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GREEN BUILDER®

January/February 2023 / www.greenbuildermedia.com

GREEN HOME OF THE YEAR AWARDS

Equipped with the latest energy-saving technology, this year's award-winning projects range in design from the familiar to the exotic.

HOME OF THE YEAR
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The Best of Green Building

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CABLE • SPECIALTY

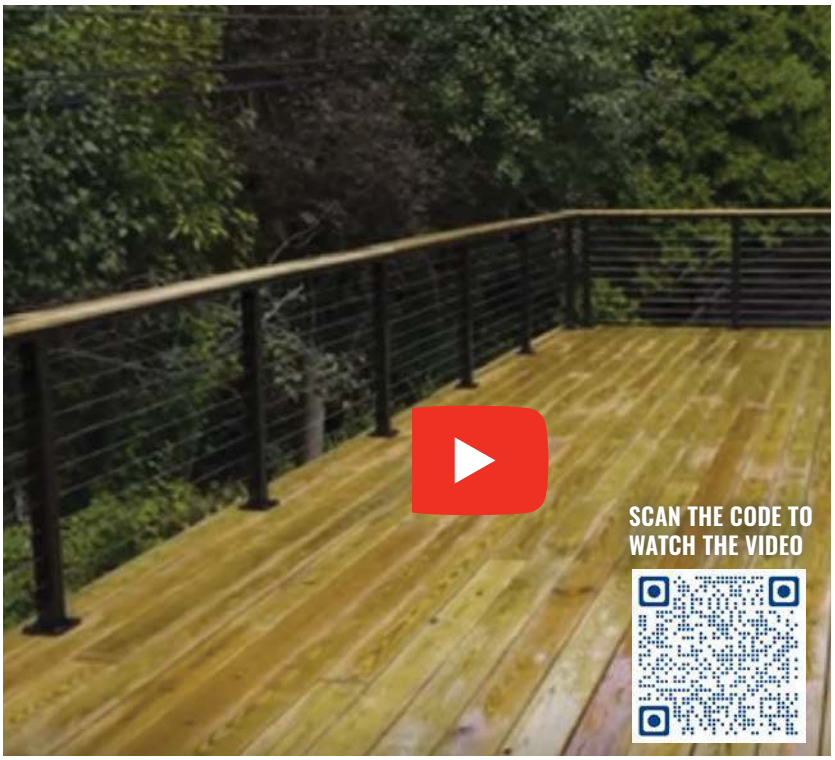
RAILFX IN ACTION

THE ULTIMATE DECK RAIL SOLUTION

When pro remodelers Mark and Theresa Clement of MyFixItUpLife took on a homeowner's deck rehab project, they turned to RailFX to get an easy-to-install, durable railing system for its sophisticated beauty and to maximize the view.

They quickly learned why RailFX is called the world's easiest cable railing system!

Follow along as the remodeling duo shows how easy it is to install a RailFX railing system in this how-to video, which offers tips and best practices for how to make your next cable rail installation a snap.



Check out the **RailFX website** (railfx.net) for product details, inspirational deck photos and to get a quote for your railing projects—both interior and exterior—today!

10 Reasons to Build with RailFX

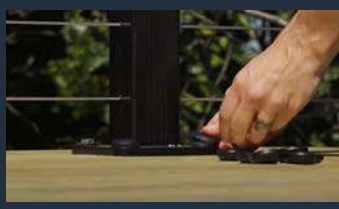
Not just a beautiful alternative to clunky, view-blocking wood railings, RailFX has a host of other important upsides:

1. Ease of Ordering
It's simple. Visit RailFX (railfx.net) and click the get a quote button—input your measurements and answer a few questions—and RailFX will have a quote sent your way within 48 hours.

2. Incredible Transformation
Check out the **RailFX Inspiration Gallery** for a wealth of design ideas.

The Inspiration gallery allows you to search for projects by color, material, railing application, and top rail style.

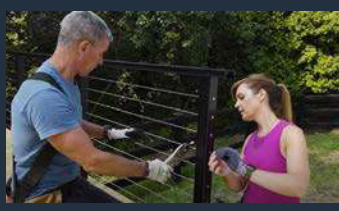
3. Safety First!
Properly installed and tensioned cable railing meets building codes and keeps people safe while providing unfettered views.



The RailFX system includes low-profile, hidden fasteners, creating a sleek finished look.

4. Low-Profile/ Hidden Fasteners
Through-the-post hardware and snap-on caps keep the brawn of the railing system hidden.

5. Sleek Top Rail Design
A 20-foot top rail offers very few rail splices for a seamless look.



Cables are mounted with receiver hardware on one end before threading the cable through the post bosses. Then, a Pull-Lock® is slid on, and the cable is hand-tensioned.

6. Simple Tensioning
The system offers a simple way to tension the cables with only an allen key.

7. Easy to Clean
RailFX EZ-Clean and a soft cloth are all that's needed to keep railings clean and protected.

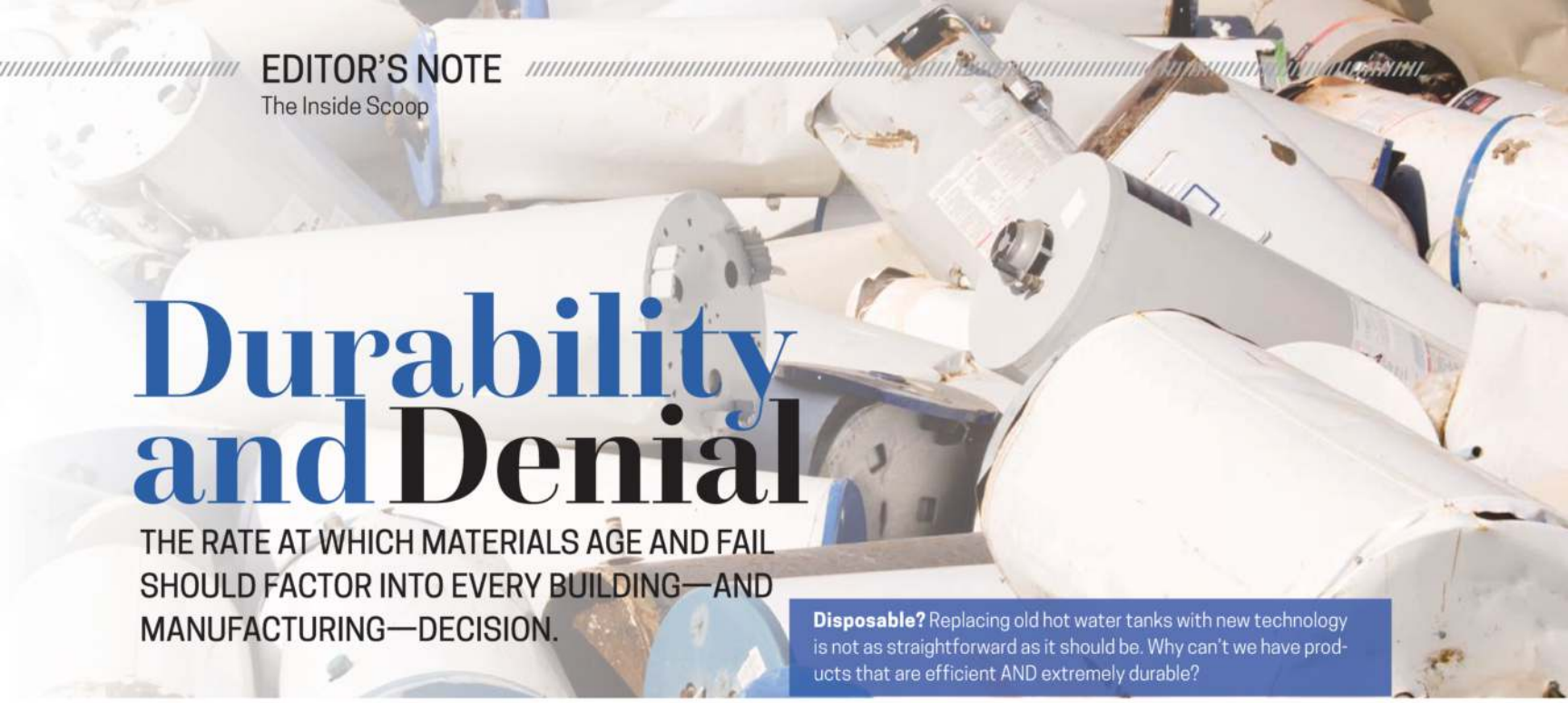
8. Limited Lifetime Warranty
The RailFX warranty also includes replacement labor!

