and television—became the communication medium to manage and market the oil-powered auto age, and the mass consumer culture of the Second Industrial Revolution.

In the mid-1990s, it dawned on me that a new convergence of communication and energy was in the offing. Internet technology and renewable energies were about to merge to create a powerful new infrastructure for a Third Industrial Revolution (TIR) that would change the world. In the coming era, hundreds of millions of people will produce their own green energy in their homes, offices and factories, and share it with each other in an "energy Internet," just like we now create and share information online. The democratization of energy will bring with it a fundamental reordering of human relationships, impacting the very way we conduct business, govern society, educate our children and engage in civic life.

SIGNS OF THE TIMES

I introduced the Third Industrial Revolution vision at the Wharton School's Advanced Management Program (AMP), at the University of Pennsylvania, where I have been a senior lecturer for more



CREDIT: ARTUAZ/ISTOCK

Five makes one. Renewable energy is one of the five key components or “pillars” behind the Third Industrial Revolution.

than 16 years on new trends in science, technology, the economy and society. The five-week program exposes CEOs and business executives from around the world to the emerging issues and challenges they will face in the 21st century. The idea soon found its way into corporate suites and became part of the political lexicon among heads of state in the European Union.

By the year 2000, the European Union was aggressively pursuing policies to significantly reduce its carbon footprint and transition into a sustainable economic era. Europeans were readying targets and benchmarks, resetting research and development priorities, and putting into place codes, regulations and standards for a new economic journey. By contrast, America was preoccupied with the newest gizmos and “killer apps” coming out of Silicon Valley, and homeowners were flush with excitement over a bullish real estate market pumped up by subprime mortgages.

Few Americans were interested in sobering peak oil forecasts, dire climate change warnings, and the growing signs that beneath the surface, our economy was not well. There was an air of contentment, even complacency, across the country, confirming once again the belief that our good fortune demonstrated our superiority over other nations.

Feeling a little like an outsider in my own country, I chose to ignore Horace Greeley’s sage advice to every malcontent in 1850 to “Go West, young man, go West,” and decided to travel in the opposite direction, across the ocean to old Europe, where new ideas about the future prospects of the human race were being seriously entertained.

EUROPE IS WHERE THE ANSWER IS

I know at this point, many of my American readers are rolling their eyes and saying, “Give me a break! Europe is falling apart and living in the past. The whole place is one big museum. It may be a nice destination for a holiday, but is no longer a serious contender on the world scene.”

I’m not naïve to Europe’s many problems, failings and contradictions. But pejorative slurs could just as easily be leveled at the United States and other governments for their many limitations. And before we Americans become too puffed up about our own importance, we should take note that the European Union, not the United States or China, is the biggest economy in the world. The gross domestic product (GDP) of its 27 member states exceeds the GDP of our 50 states. While the European Union doesn’t field much of a global military presence, it is a formidable force on the international stage. More to the point, the European Union is virtually alone among the governments of the world in asking the big questions about our future viability as a species on Earth.

So I went east. For 10 years, I spent more than 40 percent of my time in the European Union, sometimes commuting weekly back and forth across the Atlantic, working with governments, the business community and civil society organizations to advance the Third Industrial Revolution.

In 2006, I began working with the leadership of the European Parliament in drafting a Third Industrial Revolution economic development plan. Then, in May 2007, the European Parliament issued a formal written declaration endorsing the Third Industrial Revolution as the long-term economic vision and road map for the European Union. The Third Industrial Revolution is now being implemented by the various agencies within the European

Commission as well as in the member states.

A year later, in October 2008, just weeks after the global economic collapse, my office hurriedly assembled a meeting in Washington, D.C., of 80 CEOs and senior executives from the world’s leading companies in renewable energy, construction, architecture, real estate, IT, power and utilities, and transport and logistics to discuss how we might turn the crisis into an opportunity.

Business leaders and trade associations attending the gathering agreed that they could no longer go it alone and committed to creating a Third Industrial Revolution network that could work with governments, local businesses and civil society organizations toward the goal of transitioning the global economy into a distributed post-carbon era. The economic development group is the largest of its kind in the world, and is currently working with cities, regions and national governments to develop master plans to transform their economies into Third Industrial Revolution infrastructures.

AN EXPANDING IDEA

The Third Industrial Revolution vision is quickly spreading to countries in Asia, Africa and the Americas. On May 24, 2011, I presented the five-pillar TIR economic plan in a keynote address at the 50th anniversary conference of the Organization for Economic Cooperation and Development (OECD) in Paris, attended by heads of state and ministers from the 34 participating member nations. The presentation accompanied the rollout of an OECD green growth economic plan which will serve as a template to begin preparing

In the coming era, hundreds of millions of people will produce their own green energy in their homes, offices and factories, and share it with each other in an “energy Internet,” just like we now create and share information online.

the nations of the world for a post carbon industrial future.

In designing the EU blueprint for the Third Industrial Revolution, I have been privileged to work with many of Europe’s leading heads of state, including Chancellor Angela Merkel of Germany; Prime Minister Romano Prodi of Italy; Prime Minister José Luis Rodríguez Zapatero of Spain; Manuel Barroso, the president of the European Commission; and five of the presidents of the European Council.

LESSONS TO LEARN?

Is there anything we Americans can learn from what’s happening in Europe? I believe so. We need to begin by taking a careful look at



CREDIT: TOM WANG/ISTOCK

New day dawning. The sun is setting on Old World-style fossil fuel-based energy sources and rising on green sources such as solar and wind.

The single-most important factor in raising hundreds of millions of people out of poverty is having reliable and affordable access to green electricity. All other economic development is impossible in its absence.

what our European friends are saying and attempting to do. However falteringly, Europeans are at least coming to grips with the reality that the fossil fuel era is dying, and they are beginning to chart a course into a green future. Unfortunately, Americans, for the most part, continue to be in a state of denial, not wishing to acknowledge that the economic system that served us so well in the past is now on life support. Like Europe, we need to own up and pony up.

But what can we bring to the party? While Europe has come up with a compelling narrative, no one can tell a story better than America. Madison Avenue, Hollywood and the Silicon Valley excel at this. What has distinguished America is not so much our manufacturing acumen or military prowess, but our uncanny ability to envision the future with such vividness and clarity that people feel as if they've arrived even before they've left the station. If and when Americans truly "get" the new Third Industrial Revolution narrative, we have the unequalled ability to move quickly to make that dream a reality.

The Third Industrial Revolution is the last of the great Industrial Revolutions and will lay the foundational infrastructure for an emerging collaborative age. The 40-year build-out of the TIR infrastructure will create hundreds of thousands of new businesses and hundreds of millions of new jobs. Its completion will signal the end of a 200-year commercial saga characterized by industrious thinking, entrepreneurial markets and mass labor workforces, and the beginning of a new era marked by collaborative behavior, social networks and boutique professional and technical workforces.

In the coming half century, the conventional, centralized business operations of the First and Second Industrial Revolutions will increasingly be subsumed by the distributed business practices of the Third Industrial Revolution; and the traditional, hierarchical organization of economic and political power will give way to lateral power organized nodally across society.

LATERAL POWER CHARTS A PATH

At first blush, the very notion of lateral power seems so contradictory to how we have experienced power relations through much of history. Power, after all, has traditionally been organized pyramidically from top to bottom. Today, however, the collaborative power unleashed by the coming together of Internet technology and renewable energies, fundamentally restructures human relationships, from top to bottom to side to side, with profound implications for the future of society.

The music companies didn't understand distributed power until millions of young people began sharing music online, and corporate revenues tumbled in less than a decade. Encyclopedia Britannica did not appreciate the distributed and collaborative power that made Wikipedia the leading reference source in the world. Nor did the newspapers take seriously the distributed power of the blogosphere; now many publications are going out of business or transferring

much of their activities online. The implications of people sharing distributed energy in an open commons are even more far-reaching.

Like every other communication and energy infrastructure in history, the various pillars of a Third Industrial Revolution must be laid down simultaneously or the foundation will not hold. That's because each pillar can only function in relationship to the others. The five pillars of the Third Industrial Revolution are: (1) shifting to renewable energy; (2) transforming the building stock of every continent into micro-power plants to collect renewable energies on site; (3) deploying hydrogen and other storage technologies in every building and throughout the infrastructure to store intermittent energies; (4) using Internet technology to transform the power grid of every continent into an energy-sharing intergrid that acts just like the Internet (millions of buildings are generating a small amount of energy locally, [but] on site, they can sell surplus back to the grid and share electricity with their continental neighbors); and (5) transitioning the transport fleet to electric plug-in and fuel cell vehicles that can buy and sell electricity on a smart, continental, interactive power grid.

PILLARS OF POWER

The critical need to integrate and harmonize these five pillars at every level and stage of development became clear to the European Union in fall 2010. A leaked European Commission document warned that the European Union would need to spend €1 trillion between 2010 and 2020 on updating its electricity grid to accommodate an influx of renewable energy. The internal document noted that "Europe is still lacking the infrastructure to enable renewables to develop and compete on an equal footing with traditional sources."

The European Union is expected to draw one-third of its electricity from green sources by 2020. This means that the power grid must be digitized and made intelligent to handle the intermittent renewable energies being fed to the grid from tens of thousands of local producers of energy.

Of course, it will also be essential to quickly develop and deploy hydrogen and other storage technologies across the European Union's infrastructure when the amount of intermittent renewable energy exceeds 15 percent of the electricity generation, or much of that electricity will be lost. Similarly, it is important to incentivize the construction and real estate sectors with low-interest green loans and mortgages to encourage the conversion of millions of buildings in the European Union to mini power plants that can harness renewable energies on site and send surpluses back to the smart grid. And unless these other considerations are met, the European Union won't be able to provide enough green electricity to power millions of electric plug-in and hydrogen fuel cell vehicles being readied for the market. If any of the five pillars fall behind the rest in their development, the others will be stymied and the infrastructure itself will be compromised.



CREDIT: JAAKKO HEIKKILÄ/ISTOCK

Shining light. Electricity is a luxury for at least one-third of the world. The dropping cost of solar panels promises a more comfortable life for millions.

The creation of a renewable energy regime, loaded by buildings, partially stored in the form of hydrogen, distributed via smart intergrids, and connected to plug-in, zero-emission transport, opens the door to a Third Industrial Revolution. The entire system is interactive, integrated and seamless. When these five pillars come together, they make up an indivisible technological platform—an emergent system whose properties and functions are qualitatively different from the sum of its parts. In other words, the synergies between the pillars create a new economic paradigm that can transform the world.

THE THIRD INDUSTRIAL REVOLUTION'S NO. 1 IMPACT

To appreciate how disruptive the Third Industrial Revolution is to the existing way we organize economic life, consider the profound changes that have taken place in just the past twenty years with the introduction of the Internet revolution. The democratization of information and communication has altered the very nature of global commerce and social relations as significantly as the print revolution in the early modern era. Now, imagine the impact that the democratization of energy across all of society is likely to have

when managed by Internet technology.

The Third Industrial Revolution build-out is particularly relevant for the poorer countries in the developing world. We need to keep in mind that 40 percent of the human race stills lives on two dollars a day or less, in dire poverty, and the vast majority have no electricity. Without access to electricity they remain "powerless," literally and figuratively.

The single-most important factor in raising hundreds of millions of people out of poverty is having reliable and affordable access to green electricity. All other economic development is impossible in its absence. The democratization of energy and universal access to electricity is the indispensable starting point for improving the lives of the poorest populations of the world. The extension of micro credit to generate micro power is already beginning to transform life across the developing nations, giving potentially millions of people hope of improving their economic situation.

There is no inevitability to the human sojourn. History is riddled with examples of great societies that collapsed, promising social experiments that withered, and visions of the future that never saw the light of day. This time, however, the situation is different. The stakes are higher. The possibility of utter extinction is not something the human race ever had to consider before the past half-century. The prospect of proliferation of weapons of mass destruction, coupled now with the looming climate crisis, has tipped the

odds dangerously in favor of an endgame, not only for civilization as we know it, but for our very species.

The Third Industrial Revolution offers the hope that we can arrive at a sustainable post-carbon era by mid-century. We have the science, the technology and the game plan to make it happen. Now it is a question of whether we will recognize the economic possibilities that lie ahead and muster the will to get there in time. **GB**

Note: This article is an excerpt from *The Third Industrial Revolution: How Lateral Power Is Transforming Energy, the Economy and the World*, explores how Internet technology and renewable energy are merging to create a powerful "Third Industrial Revolution."



Jeremy Rifkin is an economist, futurist and author. He is a keynote speaker at Sustainability Symposium: Champions of Change on Jan. 8 in Orlando, Fla. To register, visit www.greenbuildermedia.com/champions-of-change-2018.

The Common Sense of Lean Urbanism

With the right ideas and planning, building 500 homes can be as easy as building five.

BY ROBERT STEUTEVILLE

LEAN URBANISM IS a multidisciplinary movement to lower the barriers to community building, to make it easier to start businesses, and to provide more attainable housing and development. Like New Urbanism, Lean shares the principles of creating holistic communities—but it seeks more efficient ways to achieve that end to allow small operators to take part. Great neighborhoods need to be built by multiple hands—including those with limited capital. Hank Dittmar, an urban planner who advises governments, companies and communities worldwide on making cities and towns more livable and resilient, and Brian Falk, director of the Center for Applied Transect Studies and the Project for Lean Urbanism, offer their views on the subject of Lean Urbanism.



