Award-Winning Coverage of Sustainable Construction, Products and Lifestyles

GREEN BUILDER®

January/February 2021 / www.greenbuildermedia.com

13TH ANNUAL GREEN HOME OF THE YEAR AWARDS

Despite a raging pandemic, political upheaval and climate extremes, the best in the business brought forth cutting-edge projects and homes.

ALSO IN THIS ISSUE:

Our 3rd Annual Sustainability Awards

High-Performance Metal

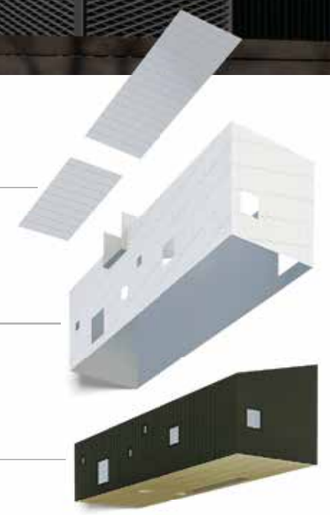
Civitas | Net Zero Design

"We went through a process of energy studies, and aluminum started coming in" as a favored choice. "If you install it correctly, it will last forever."

-Barry Alan Yoakum, FAIA, Principal, archimania

Civitas, Memphis Installing contr.: Ralph Jones Sheet Metal Architect: archimania
Owner: Barry Alan Yoakum Photo: archimania

Civitas makes a strong statement not only in its visual presentation, but also in its accomplishment as the first single-family home in the Americas to be registered as a Zero Energy/Zero Carbon home. Petersen's wall and roof systems contributed to both design and performance of this progressive home.



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EDITOR'S NOTE

The Inside Scoop

By Matt Power
Editor-in-Chief

Beauty Prevails

Despite the carnage of 2020, the best in the business did not abandon their vision and craft.

THE ONGOING PANDEMIC, horrific as it has been, has largely spared the U.S. building industry. For that, we should be grateful, but never cocky. Spending more time than ever at home, it turns out, brings out the nesting instinct in people. Money that might previously have been spent on travel, tourism or dining out has, for the fortunate, been redirected toward kitchen renovations, deck upgrades and accessory dwelling units.

This year, as we prepared for our annual Green Home of the Year Awards, we weren't sure what to expect. Would builders and architects briefly pause their labors to put their best work forward, or would the sheer momentum of demand keep them focused on the small picture, the utilitarian demands of scheduling, material deliveries and subcontractors?

We needn't have worried. Our mailbox soon filled up with entries from the U.S. and beyond; high-impact projects that show an attention to design and building science. For all of you who entered, I want to say thank you, whether you made the final cut or not. No effort is wasted; we want you on our radar, so we can come to you when we're looking for a specific type of project or detail. You've become part of our permanent library.

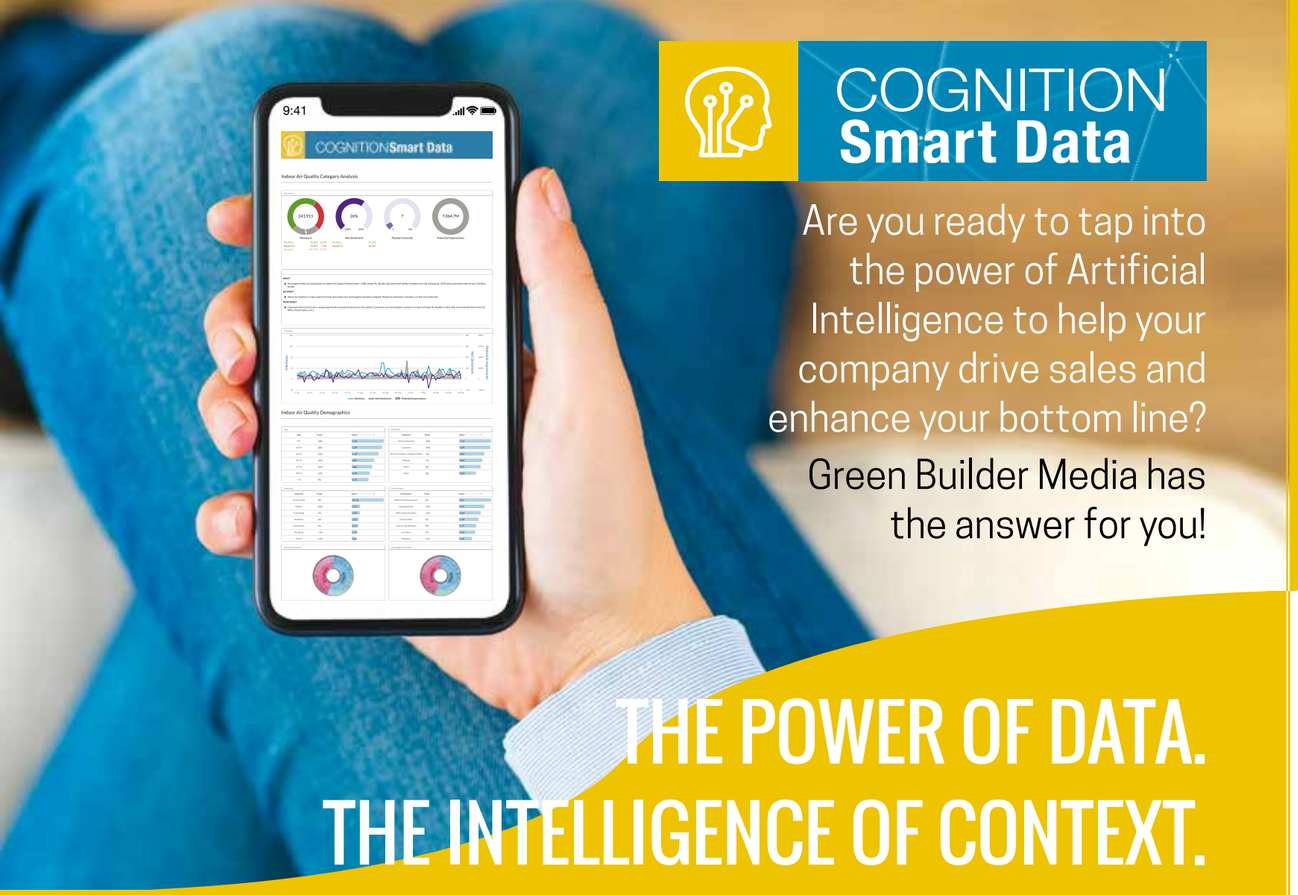
From a strikingly modern net-zero custom home in New Jersey, to a super solar courtyard community in Washington state, to eye-popping, ultra-energy efficient dwellings in New Zealand, these projects raised the bar of sheer possibility to new heights.

But this issue isn't really about sticks and bricks and ICFs and SIPs. It's about the people behind the projects, and the forces at work in their communities, "pushing the envelope" toward better performance. That's why we'll also honor the cities taking the lead on Climate Change, and individuals like builder Gene Myers, who give us a hero to look up to.

So take a break from your labors, make a fresh cup of coffee, and leaf through this compendium of the best of the best. It's been a long pandemic. You deserve some kudos, and some optimism. **GB**

Spending more time than ever at home, it turns out, brings out the nesting instinct in people. Money that might previously have been spent on travel, tourism or dining out has, for the fortunate, been redirected toward kitchen renovations, deck upgrades and accessory dwelling units.

By example. This year's Sustainability Superhero, Gene Myers of Thrive Homes, exemplifies how the industry's best have handled the daunting challenges of our time. COURTESY OF GENE MYERS



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Can the U.S. Match Europe's Renewable Success?

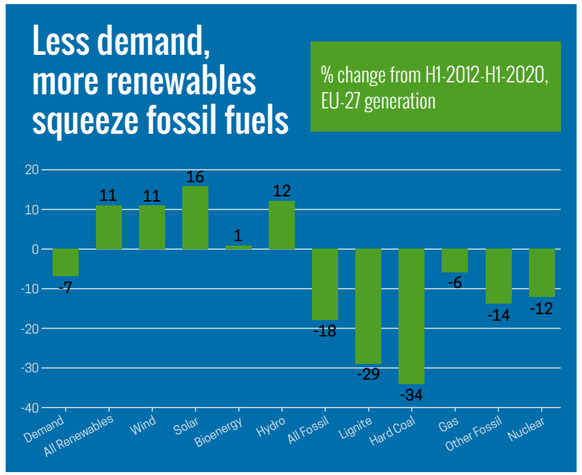
It's a challenge worthy of the new administration's Climate Change emphasis.

STRICT GOVERNMENTAL POLICIES have renewable energy production on the rise in Europe. According to a report from German thinktank Ember and Agora Energiewende, more than 38 percent of Europe's electricity came from renewable or clean power sources in 2020. It marks the first time that renewables have surpassed fossil fuels for power. Fossil fuels accounted for 37 percent of Europe's energy.

Solar and wind power drove renewables up a combined 24 percent from 2019, and they now account for 20 percent of all electricity used in Europe, the report notes. Meanwhile, coal usage declined by 20 percent, nuclear power dropped by 10 percent, and natural gas by 4 percent. The decreases were largely due to a lessened demand for electricity due to the pandemic.

Collectively, Europe's electricity in 2020 was 29 percent cleaner than in 2015, according to Ember senior electricity analyst Dave Jones. The totals still lag behind the pace needed by European nations to meet their 2030 European Green Deal targets, but it is a positive start to what needs to be "a decade of global climate action," Jones says.

The United States could – and should – look to Europe as an example of how to promote clean energy, Agora Energiewende Director Patrick Graichen notes. Many nations have the resources to generate all the power needed to make fossil fuel usage obsolete, but they lack government policy. Europe's leaders in wind and solar, Graichen says, "show what is possible if there is a sustained political will."



Extinction imminent? Use of fossil fuel-based energy sources continued to plummet from 2019-2020, while renewables rose to all-time highs. CREDIT: EMBER

Earth's Air Got A Lot Cleaner in 2020

However, the world's massive drop in carbon emissions may be short term.

THE PANDEMIC HELPED CUT THE WORLD'S CARBON EMISSIONS by 7 percent in 2020 — the largest decrease since emissions were first recorded in the 1940s — thanks to national lockdowns implemented worldwide throughout the year, according to a report by research firm Global Carbon Project (GCP).

Last year's 2.4 billion metric ton decrease was also largely due to more people staying at home, GCP notes. Road transport emissions, the largest segment of greenhouse gas (GHG), dropped by 10 percent over the year. Aviation emissions, another huge category, dropped by 40 percent, while industrial activity saw a 30 percent decline. Overall, the United States and European Union saw GHGs decrease by 12 percent and 11 percent, respectively.

But the GCP's study also warns that GHGs will likely climb worldwide once COVID-19-related restrictions end. "Long-term emission trends would depend on how countries power their economic recovery post-pandemic," says study co-author Corinne LeQuere, a climate scientist at the University of East Anglia in the United Kingdom. "All elements are not yet in place for sustained decreases in global emissions, and emissions are slowly edging back to 2019 levels."

Power struggle. A clean energy-generating wind farm's environmental benefits are offset by a carbon-polluting interstate. CREDIT: KEVIN DOOLEY/FLICKR

East Coast Homes Face Flooding Threat

Rising sea levels will pose a huge risk to affordable housing by 2050.

AFFORDABLE HOUSING ALONG THE EAST COAST is already under threat of flooding, thanks to Climate Change-induced sea level rise. However, it will face an even greater risk in the next three decades — possibly three times worse than today, according to a study by research group Climate Central and the National Housing Trust.

The report predicts that by 2050, the U.S. will lose 24,519 units due to repeated flooding, mostly concentrated in northeastern and mid-Atlantic states such as Virginia, Massachusetts and New Jersey.

Sinister forces. Flooding in coastal cities such as New Orleans — a prominent victim of storms, including Hurricane Katrina in 2005 — will be much worse if Climate Change reaches a projected point of no return by 2050. CREDIT: CAN EUROPE/FLICKR

The impact will vary: New York City is expected to see the greatest number of units lost — 4,774 — but that total is only 2 percent of the city's entire inventory of affordable housing. On the other hand, Miami Beach will lose only 314 units, but that represents a 1,074 percent increase in the current amount of threatened housing.

Compounding the problem is the fact that many of the houses threatened are in lower income neighborhoods, where people are unlikely to repair or return to their homes after a disaster, according to Climate Central CEO Benjamin Strauss, the report's co-author. But future research may help pinpoint the exact areas that are in danger and enable more-effective use of federal or state aid, he notes.

Shifting gears. Over the next 14 years, General Motors phase out gasoline-powered vehicles in favor of electric ones. Many, like the Ford *F-150*, won't look much different in either form.

CREDIT: FORD MOTOR COMPANY

No More Fossil Fuel-Powered Cars in GM's Future

The auto giant says it will end production of gasoline vehicles by 2035.

CONSTRUCTION WORKERS, REPAIR PERSONS AND OTHERS who rely on heavy duty vehicles will soon have to say goodbye to the gasoline-powered variety. General Motors, one of the world's largest automakers, plans to phase out all fuel-driven cars and trucks, and market only non-carbon emission vehicles by 2035. The decision is part of the company's plan to become carbon neutral by 2040. It's also expected to persuade elected officials to push for more-aggressive policies to combat Climate Change, according to a report in *The New York Times*.

Electric cars today are the fastest-growing segment of the auto industry, but they still make up only 3 percent of the world's total new car sales, according to the International Energy Agency (IEA). They accounted for only 20,000 of 2.6 million vehicles sold in 2020.

GM's announcement comes shortly after President Joe Biden revealed plans to replace the U.S. government's 650,000-vehicle fleet with electric models, as the new administration shifts its focus toward clean energy. **GB**

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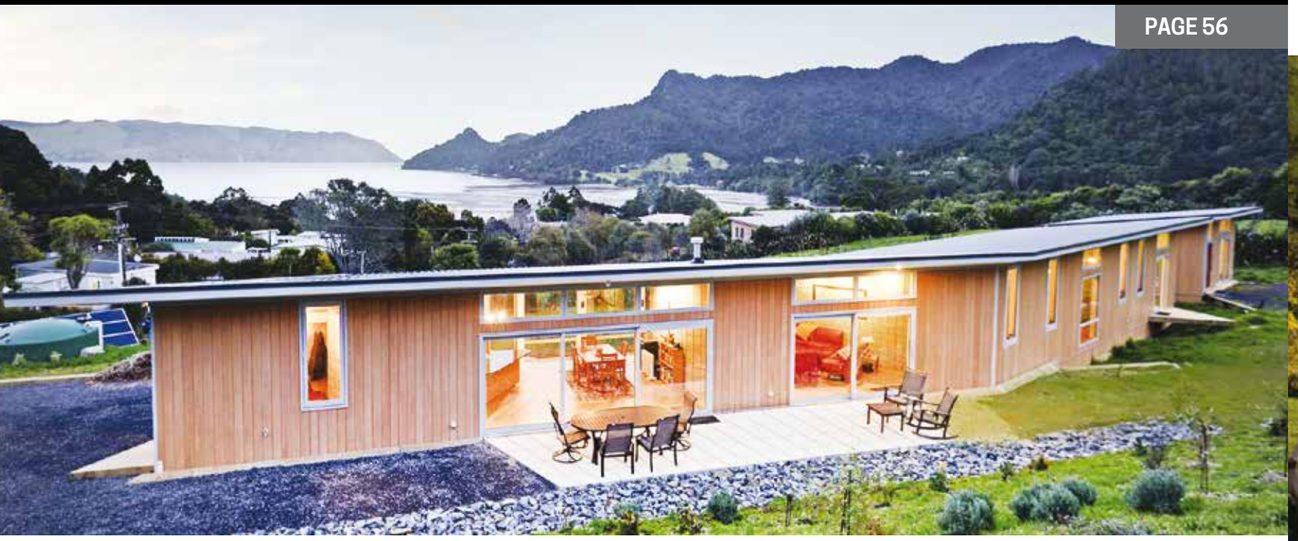

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ON THE COVER

HOTY SUSTAINABLE COMMUNITY WINNER: THE WALK-BAINBRIDGE

Photographer: Jonathan Davis/davis studio AD

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Green Builder's annual Sustainability Awards recognizes people and companies that are leading by example when it comes to informing the public about why and how to go green.