9. Get It Done Fast!
Pre-drilled posts, easy-to-follow instructions, and included fasteners offer speedy installation.

10. Great Technical Support
The company's LEAN ON US® promise gets your installation questions answered quickly—and your deck project done on time!

Done in a day! The railing here replaced a clunky wood railing system that hid the treeline.

Go to RailFX to learn more!



Durability and Denial

THE RATE AT WHICH MATERIALS AGE AND FAIL SHOULD FACTOR INTO EVERY BUILDING—AND MANUFACTURING—DECISION.

Disposable? Replacing old hot water tanks with new technology is not as straightforward as it should be. Why can't we have products that are efficient AND extremely durable?

Is it any wonder that many of us struggle to do the right thing—and spend less money over the long term—operating, maintaining and replacing parts and products in our homes?

My six-year-old electric resistance hot water tank is failing. As I explore possible replacements, I have to factor in and compare a whole range of variables, not the least of which is the probable lifespan of each technology. Let's look at just the uninstalled costs.

To replace my old 30-gallon electric resistance tank with another of its ilk, I'd spend about $450, with a probable lifespan of 6-10 years. Some product reviewers, however, suggest that I might replace the heating element and anode, and get a few more years out of the tank. At least one manufacturer, Rheem, offers a ***Marathon* model**, which has a plastic tank with a lifetime warranty, at two to three times the cost of a standard unit.

Alternately, I could go solar, switching to a 40-gallon, roof-mounted solar hot water system with a 240 volt backup, at a cost of about $2,000. These tend to last 20 years or more, and save somewhere between 25 percent to 85 percent over conventional tanks, depending on where you live.

A third option would be a hybrid heat pump water heater. They pay for themselves quickly in energy savings, typically in five years or less, saving 30 percent to 40 percent on heating bills. I've installed two of these this year myself. But their lifespan is an open question. **Reviews of their reliability from Consumer Reports** are mixed, as you need repair people with HVAC and plumbing skills to fix one. Most units carry a 10-year warranty.

As for wall-hung hot water heaters, **reviews** of on-demand systems put the payback time for upgrading from a storage tank gas water heater to a gas tankless unit at 22½ years to 27½ years. I'm not a fan of gas dependency, but the same study puts electric wall-hung replacements at a 12- to 20-year payback. In my experience, most wall-hung units need repeated repairs and regular maintenance, and at least one major repair within five or six years. Most will be lucky to last 10 years without an overhaul.

Given these durability wild cards, solar would appear to be the best long-term investment. In Florida, solar could supply about 85 percent of my hot water, with a stainless storage tank. I could save about $350 a year in heating costs, enabling me to pay it off in less than 10 years, with another 10 years of "free" hot water still to come. But that efficiency drops to only about 25 percent in a Northeast winter.

For my location in Maine, then, I'd have to choose between a standard efficiency—but durable—plastic or stainless tank with no real efficiency gain over my old unit, other than the fact that I wouldn't replace it twice if I live there 20 years. Or, I roll the dice on a more-efficient heat pump model with shorter lifespan.

My point is that durability (or the lack thereof) is the missing link in high-performance products. Efficiency rebates might shorten the payoff somewhat, but what about the hassle and environmental impacts of product replacement?

Hot water equipment is just the proverbial tip of the iceberg. Every product we put in a house begins to "age out" the moment it's installed. Each choice casts a much longer shadow than merely weighing the embodied energy of the house as it's being built.

As you enjoy this year's top-shelf selection of the Green Homes of the Year, put on your building science hat, and think about durability. How have these builders struck a balance between beauty and durability? Which homes will operate with the greatest efficiency, with the least service calls?

Vinyl gets brittle. Wood degrades and grays. Window seals fail. Ferrous tanks rust. Grout sealant washes away. Driveways crack. Foundations shift. Roof shingles degrade. Nails rust.

Great builders and manufacturers do their best to make the long process from creation to demolition (and reuse) as smooth and low impact as possible. **GB**

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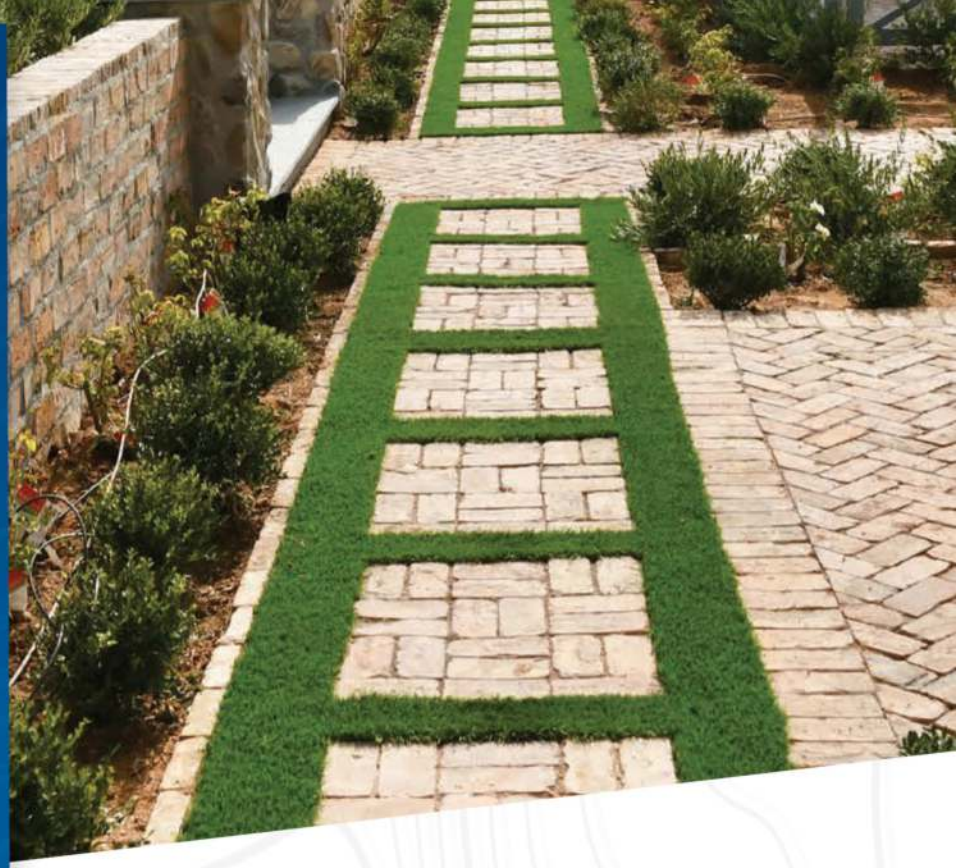