Hank Dittmar



Brian Falk

What is Lean Urbanism and how does it differ from New Urbanism?

FALK: Lean Urbanism is community building that requires fewer resources. It reduces the requirements, complexities and costs that unfairly burden small-scale developers, entrepreneurs and homeowners. We've put these ideas into practice through initiatives like the Project for Lean Urbanism.

DITTMAR: Lean Urbanism was conceived as an effort to deal with a problem that many of us had. It was difficult to get common-sense ideas through the planning and building process. We observed that it was almost as hard to do five homes as it was 500. And so Lean Urbanism, unlike the New Urbanism, is much more about incremental development. It's about identifying projects in an infill context and short-term opportunism. In British planning, there's a phrase for things that come along that aren't in the master plan. They're called windfall projects, as in apples that fall from the tree. Lean Urbanism recognizes that a lot of what's great about our cities are windfall projects.

What does it have in common with New Urbanism?

DITTMAR: First of all, it shares the ideals of the Charter. Lean Urbanism is part and parcel of the New Urbanism. It sits within it, but it attempts to fill a gap that we saw, in terms of a smaller scale. As we see it, Lean Urbanism is mixed use, walkable, contextual, and it aims to complete the neighborhood. This is about the missing teeth—doing some good dental work.



City synergy. Lean Urbanism projects such as the Dequindre Cut and RiverWalk, with easily approved, environmentally friendly construction and landscapes, have helped improve the economy of once-struggling Detroit.

What is the Project for Lean Urbanism?

FALK: The Project for Lean Urbanism is a multi-year project that's developing tools to make small possible. The project focuses primarily on three goals: incremental successional growth, reducing the resources required for compliance, and providing ways to work around financial, bureaucratic and regulatory processes that disproportionately burden the small actors and small projects. One of its goals is to make it possible for residents and business owners to participate in the building of their homes, their businesses and their communities.

DITTMAR: The first phase of the project defined the idea and began to develop the parameters and some of the tools. The second phase, which we're in now, aims to demonstrate that the project can make a difference through pilots on the ground in a number of cities, and through those pilots to develop toolkits that can be disseminated broadly.

Can you talk about some of the specific lean projects and what they accomplish?

DITTMAR: One of our tools, the "lean scan," identifies in a community both the barriers to small-scale development and the opportunities that might exist if it can assemble a crew of committed people in the private and public sectors who commit to short-term actions over a three-to-five-year period. That is followed by a second workshop that introduces the "pink zone." The pink zone is an area where red tape is lightened and where human capital is brought to bear on enabling small. It could be as big as a district or as small as a corridor, but it identifies a series of short-term projects that would catalyze development.

FALK: For the pilot projects, we have four at the moment: Lafayette,

La.; Chattanooga, Tenn.; St. Paul, Minn.; and Savannah, Ga. Once we develop and refine these tools, we'll release them as part of a toolkit that we plan to make available to all, free of charge.

Can you talk about how any of those pilot cities are easing red tape?

FALK: We've done the first phase—the lean scan—in three of the four, and now we need to test the pink zones.

DITTMAR: There are some characteristics of the type of areas that we want to work in at each of these cities. Typically, it's a place close to, but not in, the city center. Places where development is not impossible but is not active. And places where there are clear opportunities for infill. Ideally, we're also looking at neighborhoods where we can identify people and community organizations that can take up the challenge. Small businesses, not-for-profits, or even homeowner or small business groups that want to get involved, and want to get involved in a way that's different from the community development model that involves subsidies. Because this is not about subsidized redevelopment.

How have the citizens and public officials reacted in these communities to this idea of Lean Urbanism?

DITTMAR: We sent out an open call to a number of cities and received several applicants. The cities that were selected offered both a public and a private sector commitment to involvement. At the leadership level, they're all engaged in the idea of Lean Urbanism and have made funding commitments to match the grant money and in-kind resources that we're bringing to the table. I firmly believe that if you don't have skin in the game, you're not really playing the



CREDIT: DUANY PLATER-ZYBERK & CO

Urbanism pioneer. Considered to be one of the first environmentally designed towns, Seaside, Fla., homes and other structures in the town have metal roofs to better resist wind, and long overhangs that provide shade and allow windows to be kept open in the rain.

game for real. With the scans, we've begun to talk to residents and developers and we're finding real interest. This isn't about wholesale redevelopment. It's about filling in missing pieces.

FALK: We offer municipalities a way to diversify their economic development, which very often take a large approach, larger employers, larger projects, etc. By focusing on the smaller projects and the smaller players who are often overlooked, they get to diversify in a way that essentially costs them nothing. They don't have to invest in this, but rather just get out of the way.

The residents, the people who live in these communities, like it because we're offering them a way to get involved in this economic development, in the revitalization of their communities, as participants, not bystanders. Many people feel that previous efforts to create economic development have been exclusively top-down and haven't taken their desires and needs into account.

Finally, the business community, whether it's entrepreneurs or developers, are now excited about the idea of being able to make projects work and pencil out, ones that previously couldn't because the cost of compliance was too high or it was too difficult to find financing in their area.

One of the significant points on the Lean Urbanism website is that it says the current system is unfair. Can you talk a little bit about why that is?

DITTMAR: Often the level of expertise, the resources and time availability that is assumed about development, it allows for someone

familiar with the process to come into a city and build a hotel, a large apartment complex or a subdivision. But it creates a very high barrier to entry for the person who wants to do a four-unit building, or four to five shopfronts on an arterial roadway, or convert an older building into artist studios. The person who's doing this for the first time doesn't have ready access to the expertise of the traffic consultant, the architect, the landscape architect and the lawyer. There isn't an easy pool of available capital. They don't know which bank to go to, and when they encounter planning and building regulations, they often find that they have to fulfill the same requirements as the large-scale projects.

In the Lean Urbanism, we talk about identifying thresholds underneath which small-scale development might not have to meet certain requirements. There are workarounds, which meet the requirements without necessarily having to go jump through every hoop on the process and meet the spirit, if not the letter of the requirement and hacks, which are things that people have figured out during the process that you don't know if you haven't already been through it once or twice.

FALK: The need for Lean Urbanism originated from the complaint that it had become too difficult to make these projects happen. Even the experts were having difficulties. So we began to identify groups of non-experts who might be having even greater trouble.

The first group includes young people, who unlike their older counterparts have to master this accretion of requirements and impediments all at once, rather than gradually over a lifetime.

Another is immigrants. There are many immigrants here who were very successful, capable professionals in their own countries, but standard conventions here inhibit their capabilities. Small operators like these and their projects are, for all intents and purposes, very often excluded from participating in many communities.

And what do you mean when you say that it is difficult to get common-sense ideas through the planning process? How has common sense been left behind?

DITTMAR: There's a great book called *The Death of Common Sense* by Philip K. Howard that discusses the replacement of vernacular rules of thumb that used to be described as common sense with law and regulation. We live in an era where something that is self-evident has to be proven by an authority. The rise of a health and safety culture has created a culture in which no level of risk is to be taken on or assumed by the public.

We've seen this with street design—despite the fact that there are very few lawsuits that ever emerge, the fear of losses has begun to define that process. The simplest way to return to common sense is to create a culture in which people who work as planners or building officials for a city might be empowered to sign off minimal changes to a building without going to the planning commission or the city council, because their training and their understanding is such that they are trusted to make those decisions.

And so how does this work with regards to pink zones?

DITTMAR: Let me give you an example of a way to reduce red tape that doesn't impact safety. Within a pink zone, we advocate for a process of pre-approval for certain types of building interventions, which creates a number of different building types. For instance, there might be the four-unit building without an elevator. There might be the four-unit building with mixed use on the ground floor or the single-family house with the accessory dwelling unit. If those types are pre-approved and subject to a lighter inspection, then the developer that comes in and implements them deals with less red tape, because they don't have to go through the process individually for each one. But at the same time, public safety has not been compromised, because those types of buildings have already gone through a review process.

In essence, that's what a large-scale developer will do. They could have five building types and they'll get those reviewed, and then churn them out across the cul-de-sacs of the subdivision. You can apply that sort of approach to small-scale building as well.

The "lean seam" identifies parameters for Lean Urbanism. For example, Lean Urbanism ignores protest and advocacy but rather focuses on do-it-yourself or strategic actions. Can you talk a little bit about this?

DITTMAR: When we apply the public process in lean urbanism, it's not necessarily about identifying a vision or a master plan for a broader community. It requires bringing that broader community on board. It's about identifying near-term opportunities and aligning ourselves with people who want to get them done, and then removing the barriers to getting them done. So, it's a different point of entry into the public process than, say, the typical New Urban charrette. We're

not attempting something that requires consensus. We're attempting something that may require negotiation with the immediate neighbor.

With respect to the pink zone, it started as a dialogue from within the community of New Urbanists, developers, architects, urban designers and city officials who wanted to get things done. We were dealing with the frustration of a process that makes that hard.

Last autumn, there was a fire in a warehouse/artist space called the Ghost Ship in Oakland that killed 36 people, and it was a space that had been modified without reference to structural engineering or architects. They stacked pallets up to create a staircase and they didn't have clearly marked exits. It was a tragedy. But it reminded me that in my view, a lot of the stuff we do belongs to the informal economy, moving into storefronts or taking over lofts and things like that. But why it is that so much development, particularly in more deprived areas, is under the radar without proper electrical wiring and fire exits, and how can lean urbanism or a pink zone potentially bring those types of users from the gray economy into the pink, if you will?

FALK: That also gets at the topic of common sense. These people are often doing the only thing they're able to do. It ends up being unsafe because they're not allowed to work through the official system in a way that allows them to achieve what they want. Very often municipalities don't think about unintended consequences of regulation.

Are there people out there that are doing Lean Urbanism, but don't really know it?

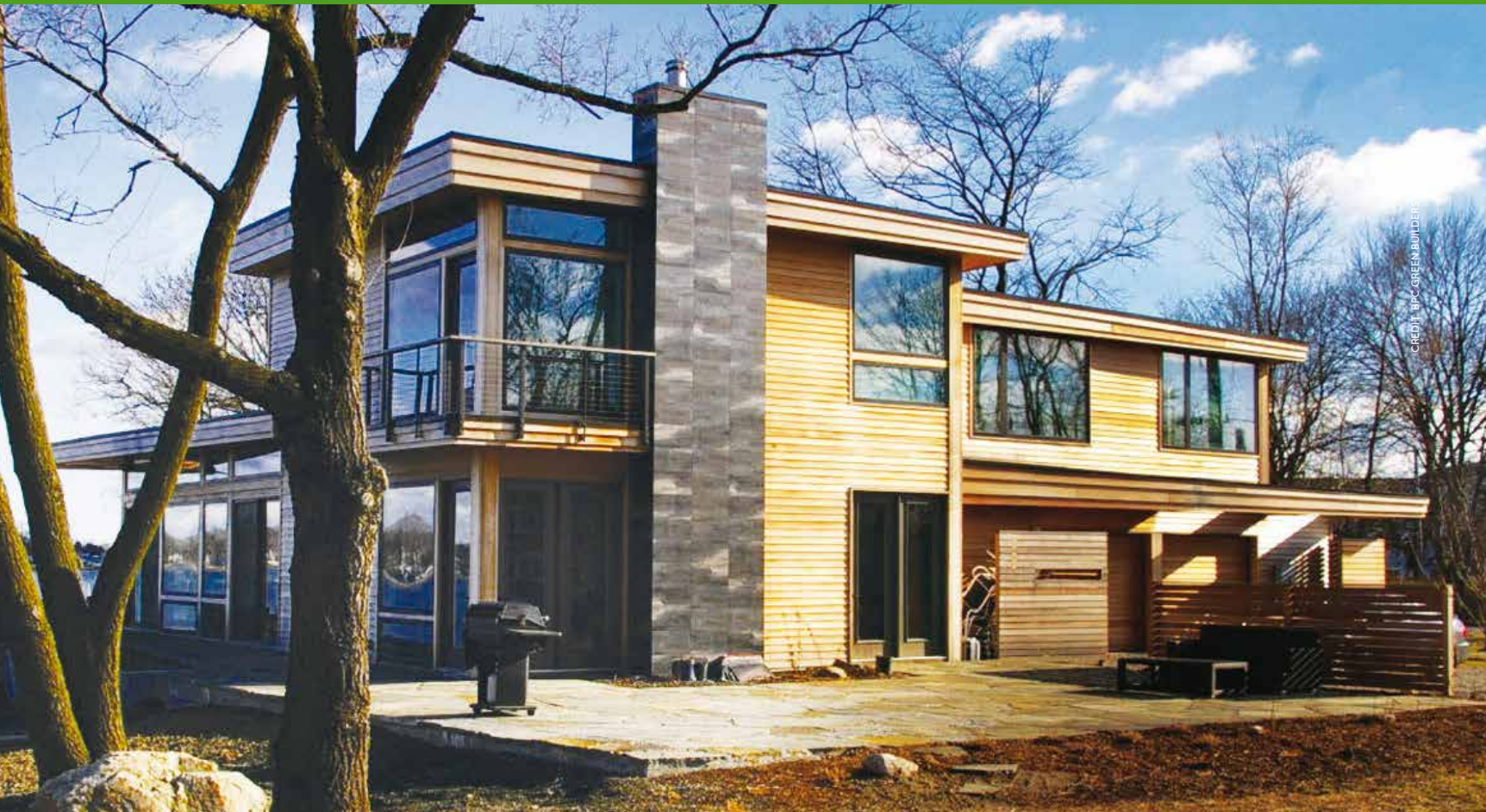
FALK: We were inspired initially by work that's going on in Detroit. Everyone is aware of the economic difficulties that Detroit suffered. But few people are aware of all the activity that actually is going on. And part of that was because they were not held to the same requirements that they had been previously.