This year, we honor our Sustainability Superhero, Gene Myers; Tucson, Arizona, Boulder, Colorado, and Burlington, Vermont, as Sustainable Cities of the Year; and our 14 Green Innovations of 2021. All are making huge strides in working toward solving environmental challenges.

CONGRATULATIONS TO ALL OF OUR WINNERS.

GREEN BUILDER® Sustainability Awards 2021

"The key is to not be afraid to try things. Don't be afraid to innovate."

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Sustainability Awards 2021

Gene Myers: Fearless Leader

Gene Myers and Thrive Home Builders keep having fun raising the bar on high-performance housing by 'just doing the right thing.'

BY ALAN NADITZ

ASK GENE MYERS ABOUT WHAT MAKES him a sustainability superhero, and you'll notice right away that he doesn't brag about his accomplishments. He doesn't need to.

Myers, as CEO of Thrive Home Builders in Denver, has guided his staff to multiple awards in just about every major sustainability arena over the past 20 years: U.S. Department of Energy, EPA, Energy Star, U.S. Green Building Council LEED, National Housing Quality and Green Builder Magazine, to name a few.

There are, he says, two reasons for this success. One is his employees, whom he has the utmost respect and appreciation for. ("They really are the thing that's propelled our business over the years.") The other is his customers, who continue to challenge Thrive in unusual ways, forcing the company to become ever more innovative.

Thrive Home Builders, which specializes in high performance single-family subdivision homes, sees all types of customers. There are Baby Boomers who don't want to buy another house but end up doing so after seeing a Thrive product. Millennials who are buying because their parents are "kicking them out of the house." Gen Xers who simply want to feel like they're doing the right thing with green home ownership.

And the requests? Clean-energy encouraging solar. Air-freshening HVAC. Environmentally clean all-electric. Net zero. Modern architecture. Unique design. Easy decision making. Affordability. On the surface, not a big challenge for any builder. But making them all work can be hard, depending on what a buyer wants, or thinks they want.

"I'm a civil engineer by training," Myers says. "So, I think I've always brought a problem-solving approach to everything. If a problem looks really big or challenging, you just break it down into its parts and start by examining the little ones, and start solving the little problems. The key is to not be afraid to try things. Don't be afraid to innovate."

That goal carries over to business dealings. In his 30-plus year career in housing construction, Myers has learned that manufacturers can be great partners. He is more progressive than most when it comes to tying a product into a home's construction and sale. ("For a lot of builders, the answer's a no right off the bat," he notes.) And there have been some great successes, such as in dealings with Panasonic or Broan.

But there have also been some flops. One prominent home battery maker failed to meet its obligation and left Thrive with customers who had paid for the product and waited for up to a year to have it installed. But now there's a similar plan in the works with Sonnen, another prominent home battery manufacturer, one that looks far more stable, Myers notes.

In another case, a solar panel manufacturer offered customers a no-money-down lease, which Thrive worked into its home pricing. But then the company cancelled the program without telling Myers. The "huge mess" was resolved with the help of SunStreet and its similar leasing program.

A lot of the learning process is "fail forward," Myers says. "After situations like that, your thought may be, 'Oh, man, I never going to do that again,'" he notes. "Well, if it doesn't work, you try to find out why it didn't work. That's been pretty typical of our evolution over the years."

Thrive's community standing can't be ignored, either. Over the years, the company has donated more than $1 million dollars in time and homes to Denver-area nonprofits and local building associations and foundations. "Our mantra is to always do the right thing," Myers says. "It's something everyone can believe in."

There are a dozen other reasons why Myers and Thrive Homes have succeeded over the years, through good economies and recessions, through pro-green and science-defying Administrations. But going into all of those here would result in an epic like War & Peace.

He offers some parting advice. "We, as green builders, like to think that if we build these homes, they will come," Myers says. "I think what we've learned is that they might not. The home still needs to be beautiful, emotional and comfortable. It needs to be all of the things a customer is looking for...we can't coast on sustainability, we can't coast on green building, we can't coast on zero energy homes. It's got to be the whole package." GB

Gold standard. Thrive Home Builders' award-winning product, such as Panacea, a Green Builder Home of the Year winner from 2019, can be found throughout Colorado. COURTESY OF THRIVE HOME BUILDERS

Superhero Stats

Some of **GENE MYERS'** career accomplishments include:

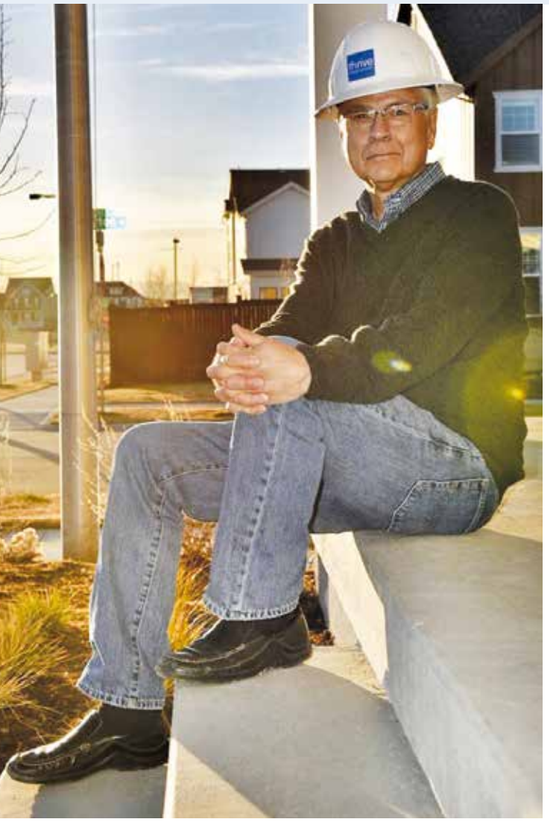
11x **GRAND WINNER** of the U.S. Department of Energy's Housing Innovation Awards

5x **WINNER** of the U.S. Environmental Protection Agency's Indoor airPLUS Leader Awards, including Builder of the Year in 2019

8x **WINNER** of the ENERGY STAR Certified Homes Market Leader Award

3x **GREEN BUILDER® HOME OF THE YEAR WINNER**

Thrive Homes is Colorado's largest LEED Certified Home builder
and was the U.S. Green Building Council's Partner of the Year in Colorado in 2019



Learn and live. Gene Myers and Thrive Home Builders have taken on a lot of challenges over the years, and they are ready for whatever lies ahead.
COURTESY OF GENE MYERS

Say No to Going Solo

Being a great builder means being part of a group effort.

BEING A SUCCESSFUL, high performance builder is not easy. Thrive Home Builders CEO Gene Myers agrees that the innovation and change-management necessary to move beyond code-minimum building is often difficult, frustrating and grinding. But there's a four-word piece of advice he offers to anyone who wants to be a developer that stands out from the crowd: Don't go it alone.

Myers says it's the most-important lesson of his career, one he's happy to share.

PICK A LEGITIMATE STANDARD TO AIM FOR. Don't come up with your own. Whether it is ENERGY STAR, Zero Energy Ready and/or EPA Indoor airPLUS, these programs are backed by hard science from the National Laboratories. "If you come up with your own, you are probably watering down one of these standards," he notes. "Or you are 'winging it' with possible unintended consequences for you and your customers."

All of these programs come with marketing support, with resources that have been developed to tell a customer about the benefits of your product, while ensuring that you are making truthful and substantiated claims. The programs require third-party verification by an established base of raters, and there is a sophisticated and seasoned network of experts behind these programs that is vested in your success. "I liken NOT being in one or more of these programs to 'performing without a net,'" Myers notes. "Home building is risky enough. I sleep better at night knowing that our homes are field verified to meet the highest building standards in the land."

PLUG INTO THE HIGH PERFORMANCE BUILDING COMMUNITY OF SUPPORT. Myers says some of his best friends and best advice has come from interacting with others who are also vested in getting better homes built for people. The Energy and Environmental Building Alliance (EEBA) is where most of that interaction has happened through conferences, training and education, employee certification programs and EEBA's Builder Benchmark Group. "Frankly, it has been the ONLY place that convenes the best of building product manufacturers, building science experts and fellow builders," he notes.

Share your vision and the burden of innovation. Building better homes for your customers and for the planet is a high calling. It requires change in the way you, your team and your trade partners build. You cannot do this alone.

BRING PEOPLE IN YOUR FAMILY AND COMPANY ALONG WITH YOU. Invest in training your people by bringing them along to conferences, celebrating certifications and awards and "internally marketing" to your team. "A shared vision is a strong vision," Myers says. "An unshared vision is recipe for loneliness, frustration and even failure. 'Infecting' your team with the mission shares the burdens…and the successes."

An inspired team will also help to bring along inspired trade partners. Myers says great partnerships can be formed with building product manufacturers who want their products installed right so they perform right. Also, be sure to give your partners some pats on the back. "Handing out awards and recognition to your trades is a way of thanking and respecting them," he says. "Shining the light on your high performing trade partners will inspire others."

SHARE YOUR VISION AND INSPIRATION WITH YOUR CUSTOMERS. Your homebuyers are consummate consumers who are often educating themselves about high performance building long before they meet you, Myers notes. Make sure that your sales team is a team of 'believers,' so that your message is getting through to customers.

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Sustainability Awards 2021

CREDIT: RAWPIXEL/ISTOCK

Vanguards of Hope

With all of the controversy of the past year, it's easy to believe that cities haven't been able to focus much on sustainability efforts. But several municipalities forged ahead, and laid the groundwork for others to build upon as they resume green thinking in 2021. Our three Sustainable Cities of the Year offer insight on water conservation, carbon emissions reduction and going all-in with renewable energy. Congratulations to Tucson, Arizona, Boulder, Colorado, and Burlington, Vermont!

Sky's the limit. Most of Arizona's green energy effort stems from solar, as evidenced by installation of more than two dozen photovoltaic systems and leasing of city acreage for solar farms.
CREDIT: ARIZONA DEPARTMENT OF WATER RESOURCES

LARGE MUNICIPALITY

Tucson, Arizona

POPULATION: 548,073

For 'Old Pueblo,' keeping pace with population growth means keeping careful track of Mother Nature's gifts.

GREEN BUILDER
Sustainability Awards 2021

WHEN IT COMES to living sustainably, Tucson residents have had a head start on most of the U.S. for more than a decade. Chalk that up to Arizona's rapid population growth — the state had the nation's second-fastest rate in 2020, and has been in the top five since 2018 and top 10 since 2015, according to the Census Bureau. The number of Tucson residents, meanwhile, has risen by a bit more than five percent from 2010-2020, to about 550,000, Census data shows.

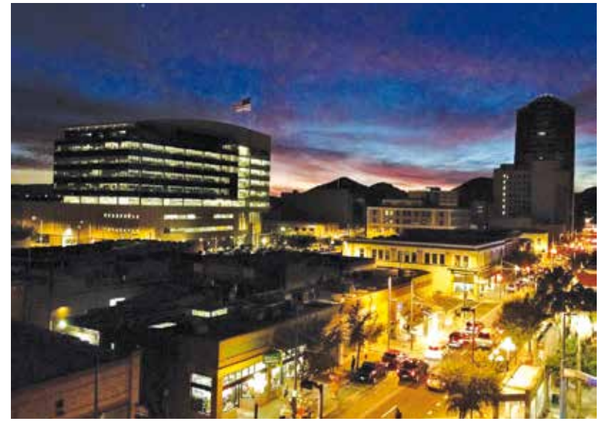
That's a lot of stress on city resources, and local government has responded with some of the state's most stringent water and energy practices. Between population growth and continual drought, water is precious: Conservation efforts include banning lush lawns in private yards, which instead must consist of native desert landscaping; mandatory reclaimed water use in outdoor areas, or watering by designated schedule only; no washing and rinsing of sidewalks, driveways, patios and parking areas with a hose or higher-pressure device, except for where public health is concerned; and only use of water cooling systems that circulate water.

In 2019, the city, known locally as "Old Pueblo," completed an effort to restore the Santa Cruz River's flow through downtown Tucson by diverting treated wastewater into the river line. The recycled water — as much as 2.8 million gallons daily — also soaks down into the riverbed and helps recharge its aquifer. "This work is an important building block in Watershed Management Group's (WMG) 50-year vision and plan to restore Tucson's heritage of flowing rivers," notes Lisa Shipek, WMG's executive director. "Having flow in the Santa Cruz River downtown provides a daily visual of what a desert river looks like, which will help open the hearts and minds of the greater

community to what is possible."

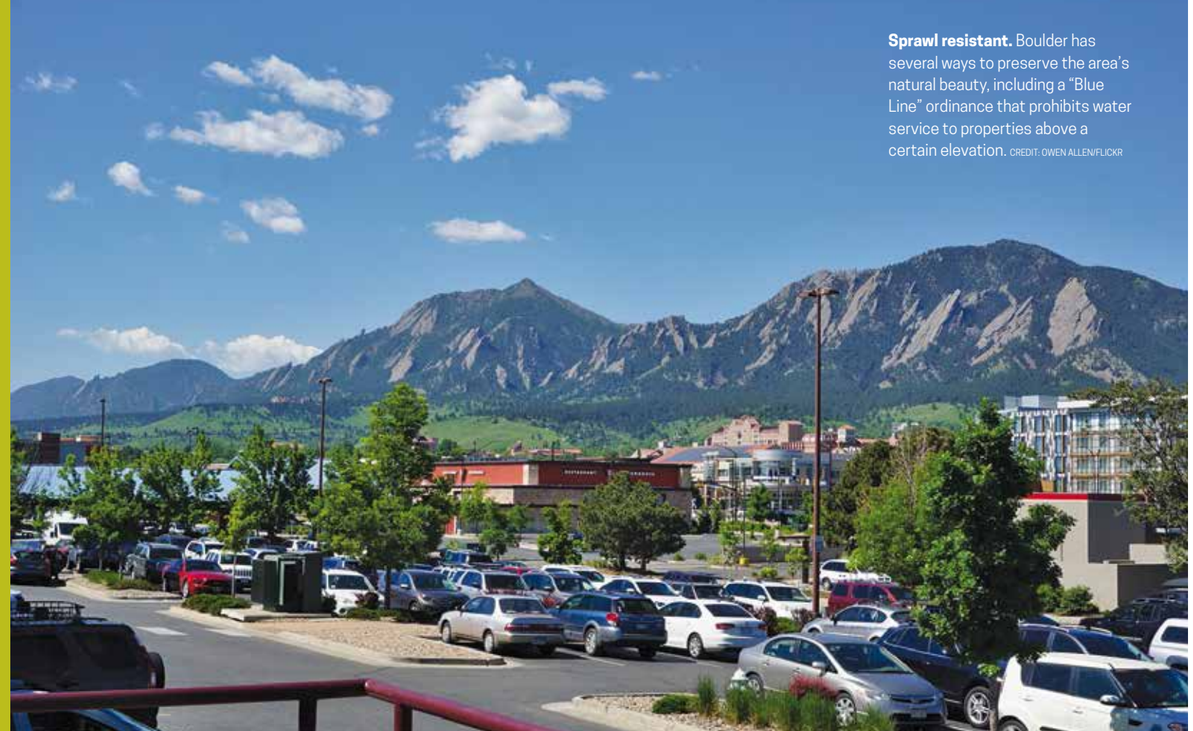
Meanwhile, Tucson in 2018 joined the 2030 Districts Network, a collaboration of (thus far) 23 cities that have pledged to demonstrate that sustainably built buildings can be the most valuable buildings in the region, boosting the economy. The project's goal, according to Tucson 2030, is to dramatically reduce energy and water consumption, as well as transportation emissions in new and existing structures, by at least 50 percent by 2030. Close to 60 percent of the district's 24 million square feet of building space is currently committed to the effort.