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Clean Energy Poised to Overtake Coal

Wind, solar and hydro are to become the world's top power sources within two years.

Burning out. Coal's dominance over the energy market will sunset within the next two years, according to a report from International Energy Agency.

By 2025, renewable energy will pass coal as the planet's largest power source, according to a new report from the International Energy Agency (IEA). Over the next five years, renewable capacity worldwide for wind, solar and hydropower will increase by as much as it did over the past two decades, largely triggered by a global energy crisis created when Russia invaded Ukraine, IEA notes.

A disruption in fossil fuel supplies has led to greater demand for electricity generated from renewable sources, while higher fuel prices have made technologies such as solar panels and wind turbines more competitive. As a result, "renewables are the only electricity generation source whose share is expected to grow, with declining shares for coal, natural gas, nuclear and oil generation," the report notes. The upward trend will be driven by China, the European Union, India and the United States.

IEA executive director Faith Birol calls the energy crisis a "historic turning point" towards a cleaner, more-sustainable and more-secure global energy system. "Renewables were already expanding quickly," she says, "but the global energy crisis has kicked them into an extraordinary new phase of even faster growth as countries seek to capitalize on their energy security benefits."

Gas Stove Warnings Fail to Address the Underlying Cause of Cooking Pollution

Recent studies have "discovered" that cooking with gas stoves has a direct link to childhood asthma and other health side effects. In most homes, use of proper ventilation is sorely lacking. All forms of cooking indoors release toxins into the home. Gas appliances simply add a few noxious fumes to the mix.

For example, researchers from nonprofit energy research institute PSE Healthy Energy (PSEHE) took gas samples from 159 deactivated residential stoves in 16 counties throughout California; they found benzene in 99 percent of the samples. The leakiest stoves exposed people to indoor concentrations that were up to seven times the level deemed safe by the California Environmental Protection Agency. Natural gas-powered stoves are found in 47 million U.S. homes.

Hot topic. Gas stoves do release toxins, but ventilation can ease the transition to electric technology over time.

In our view, gas stoves do need to be phased out due to Climate Change, but there's no need for a sudden panic. Cooking fumes can be exhausted from the home mechanically, and ALL cooking should be done under a range hood.

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EDITORIAL OFFICES
PO Box 97
Lake City, CO 81235
303-246-8890
www.greenbuildermedia.com

GENERAL INFORMATION
admin@greenbuildermedia.com

GREEN BUILDER MEDIA LEADERSHIP
Sara Gutterman CEO
sara.gutterman@greenbuildermedia.com
303-246-8890

Ron Jones President
ron.jones@greenbuildermedia.com

Cati O'Keefe
Chief Development Officer / Editorial Director
cati.okeefe@greenbuildermedia.com
513-532-0185

ADVERTISING SALES
Craig M. Coale Publisher
craig.coale@greenbuildermedia.com
512-344-9754

AUTOMOTIVE ADVERTISING SALES
Ron Frederick
ron@focusmm.net
586-808-3478

CIRCULATION
Mary Kestner
mary.kestner@greenbuildermedia.com

FINANCE
Hannah Judson Chief Financial Officer
hannah.judson@greenbuildermedia.com
970-397-5483

EDITORIAL
Matt Power Editor-in-Chief
matt.power@greenbuildermedia.com
207-619-2713

Alan Naditz Managing Editor
alan.naditz@greenbuildermedia.com
916-899-5563

Kabria Cummings Design Director
kabria.cummings@greenbuildermedia.com

Melissa Smith Web Editor / Cognition Project Manager
melissa.smith@greenbuildermedia.com

Samantha Carlin Special Projects Manager
samantha.carlin@greenbuildermedia.com
630-518-0511

Michele Lerner Associate Editor
michele.lerner@greenbuildermedia.com

Grania Power Copy Editor
power.graniae@gmail.com

Victoria Muharsky ESG Editor
victoria.muharsky@greenbuildermedia.com
630-518-0511

SOCIAL MEDIA
Zhenya Altamirano Social Media Manager
zhenya.altamirano@greenbuildermedia.com

PRODUCTION
Mary Kestner Production Manager
mary.kestner@greenbuildermedia.com

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"I've responded, for over 50 years, to the problems of civilization on this planet. I've incorporated my own solutions, trying to make a building that would be appropriate and responsive to the modern day issues of climate change, overpopulation, and dwindling resources." PAGE 50

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GREEN BUILDER®

Sustainability Awards 2023

Green Builder's annual Sustainability Awards recognize people and places that are leading by example when promoting why and how to go green.

Which people and cities are leading by example when promoting why and how to go green? Here is Green Builder's answer.

This year, we honor a Sustainability Superhero whose message went from business green to environmentally greener; three communities that emphasize energy, air and community sustainability practices; and our first-ever Pathfinder and its business-wide sustainability educational tactics.

SUSTAINABILITY SUPERHERO

Riding the Solar Coaster

THIS YEAR'S SUSTAINABILITY SUPERHERO, **MARIA KINGERY**, HAS A MESSAGE TO OTHERS IN THE INDUSTRY: **STAY THE COURSE**.

ALL PHOTOS COURTESY OF SOUTHERN ENERGY MANAGEMENT

Trendsetter. Maria Kingery and her husband, Bob Kingery, have turned Southern Energy Management from a company that merely emphasized home energy efficiency, to a Certified B Corp with an eye on environmental health.

GREEN BUILDER Sustainability Awards 2023

BY JIM GUNSHINAN

Maria Kingery, Green Builder's 2023 Sustainability Superhero, has a two-word phrase that sums up her time as co-founder and CEO of Southern Energy Management, as well as the overall history of the Raleigh, North Carolina company.

Solar coaster.

"We've been on it for 21 years now," she says. "We refer to it as the 'solar coaster' because, in the solar industry, there's been many, many ups and downs in terms of policy, which has depended on who happened to be in favor at the moment or who was not in favor."