Another example is in the city of Phoenix. The City recognized that people in a certain neighborhood were creating projects that were contributing to the neighborhood, but they weren't doing it through official channels. Rather than shutting these people down, the City recognized that they were positive projects. The City figured out ways to make it possible for them and for others to do similar things.

DITTMAR: There's a group in the United Kingdom called "Massive Small," which is dedicated to the idea that encouraging small-scale development is the right way to deal with the global challenge of urbanization. There's also the recent government white paper here in the UK that has proposed the creation of pink zones or places where planning can be pre-approved to enable smaller-scale development to take place. They heard about it from us but then they've taken it forward on their own, so the idea is gaining currency in many different ways. It's not important whether we own the label. **GB**

- Public Square (www.cnu.org/publics)
- Project for Lean Urbanism (<https://leanurbanism.org>)
- Center for Applied Transect Studies (<https://transect.org>)

This article appeared in Public Square, a publication dedicated to cultivating best practices in urbanism in the United States and elsewhere. Robert Steuteville is Public Square's editor.



The contemporary approach. As consumers become more educated about sustainability, achieving LEED certification—such this home in Norwalk, Conn., which earned a Platinum rating—is the ultimate goal of green builders.

The ABCs of EPDs

Environmental Product Declarations are helping to drive change in green construction.

BY DENNIS WILSON

IN RECENT YEARS, building and design professionals have witnessed a significant shift in what is considered a sustainable construction project.

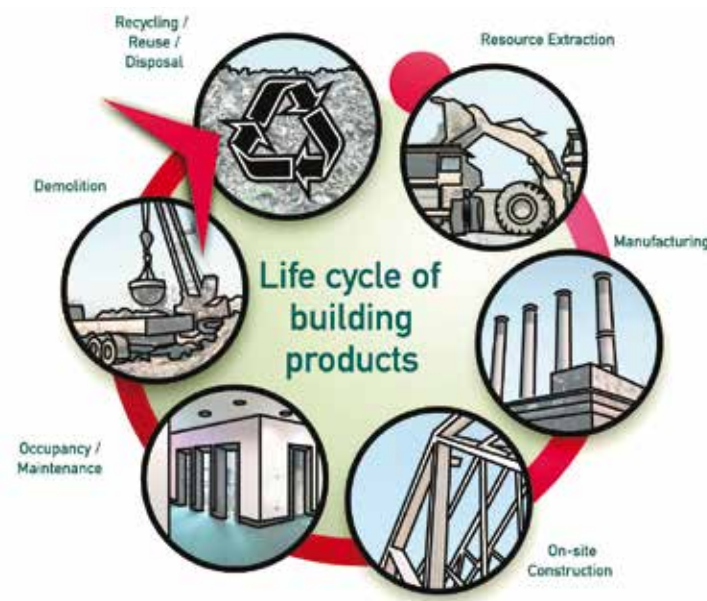
The more-stringent requirements of the new U.S. Green Building Council (USGBC) Leadership in Energy and Environmental Design (LEED) v4 rating system have raised the bar for project teams with sights set on LEED certification. The same has been true for building product manufacturers. Earlier versions of LEED allowed manufacturers to make sustainable product claims based on one attribute, while the product's other attributes may not have made the grade. Under LEED v4, however, manufacturers are being asked to provide more detailed information on material content and comprehensive environmental impact before their individual products can be considered for a green product designation.

These changes to the LEED rating system were designed by the USGBC to push the construction and building product industries toward more sustainable operations. One of the most discernable differences between LEED 2009 and the new LEED v4 rating systems is the demand for more transparency from manufacturers in green product claims. The best way for manufacturers to meet this demand and demonstrate their progress toward more sustainable products is to obtain an Environmental Product Declaration (EPD).

EPDs are rigorous, third-party examinations of a product's environmental impact throughout its life cycle that offer holistic evidence of the product's drive toward sustainability. Together with the evolving LEED rating system, these product documents are helping drive change in the commercial construction industry today. But, why is this change so important to the industry?

Why EPDs?

As the public continues to become more educated about sustainable living, the need for transparency from manufacturers grows. Transparency helps architects and specifiers make more informed, sustainable specification decisions that put them on the track toward achieving LEED certification and a healthier



CREDIT: ATHENA SUSTAINABLE MATERIALS INSTITUTE

building for the customer. In addition, the more sustainability-minded consumers of today are becoming more interested in the environmental impact of the products they use. According to the 2015 Corporate Social Responsibility (CSR) report from public relations and marketing agency Cone Communications, 90 percent of consumers said they would switch from using a current brand to another brand that associates with a social or environmental cause, 80 percent said they seek out environmentally responsible products and 71 percent are willing to pay more for a product if it was certified sustainable.

However, as consumers become more interested in sustainable products, many of them are viewing manufacturers' sustainable product claims with suspicion. According to the CSR study, only 44 percent of Americans believe the sustainable product claims made by manufacturers, and 77 percent said they would stop using a product if it was proved less sustainable than originally claimed. The greater transparency offered by an EPD gives proof that a manufacturer is striving to be an environmental steward and helps win the confidence of consumers.

To gain clearer understanding of the depth of transparency provided by EPDs, it is helpful to take a closer look at the process.

How EPDs Are Made

Manufacturers must undergo a lengthy, robust business process when developing an EPD. This starts with the selection of a program operator, an independent agency which ensures that the key steps in creating an EPD are followed in accordance with ISO standards. Next, the manufacturer must establish product category rules (PCRs) that follow the guidelines of industry standard ISO 14040:2006 - *Environmental management—Life cycle assessment—Principles and framework*. The manufacturer then conducts a life cycle assessment (LCA) to determine the product's overall environmental impact,

CHAMPIONS OF CHANGE

create the EPD and have it verified by an independent third party, such as Underwriters Laboratory (UL) Environment, for added credibility.

Two definitive approaches taken by manufacturers in pursuit of an EPD are the "cradle-to-gate" approach and the "cradle-to-grave" approach. The cradle-to-gate evaluation of a product is the minimum allowed for an EPD under LEED v4; it examines the product's environmental impact from raw material extraction until it reaches the "gate" of the manufacturing facility.

Manufacturers like CertainTeed Gypsum, however, are increasingly opting for the more-robust cradle-to-grave approach. In fact, CertainTeed Gypsum was the first manufacturer in the drywall category to use EPDs as a transparency vehicle. The cradle-to-grave approach is based on a full LCA that examines the product's environmental impact at each stage of its life cycle, from "cradle to grave." For example, LCAs for a building product would likely report on the environmental impacts tied to raw material extraction and transportation, product manufacturing, use phase and the product's end of life.



CREDIT: SAINT-GOBAIN NORTH AMERICA

Now you see it. CertainTeed Gypsum was the first drywall manufacturer to use Environmental Product Declarations as a transparency vehicle.

So, compared to the cradle-to-grave approach, the cradle-to-gate evaluation gives a very limited view of a product's overall environmental impact. Project teams that seek out products with cradle-to-grave EPDs during specification are better able to understand the full environmental impact picture, from raw material extraction to product end of life. They can then make more sustainable decisions accordingly.

How EPDs Help Earn LEED Credits

There are a variety of categories under LEED v4 where specifiers can maximize their credits by selecting products that have EPDs. The first and most common way to achieve LEED credits is under *LEED v4 Materials and Resources Credit (MR credit 2)—EPD*. This credit requires that a project team specify 20 different products that have EPDs, sourced from at least five different manufacturers. The availability of manufacturer-specific EPDs



CREDIT: MOKULUA HIGH PERFORMANCE BUILDER

Best performer. The Smith Residence in Kailua, Hawaii, a LEED Outstanding Single-Family Home of the Year winner by Mokulua High Performance Builder, is also the first in the state to certify (Gold) under the latest version of the rating system, LEED v4.

enables the architect or specifier to achieve this credit, as defined in LEED v4 requirements.

The second way a project team can achieve LEED credits under MR credit 2 is to specify products with multiple sustainable attributes. This strategy is intended to reward manufacturers for using EPD documents as a playbook for sustainable product innovation by showing environmental impact reduction or performance

improvement, below industry average or across iterations of a manufacturer-specific EPD in at least three of the environmental impact categories measured in an EPD. Those categories measure product impact on factors such as global warming potential or depletion of non-renewable energy resources. For more information on how to earn credits under MR credit 2, go to www.usgbc.org.

LEED v4 also awards pilot credits for actions and projects that the USGBC consider innovative, but have not been formally approved as a standard credit in their rating system. MRpc84 *Materials Multi-Attribute Assessment*—EPDs, formerly known as Pilot Credit 52, was added to LEED 2009 with the introduction of LEED v4. This credit in LEED 2009 mirrors the MR Credit 2, Option 1 credit

from LEED v4, which incentivizes projects that specify at least 20 different products that have EPDs sourced from at least five different manufacturers, in the same way as it is achieved in the LEED v4 system.

For more information on either of these credits, specifiers can visit the USGBC website.

A Bright Future

It is true that EPDs are helping drive change within the manufacturing sector and the construction industry, challenging stakeholders to step up and do their part for environmental stewardship. As more manufacturers continue to develop cradle-to-grave EPDs and more project use products that carry the EPD label, the sustainable construction movement will continue to grow in the right direction for years to come. **GB**

- CertainTeed Gypsum: www.certainteed.com
- U.S. Green Building Council (USGBC): www.usgbc.org
- Saint-Gobain North America: <https://saint-gobain-northamerica.com>

Dennis Wilson is director of Product Stewardship & Sustainability for Saint-Gobain North America. Saint-Gobain is the world's largest building materials company.

A LEED Refresher

How to earn certification, trends in green flooring and more.

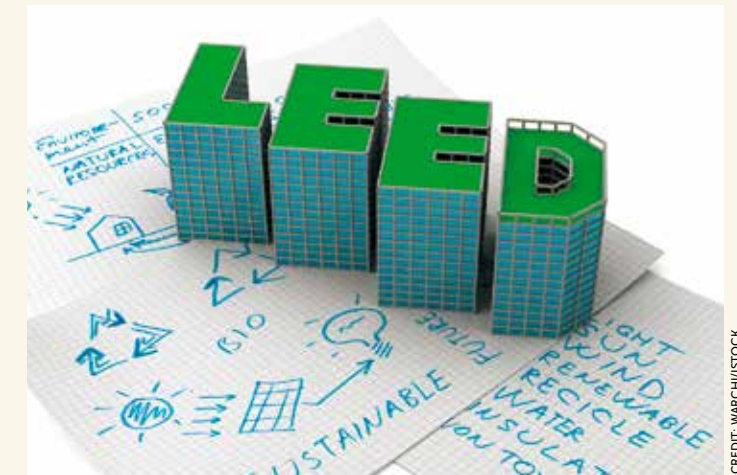
BY AARON HARTUNG

FROM DRAWING PLANS TO BREAKING GROUND, building green has become more than just a trend. At this point, green is practically standard and worth thinking about from the very beginning of any project. Eco-friendly options not only reduce greenhouse gases and conserve resources—they save money.

With green building, Leadership in Energy and Environmental Design (LEED) certification is the place to start. If, however, you think you know LEED certification, know that LEED v4 certification is much more stringent than the older guidelines. Much more than green washing, the new certifications focus on a holistic approach to evaluating projects for performance, resource conservation and material selection.

Before your project will even be considered for LEED certification, you must meet the U.S. Green Building Council (USGBC) Minimum Program Requirements (MPRs). The USGBC has put MPRs in place to define the type of project eligible for LEED certification.

Your project or portfolio must meet three basic requirements in order to be considered. First, your project must be a fixed location on existing land—projects on artificial land or those designed for eventual relocation will not be considered because of the environmental implications. Next, the physical boundaries of the project in question must be defined to ensure a holistic evaluation. The last MPR is that your project must fall within the project size requirements for the certification you are seeking—whether it's a house, neighborhood development or building design. Take a look at the Building Design and Construction (BD+C) scorecard to get a more



CREDIT: WARCHI/ISTOCK

Sustainable achievement. The new LEED certification requirements are harder to meet, but they result in greener, more-energy efficient buildings.

detailed view of what goes into a LEED certification.