Also, over the past 20 years, the city has taken advantage of one of its greatest resources, sunlight, with the installation of 25 photovoltaic arrays — generating a total of 4.7 megawatts of solar energy — as well as seven solar hot water heaters on city properties, and the leasing of land for future solar farms. The city, which was designated as a Solar American City by the U.S. Department of Energy in 2007, has also adopted solar-ready requirements for all new construction of single-family homes and duplexes to ensure that future solar photovoltaic and hot water systems can be easily installed. The city also makes information about its solar energy production and use available online. **GB**



Resilience strategy. A tough natural environment — hot weather, drought and limited greenery — has the city of Tucson focusing on water management, energy conservation and carbon neutrality throughout the 21st century.
CREDIT: CONGRESS13/FLICKR

Precious resources. Landscape preservation is a huge part of Tucson's goal to manage environmental resources with population growth over the next 30 years.
CREDIT: SHEILA SUND/FLICKR



Sprawl resistant. Boulder has several ways to preserve the area's natural beauty, including a "Blue Line" ordinance that prohibits water service to properties above a certain elevation. CREDIT: OWEN ALLEN/FLICKR

MID-SIZED MUNICIPALITY

Boulder, Colorado

POPULATION: 105,673

When visiting this 'Republic,' it's impossible not to bump into, step on or catch sight of something that's simply sustainable.

GREEN BUILDER
Sustainability Awards 2021

BOULDER, COLORADO, MAY not be a household name when it comes to U.S. cities (for many people, the first thing its name brings to mind is the late 1970s TV show, "Mork and Mindy"). But among green-minded communities, "The People's Republic of Boulder" has a reputation for putting nature and the environment at the top of the lifestyles list.

The city has embraced bicycling as the way to travel through the community, reduce carbon emissions and provide the populace with healthy exercise. Forbes, the advocacy group PeopleForBikes, and The Travel Channel have all placed Boulder at or near the top of "Top Cycling City" lists, largely due to its extensive network of bike lanes, multi-use paths and designated bike routes. The city also offers some fringe benefits, such as vending machines with spare bike parts, tool boxes on loan from local businesses, and "B-cycle" kiosks where a rider can check out a bike for free for 30 minutes. "The minute you set foot in Boulder, you'll see plenty of helmeted, lycra-clad cyclists," notes the Boulder Convention and Visitors Bureau website. "[Often, they'll be] in groups, getting in a workout over their lunch breaks, riding to and from work or reveling in a carefree weekend ride." (Reportedly, "Mork & Mindy" star and comedic legend Robin Williams, himself an avid cyclist, pushed for a show setting that could emphasize bike use.)

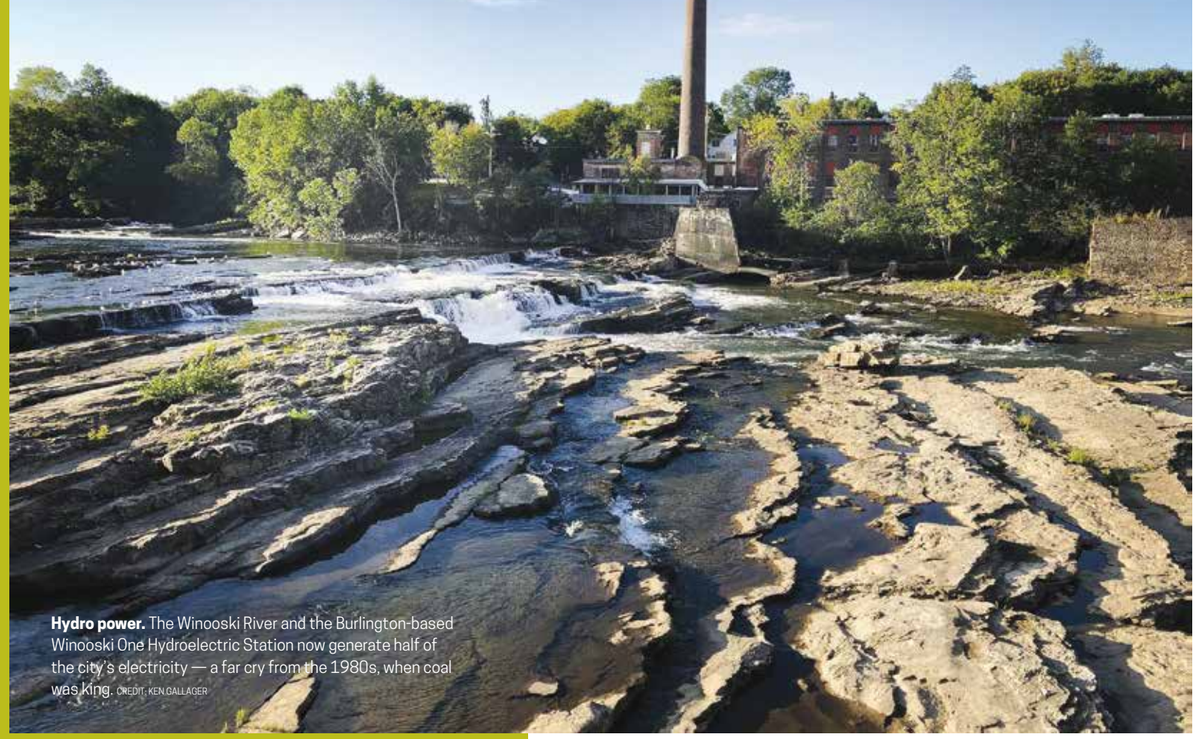
The City of Boulder has other green plans underway. Environment threatening situations such as diminished Rocky Mountain range snowpack and winter snowfall, hotter summer temperatures and a higher pollution level led to the declaration of a climate emergency in 2019. The city, through its Climate Mobilization Action Plan, has now set 2030 as the deadline for running entirely on renewable energy, cutting city operations greenhouse gas (GHG) emissions by 80 percent, and upping local renewable power generation by 100 megawatts (MW). And, carbon emissions are to be cut by 80 percent by 2050.

Progress is promising, according to city officials. About 54MW of the 100-MW new green energy goal has been met in just two years, as has slightly more than one quarter of the planned GHG reduction. Boulder is also 40 percent of the way toward its government emissions cutback.

Of course, that shouldn't be much of a surprise. Boulder has a history of efforts that promote a green lifestyle, such as establishing a "Blue Line" designed to prevent development on the city's mountain backdrop (by prohibiting water service to any property above a certain elevation); a new home construction limit of less than one percent annually; a sign code that restricts the use of size, height and location of billboards, designed to preserve natural beauty in and around Boulder; and a building heights charter that limited new construction size to no more than 35 feet tall. **GB**

Recycled power. Boulder's cogeneration facility uses gas byproducts to produce clean electricity and heat. CREDIT: CITY OF BOULDER

Two-wheeled rule. Bikes are a world unto themselves in Boulder, being given their own traffic lanes, trails and maintenance sites. COURTESY OF CITY OF BOULDER



Hydro power. The Winooski River and the Burlington-based Winooski One Hydroelectric Station now generate half of the city's electricity — a far cry from the 1980s, when coal was king. CREDIT: KEN GALLAGER

SMALL MUNICIPALITY

Burlington, Vermont

POPULATION: 42,819

As the nation's first city to be powered entirely by green energy, Burlington now heads for net-zero territory.

GREEN BUILDER
Sustainability Awards 2021

ANY MUNICIPALITY GOVERNMENT that says it's just too difficult to operate entirely on renewable energy should take its case to Burlington, Vermont. The far northeastern city, only 43 miles from the Canadian border, has been 100 percent green-powered since 2014 and is generally considered the first municipality in the U.S. to reach that goal. It has since become the poster child for more than 170 U.S. cities that have promised to drop coal and natural gas for wind, water and solar by 2035.

Vermont's largest city — a.k.a., the "Queen City" — was once almost entirely dependent upon coal for power. But in the mid-1980s, Burlington's coal plant was shuttered by pollution and aesthetic concerns. Power generation duties then shifted to a new waste wood-burning facility (promoted by then-mayor, now U.S. Senator Bernie Sanders). Each year, the facility burns some 400,000 tons of wood chips — significantly cleaner and easier on the eyes.

Buoyed by an increasingly sustainability-minded populace in Burlington and statewide, the city began to move toward all-renewable power. Long- and short-term energy contracts were secured, energy efficiency-directed bonds approved, and solar energy systems marketed to residential and commercial avenues. According to the Burlington Electric Department (BED), solar's popularity is a bit of a surprise, as Burlington receives some of the nation's lowest average levels of sunlight per day. Yet, Burlington now has more than 16 times the solar power storage capacity that it had at the end of 2011.

The final component of the conversion to all-renewable power was the purchase of a hydroelectric facility in 2014, which now supplies half of the city's energy. The wood chip plant still supplies 30 percent, and the remaining 20 percent comes from landfill methane, wind and solar. Residents are experiencing environmentally friendly power, as well as benefits such as utility rates that haven't increased since 2009. The city, meanwhile, expects to save about $20 million by 2035, according to BED.

Burlington's next goal is to become net zero by 2030. According to city mayor Miro Weinberger, the "roadmap" to gaining a carbon neutral footprint will include getting 95 percent of household floor space to be heated by electric heat pumps and water heating systems, 80 percent of vehicles to be electric, and for annual vehicle travel to decrease by 15 percent. "Reaching the goal will require us to completely restructure our transportation and thermal sectors in less than [nine] years," Weinberger notes in a report in VTDigger. "[But] with political will, and with strong technical expertise...very ambitious climate goals are possible." **GB**

One with the wind. A key part of Burlington's journey toward 100 percent green status is courtesy of the neighboring Georgia Mountain Community Wind farm's four wind turbines, which power more than 4,200 Vermont households. CREDIT: U.S. GREEN BUILDING COUNCIL

Great panes. Solar energy only makes up a little more than 10 percent of Burlington's green power, but careful placement around the community helps the city make the most of every panel. CREDIT: ENCORE RENEWABLE ENERGY

Follow the Sun

This year's greenest ideas bring us closer to harnessing the true potential of solar energy.

BY MATT HARRIS AND SAMANTHA CARLIN

It's time again to honor an elite group of manufacturers and products that are making real progress in reducing the impact of construction upon our natural environment. They range from super-efficient solar energy management and heating equipment, to one-of-a-kind recycling projects and an indoor greenhouse. Products like these — along with help from a new, forward thinking administration — will continue to steer us toward more sustainable lifestyles.

HERE'S A LOOK AT THIS YEAR'S WINNERS.

SOLAR PANELS

Eagle TR G4 Solar Panel

MANUFACTURER: JINKOSOLAR

JinkoSolar's new *Eagle TR G4* photovoltaic panel follows in the successful footsteps of its predecessors in the Eagle line, but hosts a slew of new improvements. One of the most notable qualities of the *Eagle TR G4* panel is its Tiling Ribbon (TR) technology, which eliminates cell gaps — allowing the panel to have a higher efficiency, while reducing the size of its carbon footprint.

Unlike its predecessor the *Eagle G3*, the *TR G4* panel was specifically designed to be roof mounted. The unit's smaller footprint decreases the amount of mounting and cabling materials necessary, saving time and money. The *Eagle TR G4* is incredibly durable, hosting the same back sheet as its predecessors. This makes it a good choice for structures in varied environments that may experience harsh weather, such as hail and extreme winds. The *Eagle TR G4* panel has an efficiency higher than 20.7 percent, with a maximum power output of 400W, packing a punch for its small footprint.

Like its predecessors, the *Eagle TR G4* uses a half-cell design, allowing it to generate electricity even when partially shaded. The panel comes in the *Eagle 66TR G4* and *Eagle 78TR G4* sizes, as well as the *Eagle 78TR G4b* bifacial model with a 5 percent to 30 percent backside energy gain.

More information: JinkoSolar U.S.

Sun watcher. JinkoSolar's latest evolution of its *Eagle* photovoltaic line offers all the effectiveness of its predecessors, but it's also easy to mount on a roof or adjust the panel's orientation to the sun.

Photo(voltaic) finish. Ease of install, including a direct-to-circuit breaker plug-in and AC/DC inverter, is one of the *NeON R Ace*'s key selling points. Extra effective energy conversion is another.

NeON R ACe Solar Panel

MANUFACTURER: LG ELECTRONICS

LG Electronics' newest solar panel, the *NeON R ACe*, pushes the solar industry forward with new levels of convenience, both in installation and use. One of the panel's most impressive features is its ability to house a direct current (DC) to alternating current (AC) 320W inverter right on the back of the panel. This makes the panel more convenient when installed and saves money for customers, since they don't have to buy a separate inverter.

To improve convenience even further, the *NeON R ACe* panel plugs right into a 240V circuit breaker and only has one cable accessory, drastically simplifying installation. This panel is also guaranteed to produce 90.8 percent of its labeled power in its 25th year. The *NeON R ACe* panel has a high efficiency of 21.7 percent, with a maximum power output of 380W, making it convenient and powerful.

The panel has a high standard of performance in hot and cold conditions with a temperature coefficient of minus 0.3 percent/degrees Celsius.

More information: LG Business Solutions

Panasonic *HIT®+ N340* Solar Panel

MANUFACTURER: PANASONIC LIFE SOLUTIONS

Equipping a home with Panasonic *HIT+ N340* solar panels brings further benefits beyond the increase in home value, attractiveness to buyers, and decreased energy costs of most solar panels on the market. The new benefits include efficiency, performance, dependability and durability.

The *HIT+ N340 Solar Panel* delivers an advanced renewable energy source to power any home while issuing zero emissions. The high-efficiency photovoltaics feature a 20.3 module efficiency rating and 340 watts per panel. The N340 also delivers a zero emissions capability, being made of n-type crystalline cells combined with amorphous layers. In terms of extreme heat performance, the panels have a temperature coefficient of minus 0.258 percent/degrees Celsius. This technology decreases the annual degradation to 0.26 percent, compared to 0.70 percent in conventional panels, guaranteeing more power for the long haul.

With a smaller footprint and increased strength and durability, the *HIT+ N340 Solar Panel* allows for building flexibility and supports projects with higher voltage needs. The water drainage system helps to direct rain and snow off of the panel surface, reducing water stains and soiling, allowing more sunlight absorption, and ultimately increasing the lifespan of the panel.

More information: Panasonic N340 HIT+ Series

By the numbers. Panasonic's *HIT+ N340* solar panels give homeowners an easy way to work toward having a house that is emissions-free.

DECKS/DECKING RELATED

MoistureShield *Elevate* Capped Composite Decking

MANUFACTURER: MOISTURESHIELD

MoistureShield redefines decks entirely with its *Elevate* capped composite decking, which is among the most durable decking materials on the market, and 95 percent of which is made of recycled content.

The solid core of MoistureShield's composite decking is made from wood fibers, but to make it incredibly durable and waterproof, each wood fiber is encapsulated in a plastic barrier. This revolutionary design makes the decking so waterproof it can be used underwater.

No exposed wood also means that there is no food source for insects, protecting the decking against typical damage from pests. With weathering and insect damage covered, this decking has no rotting or warping. This makes the decking much longer-lasting, and it even has a 50-year transferable structural warranty.

On top of its durability, the deck is also affordable and sustainable, being made of recycled plastics and wood. This decking comes in a wide array of colors and finishes to perfectly match or compliment an outdoor living space. *Elevate* is also slip-resistant and reduces heat by up to 35 percent, making the living space more comfortable and safer.

More information: MoistureShield Elevate

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Sustainability Awards 2021

Wooden warrior. MoistureShield's *Elevate* capped composite decking keeps the elements, insects and warping away.

Second life. AZEK's *Full Circle PVC Recycling Program* turns discarded decking and siding materials into born-again decking, siding, cladding and trim.