Southern Energy Management, North Carolina's preeminent solar energy system installer, has weathered those ups and downs. According to Maria, the key is wanting to stay in the business of home performance and solar for the long haul. When the housing bubble burst in 2008, SEM was still a relatively small company with about 30 employees—most of whom were assigned to building performance.

"Solar hadn't taken off," says Maria. "At the time, in terms of energy savings and avoiding greenhouse gasses, the energy efficiency part of our business was much more impactful."

Fast-forward to 2011 and 2012, when the company was at the peak of the solar coaster. "We were riding high, doing business in 12 states, and we thought we were really hot stuff," she recalls. "But we were very young, and we learned some hard lessons."

For example, SEM tried to add the "third wheel" of retrofit work to its new construction and solar legs, but it quickly fell off because "there was no way to sustainably do the retrofits and create a sustainable business around them."

The company also focused much of its time and energy on utility-scale solar. It, too, eventually faded from the company's main purview.

"The home performance work has been the slow and steady partner," says Bob Kingery, Maria's spouse and co-founder. "It has anchored the ups and downs of the solar business."

Inner strength. Southern Energy Management's business philosophy puts employees first.

[AT RIGHT] Sky's the limit. In the "old days"—2008—solar was a sideshow to Southern Energy Management's main focus on energy efficiency. The company's interest in photovoltaics has grown considerably since then.

THE PEOPLE PART

Every person in the construction business will say that the No. 1 challenge to sustaining a business these days is the lack of a trained and committed workforce. Company owners and founders must recognize and solve the problem by offering good pay and benefits, a chance to earn more by learning new skills, and, perhaps most of all, respect. "We don't fire somebody or demote somebody because they're bringing up issues we want to resolve," says Bob. "We think of the person before they hit Send on that email, who probably didn't think about it enough."

The company offers employees many in-house training opportunities and incentives to learn new skills. For example, a solar technician who learns how to install a battery—and then proves to their lead that they can—would get another 50 cents an hour.

As a **B Corp** for the past 10 years, SEM counts on neutral third-party evaluations to stay on a sustainable path. The team is motivated by the mission of a B Corp to make a difference in the world and fight global climate change. The company partners with Habitat for Humanity and other nonprofit and professional groups, like the National Green Building Council.

SOUTHERN ENERGY MANAGEMENT IN 2050

Maria is blunt when asked where she sees the company in 30 years. "So, 2050 is 27 years away," she begins. "But the [recently passed] **Inflation Reduction Act** gives us 10 years of policy certainty. In the solar world, this is like an eternity. But I would like to see Southern Energy Management move up the value chain and, in terms of owning other businesses, develop our neighborhoods and communities."

But Maria also admits that if she could wave a magic wand and have anything happen, SEM would still be a B Corp, and would still be "living into its values" and "leading the charge in terms of not just what we do for a living, but how we do it."

Overall, the solar coaster has proven to be quite a ride so far.

"When we first got into this work, many people said we were nuts," Maria says. "We heard all the reasons why things couldn't be done and why we were going to fail. If anything, I would want [builders] to do some forward thinking."

It won't be easy, Maria reminds us. "The pioneers get shot," she remarks. "The settlers thrive." ***GB***

PATHFINDER

Younger Days

GREEN BUILDER'S INAUGURAL PATHFINDER AWARD, FOR TRAILBLAZERS IN CONSTRUCTION, SETS THE BAR IN EMPLOYER LEADERSHIP.

ALL PHOTOS COURTESY OF COURTESY OF YOUNGER HOMES

A perfect pair. With Danielle and Jesse Younger, public health meets mechanical engineering to form an ENERGY STAR and "near zero"-minded construction firm.

GREEN BUILDER Sustainability Awards 2023

BY JIM GUNSHINAN

You might say that Danielle and Jesse Younger, co-owners of Younger Homes, live to serve. The Austin, Texas-based duo serves their community, their clients and their employees through a series of accomplishments in sustainable home building.

The Youngers build high-end custom homes and more-affordable "Zero Energy Ready" semi-custom homes. They are also developing a 19-acre mixed-use community in Austin.

They're a dynamic duo. Danielle has a background in public health and toxicology. Jesse is a mechanical engineer who grew up in a family of homebuilders. Danielle is more of an idea person; Jesse is practical. Both are down to earth, and both depend on their faith to guide them and to enliven their mission.

"I can say, 'Hey, I think that we should build all of our homes ENERGY STAR certified,'" says Danielle, "and then, 'wait, let's kick it up a notch and let's do all Indoor Air Plus,' and 'wait, let's pick it up another notch, and now let's make Zero Energy Ready standard for all of our homes.' And he [Jesse] doesn't blink an eye."

HUMBLE BEGINNINGS

Jesse's father, Roland, was in construction for 45 years, and Jesse was in and out of his dad's business starting at age 14. By the time Roland sold the company in Houston in 2017, Jesse had already taken his first green builder course through the National Association of Home Builders in 2016 and was ready to begin his own career. He and Danielle moved from Houston to Austin and started their own company in 2017.

Jesse and Danielle were in the oil and gas industry previously. "We had a 1994 Ford Ranger, and it had 200,000 miles on it. It had a ladder rack on top," says Jesse. "I was wearing my tools. I'd pull to the job site, and people would think I was a worker. I'm like, 'I'm the owner of the company.'"

That mistaken identity didn't last long. In a few years, Jesse and Danielle had 10 people working with them. Younger Homes has doubled its growth twice yearly since 2017—even with the fallout from the pandemic, supply chain problems and a lack of a committed, trained workforce—and was recognized by Inc. in 2022 as one of the 5,000 fastest-growing companies in America.

Grand manner. Younger Homes' projects include this Jonestown, Texas-based residence that comes complete with ideal solar orientation, solar panels, rainwater collection capability, and rooms sized to prevent wasted leftover material.

[AT RIGHT] Group effort. To continually improve itself, the Younger Homes team focuses on in-house training, as well as offsite community events.

Much of that success comes from making the business into a haven for its team members. As Jesse notes, "our focus was on our purpose and our people."

The Youngers support ongoing, in-house training. According to Danielle, this is an example of servant leadership—do what's right for the company, its clients, its team members, and the local community. "Success is a byproduct," she says.

But training away from the worksite also holds merit. "In 2022, noticing burnout in ourselves and our team, we created a partnership with a local counseling center and met to work on team building, mental health and organizational goals," Danielle says.

There is also a commitment to community service. In late 2022, the Youngers sponsored "The Big Event," which brought hundreds of people to repair homes in the area without charge. Measures included fixing broken soffits and retrofitting bathrooms. The group effort raised $70,000 in monetary and material contributions.

I FOUGHT THE LAW, AND I WON

Neither Jesse nor Danielle knew that doing the right thing could get your contractor's license taken away. "It was during the shutdown, and we were getting ready to pour a slab," Jesse recalls. "Governor [Greg] Abbott and Travis County, where we live and work, decided that construction needs to stop in Travis County. We had just passed our engineering inspection. We had rebar exposed on the slab, and rains were coming next week, so I said, 'I'm going for it.' And so we poured."