If you meet the three MPRs, you are eligible to apply for LEED certification. LEED v4 certification revolves around four main components: performance-based, smart-grid, water efficiency and materials. Performance-based benchmarks focus on indoor air quality to ensure occupants of the building will be comfortable. Smart-grid benchmarks serve to award points to buildings that respond to demand properly. Water efficiency guidelines ensure that projects use water in a smart and sustainable manner. Materials are, quite literally, the building blocks of any project—as such, the LEED benchmarks seek to ensure builders know exactly the impact their material selection will have on the environment.

To achieve certification, your project must exemplify each of these four components. If your project passes, it will be awarded one of four certification levels: certified, silver, gold or platinum. **GB**

TRENDS IN GREEN FLOORING

WITH MANY NEW GREEN flooring material trends on the rise, choosing the right material for application and LEED certification can be difficult. An experienced flooring contractor should be able to take the customer's needs into account and choose the right flooring materials to drive sustainable ROI (SROI). While pointing that customer in the right direction, here are several material options you can make worth their consideration:

- **Bio-based tile (BBT).** Bio-based tile is a growing trend in flooring that holds many of the same advantages as resilient flooring—durability, strength, design versatility, affordability—with the added bonus of being extra eco-friendly.
- **Terrazzo.** Terrazzo is known for its durability and design versatility. And, from a green standpoint, terrazzo is easily installed without the use of harsh environments and can help maintain a healthy indoor environment.



CREDIT: RICHARD WATKINS

By the foot. Terrazzo flooring can be easily installed without use of harsh chemicals.

▪ **Polished concrete.** Polished concrete has a wide variety of applications, from schools to industrial facilities. It is easily installed with a six-step process and easily maintained, as there is no need for the typical wax-and-strip method. It is safe, long-lasting and durable. Moreover, it is environmentally friendly and contributes to your LEED certification.

▪ **Carpet and carpet tiles.** There are many sustainable carpeting options stemming from recycled materials. Broadloom and carpet tiles are two of them, with the latter cutting down on waste during maintenance

and installation. If there is a stain on one tile, you only have to replace that one square. **GB**

Aaron Hartung is the communications manager at Spectra Contract Flooring, the largest commercial flooring contractor in the U.S. Learn more: <http://spectracf.com>



Living space. The Hassalo on Eighth mixed-use development in Portland, Ore., is LEED's Project of the Year, largely due to its 1 million square feet of apartment space, parking, an outdoor urban plaza and North America's largest bike hub with space for 900 bicycles.

Hassalo, Right-Sized Passive Top LEED 2017 Award Winners

USGBC's latest green homes competition offers a mix of veteran and first-time LEED certification recipients.

BY GREEN BUILDER STAFF

THE U.S. GREEN BUILDING COUNCIL (USGBC) has announced the recipients of its annual LEED Homes Awards, which recognizes projects, architects, developers and homebuilders who have demonstrated outstanding leadership and innovation in the residential green building marketplace.

According to USGBC CEO Mahesh Ramanujam, the LEED Homes Award recipients include multi-family, single-family, and affordable housing projects and companies that are trailblazers in the residential sector and have prioritized incorporating sustainability within their projects in 2016.

"Homes provide more than just shelter—LEED homes improve the health and wellbeing of the occupants while saving energy, environmental resources and money," Ramanujam says. "This year we praise the innovative and integrative LEED Homes' honorees for advancing the residential green building movement."

The awards also recognize the "LEED Homes Power Builders," which USGBC developed to honor an elite group of developers and builders that have exhibited an outstanding commitment to LEED and the green building movement within the residential sector. To be considered as a LEED Homes Power Builder, developers and builders must have LEED-certified 90 percent of their homes or unit count built in 2016. Homes at any LEED certification level—Certified, Silver, Gold or Platinum—are eligible for consideration.

Project of the Year: Hassalo on Eighth, Portland, Ore.

Developed by American Assets Trust, designed by GBD Architects and constructed by Turner Construction, Hassalo on Eighth is a LEED Platinum mixed-use, dense development that creates a vibrant, 24-hour neighborhood for people to live, work and play. With more than 1 million square feet of new construction spread across three buildings, this project covers apartments, parking, an outdoor urban plaza and North America's largest bike hub with space for 900 bicycles. Site-specific strategies include: rainwater harvesting and treatment; on-site wastewater treatment and re-use with infiltration; district energy; natural daylighting and access to public transportation. <http://hassalooneighth.com>

Outstanding Single-Family Project: Right-Sized Passive Home, Oak Park, Ill.

Designed by Tom Bassett-Dilley Architect, constructed by Evolutionary Home Builders and verified by Eco Achievers, the Right-Sized Passive Home is a LEED Platinum home. Nontoxic, no-added formaldehyde, water-borne finishes and materials were carefully selected for this project, helping it become sustainable. This home also has its own energy monitoring system, allowing owners and designers to track energy use compared to modeled predictions. <http://bit.ly/2yYJ6ca>

Outstanding Single-Family Developer (tie): John Marshall Custom Homes, Davidson, N.C.; Koral and Gobuty Development Co. LLC, Bradenton, Fla.

John Marshall Custom Homes continues to be a leader in sustainable building. In 2016, the firm developed a "pocket neighborhood" of 15 homes in Davidson, N.C. Currently 12 of these homes have achieved LEED Silver certification while the remaining are waiting for certification and construction completion. Proximity of this community to amenities is one of its biggest attractions, as it sits within a five-minute walk of the elementary school, park, shops and public library.

www.johnmarshallcustomhomes.com

Koral and Gobuty Development Co. LLC are the developers of Mirabella, an innovatively designed, eco-conscious neighborhood of 160 paired villas created for active adults age 55-plus. Thus far, 72 Mirabella homes have achieved LEED Platinum certification, or 100 percent of the community's building stock. Mirabella has an additional 37 homes under construction and 51 lots remaining, and the developer plans to have those 88 properties also earn the same level of LEED certification. www.mirabellaflorida.com

Outstanding Multi-Family Project: Arete, Kirkland, Wash.

Built by Natural & Built Environments and developed by Sustainable Kirkland, LLC, five buildings make up the Arete community that earned LEED Platinum status last year. This is the first micro-apartment project in the city of Kirkland and consists of living, working and art-centered spaces. Energy performance is one of the greatest successes for this community, as some buildings



Green inside and out. Right-Sized Passive Home in Oak Park, Ill., was named Single-Family Project winner thanks in part to an interior with nontoxic, no-added formaldehyde, water-borne finishes, and a dedicated energy use monitoring system.

surpass 40 percent savings over the LEED baseline. Additional energy features include solar hot water providing 40 percent of annual demand, triple-pane windows, blown-in-blanket insulation, advanced air sealing, 100 percent LED lighting, efficient central ventilation, and 96 percent efficient boilers with radiant in-floor heat. <http://aretekirkland.com>

Outstanding Affordable Project: Prospect Plaza Site One, Brooklyn, N.Y.

Developed by Oceanhill LLC, designed by Dattner Architects and built by Blue Sea Development, Prospect Plaza Site One is the first to be completed in a three-block project that will provide 394 units of modern, human-scaled, affordable housing. Site One is LEED Platinum certified and consists of 110 units of sustainable, energy-efficient, healthy housing in four attached townhouse style buildings and a mid-rise elevator building. Prospect Plaza received the first national affordable housing Active Design Verified certification from the Partnership for a Healthier America. It is the subject of a Mt. Sinai School of Medicine clinical study on long-term health benefits of living in a green building. www.dattner.com/portfolio/prospect-plaza

LEED (Leadership in Energy and Environmental Design) is the world's most widely used rating system for green buildings. There are more than 1.2 million residential unit participants. Learn more: www.usgbc.org/leed

To learn more about LEED for Homes, visit www.usgbc.org/guide/homes.

For a complete list of LEED Homes Awards winners, see <http://bit.ly/2fotAxz>

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The Promise and Pitfalls of PLASTICS IN CONSTRUCTION

The world is literally drowning in waste plastics. Can we redirect the stream into long-lasting building materials?



Resilience ready. Although not without its drawbacks, the right time is now for lumber and other building products made with recycled plastic.

CREDIT: BRITISH RECYCLED PRODUCTS

BY MATT POWER, EDITOR-IN-CHIEF

I WON'T SPEND A LOT OF TIME elaborating on our global plastic addiction. Suffice it to say, the stuff is taking over. We've polluted our oceans and seafood with it, laced our drinking water with it, and are now using (and throwing "away") more of it than ever. We need an intervention.

Perhaps that intervention could come in the form of an embrace. Given the season of storms and flooding we just experienced, plastic-based building materials are consistently looking better. In the least, we could keep some trash out of landfills and waterways. At best, we might create a whole new way of building, with durable, flood-resistant materials.

Plastic, especially when recycled, is actually much less energy intensive to produce than cement or steel. Biochemist Anthony L. Andrady argues that "the benefits provided by plastics justify the 4 percent fossil fuel raw materials and another 3 percent to 4 percent energy resources devoted to manufacturing it. In building applications, plastics save more energy than they use."

But Andrady acknowledges that the plastics industry "has its share of environmental issues." It is based on a linear flow of nonrenewable fossil fuel resources via useful consumer goods into the landfills. Lack of cradle-to-cradle corporate responsibility and design innovations to allow conservation of resources is responsible for this deficiency.



By the book. With careful engineering, plastic lumber has been shown to be feasible even for projects with higher load requirements.

"For instance," he adds, "there is not enough emphasis on design options for recovery of post-use waste. The move toward bio-based plastics, an essential component of sustainability, is too slow, with not enough incentive to fully implement even what little has been achieved."

For plastic to remain a viable, useful material, full transparency about the products and processes is needed. We must acknowledge plastic's down side—the perils of toxic emissions, ocean contamination and harmful byproducts—and address them directly.

Which leads back to the question posed by this article: Can the linear life cycle of plastics be interrupted on a large scale by the building industry, diverting post-consumer plastics to be used in construction? I believe it's possible. But it's a shift that will require new thinking from industry and consumers. The dire problems we now face from plastic pollution may hold within them solutions to other issues around housing and resilience. Imagine durable plastic walls and framing required by code in flood-prone areas. Just hose it down after a flood event, with no rebuilding or untold tons of landfill waste.

Before we get there, however, we need more honest, third-party research and a commitment to closing the life-cycle loop—not just more use-it-and-toss-it mentality.

DIGGING FOR DATA

What do we really know about plastic's potential in the built environment? Research on the topic tends to focus myopically on one engineering challenge (such as UV resistance) or entirely ignore the big questions of durability and end-of-life prospects.

Information on plastics is complex and variable. One challenge is that no two types of plastics have the same physical properties. For example, vinyl siding, made with 80 percent polyvinyl chloride, is probably the plastic material most familiar to homebuilders.

The industry-funded Vinyl Siding Institute (VSI) is the best-known source for information on the performance and fate of PVC siding. VSI, however, often narrows its product R&D to "silos" of inquiry. For

Plastic Plywood?

A couple companies sell this material. One is in California: American Plastic Lumber, Inc. Its 3/4-inch-thick recycled plastic "sheet goods" (imported from Asia) have the following characteristics:

PROPERTY	ASTM SPEC	UNIT	HDPE
Tensile Strength	D1708, D638	psi	3,600
Flexural Modulus (at 23 °C)	D790, D638	psi	175,000

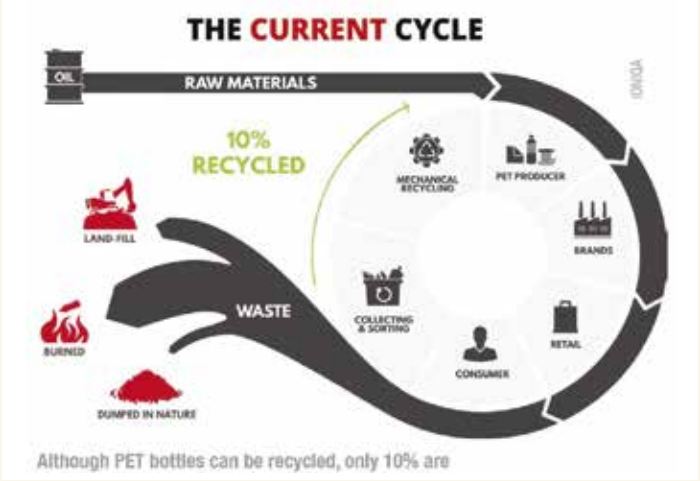
Typical tensile strength for "sheathing grade" plywood, according to MatWeb, is 4,000 to 5,000 psi. Its flexural modulus is about 149,000 psi. In other words, plywood and plastic sheets have similar strength characteristics when temperatures are mild. The full specs can be found at <http://bit.ly/2y51orb>.



Flexing its benefits. Recycled plastic plywood from American Plastic Lumber shares some characteristics with wood sheathing, but its properties are more variable in extremely hot weather.

Overcoming Recycling Hurdles

The key challenge is sifting and separating different types of plastics.



The ugly truth. Although efforts to improve recycling rates continue, production of plastic far outpaces recycling.