AZEK *Full-Circle PVC Recycling Program*

MANUFACTURER: THE AZEK COMPANY

Traditionally, when a piece of decking is trimmed off or siding is cut to fit, the scraps are thrown away. Now, the AZEK Company is changing all of that with its *Full Circle PVC Recycling Program*. Utilizing an innovative product technology, an expansive network of professionals and its vertically integrated recycling capabilities, the company collects scraps directly from construction and job sites, and reprocess them into brand new decking, siding, cladding and trim.

This on-the-ground program not only recycles more than 2.5 million pounds of PVC waste per year that would otherwise be disposed of in landfills, but also reduces contractors' overhead waste disposal costs. More than 60 million PVC pounds are processed annually by AZEK partner Return Polymers.

And the environment isn't the only one who benefits. The program makes it easier for contractors to advertise themselves as green builders, attract new clients, save money and reduce their environmental impact on the planet.

More information: AZEK Full-Circle PVC Recycling

GREEN INNOVATIONS OF THE YEAR AWARDS 2021

HVAC AND HOT WATER

Rheem *ProTerra Hybrid Electric Water Heater*

MANUFACTURER: RHEEM

The *ProTerra Hybrid Electric Water Heater* from Rheem delivers unbeatable efficiency, without compromising on functionality, through its advanced heat pump technology. Rheem's *ProTerra* system is four times more efficient than the standard electric tank, cutting down on greenhouse gas emissions and saving money. Installing the *ProTerra* system, on average, saves consumers $480 per year on energy costs, while also providing a $300 tax credit and up to a $1,000 in local utility rebates.

With a built-in *EcoNet* connection device, the *ProTerra* can be controlled from a mobile device, and includes features such as the ability to set designated times for hot water availability. *EcoNet* also enables the tracking of water and energy usage, and users can choose from five operating modes that are optimized for different preferences.

The *ProTerra* system also has built-in leak detection and can automatically shut off the water to protect the home. Add in incredible energy and cost savings, and *ProTerra* is the right water heater for any home and the planet.

More information: Rheem ProTerra Hybrid Electric Water Heater

Hotter hybrid. Rheem's *ProTerra*-model hybrid electric water heater beats a standard electric unit four times over in terms of energy costs and the ability to quickly heat the water.

GREEN INNOVATIONS OF THE YEAR AWARDS 2021

LG Multi-position Vertical Air Handler Unit with LGRED°

MANUFACTURER: LG AIR CONDITIONING TECHNOLOGIES

LG's *Multi-position Vertical Air Handler Unit (VAHU) with LGRED°* (Reliable to Extreme Degrees) *heat technology* gives homeowners a fully electric option capable of delivering year-round heating and cooling in an all-in-one inverter heat pump system. Available in various capacities (18,000 Btu/h - 48,000Btu/h), this unit is customizable to an array of home and load size requirements.

The VAHU challenges the status quo of fossil-fuel dependent heat generation and addresses the nationwide need for single-source heating and cooling. This product features an R1 compressor with vapor bypass and vapor injection technologies, which boosts efficiency and performance. Equipped with *LGRED°*, the multi-position VAHU boasts superior heat capacity performance of down to 5 degrees Fahrenheit and continuous heating operations down to minus 13 degrees Fahrenheit. It delivers warmth efficiently without the need for supplemental or backup heat, making this a must-have for the cold winter months.

Additionally, the *LG Multi-position VAHU* is ENERGY STAR® certified and contains LG Inverter technology, making it eligible for attractive rebates and incentives from both government agencies and utility providers nationwide.

More information: LG Air Conditioning Technologies

Sustainable heat. The *Multi-position Vertical Air Handler Unit* from LG offers homeowners a practical way to decrease reliance on fossil fuel-based heating and cooling.

Intelli-Balance Boost 100 Energy Recovery Ventilator (ERV)

MANUFACTURER: PANASONIC

The *Intelli-Balance 100* by Panasonic is a unique energy recovery ventilator (ERV). It is designed to be versatile, easy to install and energy efficient, benefiting consumers and builders alike. A key feature of the *Intelli-Balance 100* is its ability to balance pressure in homes, with two electronically commutated motors (ECMs) providing customizable air flow to eliminate positive or negative pressure. The unit comes with a MERV 8 air filter that prevents outdoor particulates, such as pollens and other biologic allergens, from entering the home.

The *Intelli-Balance 100* has been designed for ease of installation, able to be ceiling or wall-mounted, and does not need to be connected to the central HVAC system or condensation line. The unit also saves energy by running on a low CMF setting that exhausts stale air and indoor pollutants, while bringing in clean, tempered outdoor air. The *Intelli-Balance 100* delivers efficient whole-house ventilation, while meeting the ASHRAE 62.2 standards.

More information: Intelli-Balance 100

Balancing act. Panasonic's *Intelli-Balance 100* energy recovery ventilator controls air pressure inside the home to help keep allergens and other particulates outdoors.

Package deal. The *Tranquility by Trane* system offers builders a unified way to offer HVAC, IAQ and smart technology resources to homeowners.

GREEN BUILDER®
Sustainability Awards 2021

Tranquility by Trane platform

MANUFACTURER: TRANE

Trane, a global leader of home comfort systems and services, is changing builders and homeowners' HVAC conversations with its *Tranquility* indoor air quality (IAQ) platform. The *Tranquility by Trane* approach equips builders with innovative and efficient strategies to transform traditional heating, ventilation, and air conditioning (HVAC) processes through the application of building science. This approach ensures optimized performance, energy efficiency, and improved occupant health and comfort through superior temperature and humidity control.

This system is easy to use and includes integrated Wi-Fi controls and sensors to monitor performance through Trane's smart technology, *Nexia* dealer diagnostics. This technology ensures a home's HVAC system is running at peak performance and allows occupants to access real-time intelligence on the system's performance, providing a sense of security and safety to homeowners.

Tranquility also provides system alerts, from routine maintenance needs to system malfunctions. These are automatically sent to the dealer, who can proactively notify the homeowner and address the issue if any follow up is required. Data is encrypted and securely transferred between Trane's smart thermostat and *Nexia*.

More information: Tranquility by Trane

APPLIANCES

Red light, green right. Natufia Labs' *Kitchen Garden* offers a natural, farm-to-fork way for people to grow healthy plants and herbs inside their homes.

Natufia *Kitchen Garden*

MANUFACTURER: NATUFIA LABS

What happens when a home buying client wants space for a garden, but the house doesn't have a backyard? Estonia-based Natufia Labs provides an answer with its *Kitchen Garden*, a product that allows anyone to grow almost any herbs, vegetables, and microgreens right in their kitchen all year round.

Kitchen Garden, which the company says is the world's first fully integrated and automated hydroponic kitchen garden, features technology that automatically maintains the perfect light, temperature, water and pH level to ensure optimal health for the plants. It also optimizes all minerals, nutrients and vitamins. The *Garden* can produce enough plants and herbs to ensure up to two harvests per day.

Since it is controlled indoors, homeowners do not need to worry about pesticides, herbicides or fungicides, nor do they face challenges from Mother Nature or changes of seasons. They can practice a sustainable lifestyle and eat healthy while minimizing the environmental impact of packaging, pollution, food miles, food waste and toxins.

More information: Natufia Labs

SOLAR EQUIPMENT

Double duty. Panasonic's *EverVolt* home battery provides extra energy when needed, and comes in AC- and DC-compatible versions (DC is pictured here).

EverVolt Home Battery

MANUFACTURER: PANASONIC LIFE SOLUTIONS OF AMERICA

The *EverVolt* home battery by Panasonic adds resilience to a home's solar array by allowing for high levels of energy storage. This storage can be used in outages, for supplementing nighttime loads, or it can be sold back to the grid. The *EverVolt* system allows for energy security by providing backup power to support pumps, A/C units, and EV chargers.

Standard solar systems shut down when they lose grid power, but with the *EverVolt* system, arrays are still able to generate during power outages. The *EverVolt* system offers a wide range of customization to fit every home. The systems come in AC and DC versions, and offer flexible storage options ranging from 11.4 kWh to 102 kWh. If more energy capacity is needed, three EverVolt systems can be stacked to provide optimal storage.

With easy installation, seamless integration with most energy systems, and a 10-year complete warranty, Panasonic's *EverVolt* home battery makes energy independence easy and reliable.

More information: Panasonic EverVolt Battery Storage

Energy Hub Inverter with Prism Technology

MANUFACTURER: SOLAREDGE

SolarEdge's *Energy Hub Inverter with Prism Technology* delivers a complete residential energy ecosystem in order to have a meaningful impact on the management of the home's energy, electric bills and carbon footprint. It combines the management of solar production, battery storage, backup power, electric vehicle charging and smart energy devices, as well as generator and grid support, into a single inverter and app. This saves space on the main distribution panel and reduces the need for panel upgrades.

Multiple inverters can work together in a network to smartly manage energy. They transform photovoltaic (PV) systems, batteries, and appliances into energy resources for the grid, turning each household into active energy participants and producers. This will revolutionize the grid into a decentralized energy network, and power the world based on a new clean energy economy.

With *Prism* technology software, the system can easily connect to a growing range of smart energy add-on devices. This approach potentially revolutionizes the solar market for installers, by creating a new generation of solar consumers, who have typically been thought of as one-time buyers, into potential repeat customers.

More information: SolarEdge

Prism performers. SolarEdge's *Energy Hub Inverter with Prism Technology* turns multi-pronged energy management into a one-item affair.

GREEN BUILDER®
Sustainability Awards 2021

GREEN INNOVATIONS OF THE YEAR AWARDS 2021

INSULATION

Pure Safety High Performance Insulation

MANUFACTURER: OWENS CORNING

Owens Corning has reimagined the standards of insulation with its *Pure Safety® High Performance Insulation*. *Pure Safety* insulation offers peace of mind when it comes to fire protection, air quality, sound reduction and thermal performance. The product is bio-based and meets USDA BioPreferred® guidelines while also achieving a certified minimum average recycled content of 65 percent. With a high density rating of R-15, this insulation is easy to install, and provides the best thermal performance in its class.

Owens Corning acknowledges that millions of people live with asthma, allergies and chemical sensitivities, and the company has worked to make it easier for contractors and developers to build a home that is clean and efficient. *Pure Safety* was the first insulation to earn and receive the Asthma and Allergy Foundation of America's certification and is designed to provide a safe and healthy indoor environment. Further notable achievements include mold and mildew resistance, low-VOC emissions, formaldehyde-free status, and 65 percent less dust than conventional insulation products.

More information: Owens Corning Pure Safety High Performance Insulation

Indoor air option. A highly dense, bio-based and mostly recycled product makes Owens Corning's *Pure Safety High Performance Insulation* a no-nonsense choice for homeowners and builders.

Safety zone. Green elements in the *Sanctuary Blow-in Insulation* range from a high recycled paper content to a manufacturing process that keeps tens of thousands of tons of paper out of landfills.

GreenFiber *Sanctuary Blow-In Insulation*

MANUFACTURER: GREENFIBER

Greenfiber's *Sanctuary Blow-In Insulation* provides an easy-to-install thermal blanket, increasing the health and comfort of the home, while still being healthy for the environment. The *GreenFiber* cellulose insulation lowers monthly heating and cooling expenses by up to 25 percent, while simultaneously reducing sound power by up to 60 percent. Ideal for attics, walls, ceilings and floors, it can be installed in new builds and when re-molding, as it can be applied over existing insulation. The product excels at filling in tiny joints, crevices and gaps to create a dense barrier capable of reducing air infiltration and mitigating sound.

Sanctuary insulation is made with 85 percent recycled paper that is specifically treated for fire-resistance, and uses low energy manufacturing and short-haul transportation. This low-energy process generates zero waste, other than dust, which is confined within the production system and filtered out of the air that gets discharged into the atmosphere. Greenfiber's manufacturing process uses 13 times less energy to manufacture than for fiberglass, is carbon neutral, and diverts 160,000 tons of paper out of landfills annually.

More information: GreenFiber Sanctuary Blow-in Insulation

13th ANNUAL GREEN HOME OF THE YEAR AWARDS

CAUSE FOR INSPIRATION.

Our six finalists' homes are packed with environmentally friendly aspects, from sustainability-focused construction materials and energy efficient products, to resident-generated solar power and on-site black water treatment. They also share a powerful message: If we did it, so can you.

Our expert panel of judges evaluated projects in terms of overall sustainability, resilience, synergy with the environment and surrounding neighborhood, affordability, creativity and the depth of science employed. Here are their choices for the most exemplary and imaginative green homes of 2021.

HOME OF THE YEAR AWARDS
GREEN BUILDER
2021
The Best of Green Building

THE JUDGES

PETER PFEIFFER, FAIA, is an architect, interior designer, building science consultant and a founding principal at Barley/Pfeiffer Architecture in Austin, Texas. A LEED-accredited professional, he has spent more than 30 years designing and developing pragmatic high-performance green buildings and homes.

SUSAN RATERMAN, CIH, is the founder and president of The Raterman Group, Ltd., and is an experienced consultant in the critical areas of air quality, mold mitigation, environmental hazards and industrial hygiene in the Scottsdale, Arizona area.

BRANDON WEISS is chief innovation officer for luxury home builder Dvele and founder of Chicago-based Evolutionary Home Builders. He has 20-plus years of design and build experience, and is an award-winning, LEED accredited, certified master builder with numerous professional affiliations.

Optimal Efficiency

Above-and-beyond energy saving features in this compact New Zealand home won over our judges.

BY GREEN BUILDER STAFF

SOMETIMES, SMALL THINGS can lead to a bigger one. That's the case for the Emay Crescent Home in Pahi, Northland, New Zealand, which is the Grand Winner of Green Builder's 2021 Green Home of the Year competition.

CREDIT: MARGRIET GEESINK

PROJECT STATS:

NAME: Emay Crescent House, Kaipara District, Northland, New Zealand

BUILDER: Grant Eager, Brogan Builders Limited

ARCHITECT/DESIGNER: Duncan Firth, Solarei Limited, Architect

PHOTOGRAPHER: Margriet Geesink

Let there be light. A north-facing veranda roof draws in sunlight year-round, even during the low-angled light of winter. CREDIT: MARGRIET GEESINK

The four-person family home, designed by architect Duncan Firth, founder of Solarei Limited, and constructed by Grant Eager, director of Brogan Builders Limited, is a mere 785 square feet. It appears even smaller, thanks to its location on a very steep, west-facing 22,388 square-foot site. According to homeowner Margriet Geesink, building a tiny, sustainably focused home was an effort to keep things affordable, avoid a big mortgage, and attain a more-flexible lifestyle.

"Sustainable" and "solar" are two key words. Emay Crescent Home was designed as a vernacular-inspired model that incorporates traditional New Zealand materials, site-specific environmental design principles, passive solar gain with ample winter sunlight, and a sensitive westerly orientation which optimizes harbor views while reducing solar gain. The home design also maximizes air flow and promotes outdoor living.

The floor plan is orientated on an east-to-west axis to achieve economy of construction, practical vehicle access, outdoor living and optimization of westerly views. A 200-square-foot loft space over bedrooms creates more livable space.

A north-facing veranda roof brings low-angled winter sunlight into the front aspect of the home during winter, and also provides shade to the outdoor living area during summer. The roof veranda opening is specifically designed to achieve winter sunlight and summer shading. Living spaces also receive direct passive solar gain with westerly outlooks over the neighboring Kaipara Harbour.

During summer the home is designed for optimized passive cooling using stack effect (hot air rising principle) and cross ventilation. Windows are specifically positioned to maximize passive air flow and cooling, reducing heat buildup from westerly afternoon solar gain.

POWER PLAY

The house is designed for an anticipated electrical energy load of 1,500-2,000 kWh annually or an annual energy index of approximately 24.5kWh per square meter. Internal temperatures passively peak at 24 degrees Celsius during later afternoon mid-winter, with the extreme low being 17 degrees Celsius during early morning.

Green technologies and features which have been used for this home include off-site prefabrication, structurally insulated panels in the walls, metal-insulated panels in the roof, and above code insulation for floor, walls and ceiling. There is also New Zealand-made metal cladding, Canadian cedar fascia boards at roof edges, and a timber subfloor clad in a 10mm recycled native hardwood called "kauri".