It may be true that no good deed goes unpunished. "Sure enough, here come two police officers," says Jesse. "And one comes up to my window and says, 'son, you're busted; give me your license.'"

But while the officer was looking up Jesse's license in the state database, there was an announcement that Governor Abbott had overruled Travis County because "construction is critical." When Jesse told the officer about the decree, the officer merely replied, "Have a good day. Carry on."

SHARING THE BS

Having fun does not necessarily keep a company from being at its best. It might even help—it depends on where you have fun and who you have fun with.

Younger Homes is a founding member of a local chapter of an organization called "**BS + Beer,**" an online talk show that discusses the latest in...building science. The group's goal is to "spread 'BS' far and wide, and to have fun doing it."

That's not the only way the Younger Homes team supports and works together with other building science and green building organizations. Danielle is on the board of directors for the **Energy & Environmental Building Alliance (EEBA)**. And Younger Homes is in partnership with construction technology firm **Digibilt** and **Housing 2.0** luminary Sam Rashkin's "**Future of Housing**" efforts. Digibilt uses virtual-reality tools to help builders create and sell efficient homes. Rashkin is a well-known leader in the green building field from his decades working with the Department of Energy (DOE) and as the founder of the Housing 2.0 program. **GB**

Golden green town. Since 2015, Vancouver has been among the world's top five greenest cities for its efforts in carbon reduction, near-total usage of clean energy, and tourism-related sustainability methods. CREDIT: MAGNUS LARSSON/FLICKR

GREEN BUILDER
Sustainability Awards 2023

SUSTAINABLE COMMUNITIES OF THE YEAR

BY JIM GUNSHINAN

LARGE MUNICIPALITY

Vancouver, British Columbia

Two decades of success have this greenest of green cities striving for even more.

Asked about what he is most proud of when it comes to Vancouver, British Columbia, George Benson, **the city's manager of economic transformation**, needs only two words: "Vancouver's ambition."

In recent years, Vancouver has broadened its efforts to remain one of the world's greenest cities—various reports have ranked it anywhere from first to fifth since 2015—and go beyond just focusing on economic development. It also wants to rid its skies of unnecessary carbon emissions and make the change to a low carbon economy—an equitable transformation for everyone, Benson says.

That's ambitious indeed, given the city's 40-year commitment to tech innovation and creation of a circular economy, helping to make Vancouver one of the lowest-carbon cities in the world. "With per capita emissions of fewer than 3.5 tons of carbon dioxide equivalent (C02e) per person, we have picked most of our low-hanging fruit," Benson says. "And, because of our existing low-emissions hydro-powered electricity system, most of our remaining decarbonization efforts involve expensive, low-ROI interventions, particularly in buildings, to get those 'final tons' of greenhouse gasses (GHGs) that we need to remove."

CITY BY THE ENGLISH BAY

It's easy to fall in love with Vancouver. Visitors can easily set themselves up in a green-minded hotel—**British data comparison firm Uswitch reports that 44 percent** of the city's lodging falls into this category, offering anything from restaurants with all-organic menus to on-site composting. They also can **easily get around on a bike**, rented or owned, and roll onto a ferry to Stanley Park for a trip around the island or through its forests, and to stop by a homemade rock garden.

But bikes aren't always necessary. Sometimes, a good pair

Rush hour. By 2019, Vancouver had installed 2,900 miles in bike lanes in the greater metro area, helping to reduce automobile-generated downtown traffic by 26 percent. CREDIT: PAUL KRUEGER/FLICKRZ

2,636,000
POPULATION

146%
GROWTH RATE IN THE CITY'S GREEN BUILDING AND CONSTRUCTION SECTOR SINCE 2010

1 in 4
HOW MANY CANADIAN CLEANTECH COMPANIES ARE BASED IN VANCOUVER

of shoes is good enough.

"When I asked the hotel staff about a particular restaurant, they told me, 'It's about a mile away," says Deborah M., a recent visitor from California. "An easy walk.'"

Overall, about 40 percent of trips in the city are on foot, bicycle or public transit, and almost 80 percent of residents are within a 15-minute walk to a grocery store, **according to data from Simon Fraser University**. In addition, Vancouver's mild climate minimizes heating and cooling needs. Its dense downtown, with reflective skyscrapers, has helped reduce traffic and automobile ownership.

Throw in the fact that the province of British Columbia runs a nearly carbon-free electric grid, powered by a clean energy cocktail of hydroelectric, wind, biomass and natural gas—supplying 95 percent of Vancouver's energy, according to data from the City of Vancouver—and you have a city that is definitely on a path to sustainability greatness, according to the Vancouver Economic Commission (VEC).

ADVICE FOR OTHER SUSTAINABLE CITY CANDIDATES

Vancouver has stood out as a leading sustainable metropolis for more than 20 years. For cities wanting to contribute to the global efforts to slow down the worst effects of climate change and increase their visibility, Vancouver leaders recommend that they "be ambitious but pragmatic."

For example, Vancouver has a "balanced, credible plan" that's been scientifically verified to enable the city to reach a 2030 target of reducing GHG emissions by 50 percent and net zero by 2050—but only if everything goes right. "Better to have a real plan that gets you to a target than an impossible one that doesn't," Benson says. "If the resources don't match the scientifically necessitated targets, you have to work with your community to figure out how to close that gap."

Any successful effort needs to have buy-in from every possible sector, he adds. For example, VEC supports the business community and workers. "But," Benson notes, "the more actors you can bring in and the greater the sense of shared responsibility possible, the more successful you will be."

Natural abilities. Aspen, Colorado prides itself on operating with 100 percent renewable energy, as well as implementing a staunch greenhouse gas emissions reduction goal.

GREEN BUILDER® Sustainability Awards 2023

SUSTAINABLE COMMUNITIES OF THE YEAR

BY JIM GUNSHINAN

MID-SIZED MUNICIPALITY

Aspen, Colorado

Two decades ago, this outdoor recreation-based city started a move toward using only clean energy. Now, it plans to clear the air—literally.

Aspen, Colorado is known for its skiing, mountain life, and small-town celebrity culture. But it also aspires to lead in sustainable living.

The ideology has been there for a while. The city has run on 100 percent renewable energy since 2015. It aims to reduce greenhouse gas emissions by 63 percent by 2030 and 100 percent by 2050.

According to Tessa Schreiner, the City of Aspen's sustainability manager for the **Environmental Health and Sustainability Department**, Aspen's efforts begin with policy alignment—and that is not just business-speak. "The City of Aspen is proud of our intentionality of aligning building code, engineering code, land use regulation, and utility policy with our long-standing climate action values," says Schreiner.