HEALTHY BUILDING NEWS (<http://bit.ly/2hguSel>) reports that with regard to polyethylene, “proportionally less ‘good material’ is coming out of the plastic waste recycling stream due to the rising use of municipal single-stream recycling over the past decade. Mixed- and low-quality scrap materials that come from single-stream recycling centers are more likely to be exported than sorted and screened for high-quality polyethylene scrap. As a result, more recovered plastic bags are exported than processed domestically.”

The Healthy Building Network’s efforts to optimize recycling track how the building industry is doing. They note that the plastic lumber sector, unlike the plumbing manufacturers, are stepping up their recycling protocols (<http://bit.ly/2hIXJsF>) despite a lack on industry-wide standards for post-consumer product quality. “This year, the Association of Plastic Recyclers (APR) posted the industry’s first testing protocols, benchmark specifications and a grading system for bales of collected HDPE. It prohibits many contaminants and restricts others.”

Another growing problem is the use of pouches that combine aluminum and plastic layers. They’re notoriously tough to recycle. Dow Chemical is reportedly working on a recycling solution.

Fortunately, new methods of marking and recycling plastics are being tested, at least outside of the U.S. For example, Ioniqa Technologies, based in the Netherlands, has developed a way to separate plastics from the additives that give them color or other properties.

As reported in a white paper by Ethical Corporation, “When PET is added to the magnetic smart liquid that Ioniqa has developed, and then heated, the PET depolymerises. The colourants and other contaminants are removed in a magnetic field, to leave the original building blocks of the polymer.” Those building blocks can be used to create new PET, over and over again. That’s a big advantage, because at the moment PET can only be recycled up to six times.

example, a 10-year study of vinyl siding that started in 1994 (VS4W) looked at the “color ellipsoid” of installed product, not whether it became brittle, warped or caused any moisture damage to sheathing. Too often, the really big questions are ignored, skipped or buried in dense academic research that’s indecipherable to anyone but a chemist and/or engineer.

Plastics behave differently as the temperature increases. Each has different tensile strength and load-bearing ability at specific temperatures. These are key factors in determining how and where plastic-based materials can be used in construction.

Fortunately, the ASTM (previously known as the American Society for Testing and Materials) has been proactive in developing standards for recycled plastic lumber (RPL), primarily for decking (D 6662). During this process, the organization identified and attempted to remedy missing info and specs. Here are some key takeaways:

Dimensional Tolerances: Tolerance limits were established that would meet industry requirements and performance considerations.

Creep: The viscoelastic nature of RPL makes it susceptible to creep at sustained loads at elevated temperatures. A methodology was developed to use creep data per ASTM D 6112 to define design limits to avoid excessive deflection and creep in the decking boards.

Flammability: ASTM’s fire test method uses a small ignition source, as might be expected on a deck, when hot charcoal briquettes from a tipped over barbecue grill make contact.

Allowable Material Properties for Structural Design: A complete methodology was presented in the standard to determine allowable maximum span lengths for decking boards based on the material properties determined from the test methods listed above.

EYES-OPEN ENGINEERING

Like any building material, plastics must be able to withstand the rigors of their intended use. Standards such as those devised by ASTM answer many of those questions. But here’s the scoop in layman’s terms:

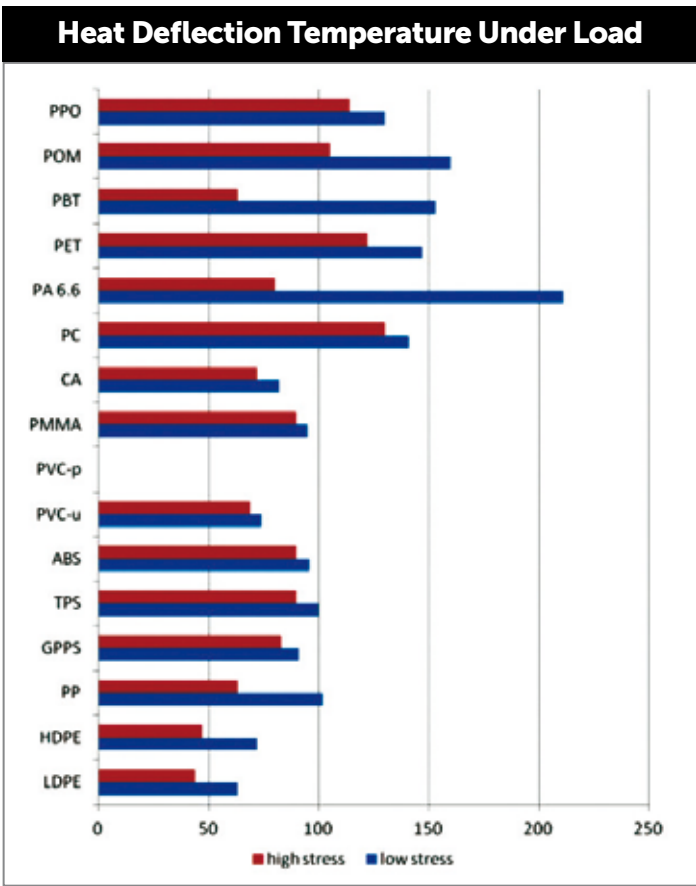
Some plastics get soft at relatively low temperatures. For example: HDPE, the plastic used in most milk jugs, begins to soften at 172°F under low stress, but about 114.8°F under high stress. (See chart.)

A Denver-area deck builder tested surface temperatures (<http://bit.ly/2zVFATn>) of various deck materials at 87°F ambient temperature in full sun. He found that virtually all deck boards, including cedar and plastic composites, soared above 150°F, well past the heat

Plastic Classification

These polymer codes make recycling much easier and more efficient.

1. Polyethyleneterephthalate (PET)
2. High-Density Polyethylene (HDPE)
3. Polyvinyl Chloride (PVC)
4. Low-Density Polyethylene (LDPE)
5. Polypropylene (PP)
6. Polystyrene (PS)
7. Other Types



Temperature matters. Additives can improve some of the issues around plastic softening in heat, but good system design is paramount.

deflection point of all common plastics.

Of course, building standards, such as reducing the joist distance, can compensate for some polymer weaknesses. But designers who use RPL also face a new, emerging variable—extreme heat. Progressive temperature rise and temperature spikes are expected to increase in coming years, due to climate change.

Most thermoplastics do not fully melt until they reach about 250°F (HDPE melts at between 248°F and 356°F), but they become soft and bendable long before that benchmark.

Deck tests in Boston found that decks typically get up to 76°F hotter than the ambient air (in full sun). Of course, outdoor temperatures would need to approach 174°F before the plastics would completely melt, but in the American West, ambient temperatures frequently exceed 100°F. Sun-exposed HDPE products without additives could easily exceed their design limit (100°F + 76°F = 176°F). American Plastics, for example, lists 170°F as the maximum temperature acceptable for its recycled HDPE sheet polymer.

Another concern with plastics, of course, is fire. Polymers are not especially ignition prone, but they burn hot and fast, igniting at about 540°F. As high-carbon materials, however, plastics tend to give off a very dense black smoke. The level of toxicity varies by material, but at the very least it’s disorienting and difficult for firefighters to navigate.

As engineer Geoffrey Pritchard notes in *Reinforced Plastics Durability*, adding fire retardants to plastics has pros and cons.

They will work, but “there can be adverse effects on processing, mechanical properties or chemical resistance.” In other words, the material becomes less workable.

THE ECO-ARGUMENT FOR PLASTIC LUMBER

The total recycling rate of HDPE, LDPE and PET in the U.S. was 8 percent in 1996, and has now increased to only about 10 percent for HDPE, 5.3 percent for LPDE and 19.5 percent for PET (data from 2015 <http://bit.ly/2zk3WoF>).

But as WorldWatch Institute points out, plastic manufacturing has grown at a vastly faster rate. Recycling can’t keep up with the avalanche of waste: “From 1950 to 2012, plastics growth averaged 8.7 percent per year, booming from 1.7 million tons to the nearly 300 million tons of today.”

This is just one of many reasons for introducing recycled plastic-based products into construction. Others include:

Less treated wood. Plastic lumber can replace treated wood, which is still considered a hazardous waste material by most landfills. Although modern treated wood has far less (if any) chromium or arsenic, it is still infused with copper, making it hard to reuse.

Alternative to tropical and redwoods. Plastic wood has many of the desirable durability qualities of pricey (and sometimes endangered) South American and Asian wood species such as teak and ipe. It can take some of the pressure off of endangered forests, although other threats such as palm oil production have replaced lumber sales as the biggest source of deforestation.

Flood resistance. With its natural resistance to rot and mold growth, some plastic lumber is ideally suited for use in wet or high flood risk locations.

Garden friendly. Although more research is needed, some early studies of plastic lumber in marine environments (<http://bit.ly/2ixvDAu>) found very little leaching, compared with treated wood alternatives. This makes it a good candidate for garden hardscapes and beds.

Lower GHG than concrete or metals. On a pound-for-pound basis, plastic is less resource intensive than creating Portland cement or melting down metals. Recycled material has far more of an edge than virgin production. And, of course, plastic has durability on its side. It should last for decades, before being recycled again.

INDUSTRY LEADERS AND LAGGERS

A few building product manufacturers have recognized the ethical importance of recycled plastic content—and its potential to improve their bottom line. Interface (www.interface.com), for example, has recycled about 309 million pounds of plastics over the past 20 years. The late CEO of Interface, Ray Anderson, set a goal of freeing the company completely from use of virgin materials, and the company seems to have remained committed to that idea. Its carpet backing material, *Glasbac*, contains about 98 percent recycled material. But in the long view, Interface and others have barely scratched the problem. The carpet industry still dumps about 4.5 billion pounds of end-of-life product into landfills every year.

I’d also be remiss not to give a caveat to Trex (www.trex.com). Back in the 1980s, this company arguably launched a whole industry of composite decking where none existed. It has proven that profit and recycling can be close bedfellows. And it has shown how to be more

Effects of Additives, Fillers and Reinforcements on Polymer Properties

Stabilizers and resins can improve the performance to some degree. For example, the bendability of plastic lumber can be decreased by adding fine mineral fillers, such as talc to the mix (<http://bit.ly/2hJp8e9>). Generally, the smaller the particles added, the greater the boost in stiffness. But the original plastic resin begins to lose impact strength as the level of fillers increases. Here’s a chart showing effects of other additives on polymers.

Additive / Filler / Reinforcement	Common materials	Effects on polymer properties
Reinforcing fibers	Baron, carbon, fibrous minerals, glass, Kevlar	<ul style="list-style-type: none">Increases tensile strength.Increases flexural modulus.Increases heat-deflection temperature (HDT).Resists shrinkage and warpage.
Conductive fillers	Aluminum powders, carbon fiber, graphite	<ul style="list-style-type: none">Improves electrical and thermal conductivity.
Coupling agents	Silanes, titanates	<ul style="list-style-type: none">Improves interface bonding between polymer matrix and the fibers.
Flame retardants	Chlorine, bromine, phosphorous, metallic salts	<ul style="list-style-type: none">Reduces the occurrence and spread of combustion.
Extender fillers	Calcium carbonate, silica, clay	<ul style="list-style-type: none">Reduces material cost.
Plasticizers	Monomeric liquids, low-molecular-weight materials	<ul style="list-style-type: none">Improves melt flow properties.Enhances flexibility.
Colorants (pigments and dyes)	Metal oxides, chromates, carbon blacks	<ul style="list-style-type: none">Provides colorfastness.Protects from thermal and UV degradation (with carbon blacks).
Blowing agents	Gas, azo compounds, hydrazine derivatives	<ul style="list-style-type: none">Generates a cellular form to obtain a low-density material.

SOURCE: SANTA CLARA UNIVERSITY ENGINEERING DESIGN CENTER

flexible, not less, in terms of the types of plastics that are eligible. Trex currently processes grocery bags, bread bags, case overwrap, dry cleaning bags, newspaper sleeves, ice bags, wood pellet bags, Ziploc and other re-sealable bags, produce bags, bubble wrap, salt bags and cereal bags into their 95 percent recycled decking products.

But not every plastic-lumber company can boast the same eco-awareness. It’s important to read the fine print. Companies such as TimberTech (<https://timbertech.com>) for example, use only virgin PVC in their decking, resulting in a far less sustainable product than Trex.

The same is true of roofing manufacturers. To my knowledge, there is no U.S. firm selling roofing tiles with significant recycled plastic content. One Canadian company, Moderne (www.moderneslate.ca), produces a synthetic slate with recycled plastic scrap from industry. The types of plastics used are not specified. DaVinci Roofscapes does offer a composite roofing, but like TimberTech, they work only with virgin PVC and “processed polymers” from manufacturing (essentially PVC cuttings and scrap). TimberTech also describes its product with terminology that borders on greenwashing: “We use 100 percent pure virgin resins in our roof tiles to guarantee a sustainable product.”

Why do manufacturers deal only with “virgin” plastic? They say it’s easier to work with and more consistent. But the American Society for Testing and Materials (ASTM) has created performance-based industry standards for plastic lumber products that ensure that recycled content does not reduce the performance of end products (see “How Plastic Lumber is Tested,” page 50).