Indoors, you'll find argon gas insulated glass, energy efficient appliances, water-efficient taps in the bathroom and kitchen,

PHOTOS BY MARGRIET GEESINK

and breathable bio-paints for interior finishes. Living spaces receive direct passive solar gain with westerly outlooks over the Kaipara Harbour.

In terms of irrigation and moisture management, there is an onsite tiger worm composting system that treats black and grey water (Geesink notes that it was "time to get some new pets" — worms for the waste tanks), a hot water heat pump that sucks heat out of the air, and capacity for 10,000 gallons of rainwater harvesting and fire water storage.

A limestone chip driveway aids with irrigation efforts. "Our land is very muddy and sticky," Geesink notes. "Limestone chip is the material of the land, and it comes from a quarry not far away. The water can easily drain, and the lighter color matches the landscape and beach area around us."

The bottom line: The combination of standardized construction methods, site specific environmental design, passive solar gain, passive cooling, energy efficient technologies, and building technology create a small, desirable, sustainable family home. **GB**

FROM THE JUDGES:

"Excellent use of space for a family of four. Great design and passive strategies blend into the natural environment and take advantage of amazing scenery."

CREDIT: MARGRIET GEESINK

CREDIT: MARGRIET GEESINK

1. **WINDOW DRESSING.** The Emay Crescent Home's doors and windows feature highly efficient Rylock glass, designed to reduce excess sunlight and withhold heat when desired.
2. **NATURE SOLID.** Decks are all-wood, locally sourced New Zealand Pinus radiata timber.
3. **INSIDE INFORMATION.** Interior floors are made of New Zealand natural hardwood and recycled kauri flooring.
4. **BEHIND THE WALLS.** The Knauf Insulation-lined walls include a thick composite of polyester and recycled plastic, which offers thermal performance and sound control.

Prime placement. The home is orientated on an east-to-west axis to achieve economy of construction, practical vehicle access, outdoor living and optimization of westerly views. CREDIT: MARGRIET GEESINK

MAIN FLOOR PLAN

KEY COMPONENTS:

APPLIANCES: IKEA kitchen and pantry bay; Fisher & Paykel energy efficient refrigerator, oven, induction hob and washing machine; Mitsubishi energy efficient microwave

AUTOMOTIVE: Schneider Electric PDL electric charger

BUILDING ENVELOPE: Formance walls (165mm R 5.7 structurally insulated panels [SIPs]; Metalcraft roof 215mm R 5.3 metal insulated panels [MIPs]; inside walls (10mm gypsum board, 8mm popular plywood)

CABINETS, SHELVES, MILLWORK: 20mm New Zealand pine plywood; 18mm particle board shelves with smooth acrylic spray paint finish

CAULKS AND SEALANTS: Sika caulks and sealants

COUNTERTOPS: IKEA Corian solid bench

DECKS: 20mm-by-90mm New Zealand Pinus radiata timber frame

DOORS AND HARDWARE: Rylock glass exterior doors; hollow core Pinus radiata doors with 8mm medium density board, smooth spray paint finish; Halliday Baillie chrome finished hardware

ELECTRICAL: Schneider Electric fixtures and fittings

EXTERIOR FINISHES: Metalcraft cladding (T-Rib, 5 Rib trapezoidal metal roofing profile); fascia (310-by-20mm Canadian cedar); soffit (6mm villa board); James Hardie smooth plaster finish

FIRE PROTECTION: Metalcraft cladding (T-Rib, 5 Rib trapezoidal metal roofing profile); 3,300 gallons of firefighting water

FLOORING: 10mm New Zealand natural hardwood recycled kauri flooring

INSULATION: Knauf Insulation in walls (140mm R 3.2 composite polyester and recycled plastic); Climafoam subfloor (75mm R 2.8 closed cell polystyrene)

LANDSCAPING: Native tree restoration plan; vegetable garden

LIGHTING: LED, or energy efficient lighting throughout home

PAINTS AND STAINS: Resene Paints (low VOC, environmental choice, made in New Zealand)

PLUMBING/PLUMBING FIXTURES: PVC plumbing

ROOF: Precision Roofing (metal insulated roof panel); Metalcraft T-Rib, 5 Rib trapezoidal roofing profile

TELECOMMUNICATIONS: Standard/local connection

VENTILATION: Natural ventilation

WATER FILTRATION: Puretec Hybrid-R

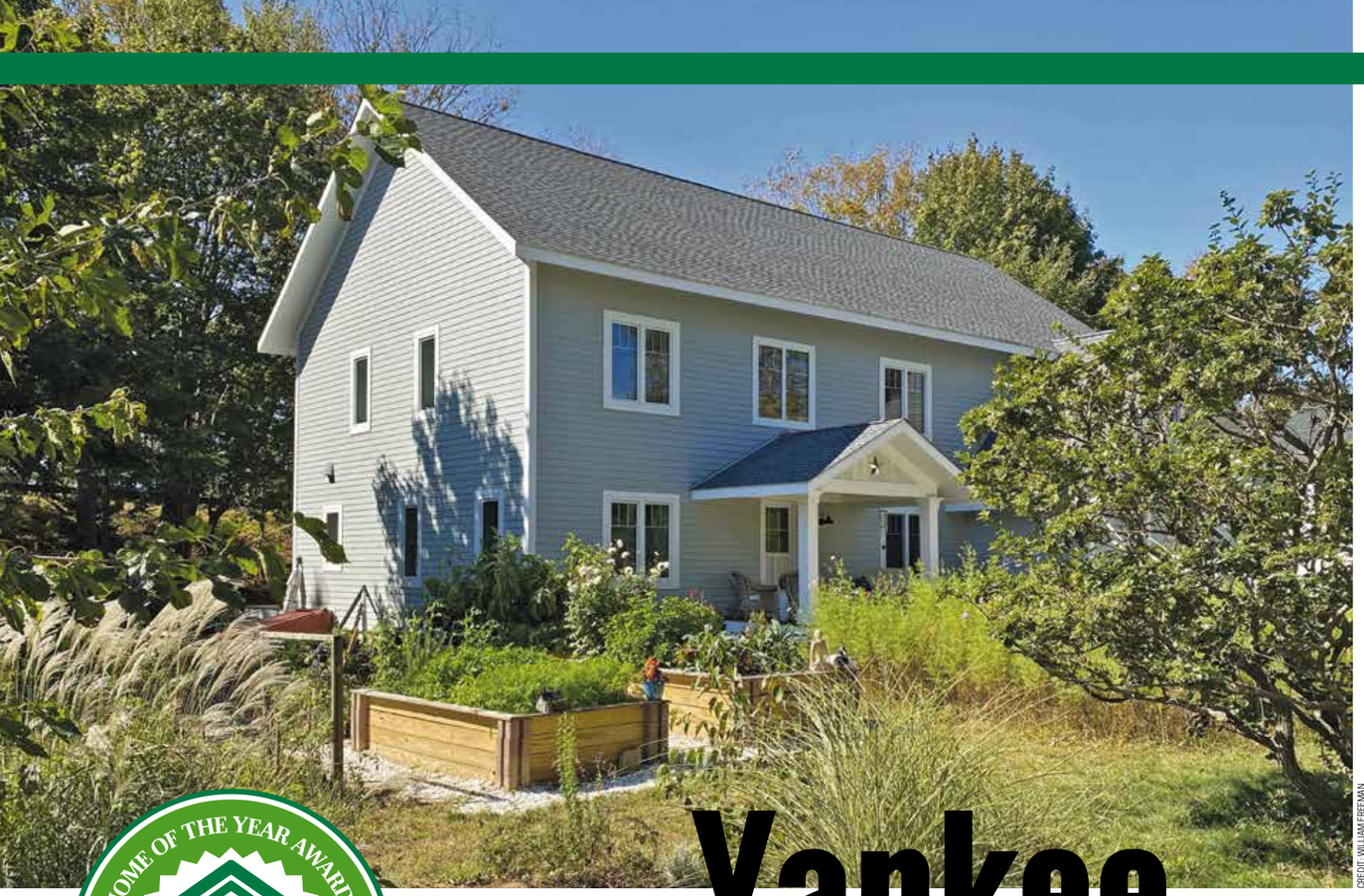
WATER HEATING: Aquarian 275L heat pump

WATER MANAGEMENT (INDOOR/OUTDOOR): Stormwater to public line

WINDOW COVERINGS: Roller blinds polyester with a layer of PVC

OTHER:

- Water flow, natural sewage water system.
- Natural waste system treats sewage; black and grey water are separated. Black water (sewage) is treated using a natural wormarator system (tiger worms), which naturally digest human waste. Grey water is irrigated over site.



CREDIT: WILLIAM FREEMAN

A strong seal. Double-wall construction, high R-value insulation and triple-pane windows help form a tight building envelope. CREDIT: WILLIAM FREEMAN

Yankee Ingenuity

With the Guilford Zero Energy Passive House, efficiency is everywhere you look.

PROJECT STATS:

NAME: Guilford Zero Energy Passive House, Guilford, Conn.
BUILDER: Bill Freeman, Celebration Green Design & Build
ARCHITECT/DESIGNER: Celebration Green Design & Build
PHOTOGRAPHER: William Freeman

BY GREEN BUILDER STAFF

BUILDING HIS FIRST Passive House in 2014 permanently altered how Bill Freeman, principal of Celebration Green Design & Build in Guilford, Connecticut, viewed the construction process relative to achieving a much higher level of energy efficiency, superior indoor air quality and unparalleled comfort.

When it became time to downsize his own residence, Freeman and his partner, Alicia Dolce, knew they wanted to pursue building a zero energy Passive House for themselves. They had several project goals: build on a site with a high walkability score to lower their carbon footprint; create a fossil-fuel-free, all-electric home; incorporate healthy and sustainable building materials; and establish a sustainable site as an alternative to a high-maintenance traditional lawn, to support local pollinators, birds, wildlife and people.

Consistent with the Passive House protocol, the design featured clean lines and generous overhangs to provide shading. During the project development process, Freeman learned that the town was encouraging accessory apartments and modified the plans to maximize the efficiency of the dwelling.

The result was a 3,140-square-foot home: 2,268 square feet for the main residence and 872 square feet for a guest house. It was built on a building lot that is a one-minute walk from the local train station and only a half mile from downtown shops and the town green.

INSIDE INFORMATION

A lot of thought was given to a sustainable build of the home, according to Freeman. In terms of structure, the house features a double-wall construction, high R-value insulation, and multiple strategies to ensure air-tightness of the building envelope, including limited penetrations, taped plywood seams, use of insulated window headers, and precise use of closed-cell foam. Triple-pane windows and doors add to the home's environmental control.

A variety of sustainable, environmentally friendly building material and appliances keep the green-minded inside theme in play: Milliken *Declare*® carpet, locally sourced

live-sawn white oak plank flooring with a zero-VOC oil finish, *FSC® Cumaru* decking material, and non-VOC paints.

The house also features MINOTAIR Energy Recovery Ventilation (ERV) multi-function ventilation for dehumidification, heating and cooling, a Rheem hybrid electric hot water heater, induction cooktops, ENERGY STAR® appliances, a ventless heat pump condensing dryer, and a high-efficiency front-loading washer.

There are also a number of environmentally friendly design elements: The guest house features reclaimed kitchen countertops and appliances, there are low-flow plumbing fixtures and LED lighting throughout the residences, and electricity use is offset somewhat by a 9kW photovoltaic rooftop array. The solar paneling also helps the home achieve a Home Energy Rating System (HERS) Index rating of 12.

OUTSIDE EFFECTS

While most people would plant a basic grass lawn in front and behind the house, Freeman and Dolce opted for an alternative lawn highlighted by an expansive pollinator meadow in the front yard, accented with "no mow" grass and raised garden beds.

FROM THE JUDGES:

"The house works very well."

There is also predominant use of native plants to sustain the local bird population and wildlife, as well as natural sustainably certified driveway material from nearby Stony Creek Quarry, and crushed clamshell walkways.

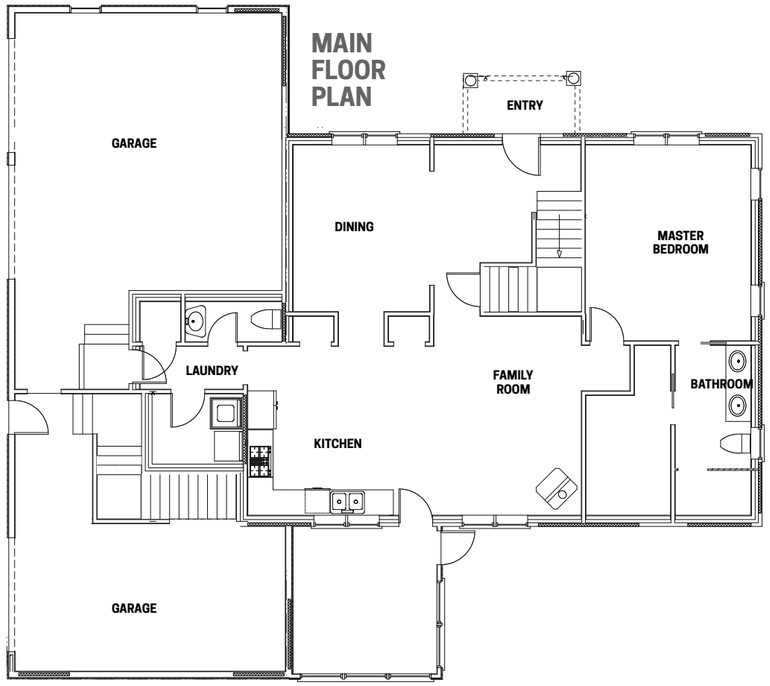
"[Freeman]'s specialty is staying on top of the latest technological innovations in building practices and products, particularly as it relates to energy efficiency," Celebration Green Design & Build notes. "He enjoys challenging himself to stay ahead of the curve and on top of developments in airtight construction, heating/cooling systems, insulation, ventilation, home automation, renewable energy sources, and most recently, comprehensive training in the [Passive House] standard."

There is similar praise for Dolce, who has spent most of her professional career in marketing, advertising, and market research. The company notes that Dolce's background and experience in communications, along with her passion for sustainable design, building and living green, "perfectly suit her mission to keep abreast of the green/sustainable building movement as it relates to commitment to raise awareness, inform and educate." **GB**

CREDIT: WILLIAM FREEMAN

1. **FRUGAL LIGHTING.** LED lights on the ceiling and elsewhere provide a low-cost way of brightening up the interior.
2. **LOCAL LUMBER.** Flooring throughout the house is made from locally sourced live-sawn white oak wood and has a zero-VOC oil finish.
3. **ENERGY STAR APPLIANCES.** The suite includes an electric induction cooktop instead of gas.
4. **DOUBLE DEFENSE.** The Guilford House's double-wall construction helps stabilize indoor temperature.

Outer limits. Zero-VOC paints, triple-pane windows and a solar array offer better control of the amount of energy used or lost during the day. CREDIT: WILLIAM FREEMAN



KEY COMPONENTS:

APPLIANCES: Bosch refrigerator and dishwasher, Blomberg washer/dryer, Samsung oven, Frigidaire induction cooktop

BUILDING ENVELOPE: Double 2-by-4 split wall, James Hardie siding, AZEK Zip wall sheathing, two-inch Lapolla spray foam insulation, Johns Manville fiberglass batt insulation

CABINETS, SHELVES, MILLWORK: Fabuwood cabinets

CAULKS AND SEALANTS: James Hardie, 3M tape, Zip wall tape

COUNTERTOPS: Quartz

DECKS: Cumaru

DOORS AND HARDWARE: Schlage locks

ELECTRICAL: Eaton

EXTERIOR FINISHES: James Hardie siding, AZEK trim

FIRE PROTECTION: Honeywell

FLOORING: Milliken *Declare* brand carpet, Hull Forest Products hardwood flooring

GARAGE DOORS: Clopay

HOME CONTROLS: iDevices

HVAC/DUCTS: Minotair Compact air treatment unit

INSULATION: Lapolla spray foam, Johns Manville fiberglass batt

LANDSCAPING: Ernst Seed Co., Outdoor Industries (Madison, Conn.), Summer Hill Nursery, Madison, Conn., Acer Gardens, Deep River, Conn., New England Wetland Plants, Amherst, Mass.