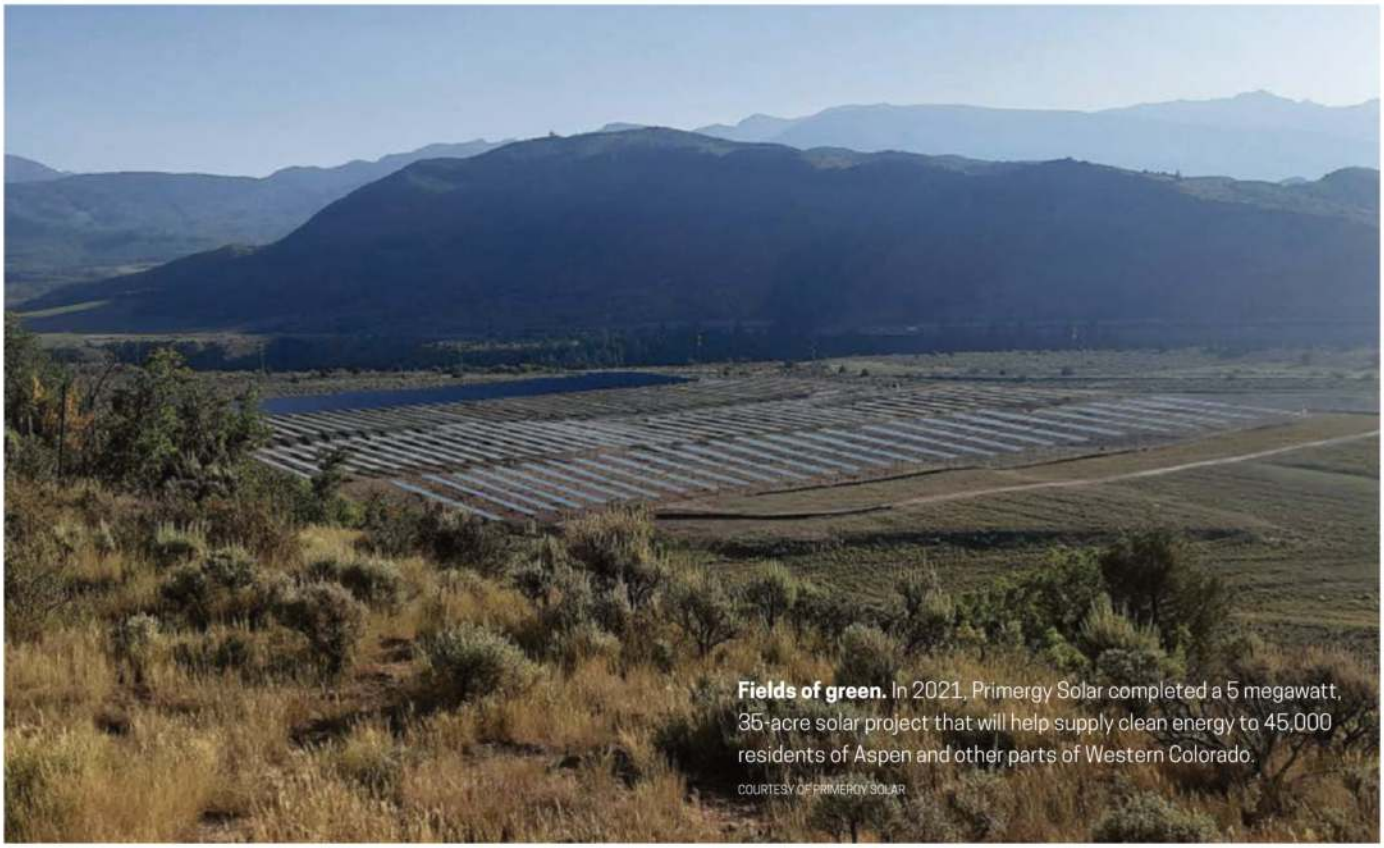
For example: More than two decades ago, Aspen, and Pitkin County, adopted the **Renewable Energy Mitigation Program (REMP)**—one of the first of its kind in the U.S.—which incentivizes the offsetting of additional energy usage on a property with renewable energy. It applies a fee if that energy is not offset.

Because Aspen's power grid runs on renewable electricity, the city is actively working on better ways to electrify its buildings and transportation, Schreiner notes.

The electrification action is boosted by other efforts within Pitkin County. A coal mine network in the Coal Basin area, about 45 miles from Aspen, is being targeted for the massive amounts of methane leaching from its various openings. About 1.3 million cubic feet is being pumped out into the air each day, or about 50 percent of the county's annual carbon emissions total, according to climate scientist and entrepreneur Christopher Caskey.

Dallas Blaney, CEO of the Community Office for Resource Efficiency (CORE), says the goal is to eventually eliminate at least 50 percent of the methane by capping mine openings or capturing and destroying the gas. Although burning methane creates carbon, it also creates steam, which can be condensed as water and released into the local watershed—ideal for the area's current drought.

There's also the possibility of building a power plant in the area, and using the methane to generate electricity for



Fields of green. In 2021, Primergy Solar completed a 5 megawatt, 35-acre solar project that will help supply clean energy to 45,000 residents of Aspen and other parts of Western Colorado.

COURTESY OF PRIMERGY SOLAR

7,721
POPULATION

7
NUMBER OF YEARS IT TOOK ASPEN TO REACH ITS ALL-GREEN ENERGY GOAL

1885
THE YEAR ASPEN BEGAN USING HYDROELECTRIC POWER

an estimated 2,000 homes, Caskey notes. His own business, **Delta Brick & Climate Company**, in Montrose, Colorado, currently fires its kilns with standard gas and electric heat, but is looking for potential sites for methane capture and utilization.

DONE BY DESIGN

Aspen faces challenges specific to its culture. There are unique building types, including large residences with high demand for energy-consumptive amenities and luxury design. "These demands, coupled with the challenges of an icy climate, make energy efficiency and usage reduction a challenge," Schreiner says.

In addition to supporting luxury facilities, the community prioritizes increasing and maintaining quality affordable housing for its residents and workforce.

In 2022, Aspen enacted an eight-month moratorium on residential building. According to Schreiner, this allowed the community to pause, reevaluate, and apply improved policy. This resulted in a land use code that limits residential demolitions and applies aggressive requirements for the building performance of properties that go through redevelopment.

Aspen is also amending the 2021 building and energy codes related to building energy performance, with the goal of electrification. "The City is working to develop building performance standards that drive efficiency over time," Schreiner says. "We could not have accomplished this without our community's commitment to shaping Aspen's built environment and sustaining our deep-rooted environmental values."

PROBLEM SOLVING?

With other cities facing similar challenges, Aspen offers clarity of purpose.

"Centering equity in policy and programming is vital to creating a truly sustainable community where all members can thrive," Schreiner says. "With costs of living increasing and the urgency to address climate change only amplifying, we need to ensure that we're addressing the needs of the most vulnerable members of our communities."

Bringing others to the table—across the organization, the community, and the region—is key to finding ways to identify and break down silos, invite new people to the conversation, make sure they feel welcome, and work across jurisdictional boundaries, Schreiner notes. "Be bold and be a leader," she says. "This climate crisis is unknown territory, and we can't wait for others to pave the way—we have to stand up, be brave and take risks."