RPL: THE STATE OF THE INDUSTRY

In December 2001, there were about 30 manufacturers of recycled plastic lumber in North America, according to ASTM. That number appears to have declined, but getting an accurate head count is tricky.

The last major third-party report on the industry by the Healthy Building Network was published in 2005. And activity by the Plastic Lumber Trade Association seems to have frozen in time at about 2007, with few updates to their listings or publications. I tried to contact a couple of the resellers of plastic lumber, but at time of writing, neither had responded. The RPL business can be rough and tumble. Many innovative upstarts have failed.

For example, Correct Deck, an RPL company that made composite decking with HDPE had a factory in Maine, but ran into liability issues—specifically related to mixing organic materials in the right proportion with plastic and “capping” deck surfaces anti-microbial material. (I installed one of their decks 12 years ago and it still looks great—just a little spotting.) Consumers are extremely intolerant of any discoloration in their surfaces.

The market opportunities for RPL have never been better. Sure, there are challenges to using these materials. But when you factor in the fact that plastic trash is ubiquitous, free and in overwhelming need of a cleanup, the building industry could provide an ideal solution. Imagine basements that never leak, lightweight roofing with cradle-to-cradle credentials, impact-resistant siding and rot-proof joists and 2-by-4s. All of these innovations are not only possible, but available now. It would be great to see some more American companies join the growing field of plastic lumber manufacturing. **GB**



Sorting problem. An overseas company called Eco Tiles makes attractive floor tiles from recycled plastics, but their method of collecting and separating the right polymers raises health and safety concerns.

Instant Factory?

In other parts of the world, reusing plastic in construction is an up-and-coming niche.

THIS SMALL MACHINE BELOW, which combines recycled plastic and sand to create roof shingles, has attracted interested buyers from all over the world. Setup costs €25,000 (\$29,000) according to the seller, Andrey Kolev, who is based in Bulgaria. The company (<http://plasticabg.net>), can make the moulds from a drawing; total prep time is three months. The unit requires 20 kW to operate and can make 60 pieces per hour. The total factory area required is about 215 square feet, not counting storage.



How Plastic Lumber Is Tested

The sophistication of plastic composite testing continues to increase from when engineers initially sought to test and classify recycled plastic lumber. The ASTM has developed seven important testing standards:

- D 6108 (www.astm.org/Standards/D6108.htm), Standard Test Method for Compressive Properties of Plastic Lumber and Shapes;
- D 6109 (www.astm.org/Standards/D6109.htm), Standard Test Method for Flexural Properties of Unreinforced and Reinforced Plastic Lumber;
- D 6111 (www.astm.org/Standards/D6111.htm), Standard Test Method for Bulk Density and Specific Gravity of Plastic Lumber and Shapes by Displacement;
- D 6112 (www.astm.org/Standards/D6112.htm), Standard Test Methods for Compressive and Flexural Creep and Creep-Rupture of Plastic Lumber and Shapes;
- D 6117 (www.astm.org/Standards/D6117.htm), Standard Test Methods for Mechanical Fasteners in Plastic Lumber and Shapes;
- D 6341 (www.astm.org/Standards/D6341.htm), Standard Test Method for Determination of the Linear Coefficient of Thermal Expansion of Plastic Lumber and Plastic Lumber Shapes Between -30 and 140 °F (-34.4 and 60 °C); and
- D 6435 (www.astm.org/Standards/D6435.htm), Standard Test Method for Shear Properties of Plastic Lumber and Plastic Lumber Shapes.

Active Plastic Lumber Manufacturers

There no longer seems to be an industry-managed list of current recycled plastic lumber/building product manufacturers. I've done my best to collect a list of every active company I could find. You'll need to read the fine print to determine which ones use recycled material (and what percentage). The only other list of this type that I've seen is rather dated, from a 2005 report (<http://bit.ly/2h1lEZa>). Contact us if you know of others that should be added to the online edition of this article.

A.E.R.T., Inc. (<i>ChoiceDek</i>)	www.choicedek.com
Aeolian Enterprises (<i>BreezeWood</i>).....	www.aeo1.com
American Plastic Lumber (<i>Ameriwood</i>).....	www.american-plasticlumber.com
Bedford Technology (<i>Select</i>).....	www.plasticboards.com
BJM Industries.....	www.bjmindustries.com
Cascades (<i>Perma-Deck Advantage +</i>)	http://bit.ly/2hJxdzF
CertainTeed (<i>Boardwalk</i>).....	www.certainteed.com
Gracious Living Innovations (<i>eon</i>).....	https://www.eonultra.com
Eco-Tech (<i>Eco-Tech</i>)	EcTch@aol.com
Engineered Plastic Systems (<i>Bear Board</i>).....	www.epsplasticlumber.com
Enviro-Curb Manufacturing (<i>Enviro-Curb</i>)	www.envirocurb.com
Epoch Composite Products (<i>Evergrain</i>)	www.evergrain.com
Fiber Composites (<i>fiberon</i>)	www.fiberondecking.com
Green Tree Composites (<i>Monarch</i>)...	www.biewerlumber.com/greentree.htm
Louisiana-Pacific (<i>WeatherBest Select</i>).....	www.lpcorp.com
PlasTEAK (<i>PlasTEAK</i>)	www.plasteak.com
Polywood (<i>Polywood nonstructural</i>)	www.polywood.com
Renew Plastics Division (<i>Evolve, Perma-Poly</i>)	www.RENEWPlastics.com
Resco Plastics (<i>MAXITUF</i>).....	www.rescoplastics.com
Synboard America (<i>Synboard</i>).....	www.synboard.com
Trex (<i>Trex Origins</i>).....	www.trex.com
Universal Forest Products (<i>Latitudes Decking</i>)	www.latitudesdeck.com

Where the Plastic Hits the Road

Could 100 percent recycled plastic roads become reality?

ACCORDING TO MOTORTREND.COM, it's already happening. A company in the United Kingdom, MacRebur, is already testing at least two roads made with recycled plastic replacing much of the asphalt bitumen. Typically, bitumen accounts for about 10 percent of the asphalt mix, but it comes at a high environmental and financial cost. *Motortrend.com* notes that "The material, dubbed MR6, is made with 100 percent recycled materials and can reduce the amount of plastic waste that ends up in landfills. Not only is it considered a greener alternative, but it's also 60 percent stronger and lasts 10 times longer than standard asphalt." **GB**

3D Printing: The Next Frontier for Recycled Plastics



Fabricating doorknobs, hinges and tiles from recycled plastics could soon be the new normal.

THE RELIABILITY AND SPEED OF 3D PRINTERS IS INCREASING. At the same time, the cost for a household-sized unit is dropping. It's a classic "Moore's law" technology story. What does this mean to building pros? Maybe more than you think. I'll reiterate my prediction that we're moving toward a time of localized manufacture.

It's not quite Star Trek yet, where a device recombines materials at the atomic level to form matter, but maybe an early iteration of that idea. And plastics—especially recycled plastics—are a widely available, free material that's optimal for 3D printing today. The products shown, from *Thingiverse*, are just a small sample of what's to come for 3D printing. **GB**

MOLDABLE VS NON-MOLDABLE PLASTICS

FROM AN ENGINEERING PERSPECTIVE, PLASTICS FALL INTO TWO BROAD CATEGORIES: *thermoplastics* and the *thermosets*. Thermoplastics refer to those plastics that soften and flow on heating, allowing them to be molded or formed into different shapes. Thermoplastics can therefore be recycled as they can be melted and reformed into different products (Subramanian, 2000). Thermoset plastics, on the other hand, are cross-linked polymers such as vulcanized rubber, polyurethanes, glass-reinforced polyester or epoxy resins that do not melt or flow on heating and cannot therefore be remolded into a different shape. When heated to high temperatures, the material simply degrades chemically into small molecular products. *Source: Andrad*

A Sealed Deal

Less science, more sustainability go into this ‘forever home.’



Staying power. ZIP System R-sheathing and polyisocyanurate continuous foam exterior insulation will help make this Westhampton, Mass., custom home energy efficient and able to withstand brutal New England winter weather.

BY KRISTIN MICHAEL

BOB LAPALME LOOKS like a satisfied sea captain heading home, peering out the second floor window of his tree-hugged Westhampton, Mass., house under construction. Perched in the center of a wide-mouth opening at the top of a winding half-mile road cleared by a buddy’s team of oxen is a project he asked a net-zero construction power team to create: a very self-sufficient, resilient home in the LaPalmes’ corner of the woods.

In short, a green, dream home.

“We’re going to grow old in this house,” LaPalme says. “I told [general contractor Kent Hicks and architect Steve Baczek] I don’t want a science house—I don’t want to be monitoring gauges and turning knobs. But my wife and I did like the idea of not having so much waste, using less resources and having a home that would not cost much to maintain.”

Indeed, LaPalme’s new solar-ready, net-zero home is where he says he and his wife will be “snug as a bug in a rug,” for the rest of their days.

AIRTIGHT ON THE OUTSIDE

“Snug” is right. Charting LaPalme’s vision for a low-maintenance, durable home, Baczek and Hicks started with a tight, high-performance thermal enclosure—a critical baseline for the 1,800-square-foot industrial-style home. Both men are known for keen attention to details for achieving staggeringly low ACH (air changes per hour) in negative and positive blower door testing. This project is no different and is expected to exceed the Passive House minimum acceptable airtightness requirement of .60 ach 50 Pa.

To build R-40 exterior walls, the Baczek-Hicks team used a 2-by-8, 24-inch, on-center wood stud frame with new ZIP System R-sheathing in an R-12 panel. The panel comes with an integrated two inches of polyisocyanurate continuous foam exterior insulation.

Situated just on the edge of Climate Zone 6 with an annual Heating Degree Day (HDD) measure of about 6600 HDD, the thick exterior insulation will help manage thermal bridging through cold, long, harsh winters, and keep consistent indoor comfort without a lot of extra energy required.

Adding the continuous two inches of rigid insulation to the exterior



Master of his domain. Bob LaPalme’s new solar-ready, net-zero home is where he and his wife plan to live a green lifestyle for the rest of their days.

of the home not only aids in eliminating the thermal bridging, but elevates the temperature in the stud cavity. The elevated temperature will help to ensure that water vapor will not condense within the wall cavity.

Like original ZIP System sheathing and tape, which is also used in the LaPalme house in 5/8-inch panels on the roof, R-sheathing panels have a built-in water-resistive barrier that eliminates the need for housewrap (and felt on the roof), and creates a fast, rough dry-in. Baczek says having this reliable weather barrier was crucial, because construction began in November (2016), and the sheathing had to withstand months of brutal New England winter.

EVEN TIGHTER ON THE INSIDE

As avid users of sheathing products, Baczek and Hicks relied on the streamlined rigid air barrier created by taped panel seams over the integrated water-resistive barrier. These provide the critical continuous air barrier on the outside that is designed to connect to the “internal air barrier.”

Baczek says he uses the ceiling drywall as the interior air barrier at the ceiling plane. To create a continuous air barrier transition from the inside (ceiling) to the outside (exterior wall), he uses a 3/4-inch piece of AdvanTech sheathing to create a flange towards the interior above the top plate of the exterior wall. “It goes out to meet the R-sheathing panel on the exterior and we tape that joint,” he explains. “So now the horizontal piece on the inside is connected to the R-sheathing on the outside. We extend the AdvanTech sheathing piece by about four inches, and apply a double bead of sealant to attach the ceiling drywall to. This completes the ‘lid’ of my primary air barrier.”

DETAILS, DETAILS

This is just one example of the LaPalme house’s unique air-sealing detailing. Other detailing includes individual holes for wiring, instead of one large penetration for a group that “could create voids when trying to seal the interior air barrier,” according to Emily Morse, project manager for Kent Hicks Construction.

The simplicity of this highly insulated, air-tight enclosure is coupled with some unique structural details that together create the perfect efficient, strong home for the LaPalmes, she notes.

To the left side of the home is an elevated second-story, screened-in porch, where the family can watch the moose, deer and wild cats who share the property. To stabilize the structure from a shear perspective, Baczek’s design extended the sheathing “flange” along the interior ceiling perimeter to four feet, creating a diaphragm along two roof truss lines. The screen porch frame is then connected to the ceiling diaphragm with a threaded rod/hold down connection.

“When you put an ‘appendage’ like this on a building and the wind blows, it wants to rack back and forth,” Baczek says. “So how do I make that rigid? We put a big bracket with a threaded rod through the header and that goes back to the sheathing. This allows the screen porch to tap the strength of the house.”

LEARNING CURVE

When completed with its corrugated metal siding and front door porthole windows, the LaPalme home—if it were visible from the road—would definitely stand out among its mid-century farmhouse neighbors. However, in all its uniqueness, three things were expected: its top-level energy efficiency, high-level of durability and resilience, and consistent indoor comfort thanks to the high-performance design and construction that comes with every Baczek and Hicks project.

“The beauty of working with Kent is we’re both on an evolutionary ride,” Baczek says. “As with every project, we’re going to scrutinize everything we do. It could be something we’ve done 100 times, but we’re still going to question its relevance to this project. We’re both out to build a better house every time, so we’re on the same learning curve.” **GB**

Kristin Michael is brand marketing manager for Huber Engineered Woods, manufacturer of ZIP System sheathing and tape and AdvanTech subflooring product lines.