LIGHTING: Halo LED

PAINTS AND STAINS: Benjamin Moore no VOC

PLUMBING/PLUMBING FIXTURES: Moen

RENEWABLE ENERGY SYSTEMS (SOLAR, WIND, ETC.): LG photovoltaic panels, SolarEdge Technologies inverter

ROOF: Precision Roofing (GAF)

TELECOMMUNICATIONS: Ubiquiti modem and router

VENTILATION: Minotair

WATER HEATING: Rheem heat pump

WINDOWS, SKYLIGHTS, PATIO DOORS: REHAU *Geneo Tilt-Turn* windows installed by Access Window and Door, Manitoba, Calif.

CREDIT: JEFFREY TOTARO

Opening way. The entrance to the house is a perfect combination of walking stones and water-careful plants. CREDIT: JEFFREY TOTARO

HOME OF THE YEAR AWARDS
GREEN BUILDER
2021
Offsite Construction

Passive Prefab

This high-performance home proves that factory-built methods can achieve greatness.

PROJECT STATS:

NAME: Lang/St. Marie Residence, Spring Lakes Heights, N.J.
BUILDER: Mark Hermann, Hermann Construction
ARCHITECT/DESIGNER: Richard Pedranti, Architect
LANDSCAPE ARCHITECT: Marsha Lea
PHOTOGRAPHER: Jeffrey Totaro

BY GREEN BUILDER STAFF

THE LANG/ST. MARIE Residence is a prefabricated, Net Zero home in the New Jersey shore town of Spring Lake Heights, designed as a weekend retreat for a retired couple from Brooklyn, New York.

According to developers, the front of the modern Lang/St. Marie Residence blends into its well-established beach neighborhood in scale and appearance. The rear of the home is a fresh turn on modern living. A stunning 16-foot cantilever cuts strong horizontal lines across the landscape and creates a large covered outdoor space.

Landscape architect Marsha Lea joined the project to create a breathtaking garden space as a backyard retreat. The relationship with the outdoors was of the utmost importance to the homeowners, she notes. A 10-foot-high by 25-foot-wide retractable glass wall unifies the rear of the home and the backyard.

Passive House developers, including builder Mark Hermann, owner of Hermann Construction, were employed in the home's design, resulting in low energy consumption for heating and cooling, and a cozy, healthy indoor environment. The high-performance triple pane windows allow for large expanses of glass. With the addition of a roof-mounted photovoltaic (PV) solar system, the home has achieved Net-Zero Building (NZB).

According to architect Richard Pedranti, this custom home was translated from existing building information modeling software into the machine language understood by robotic manufacturing systems. Using those instructions, the machines at the manufacturing facility created panelized wall assemblies for the home that were then transported from Maryland to New Jersey, and assembled at the job site.

BITS AND PIECES

The aesthetic, application of building science, and off-site fabrication combine to make the Lang/St. Marie Residence the epitome of modern residential design, Pedranti notes. The home was built using Passive House principles and building science strategies that create a comfortable, affordable, sustainable house with low energy consumption for heating and cooling.

Sustainable building principles include higher levels of insulation, airtight construction, triple-pane windows, the use

of a heat recovery ventilator, and passive solar orientation of the home on the building lot. These strategies allow the home to remain comfortable year-round without having a traditional heating, ventilation and air conditioning (HVAC) system. Lang/St. Marie requires less than half of the energy needed to heat and cool a typical American home, yet feels more comfortable, as drafts are eliminated and a stable temperature and fresh air quality is maintained throughout, Pedranti notes.

He adds that the unique combination of Passive House wall structures manufactured off-site illustrates what is possible in rapid and efficient creation of sustainable custom-designed homes. It allows for greater specialization than other prefab construction techniques, uses high-grade building materials and advanced manufacturing technologies in a controlled factory environment to create homes that expressly meet customer needs while saving both time and money.

FROM THE JUDGES:

"A beautifully designed modern home that pays respect to the local environment. [There's an] indoor/outdoor connection, and design details throughout."

"The architect's work with us from the very start was both creative and collaborative," homeowner Theresa Lang says. "They took our wish list and transformed it into a beautiful design through a shared belief that functional passive house principles are consistent with a minimalist modern aesthetic."

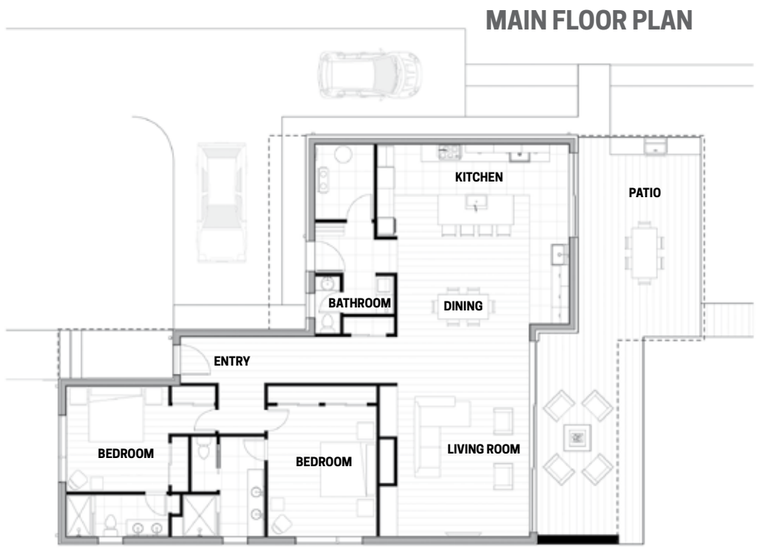
With improvements in technology and growing excitement from the architecture community, "It has become apparent that modern building science and beautiful design are not mutually exclusive," Pedranti says. "This bodes well for promoting sustainable principles and innovative building strategies to wider audiences and implementing them into a larger share of new and renovated residential design." **GB**

CREDIT: JEFFREY TOTARO

1. **ADVANCED GLAZINGS.** Triple-pane, aluminum clad wood doors and windows help keep the household temperature stable year round.
2. **NATURAL MIX.** Clerestory windows fill the open plan with light by day, while energy efficient LEDs provide evening illumination.
3. **HARDWOOD FLOORING.** Renewable and durable, white oak flooring from The Hudson Company is sustainably harvested and sourced.
4. **LOW-VOC FINISHES.** Use of low-VOC paints and adhesives reduce the indoor offgassing load.

Blending in. Decking made of FSC Certified cedar — known for its beauty, weather resistance and bug repelling qualities — is a key component in Lang/St. Marie's "at one with nature" design.

CREDIT: JEFFREY TOTARO



KEY COMPONENTS:

ALTERNATIVE BUILDING SYSTEMS: Offsite construction; panelized wall and roof systems by Blueprint Robotics; *Aerobarrier* air barrier system by Northeast Aerobarrier – 0.44ACH@50Pa

APPLIANCES: Sub-Zero, Gaggenau, Wolf, Miele, RangeCraft custom hood

BUILDING ENVELOPE: Roof (Blueprint Robotics 18-inch TJI structure, CCSF, Zip roof sheathing, EPDM system with ISO tapered insulation to drain); Wall (Blueprint Robotics prefabricated 2-by-6 framed wall with dense pack cellulose insulation, Zip R9 sheathing, furring and siding)

FOUNDATION: Frost protected shallow foundation -– 4-inch concrete slab with 6-inch sub slab, Type 9 EPS insulation, and 4-foot EPS edge insulation

CABINETS, SHELVES, MILLWORK: Henrybuilt (kitchen); Boffi (bathrooms)

CAULKS AND SEALANTS: Partel

COUNTERTOPS: Henrybuilt

DECKS: Cedar 1-by-6 with concealed fastener

DOORS AND HARDWARE: Flush Rift white oak; FSB hardware

EXTERIOR FINISHES: 1-by-6 T&G vertical white cedar siding; CUPACLAD slate shingle siding

FIREPLACE: Ortal 150 sealed combustion gas fireplace

FLOORING: Hudson Flooring rift white oak

FURNITURE: Kroll, Ikea, Room and Board, Vitsoe Shelving

GARAGE DOORS: Custom

HOME CONTROLS: Lutron

HVAC/DUCTS: Zehnder CA350 ERV and Mitsubishi ductless minisplit; Electro Industries make-up air kit.

INSULATION: Roof (CCSF in joist cavity, ISO tapered insulation to drain on roof deck under EPDM); Wall (dense pack cellulose insulation, Zip R9 sheathing); Foundation (6-inch Type 9 expanded polystyrene [EPS])

LANDSCAPING: Landscaping by Marsha Lea. Includes boardwalk, bocce court, parking court paving

LIGHTING: Lutron lighting controls; Tech Lighting pendant track in living room

PAINTS AND STAINS: Benjamin Moore zero VOC *Aura Interior Paint*

PAVERS: Cobblestone

PLUMBING/PLUMBING FIXTURES: Julien, Dornbracht, Evolution Excel, Fantini, Toto

RENEWABLE ENERGY SYSTEMS (SOLAR, WIND, ETC.): 7.5 KW roof-mounted photovoltaic (PV) system.

ROOF: EPDM roofing

STRUCTURAL COMPONENTS: Open web roof trusses with glulam beams; 2-by-6 wall framing

TELECOMMUNICATIONS: Lutron

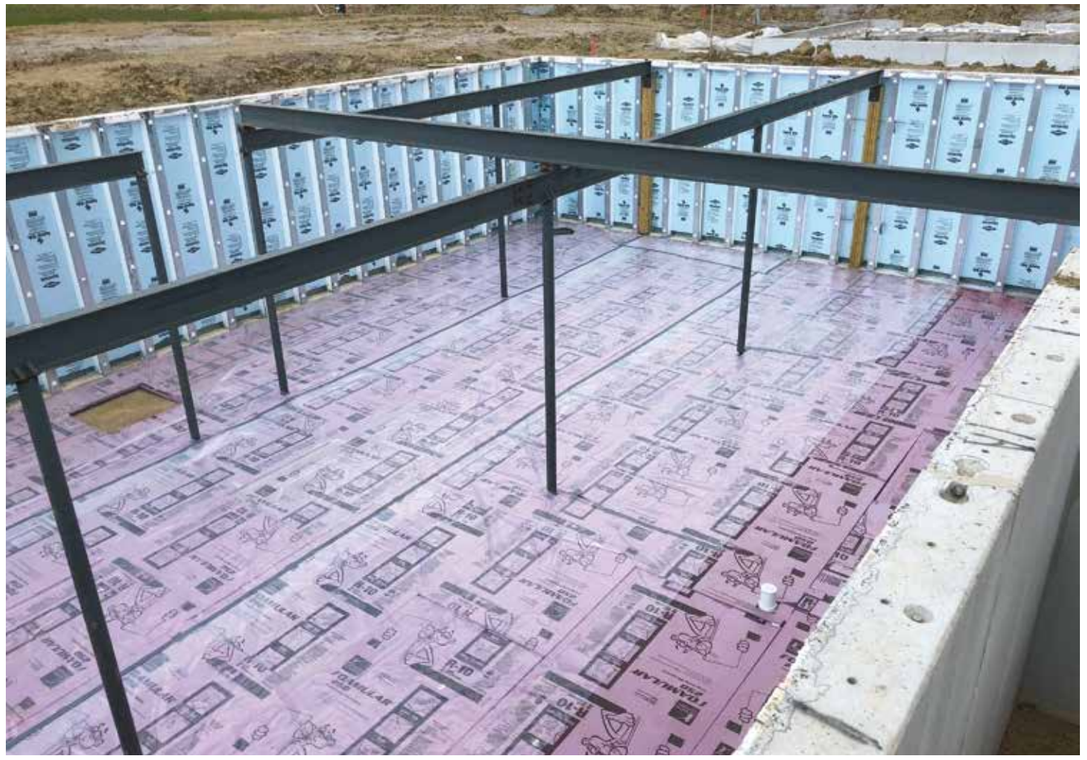
VENTILATION: Balanced ventilation using Zehnder CA350 ERV

WATER HEATING: Rheem *HWHP-Marathon*

WATER MANAGEMENT (INDOOR/OUTDOOR): On site

WINDOWS, SKYLIGHTS, PATIO DOORS: Bildau & Bussmann triple-pane, aluminum clad wood doors and windows

COURTESY OF GREENTECH CONSTRUCTION



No thermal breaks. Exterior rigid insulation keeps below-grade steel framing encapsulated within the envelope. COURTESY OF GREENTECH CONSTRUCTION

Lasting Legacy

With a HERS rating of 17, this traditional-looking home boasts exceptional building science at all levels.

PROJECT STATS:

NAME: Legacy House, Lewis Center, Ohio
BUILDER: Dan Troth, GreenTech Construction
ARCHITECT/DESIGNER: Todd Parker, F5 Design
PHOTOGRAPHER: Photos courtesy of SIPA

BY GREEN BUILDER STAFF

GEORGE YEAGER AND Sharon Riskedahl, owners of the Legacy House in Lewis Center, Ohio, wanted to create a structure that would be practical in an environment where reductions in energy consumption and fossil fuel-based carbon emissions are of very great importance.

Dan Troth, owner of GreenTech Construction in Delaware, Ohio, was happy to comply. The result was a 2,466-square-foot home that in 2019 was certified by the U.S. Department of Energy (DOE) as a Zero Energy Ready Home, and is under the U.S. EPA WaterSense program for new homes.

Thanks to various sustainable design elements, the house has a Home Energy Rating System (HERS) index rating of 17. The average score for a home of Legacy's size is 130. Yeager estimates that he and Riskedahl spent less than $1,000 on utility costs in 2020, including one month when the electric bill was a mere $4.63. "And we're still learning how to run the house," notes Yeager, in a report in the Columbus Dispatch.

BUILDING BLOCKS

GreenTech Construction is one of 13 "Preferred Builders" selected by the developers at the Evans Farm urbanist community project, which hosts Legacy House. GreenTech got the green light from Yeager and Riskedahl because it is the only builder of the group that opts for structural insulated panels (SIPs) and focuses on green building, Troth notes.

GreenTech opted for SIP 6-inch and 8-inch wall panels, and 12-inch SIP roof panels. The home also features a 7.2kW solar panel array, a high efficiency HVAC system, a heat pump hybrid electric water heater, LED lighting, ENERGY STAR® appliances and other green benefits.

Meanwhile, all adhesives and paint finishes are zero or low volatile organic compound (VOC). Boral siding that uses fly ash as a lightweight additive is installed on the interior vaulted ceiling, which uses fly ash and is Cradle to Cradle Certified for sustainability. Drexel metal roof uses 30 percent to 60 percent recycled materials and, like all metal roofs, can last more than 50 years.