Photo(voltaic) finish. Babcock Ranch runs primarily on clean energy, courtesy of thousands of solar panels throughout the development. COURTESY OF BABCOCK RANCH

GREEN BUILDER
Sustainability Awards 2023

SUSTAINABLE COMMUNITIES OF THE YEAR

BY JIM GUNSHINAN

SMALL COMMUNITY

Babcock Ranch, Florida

For this sustainable community under development, it's a case of strength in numbers.

If you want to hear from Dr. Jennifer Languell about which of **Babcock Ranch's** sustainability strengths stand out most, there are two big questions to ask first: Is it the 670,000 solar panels onsite, operated by **Florida Power and Light**? Or is it that a Category 4 hurricane devastated other communities in the area but left Babcock Ranch relatively unscathed?

"The sustainability of Babcock Ranch is not a result of any single community attribute," says Languell, the sustainability engineer who helped design the 18,000-acre community located 12 miles north of Fort Myers, Florida. "The solar array is a significant community feature, but it is the combination of thoughtful design, engineering, and building that all contribute to Babcock Ranch's sustainability."

Dr. Languell was one of the first 100 people to move to the new community in 2018. The project completed its 1,300th home and welcomed its 2,000th resident in January 2022. Eventually, the community will grow to encompass 20,000 homes and 50,000 people.

The community is at a 30-foot elevation and about 20 miles from the Gulf of Mexico, and it is non-coastal—facts that when combined with the beauty of the land itself "inspired the community vision of preservation, restoration, and durability," says Languell.

BUILT TO LAST

The homes were designed to take on the changing weather caused by global climate change. Hurricane Ian has been the biggest challenge so far, and it was a pretty big one. "A combination of hardened infrastructure, intentional redundancy in systems, and preserved/enhanced natural features all played a key role in weathering Ian," she notes. To put things in perspective, the Federal Emergency Management Agency (FEMA)'s **Operation Blue Roof**, a program that offers

House calls. Thanks to 1 gigabyte of available fiber optic connectivity, Babcock Ranch residents can engage in telehealth consultations with doctors at an onsite Lee Physician Group Clinic. CREDIT: GOOGLE MAPS

2,000
POPULATION

0
THE NUMBER OF HOMES AT BABCOCK RANCH DESTROYED BY HURRICANE IAN

4
THE NUMBER OF NEW RESIDENTS WHEN THE BABCOCK RANCH DEVELOPMENT OPENED IN JANUARY 2018

emergency residential roof repairs, has, as of this writing, installed close to 19,000 tarps. None are needed at Babcock Ranch.

Underground power lines protect homes and their power supplies, and retaining ponds keep them from flooding. The streets absorb water, further protecting the houses from flood damage. Most community residents stayed home during Ian, and the homes never lost power. There was one traffic light that went down, and some fallen signs and trees were uprooted. By comparison, nearby Fort Myers was devastated by wind and flooding. "People weren't interested in the Babcock Ranch storm features until Ian, Dr. Languell says. "When it happens, people notice."

EXTENSIVE COMMUNITY SERVICES

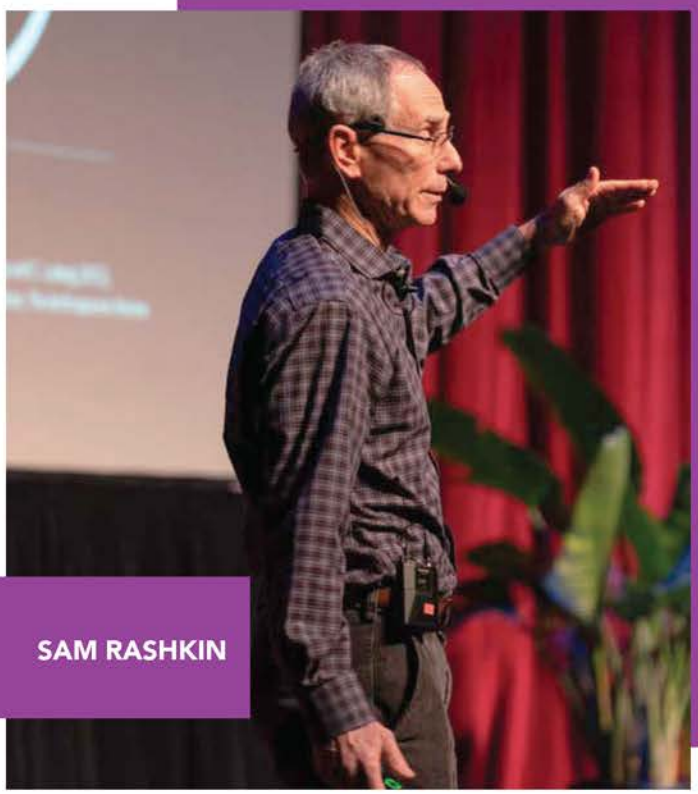
The solar panels are also pretty impressive. The 670,000 panels take up 880 acres of land, and the 150-megawatt (MW) plant can power up to 30,000 homes, 10,000 more than the project's estimated maximum size. The extra solar electricity goes back to the area's grid and is distributed to other communities.

Babcock Ranch also has 10 MWs (40 megawatt hours) of battery storage so that it doesn't have to rely on backup gas generators on cloudy days and at night.

There is something else special about the community, Languell notes: There is plenty of open space. It's bike friendly. The small pre-existing downtown is growing and includes a K-8 neighborhood school, which makes the community a draw for families with school-age kids. There's also an International Code Council (ICC)-standard field house; it provided food and shelter to some of the 2.6 million Floridians who lost power during Hurricane Ian. And no, Babcock Ranch is not just for older adults. About half of the residents are families with children. **GB**

HOUSING DISRUPTION IS HERE!

This isn't gloom and doom. It's an invitation to rise to the top of the home building industry during times of intense change.



SAM RASHKIN

HOUSING 2.0

Green Builder Media and Sam Rashkin have joined forces to launch Housing 2.0, a comprehensive training and education program designed to teach building professionals how to prepare themselves for the massive transformation that the housing sector is currently experiencing.

The program helps building professionals design and construct higher performance, healthier, more sustainable homes, optimizing the total housing user experience with an estimated 30 to 70% hard cost savings/added value.

THE HOUSING 2.0 PROGRAM INCLUDES:

6-PART WORKSHOPS (offered quarterly) that explore the Housing 2.0 fundamentals

6 ONLINE COURSES with national thought leaders that delve into key topic areas like integrating digital technology, demystifying zero carbon, advanced health controls and sensors, offsite construction, and biophilic design

HANDS-ON ACTION GROUPS that allow building professionals to apply the Housing 2.0 fundamentals to real projects

COGNITION Smart Data insights into market trends, market influencers, purchase drivers, behavioral patterns, and innovations transforming the market

RASHKIN'S SECOND BOOK, titled *Housing 2.0, A Builder Guide to Surviving Disruption*

ARTICLES, BLOGS, VIDEOS, AND EXTENSIVE EDITORIAL COVERAGE generated by Green Builder Media's award-winning editorial team

This program is perfect for anyone in the home building industry—CEOs who want to strategize new directions for their business, niche and production builders who want to offer a new product or serve a new demographic. Or how about access to this program as the ultimate perk to attract new hires or to reward stand-out employees?