Air-chitect. Architect Steve Baczek specializes in residential housing designs that achieve ultra-low air changes per hour (ACH) in blower door testing, and that exceed Passive House minimum airtightness requirements.

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Don't Mess With Asbestos

When renovating any property, protect your clients and yourself by alerting them to any and all existing asbestos hazards.

BY ANNA SUAREZ

IT NEVER PAYS TO MAKE LIGHT OF OR CONCEAL potential health hazards such as asbestos on a project. We've all seen it done, perhaps even done it ourselves—taking a safety shortcut to save a client some money, in hopes that we'll be rewarded with future contracts, or a favorable testimonial. But removing a few asbestos-insulated pipes or a few square feet of asbestos-laced shingles can have long-reaching and unpleasant consequences. While it may be hard for a client to prove that your actions resulted directly in a future mesothelioma (cancer), OSHA has strict rules about handling asbestos. You could face large fines, and if you dispose of material improperly, fines can multiply.

Older buildings in particular are more likely to be built with outdated materials that could potentially pose a risk to health. Often asbestos is a major concern, but one that is relatively unfamiliar for many clients.

Much of the public is under the impression that asbestos is banned in the United States, but this is not the case. Many other countries have banned the material, including (most recently) Canada, formerly one of the largest producers of asbestos.

In the United States, the Environmental Protection Agency began regulating asbestos use in the 1970s under the Clean Air Act and the Toxic Substances Control Act. The U.S. attempted a ban in 1989, but it was overturned two years later, which means that despite regulations, asbestos is still allowed in some forms. Even with these regulations in place, the greatest health concerns involve asbestos-containing materials installed before the laws were changed, making this an issue during renovation, repair or demolition projects.

According to the EPA, here are a few places where asbestos may be found in buildings:

- Attic and wall insulation containing vermiculite
- Vinyl floor tiles and the backing on vinyl sheet flooring and adhesives
- Roofing and siding shingles
- Textured paint and patching compounds used on wall and ceilings (e.g., popcorn ceilings)
- Walls and floors around wood-burning stoves protected with asbestos paper, millboard or cement sheets
- Hot water and steam pipes coated with asbestos material, or covered with an asbestos blanket or tape
- Oil and coal furnaces, and door gaskets with asbestos insulation

Asbestos use was incredibly widespread in terms of geography and the range of products that incorporated it. This mineral occurs naturally in the Earth's crust, but has been mined for use in consumer



Red flag. Piles of asbestos-based shingles left exposed like this are a sure sign to OSHA that materials have been removed improperly. Only a licensed asbestos mitigator can remove large areas of material, particularly on multi-family homes.

goods and products for the construction industry because asbestos fibers are highly durable and fire resistant.

However, over time asbestos came to be recognized as a serious health hazard. When asbestos is undisturbed it presents no direct danger, but the physical structure of the mineral allows it to easily break off into microscopic particles that can be inhaled or ingested. Asbestos fibers entering the body can cause lung diseases and even rare cancers that develop in the lining surrounding an organ, like the abdomen.

Clients should be made aware of the risks associated with this material, and also that professionals are available to mitigate these concerns. Building owners may not realize that only trained professionals should be handling materials like asbestos, or even why their building contains asbestos in the first place. Maintaining clear communication is important to reassure the client that this can be properly addressed. Additionally, it's important to maintain a solutions-focused dialogue so that owners are not overwhelmed with the severity of asbestos issues.

To transform older buildings into green structures that can effectively support occupant health and safety, any toxic materials must be eliminated. Yes, asbestos can be found in a host of materials in older structures, but there is still a substantial environmental benefit to renovations compared to new construction. Green buildings are the future, and renovation projects can have a positive role in creating a more sustainably built environment. **GB**

Anna Suarez is communications specialist for the Mesothelioma and Asbestos Awareness Center (www.maacenter.org), an independent group that offers news and other information about the disease.



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SMART CITIES

Sharing Smart Knowledge

There’s a lot that India and the U.S. can learn from each other—if we take time to teach it.

This is the third in a series of articles about the increasing interest in—and necessity for—smart homes, villages, cities and communities globally, and how they relate to green building in the U.S.

BY TERRY BEAUBOIS

SMART COMMUNITIES UPDATE: INTERNATIONAL AND IN THE U.S.

SINCE MY LAST ARTICLE, I traveled to India for another Smart Villages Conference reflecting the progress made to date in the state of Andhra Pradesh, followed by a visit to an EcoSmart Community that has started construction, just east of Austin, Texas.

Often, I find people in the United States thinking, “oh, poor India,” because much of the news here pertaining to events over there focuses on disasters, floods or train accidents. It’s understandable that we get that impression. But my last stay in India was full of reports of hurricanes in Houston, Florida, Puerto Rico and the U.S. Virgin Islands, and the earthquake in Mexico. Some people in India might have been thinking, “poor U.S. and Mexico.” It is my hope that through common interests in building smart communities, we can improve international relations and share more best practices in improving our communities, worldwide.

In India, the state of Andhra Pradesh is a leader in “internet dashboards” that connect the government with cities and in-progress villages. In fact, Andhra Pradesh is working on a Blockchain Institute that may work with more Southeast Asia regions and countries, not just Andhra Pradesh and India. Here’s how this and other developing technologies can be applied to the building industry in India and in the U.S.

THE VILLAGE-CITY CO-RELATIONSHIP

One of the most significant factors in this year’s recent Smart Villages conference—led by the University of California at Berkeley’s HAAS School of Business and held at K L University near Vijayawada, Andhra Pradesh, India—was the increased size, scope and participation in the Smart Villages project. It is expanding from one village to more than 400. Having participated on this project since December 2015 and now making my fourth trip to India with this team, I’m pleased to see this. With the UC Berkeley project up and running—and somewhat self-sustaining—we will expand the efforts even further.

A key to any undertaking, in any location, in any country, is successful engagement with political, business and academic communities. This has been the case with the Smart Villages India

project. The Chief Minister of the State of Andhra Pradesh helped identify the need for Smart Villages (connected to Smart Cities) and is helping to show how this is important in his state. Seventy percent of the citizens live in villages. But lack of sufficient education and jobs are two main reasons people leave them. Cities and villages rely on each other: If the villages collapse, so do the cities, and vice versa.

Continuing government agencies’ important role in encouraging and allowing advancement in the building industry includes hosting sites on the dashboard. These sites help identify companies, product manufacturers, material suppliers and other professionals, so that villages and cities can easily find this information. All of these activities, when people “opt-in,” can be seen by each villager, not just the government agencies. India has created secure identifiers of each of its 1.3 billion citizens, and it is working out how to protect privacy and high security nationwide. Security and privacy are the top concerns of individuals and organizations in smart community management.

The interconnectedness of villagers, and then between villages,



Changes ahead. Regions such as Andhra Pradesh in India will see a major shift in how villages and cities communicate, and how companies conduct business, when the Smart Villages program expands.



Smart and EcoSmart. A 7,500-home development underway in Austin, Texas, promises many of the same green upgrades planned for India’s Smart Villages project.

and then all villages and then the state, the nation and the world, is a function of improving internet coverage in India. This allows villagers who have never sold products online—weavers, potters, farmers with agricultural products such as rice, cashews, shrimp and coconut—to consider making their products available through websites that the villagers are being taught how to use.

Speaking of communication: I would be remiss if I did not clarify that in addition to contributing my experience and talent to the efforts in India, a primary reason for me being involved in the Smart Villages is for what I can learn about India’s smart community design that can be applied in the U.S. I was asked to clarify that fact in the coursework goals of my Smart Communities course module for “Smart Villages—India” with other lecturers. This knowledge can be of value to communities everywhere. And every time I visit India, I learn things that can benefit communities in the America—just as U.S. experiences can benefit India.

MEANWHILE, BACK IN THE U.S....

The same can be said with the Whisper Valley project in Austin, Texas. The launch recognized local politicians who helped guide the project to a successful opening, from the perspective of the political climate. The businesses involved in the project were each recognized for their contribution to getting the project underway. In the case of Whisper Valley, the developer, Taurus Development Group, has approached this 7,500-unit development with some innovative ideas, including:

- A geothermal concept being put in place for all of the houses

and buildings in the development. Not necessarily feasible when each homeowner has to consider this individually, the developer has taken the approach to provide this on a large scale and get the benefits of scale.

- Solar energy.
- There is fiber optic internet flowing to all houses. You see how good, high-speed connectivity helps villages in India as well as in the U.S. Again, getting the benefit of scale makes a difference when one is planning for 7,500 homes.
- The same grade of energy-efficient, higher-end appliances will be in all residences.
- Advanced fire, smoke and safety detection systems installed in all homes.

It is difficult for consumers to select these when they are just options. It is difficult for most builders to include them in their developments. In this project, there is vision in the approach of providing this to everyone as an integral part of the community. This project already has 50 homes under construction—some already sold—and will be growing. I’ll be following this subject and others like this as smart communities continue to develop further. **GB**

Terry Beaubois is an architect in Palo Alto, Calif. He is CEO of the internet startup BKS (Building Knowledge Systems) LLC, and an adjunct lecturer at Stanford University. He will be presenting at the January 2018 Green Builder Symposium in Orlando.

STAY TUNED: Upcoming Smart Communities articles

- **Disaster planning.** We often think that disasters happen to other people or other countries, but each community should be created and improved with awareness that natural disasters can occur anywhere.
- **NASA technology.** Looking at the transferring of aerospace technology to the building industry.
- **Virtual reality as a communication tool in the building industry,** based on a recent VR meeting with the Mayor of Liverpool, England, about smart communities, and connecting U.S. and U.K. efforts.
- **Factory-fabricated buildings.** An article on new approaches to factory-fabricated buildings and parts of buildings, related to the Green Building Industry.
- **More from Silicon Valley.** I recently met with Google again about Smart Communities in India and in the U.S. In addition to working with the Austin project for Google fiber to those homes, Google is involved in Smart Communities in significant ways. IBM is involved with Smart Communities globally, and specifically in India and the U.S. **GB**

Case Study: Wireless Keypads

In residence halls, lost keys usually mean potential theft. But one Mississippi college solved the problem with some smart thinking.



Smart (key) thinking. Jones County Junior College saved money and reduced stress within its residence halls by thinking wirelessly about building and room security.

BY GREEN BUILDER STAFF

WITH NEW STUDENTS ENROLLING each semester at Jones County Junior College, key management can become a security issue and big expense. Students at the Ellisville, Miss., school are issued keys at the beginning of the semester, but there are always several misplaced or stolen keys throughout the course of the year.

On a 5,000-plus student campus, that's a sure-fire way to compromise security: It's easy to duplicate keys, which increases the likelihood of thefts and break-ins. In addition, it cost JCJC \$150 in material and labor to replace a single lost key.

This became a recurring issue for the 15-20 students every year that are housed in Smith Hall on JCJC's campus. Rather than spending

thousands of dollars regularly replacing the entire lock on 108 doors, Joseph Van Tuggle, director of men's housing at JCJC, explored dedicating those funds toward electronic access control.

"Just because you lose a key, doesn't really mean it's lost. You can lose it, someone can put two-and-two together, and now security is compromised," Van Tuggle says. "Changing out an entire lock can be very, very costly."

Looking to avoid that, while still heightening school security, Tuggle came across the Schlage *NDE Series* electronic lock from Allegion. He liked what he saw.

"Seeing what electronic access control, key fobs and credentials can do appealed to me because if a student loses his or her credential, all our team has to do is go in, shut off that card's access and issue him or her another one," Van Tuggle says.

In July 2015, JCJC selected a system that included the Schlage *AD-400* wireless electronic locks and *NDE Series* electronic locks with *ENGAGE* technology. *NDE Series* locks were installed on 82 individual bedroom doors, and 26 *AD-400* locks were added on to the outside suite doors throughout Smith Hall.

THEFT DETERRENT

In previous years, Van Tuggle regularly faced issues related to theft and break-ins. Before implementing the new security measures, he would typically tell students to keep their doors closed and locked, but thefts were continuing to occur.

"Before the *NDE Series*, we didn't really know if students were keeping their doors shut or not because we didn't have any other way to go back and see—it was reliant on their word," Van Tuggle said. "After installing the locks to individual bedroom doors, we were able to utilize the *ENGAGE* cloud-based mobile application to view who last had access to specific doors. That enabled me to go back and question students about the incident."

The *NDE Series* is designed to be easy to install, connect, manage and use, and was developed for facilities—such as campus residence and tenant unit entry doors—that want to upgrade to electronic credentials for improved security and efficiency.

Built-in Bluetooth enables *NDE Series* locks to connect directly to smartphones and tablets. There is no need for a costly proprietary handheld device for set-up and configuration. And with built-in Wi-Fi, the locks can connect directly to an existing Wi-Fi network, enabling automatic updates to configuration, access privileges and event history.

"The convenience factor has been night and day," Van Tuggle says. "During orientation, I sit right at my desk, kids come in, and I easily enroll them into our system or switch their access to a different room. When they come back a week later and move in, they're already ready to go."