In the Columbus Dispatch report, Riskedahl said she's delighted with the air

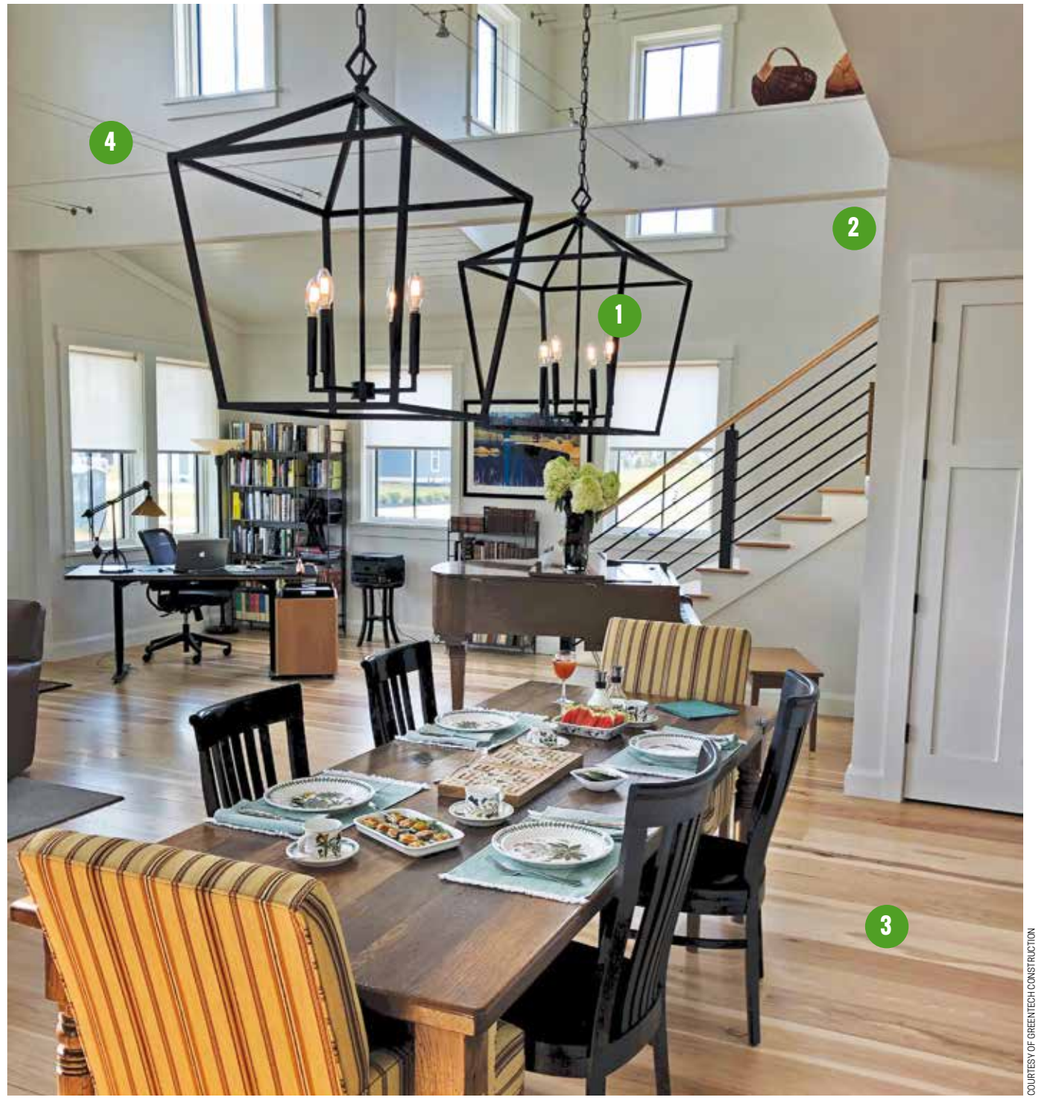
quality, the heating and cooling throughout the new home.

In the same report, Troth said proper ventilation is the key to a successful green build. "I want to build it like a submarine," he notes. "I want to take your house after it's done and sealed, and if I stick it in a big bucket of water, I don't want too many bubbles to come up."

Yeager and Riskedahl agree the home was indeed "built like a submarine," and that the Legacy House in general is built to last. "[This house] will be here long after we're gone," Yeager said in the report. "We're really in an environmental crisis, and this is one thing we can do." **GB**

FROM THE JUDGES:

"Excellent example of a high-tech building dressed in warm and inviting 'clothes.'"



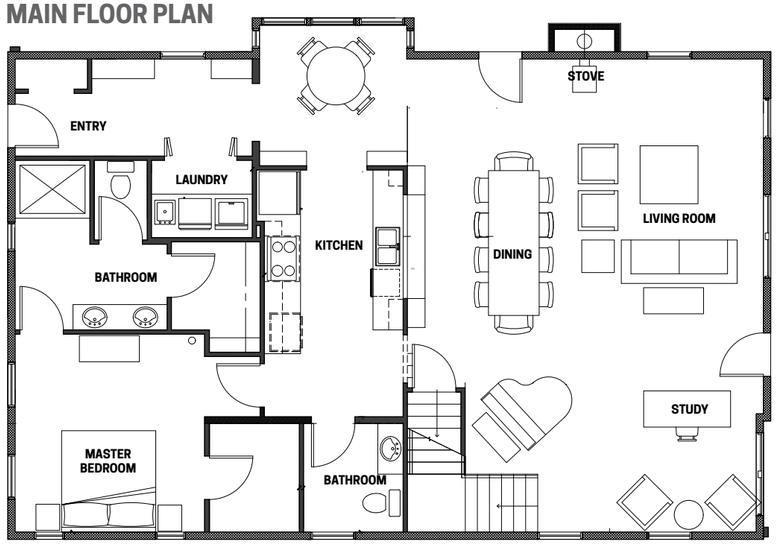
COURTESY OF GREENTECH CONSTRUCTION

1. **CATHEDRAL LIGHTING.** Multi-level windows in the grand central space flood the home with light during the day, with LEDs stationed for after-dark activities.
2. **SMART HVAC.** (not shown) Advanced Mitsubishi mini-splits, combined with Energy Recovery Ventilation keep air conditioned and constantly replaced.
3. **HICKORY FARMHOUSE.** North American grown hickory flooring offers a lower carbon footprint than imported wood product.
4. **CLEAN FINISHES.** All adhesives and paint were selected for zero-VOC or low-VOC credentials.

Soft spot. Triple-pane windows and hickory flooring keep all rooms comfortable to walk through and relax in.

COURTESY OF GREENTECH CONSTRUCTION

MAIN FLOOR PLAN



KEY COMPONENTS:

ALTERNATIVE BUILDING SYSTEMS: Structural Insulation Panels (SIPs)

APPLIANCES: ENERGY-STAR-rated Thermador induction cooktop

AUTOMOTIVE (ELECTRIC CAR CHARGING, ETC.): Tesla electric car charging station

BUILDING ENVELOPE: Structural Insulation Panels (SIPs)

CAULKS AND SEALANTS: Zero VOC or low VOC throughout

COUNTERTOPS: Granite and Cambria

DECKS: AZEK composite

DOORS AND HARDWARE: Therma-Tru, three-point latches

ELECTRICAL: All-electric home

EXTERIOR FINISHES: Factory applied paint finish

FIRE PROTECTION: Smoke alarms per code

FIREPLACE: Outside air sourced pellet stove

FLOORING: Engineered Hickory

GARAGE DOORS: Insulated

HOME CONTROLS: Amazon *Echo*, *SmartThings*, and Ring systems

HVAC/DUCTS: Mitsubishi ducted mini-split

INSULATION: SIPs continuous

LANDSCAPING: Minimal use of grass, only along parkway as required; drip irrigation to mulched landscape plantings

LIGHTING: All LED

PAINTS AND STAINS: Low VOC

RENEWABLE ENERGY SYSTEMS (SOLAR, WIND, ETC.): Twenty LG solar panels

ROOF: Precision Roofing (4-gauge cool-rated metal)

VENTILATION: Energy Recovery Ventilation (ERV) for fresh air

WATER FILTRATION: At kitchen sink only for drinking water

WATER HEATING: Hybrid electric 80-gallon

WATER MANAGEMENT (INDOOR/OUTDOOR): 150-gallon garden rainwater collection system

WINDOWS, SKYLIGHTS, PATIO DOORS: Marvin triple-pane

OTHER:

- Blower door test results: 0.53 ACH @ 50; meets Passive House Standard

CREDIT: JONATHAN DAVIS/DAVIS STUDIO AD

Au naturel. When it comes to lighting up the room, the sun's natural rays and long-lasting LEDs are easy on the eyes and good for the mind. CREDIT: KELVIN HUGHES/KELVIN HUGHES PRODUCTIONS

HOME OF THE YEAR AWARDS
GREEN BUILDER
2021
Sustainable Community

A Taste of Tomorrow

Built for a post-fossil fuel world, The Walk offers residents an all-electric, sun-powered lifestyle.

PROJECT STATS:

NAME: The Walk–Bainbridge Island, Bainbridge Island, Wash.
BUILDER: Clark Construction
ARCHITECT/DESIGNER: Jonathan Davis, davis studio Architecture + Design
DEVELOPER: Kelly Samson, Paditu, LLC
LANDSCAPE ARCHITECT: Jeff Buoma, Fischer Bouma Partnership
PHOTOGRAPHER: Jonathan Davis, davis studio AD; Kelvin Hughes, Kelvin Hughes Productions

BY ALAN NADITZ AND GREEN BUILDER STAFF

PEOPLE WHO LIVE in rental units don't have control over how green their residences are. So, developers of The Walk–Bainbridge, a 52-unit net zero townhome project in Bainbridge, Washington, took it upon themselves to make things as eco-friendly as possible.

The Walk is, to date, the largest privately developed multifamily rental community on Bainbridge Island to register for Zero Energy certification through the International Living Future Institute. Another major award, the APsystems Residential Project of the Year for 2019, went to its solar operations installer, Cascadia Solar.

According to community officials, each home at The Walk is designed with enough solar capability to provide more renewable energy than it uses. Electricity bills are reduced significantly or almost entirely, depending on how much energy a resident uses.

"If you like numbers, the total solar is 208,000 watts of panels, which will produce approximately one quarter million kilowatt hours of AC electricity annually," The Walk states on its website. "If you want a really big number, that is 250 million watts of energy produced. These numbers are equivalent to saving more than 2.5 tons of coal per home; and community wide, replacing more than 80 tons of coal per year."

Cascadia discreetly installed a series of micro-inverters on roofs, awnings and vertical end walls to collect and help generate that amount of energy. Some of that power, about 20,000 watts from 72 solar panels, also goes to electric car chargers within the development. The chargers, which can each handle eight cars, are free for use by residents.

According to Aric Ohana, co-founder of Envoy Technologies, supplier of the chargers, the goal is to "encourage the use of electric cars, thus further reducing a resident's impact on the planet and eliminating unnecessary expenses." The company has also supplied an Envoy BMW i3 electric vehicle (EV) for use by residents who do not have their own transportation.

THE TOWNHOUSE EXPERIENCE

The Walk has other sustainable elements. Each townhouse, a product of Bainbridge

Island-based Clark Construction, features a Nudura insulated concrete form (ICF) wall system for heavy insulation, reduced outside noise, minimal mold potential and better air quality. Meanwhile, the forms are made from recycled products and reduce the amount of waste generated during the building process.

Flooring consists of sustainably harvested wood, thick wool carpet and marmoleum designed to create a healthy indoor environment. Kitchen countertops are made of long-lasting, easy-to-clean quartz, which will reduce resource consumption and waste.

Appliances throughout the home are ENERGY STAR rated. Lights are LED, which are up to 80 percent more efficient than standard lighting, have a far longer lifespan and contain no toxic chemicals. In addition, according to the National Institute for Occupational Safety and Health (NIOSH), LEDs can help align a person's circadian rhythm, decrease stress and anxiety, and increase productivity and natural sleep patterns.

FROM THE JUDGES:

"Its scale is relatable; its approach to creating a sense of affordable and sustainable community is commendable!"

Ductless heat pumps in each home — in this case, courtesy of Mitsubishi — provide heavily filtered heat and air conditioning, for cleaner indoor air that's free of dust and pollen. Heat pumps also reduce energy use by up to 60 percent versus traditional electrical heating options.

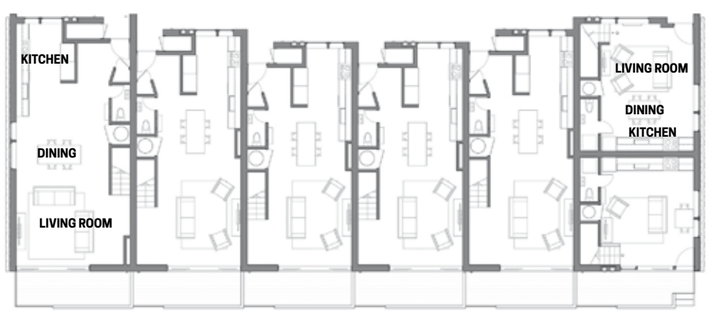
And, there is also simple geography: The Walk is a mere 10 miles from downtown Seattle, meaning people will spend minimal time on the road — a step toward fighting air pollution and reducing fossil fuel use. GB

CREDIT: JONATHAN DAVIS/DAVIS STUDIO AD

1. **OUTER ARMOR.** Galvanized steel siding offers exterior durability and eliminates a need to replace the outside every few years.
2. **SUN SERVERS.** The 500-plus solar panels installed on roofs, awnings and outside walls generate more than enough energy to power The Walk community.
3. **STRONG ENOUGH.** Pella's five-layer Impervia fiberglass wndows can withstand extreme temperatures -- minus 40 degrees to 180 degrees Fahrenheit -- thanks largely to a coating that carries a top of the line 624 AAMA window standards rating.
4. **IN THE LIGHT.** Progress Lighting's exterior lighting, available as LED, is attractive and energy saving.

Dust guard. Townhouse flooring includes sustainably harvested wood designed to minimize storage of dust and help create a healthy indoor environment. CREDIT: KELVIN HUGHES/KELVIN HUGHES PRODUCTIONS

FIRST FLOOR PLAN



KEY COMPONENTS:

ALTERNATIVE BUILDING SYSTEMS: Nudura *ICF Series*; Nudura *One Series* on end walls

APPLIANCES: GE, Haler

AUTOMOTIVE (ELECTRIC CAR CHARGING, ETC.): ClipperCreek electric car charger

BUILDING ENVELOPE: Nudura ICF (structure); mill-finished G90 galvanized corrugated steel (metal); painted James Hardie *HardiePanel* (cement panel); Pro Clima *Mento Plus* (air barrier); Pro Clima *Tescon Vana* (air seal tape)

CABINETS, SHELVES, MILLWORK: Custom painted

CAULKS & SEALANTS: Pro Clima *Visconn* (Liquid Flash), Pro Clima *Contega* (Caulk)

COUNTERTOPS: Premium Natural Quartz

DECKS: CaliBamboo *BamDeck 4G*

DOORS AND HARDWARE: Kwikset Milan Round (hardware)

EXTERIOR FINISHES: *HardiePanel*; corrugated, galvanized steel; concrete; cedar, stained deck walls

FIRE PROTECTION: Sprinklers throughout

FLOORING: Sealed concrete; Tesoro Woods (Pacific Collection – 7 inch-wide plank) and white oak natural with Matte Osmo oil finish wood flooring; *Godfrey Hirst* and *Gibraltar Collection (Cliff)* wool carpet; Forbo marmoleum (*Concrete Collection - Black Hole*) sheet goods

HOME CONTROLS: Fiber optic cable; wireless access point in each unit; smart locks (*Schlage Sense Smart*)

HVAC/DUCTS: Mitsubishi heat pumps

LANDSCAPING: Furniture and chairs (Polywood - Modern Adirondack Chair); Douglas fir bench (David Kotz Woodworks); WAC Lighting (Ledge LED Path Light)

LIGHTING: Progress Lighting exterior lights (five-inch cylinder)

PAINTS AND STAINS: Sherwin Williams (no VOC)

PLUMBING/PLUMBING FIXTURES: Moen (faucets); Kohler, Zuhne and White Haus (sinks); Aquatic (tub); Gerber (toilet)

RENEWABLE ENERGY SYSTEMS (SOLAR, WIND, ETC.): Photovoltaics (Silfab 300-watt solar modules); microinverters (APSystems)

ROOF: TPO

VENTILATION: Code

WATER HEATING: Electric

WINDOWS, SKYLIGHTS, PATIO DOORS: Pella *Impervia* windows and sliding doors

CREDIT: CRAFT HOMES LTD.

A Place For All Seasons

Off grid, and made with low-maintenance materials, Upland Road House raises the resilience bar.

PROJECT STATS:

NAME: Upland Road House, Huia Bay, Waitakere, New Zealand
BUILDER: Craft Homes Limited
ARCHITECT/DESIGNER: Duncan Firth, Solarei Limited
PHOTOGRAPHER: Craft Homes Limited

Sustainable path. Hallways with energy-saving LEDs and flooring made from recycled wood are two ways Upland Road House shows reduced dependence on fossil fuels. CREDIT: CREDIT CRAFT HOMES LTD.

BY ALAN NADITZ AND GREEN BUILDER STAFF

WHEN CRAFTING a classy home in scenic New Zealand, two major words come to mind: sustainable location.

That was the case when Craft Homes builder and managing director Toby Tilsley, and Solarei Architecture architect and founder Duncan Firth decided how they were going to develop what is now known as "The Upland Road House."

Upland Road House in Huia, Auckland, is situated on the Manukau Harbor overlooking Huia Bay, on the West Coast of New Zealand in the Southwest Pacific. The building footprint is 2,863 square feet, including a main house, carport and guest cottage. The main house has three bedrooms, two bathrooms, a walk-in wardrobe, and an open-plan kitchen, dining and living area. The cottage has a bathroom, kitchenette and open-plan bedroom and living.

According to Firth, the house's location optimizes southern views of the Manukau Harbor, allows for a north-facing courtyard protected from winds, meets with the northern seasonal sun path for optimized sunlight and passive solar gain, and provides a landscape integrated with the not-so-distant Waitakere Ranges.

The annual climate consists of cool temperate winters and subtropical summers. Winter and summer climate design principles naturally heat the house over the winter using sunlight, and natural airflow cools the house over summer.

Tilsley agrees that good design orientation plays a big part in a home's ability to use nature to its full effect. "In terms of innovation, this home has a lot packed in," Tilsley noted on the New Zealand Green Building Council website. For example, optimizing seasonal sun path for passive solar gain naturally heats the house to approximately 23 degrees Celsius during mid-winter, with the outdoor temperature at approximately 13 degrees Celsius.

Meanwhile, thermal mass walls collect and store radiant sunlight energy, naturally heating the house during winter. During summer, roof overhangs control high angled sunlight, preventing overheating. Stack effect and cross ventilation principles naturally cool the house. Strategically located corridors, windows and doors allow natural airflow to cool the house during summer. A 5.2kW solar system with lithium battery

storage powers the house during the year, with a grid connected inverter if needed.

NATURAL ELEMENTS ABOUND

Rainwater is harvested from the roof for drinking and stored in an 8,000-gallon tank. A natural waste system treats sewage, black and grey water are separated, and black water (sewage) is treated using a wormarator system (i.e., tiger worms), to naturally digest human waste. Grey water is naturally irrigated over the site. Storm water is captured, stored and irrigated onsite.

In addition, an extensive landscape planting plan is underway to bring back local flora and fauna, restoring the farm land to its native tree glory, Firth notes.

The house itself is constructed from New Zealand-grown Pinus radiata timber, and has New Zealand-made metal roofing, which is low maintenance and long lasting. Thermal mass (concrete walls) are strategically located for passive solar heat gain and texture.

Moving toward the Upland's inside, Innowood's *Innoclad*, a composite timber cladding made from recycled wood powders, is highly durable, fire resistant, low maintenance and long lasting. Oak veneer (12mm), another durable and long lasting item, was used for flooring.

The home's insulation is Knauf Insulation's *Earthwool* glasswool, which is made using recycled glass and sand, and is also a low volatile organic compound (VOC). "In terms of insulation ratings, R 5.2 was used in the ceilings, R 3.2 in the walls and a R 3.2 blanket under the floor," Tilsley notes. That last item is protected from external moisture by Pro Clima *Solitex Extasana* building wrap. Pro Clima membranes have also been used for the exterior walls and flexible membrane flashings. The connecting foundation was thermally broken using Knauf Insulation *ClimaFoam* extruded polystyrene *(XPS)*. **GB**

FROM THE JUDGES:

"Design takes advantage of the amazing natural environment and makes connections to it. Great use of natural materials. Has a very high level of resiliency, and is off grid. It's a living home."

CREDIT: CRAFT HOMES LTD.

1. **XERISCAPING.** Landscaping efforts are bringing back local flora and fauna to help create a peaceful, stress-relieving atmosphere around the home.
2. **RIGHTFUL RECYCLING.** Cladding made with wood-based composite also adds R-value to the exterior.
3. **NATURE'S BEST.** Broken rock landscaping appears natural and helps with storm drainage.
4. **BRIGHT OVERVIEW.** The Upland Road House's orientation gives it a solar-friendly elevation, along with expansive views of the nearby bay.

Carbon-free cooksite. Energy-efficient appliances, a long-lasting granite countertop and cabinets from sustainably harvested wood offer an example of how green a kitchen can be. CREDIT: CRAFT HOMES LTD.

KEY COMPONENTS:

APPLIANCES: Fisher & Paykel energy efficient refrigerators, oven, induction hob and washing machine; Mitsubishi energy efficient microwave

AUTOMOTIVE: Schneider Electric PDL electric charger

BUILDING ENVELOPE: Walls (140mm-by-45mm Pinus radiata timber frame); Roof (240mm-by-45mm Pinus radiata timber frame); inside walls (10mm gypsum board)

CABINETS, SHELVES, MILLWORK: Cabinets (2mm Matai veneer natural hardwood on 4mm Pinus radiata); Plywood (18mm Pinus radiata timber); Shelves (18mm Particle Board, with smooth acrylic spray paint finish)

CAULKS AND SEALANTS: Sika caulks and sealants

COUNTERTOPS: 16mm granite

DECKS: 20mm-by-90mm New Zealand Pinus radiata timber frame

DOORS AND HARDWARE: Rylock aluminum exterior doors; hollow core Pinus radiata doors with 8mm medium density board, smooth spray paint finish; Halliday Baillie chrome finished hardware

ELECTRICAL: Schneider Electric fixtures and fittings

EXTERIOR FINISHES: Cladding (200mm-by-25mm Innowood Innoclad vertical shiplap board), Innowood recycled composite material made from wood powder waste; Fascia (300mm-by-20mm Pinus radiata board); Soffit (6mm Villa board, James Hardie smooth finish)

FIRE PROTECTION: Fire-resistant Innoclad cladding

FIREPLACE: 2mm oak veneer on 10mm particle board

FLOORING: 10mm New Zealand natural hardwood recycled kauri flooring

INSULATION: Knauf Insulation walls (140mm R 3.2 composite polyester and recycled plastic (180mm R 4.3 composite polyester and recycled plastic); Knauf Insulation roof (ClimaFoam 75mm R.2.8 closed cell polystyrene, 50mm R 2.2 closed cell polystyrene for foundations)

LANDSCAPING: Native tree restoration plan; vegetable garden (bee blend cover crop, Persian clover, phacelia, linseed, sunflower, red rascal clover, white clover and buckwheat)

LIGHTING: LED, or energy efficient lighting throughout home

PAINTS AND STAINS: Resene Paints (low VOC, environmental choice, made in New Zealand)

PLUMBING/PLUMBING FIXTURES: PVC plumbing

RENEWABLE ENERGY SYSTEMS (SOLAR, WIND, ETC.): 5.2kW solar system with lithium battery storage, with grid connected inverter if needed

ROOF: Metalcraft T-Rib, 5 Rib trapezoidal roofing profile

STRUCTURAL COMPONENTS: 190mm concrete block walls, thermal mass, passive solar gain and structure

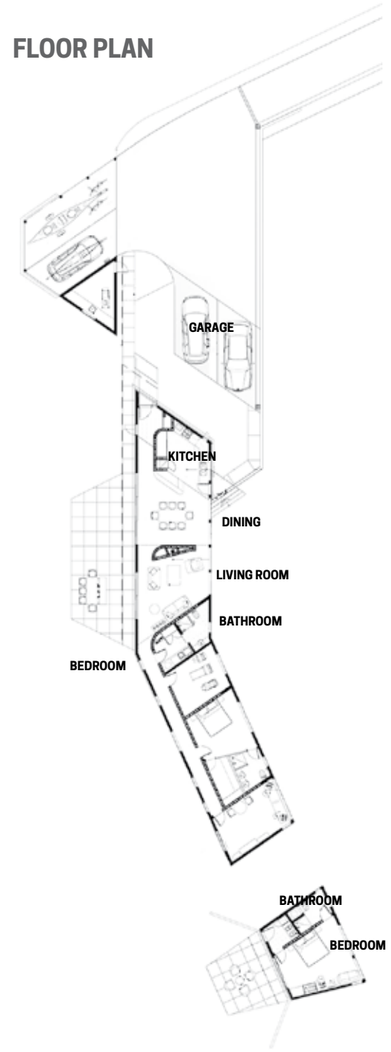
TELECOMMUNICATIONS: Standard/local connection

VENTILATION: Natural ventilation

WATER FILTRATION: Puretec Hybrid-R

WATER HEATING: Rinnai 280L energy efficient hot water

FLOOR PLAN



WATER MANAGEMENT (INDOOR/OUTDOOR): Stormwater mitigation, storage and irrigation onsite; 8,000 gallons rainwater harvesting

WINDOW COVERINGS: Roller blinds polyester with a layer of PVC

OTHER:

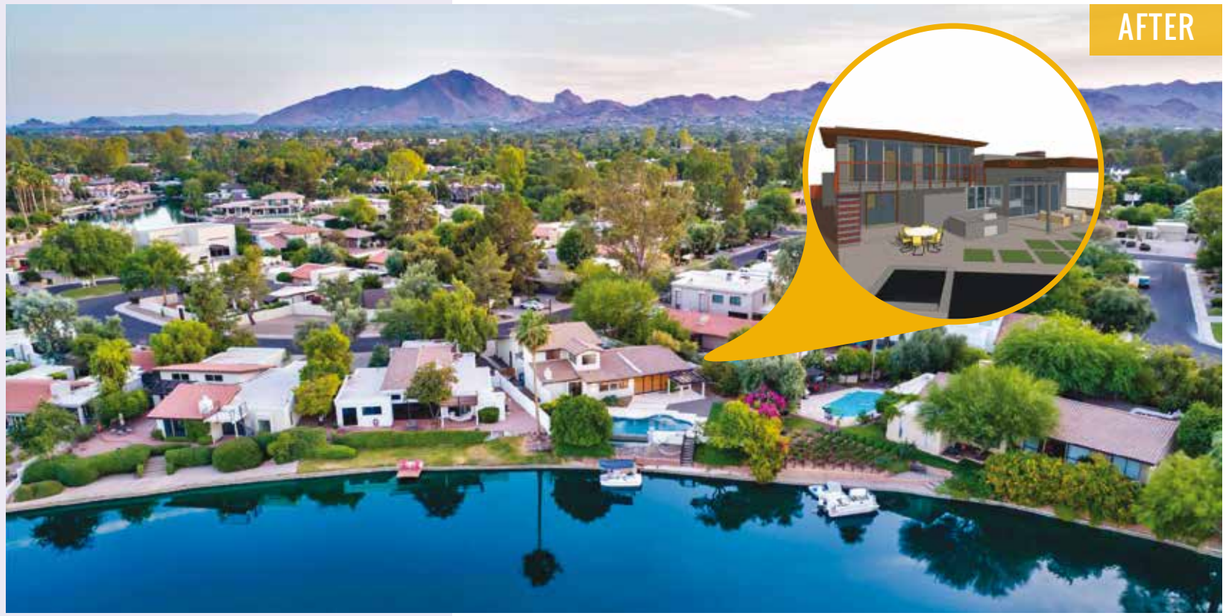
- Water flow, natural sewage water system
- Natural waste system treats sewage; black and grey water are separated. Black water (sewage) is treated using a natural wormarator system (tiger worms), which naturally digest human waste. Grey water is irrigated over site.

THE FOREVER HOUSE

Remodeling for Sanctuary

BEFORE

AFTER



THE FOREVER HOUSE: REVISION HOUSE SCOTTSDALE

Given that buildings produce approximately 40 percent of global emissions and are responsible for 40 percent of global energy consumption, the path to a sustainable future inevitably involves the retrofitting of our existing built environment.

That's why Green Builder Media has joined forces with internationally renowned building science expert Steve Easley and his wife, Indoor Air Quality expert Susan Raterman, to retrofit a 3,050 square foot house in Scottsdale, Arizona. The goal of the project is to showcase to consumers and building professionals alike how to optimize performance, sustainability, wellness, aesthetics, intelligence, and durability in a remodeling project using the most advanced products, systems and technologies available on the market today.

Uniquely positioned on a lake in McCormick Ranch, the ReVISION House Scottsdale will showcase cost-effective strategies for achieving net zero in a remodeling project using renewable energy, efficient mechanical systems, and advanced smart home technologies. The project will also highlight trending lifestyle issues, such as health and wellness and aging in place strategies and technologies.

The Forever House is designed to be a truly resilient sanctuary home. It will provide everything that the occupants need for peace of mind in a chaotic world, from remote working spaces to workout rooms to onsite power and food production for enhanced self-sufficiency.

FOR MORE INFORMATION:

Follow the project at www.greenbuildermedia.com/revision-house-scottsdale, where you'll find updated articles, blogs, photos, videos, and performance information.

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The Hot 50

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2021 Editors' Choice
GREEN BUILDER® HOT50 PRODUCTS

By Ron Jones

The Heart of the Matter

IT'S NOT AN UNCOMMON EXPERIENCE to have seen an object many times, but then suddenly really see it for the first time. It might be a natural feature, or a building you pass by every day, or a sign next to the road that you never paid attention to before.

It happened to me recently, and it involved a certain tree. We live alongside a mountain river. A feature common to this habitat is a kind of woodland found in the area's seasonal floodplains and riparian zones. In our part of the country, it is often referred to as "the bosque," derived from the Spanish word for "forest." For several years now, I've enjoyed roaming our stretch of the river and the bosque.

The dominant tree species, the narrowleaf cottonwood, utilizes spring flooding and the area's very shallow water table to grow quite tall, and much faster than the spruce, fir and pine trees that are scattered there, but which are more at home on the neighboring mountain slopes.

The cottonwoods are deciduous. Their leaves emerge in the spring to provide a cool, green canopy through the warm summer months. Then, as the hours of daylight shorten, the leaves gradually reduce their chlorophyll production and display an almost-magical transformation into a swaying sea of orange-gold color, lasting for an all-too-brief number of days before the cold windstorms of late fall sweep them away.

These trees are not prized for their wood. It is tough, stringy and hard to work with by saw or axe. It doesn't split well, and even when completely dry, it tends to smoke and smolder rather than burn bright, hot and clean. Even the largest branches, brittle and frequently hollow, can't be trusted for climbing on or bearing weight. Cottonwoods are often considered a nuisance, or even a hazard, because it's hard to gauge the health of any single specimen, and a tree may topple unexpectedly.

One such cottonwood in our grove has been a concern for several years. It is a fairly large individual, but rather than growing vertically, it leans at about 30 degrees, suggesting that it could crash down from its own weight at just about any moment. We are careful to avoid parking or even standing under it when the wind is up.

From the bottom, where part of the base actually bends and rests on the ground for a few feet, to the first fork in the trunk about 16 feet above, the tree's circumference ranges from slightly over six feet to about four and a half feet. Midway up, the diameter is a good 19 inches, and the curve is at least four feet off a straight line, forming an impressive, if not altogether symmetrical, arc.

One day, I actually "saw" the tree for the first time in my mind's eye. I went down the hill after an overnight snowfall to verify the image. The cottonwood had been waiting for me to pay attention.

But what was I discovering?

Stone sculptors often describe how the stone itself reveals the object they carve from the slab. They will tell you that it was there all along; all the sculptor did was to allow the object to be freed.

Similarly, the curved cottonwood holds a secret that wants to be unwrapped. Yes, it may be time to cut it down before it succumbs to age and gravity, which would almost surely shred and splinter the prize. Could it hide a sweeping counter? A bench? An architectural detail? Let's find out. GB

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