To add layers of security throughout Smith Hall, Van Tuggle secured suite doors with *AD-400* locks.



CREDIT: ALLEGION

In the cards. Schlage *NDE Series* and *AD-400* electronic locks are making lost room keys less of a problem for students and staff at JCJC.

These locks provide online, real-time access control and are uniquely designed with easily changeable reader modules—ideal for future upgrades since they don't require changing the entire lock. All required hardware components are combined into a single integrated design that incorporates the electrified lock, credential reader, request-to-exit switch, door position switch, tamper guard and more.

AD Series locks are made for openings that separate public areas from restricted areas, making it the ideal solution for suite doors at JCJC. With this solution, Van Tuggle and his staff can now see in real time if a door is propped open, receive alerts if necessary, and capture a history of events if needed for future reference.

"We were serious about keeping doors shut, locked and adhering to all safety measures," Van Tuggle says. "[With these locks], we've certainly upgraded. We now provide the security, efficiency and convenience of electronic access control without the cost or complexity of a fully wired system."

PAYING DIVIDENDS

In the two years prior to installing the *NDE* and *AD series* locks to suite and individual bedroom doors, JCJC had five thefts reported in Smith Hall; one in 2013-2014 and four in 2014-15. JCJC estimates an average of eight labor hours to investigate a report theft, equating to an estimated cost of \$500 to \$1,000 per incident to the college. Since then, no thefts have been reported, resulting in higher security for students and facility, and thousands of dollars in savings.

JCJC now plans to incorporate Schlage locks with *ENGAGE* on 120 doors in two of its other residence halls, Clark and Covington. **GB**

Original content courtesy of Allegion (www.allegion.com), a global pioneer in safety and security.



CREDIT: ALLEGION

All systems secure. In addition to making its campus key system management process more efficient, smart keys helped JCJC reduce its theft numbers and increase overall dorm security.

CODE ARENA

The Latest Rules, Regulations and Codes Impacting Sustainable Construction

Slowing Down the PACE?

Days could be numbered for this popular green home financing program.



CREDIT: CHOKKICX/ISTOCK

BY MIKE COLLIGNON

A 10-YEAR-OLD GOVERNMENT FINANCING vehicle that incentivizes renewable energy and energy efficiency is now in jeopardy of having its impact reduced and, quite possibly, eliminated.

Property Assessed Clean Energy (PACE) financing works like this: The property owner agrees to a long-term property tax assessment in exchange for upfront funding to pay for an energy efficiency or renewable energy upgrade. The upfront costs of such retrofits, which can be cost prohibitive, are instead financed over a period that can be as short as three years and as long as 20 years. The

interest rates on these loans are typically higher than a traditional mortgage rate but lower than a credit card's.

The shifting of debt enables the property owner to more quickly realize the positive cash flow of a reduced energy bill. Just like the upgrades, the debt obligation remains with the property should it be sold before the debt is repaid. This assessment is a disclosure in the real estate process. But ideally, the reduced energy bills would also be shared with potential buyers.

Because the debt is tied to the property tax, PACE financing has a high rate of repayment. (PACE financing can be allowed through private capital firms, too.) And, according to a study published in the *Journal of Structured Finance*, PACE financing was found to have a

net positive effect on the resale value of homes.

PACE programs aren't just limited to residential or commercial or projects. Industrial, non-profit and agricultural properties can also be eligible. And the retrofits aren't restricted to energy. Windproofing, seismic retrofits, water conservation upgrades and septic tank improvements can qualify for financing. In that light, PACE doesn't just help protect the environment, it also creates jobs and promotes local economic development.

PACE financing originated in California in 2008, but it initially struggled to gain traction. The Federal Housing Finance Agency (FHFA) almost eliminated it in 2010, but the lending mechanism managed to survive and even started to thrive. By the end of 2010, 24 states and the District of Columbia had passed PACE legislation. To help ensure the viability of PACE programs, the PACE Assessment Protection Act (also known as HR 4285) was introduced in the House of Representatives in 2014, but it never went further than a referral to the House Committee on Financial Services.

REAL PACE THREATS

Even though PACE has never received much love from Congress, it doesn't necessarily need it. Because it is a form of a lien, PACE must be enabled at the state and county levels, which makes it a very local decision. To that end, there are now 30 states and the District of Columbia that have approved commercial PACE financing, and 16 states and D.C. that have passed residential PACE legislation. It should be noted that only 13 states and D.C. have active PACE programs, and only three of those states (California, Missouri and Florida) utilize it for residential purposes.

Unfortunately, it seems PACE financing is coming under attack from the federal government once again. HB 1958, a bipartisan bill cleverly titled "Protecting Americans from Credit Entanglement" (PACE) Act of 2017, was introduced in early April. Not long after, a companion bill with the same name was introduced by four Republican Senators in mid-May. The intent of this legislation is to require PACE to meet the requirements of the Truth in Lending Act (TILA).

We probably all agree that protecting consumers against fraud is a good thing, especially in the wake of recent shenanigans in the financial world. However, lawyers for Renew Financial believe that the legislation would characterize home performance contractors as "selling" PACE financing, and would therefore have to become licensed mortgage brokers. If the legislation were to pass and if that interpretation were to hold true (two big ifs), few (if any) contractors would obtain broker's licenses.

The other threat to the future of PACE is the House FY2018 Transportation and Housing and Urban Development appropriations bill (<http://bit.ly/2gTtVwI>). The bill contains language that could severely hamper the future of PACE: "The Committee includes bill language prohibiting funds from being used to purchase, guarantee or insure any mortgage on properties that have a PACE loan in a first lien position—superior to the FHA loan."

The first lien issue has always been the Achilles heel of PACE financing. That's why this lending mechanism has drawn the ire of the Mortgage Bankers Association and Realtor groups. It's understandable why lenders would be upset with a secondary loan having higher repayment priority. As the bill states: "Loans repaid

by a tax or assessment enjoy a first lien position and, therefore, have priority in receiving proceeds in the event of a foreclosure. A PACE loan would be fully satisfied before the FHA mortgage."

We're almost three years removed from the FHFA prohibiting Fannie Mae and Freddie Mac from purchasing or refinancing a mortgage with an existing first lien PACE loan. And therein lies why the federal government continues to hound what is otherwise a state- and county-level program: the involvement of Fannie and Freddie in so many loans.

However, the THUD appropriations bill does make an unjust implication. It reads: "FHA's subordinate position increases the risk of loss to the Mutual Mortgage Insurance (MMI) fund and by extension, taxpayers. The Committee notes that the MMI fund was forced to draw \$1.7 billion from the U.S. Treasury just four years ago to cover projected losses on loans it guarantees, and just reached its statutory capital reserve level just two years ago."

That is certainly a lot of money, especially if you're projected to lose it. However, by including this statistic in this section of the bill, it implies that the 10-figure loss is due to PACE financing. No evidence is ever given to support that implication. And for the sake of context, it should be noted that in the current appropriations bill, the Committee is recommending a limitation of \$400 billion on loan guarantees in the aforementioned MMI program account. So, if the MMI program were to lose \$1.7 billion in FY2018, that would represent 0.4 percent of all loan guarantees.

To put that in perspective, the S&P/Experian First Mortgage Default Index is at 0.66 percent. And when you take into consideration all loans, the Federal Reserve reports that the delinquency rate for all real estate loans was at 2.28 percent for Q2 2017. The MMI program would be outperforming the market, while fostering sustainability improvements, which also lower societal/governmental costs.

Since Congress is struggling to pass legislation, this may all be for naught. But the House has passed a \$4 trillion budget, so the legislative logjam *might* be loosening. Both of the aforementioned bills are 5-6 months old and still sitting in Committee, but for those in the home performance industry, this is a topic worth monitoring. **GB**

Mike Collignon is the executive director and co-founder of the Green Builder Coalition.

- "PACE Loans: Does Sale Value Reflect Improvements?", Journal of Structured Finance, <http://bit.ly/2z2WApf>
- PACE Assessment Protection Act (HR 4285), <http://bit.ly/2z011RP>
- House FY2018 Transportation and Housing and Urban Development bill, <http://bit.ly/2A0xsxB>

COURTESY OF The Green Builder Coalition

The Green Builder Coalition is a not-for-profit association dedicated to amplifying the voice of green builders and professionals, driving advocacy and education for more sustainable homebuilding practices. For more information, visit GreenBuilderCoalition.org

For more information, contact Executive Director Mike Collignon at mcollignon@greenbuildercoalition.org.

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GREEN BUILDER® Rebuilding and Resilience

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FROM THE TAILGATE

New Offerings for the Sustainable Minded

By Ron Jones

Thinking ‘About’ the Box, Not Outside It

BIG IDEAS? Apparently, everybody has them. All you have to do is listen to their messaging. It seems the killer business strategy nowadays is to latch onto the latest buzzword and ride that baby until the wheels fall off, or at least until it is replaced by whatever comes next.

Let’s get real. How many truly new variations of burgers, pizzas or tacos are in that magical, irresistible cornucopia we have paraded in front of us week after week? Not many, but the “idea guys” would have us believe that they have turned the food industry upside down every time they come up with another hokey combination of the same old ingredients. Let’s wrap it in an egg! Right.

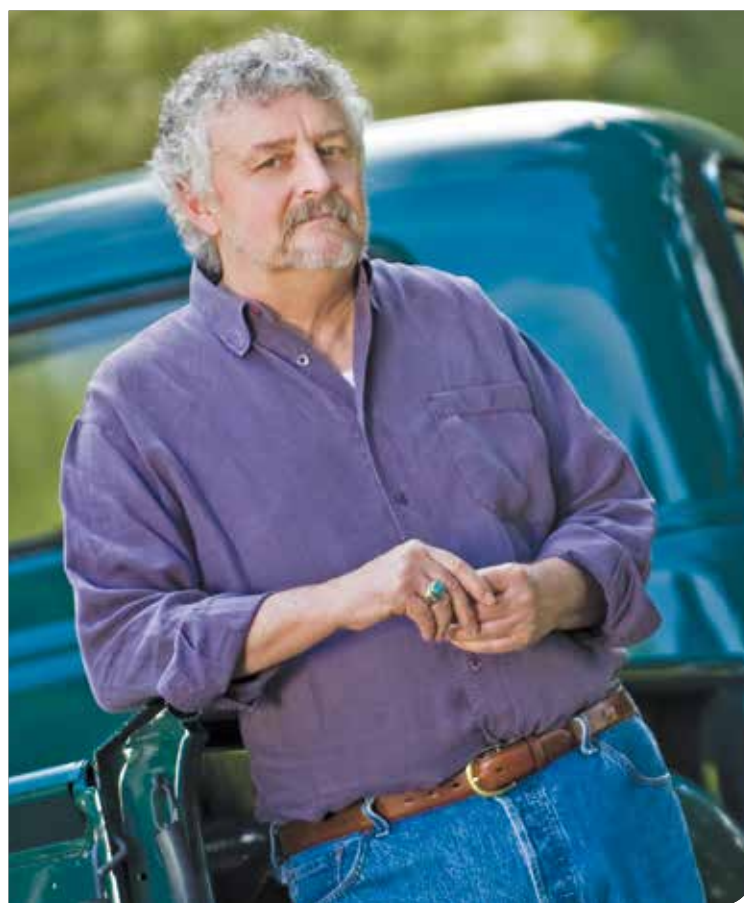
Equally laughable is the lack of originality offered by the talking heads. If you watch sports on television you know how rapidly, and annoyingly, sportscasters everywhere glommed onto the dreamt-up term “physicality.” Can somebody please come up with a replacement for that one? Careful, though. Recently, listeners were treated to another jewel that rolled off the tongue of a color analyst. He referred to a team’s “intentionality,” and said it with a straight face. Seriously?

The big idea term *du jour* in the homebuilding industry, and many others, is some variation of the word “disrupt.” Disruptive. Disruption. Disrupters. Disrupted. The marketing gurus are giddy with all the possibilities...disruptive technologies, disruptive systems, disruptive strategies, disruptive policies.

The good news is that the trade associations, along with the predictable gaggle of consultants and the traditional industry publications, have already started wearing this one out, a sure sign that the use of these will soon be considered too *passé* for the truly innovative communicators.

But in fairness, at least it has given the industry dinosaurs something to write and talk about other than millennials! We can be thankful for that.

Sorry folks. The homebuilding industry is not going to undergo the badly overdue makeover the *disrupter* crowd is crowing about as a result of outside pressure from a combination of new products, building systems, advances in performance or brilliant new strategies. Sure, these are all essential ingredients in the recipe, but they’re not going to make a meal by themselves. You can pour on all the secret sauce you want, but if it starts out as junk food it’s going to end up that way when it hits the plate.



If the industry finds itself on a new course, it will be because a relatively small number of builders are successful in taking meaningful market share away from those entrenched in the current model. Nothing succeeds like success. When a new generation of innovative builders—who are determined to deliver the homes we’re all capable of—can demonstrate that their products will outsell the mediocre, predictable offerings that dominate the current choices homebuyers are stuck with, the disruption will take place from within. Protectors of the status quo will do whatever it takes to escape the drain they’re currently circling, and grab a seat on the bandwagon. **GB**



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