2022 COURSES ARE OPEN FOR REGISTRATION

GREEN HOME OF THE YEAR AWARDS 2023

BY GREEN BUILDER STAFF

As we move from one major lifestyle challenge—an emergent pandemic—to another, with historic storms and record heat, builders have been continuously challenged to adapt. Green Builder's 2023 Green Home of the Year winners are well constructed, energy efficient and creatively designed. But our grand winner topped them all by emphasizing the local economy and the environment.

Our expert panel of judges evaluated projects in terms of overall sustainability, resilience, synergy with the environment, affordability, creativity and the depth of science employed. Here are their choices for the most exemplary and imaginative green homes of 2023.

THE JUDGES

MIKE BARCIK is a technical principal at Southface Institute, a nonprofit which promotes sustainable homes, workplaces and communities through education, research, advocacy and technical assistance. He has been with the Atlanta-based organization since 1995. With Bachelor of Science and Master of Science degrees in mechanical engineering from Georgia Tech University, Barcik is the author of numerous technical resources and has developed and led thousands of trainings for RESNET, EEBA, BPI, LEED, U.S. Department of Energy (DOE), U.S. Environmental Protection Agency (EPA) and other programs. Since 1999, Mike has trained more than 1,500 individuals in RESNET's Home Energy Rating System (HERS) program.

Mike lives with his much-smarter architect wife and two daughters in a 1920 Craftsman bungalow that they are lovingly restoring. Thanks to efficiency improvements and a 4-kilowatt photovoltaic array, the family has offset 90 percent of their electricity consumption and reduced natural gas usage by 67 percent!

THERESA (TERRI) GILBRIDE is a building energy-efficiency researcher with the Pacific Northwest National Laboratory in Richland, Washington, where she supports the U.S. Department of Energy (DOE) as a content manager for its Building America Solution Center and the DOE Zero Energy Ready Home (ZERH) program.

Gilbride has authored or co-authored dozens of reports, articles, and case studies on residential energy efficiency and related topics. She has spoken and published on residential energy efficiency, disaster resistance, zero energy homes, and affordable and healthy homes. She served as the lead editor and author of the Building America best practice guides, a 17-volume series which includes climate-specific manuals for high-performance homebuilders in all U.S. climate zones, and retrofit guides on air sealing, insulation, and HVAC. She has also helped publish documents on building codes and emerging technologies, including window attachments, solid state lighting, and HVAC.

NATHAN KAHRE brings his experiences working for a homebuilder to EnergyLogic, an applied building science company based in Berthoud, Colorado. As the innovation and initiatives manager, Kahre works on internal and externally facing projects to keep EnergyLogic at the forefront of innovation and excellence in the residential homebuilding industry.

After graduating with a master's degree in building science from Appalachian State University, Kahre came to the Denver metro area to work for a high-performance production home builder. Time spent working for that builder has helped Kahre understand what is important to builders and what information they need to get their jobs done. He has presented on building science, renewable energy, and homebuilder quality assurance throughout the country including sessions at RESNET, EEBA, and IBS. Kahre is also active in the local community, volunteering on issues that are important to him, and doing his best to be on a mountain bike as much as possible.

From the Judges

"Great focus on implementing no petrochemical products and thinking through a universal design that will allow the client to live in place for a longer time."

A Lesson in Humanity

Big benefits can come in small packages.

For developers of Habitat for Humanity Gunnison Valley (HHGV)'s Homestead and Learning Lab, success stems from a magic word: local. Much of the 1,280-square-foot, all-electric home in Gunnison, Colorado came from locally sourced products, such as lumber, soil, wood chips, and steel for roofing. There are also educational opportunities for local students, and the overall project keeps $30,000 to $40,000 of business in the local economy. And, the home was constructed using local labor.

PHOTOS (UNLESS NOTED): CILLIAN LIAM BARRETT/HEARTH DESIGN BUILD

Project Stats

NAME: Homestead and Learning Lab, Gunnison, Colorado

BUILDER: Julie Robinson, Habitat for Humanity Gunnison Valley, **www.habitat.org/co/gunnison/hfh-gunnison-valley**

ARCHITECT/DESIGNER: Cillian Liam Barrett, Hearth Design Build, Architect, **www.hearthdesignbuild.org**

DEVELOPER: Habitat for Humanity Gunnison Valley

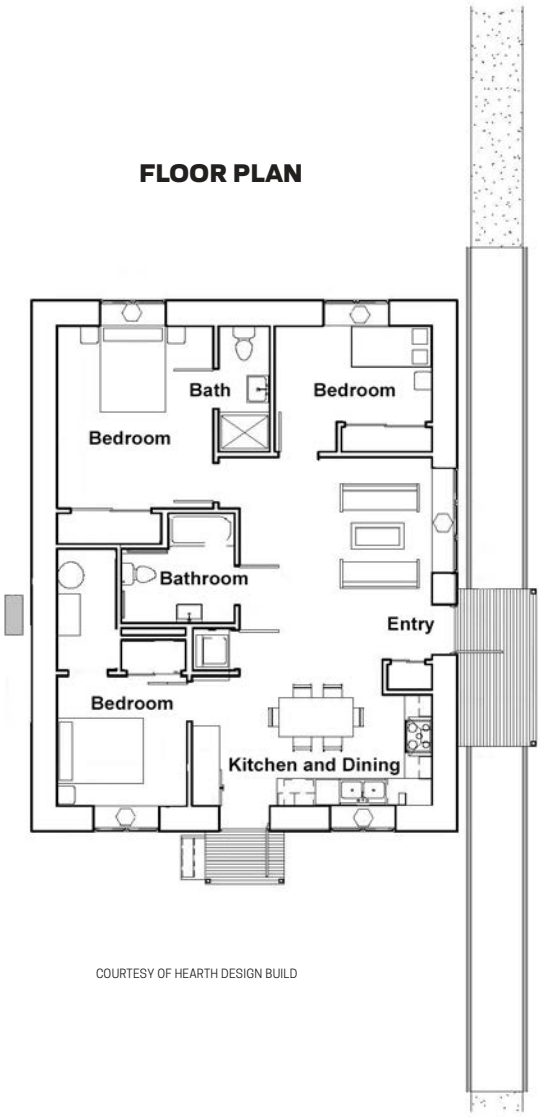
PHOTOGRAPHER: Cillian Liam Barrett

Starting point. All Habitat for Humanity Gunnison Valley homes have a similar design, including a wall cavity that is filled with materials such as untreated framing lumber, straw bales, and cellulose insulation that can absorb, distribute, and release moisture. COURTESY OF HABITAT FOR HUMANITY GUNNISON VALLEY

Equally effective. Appliances and fixtures within a Habitat for Humanity Gunnison Valley home are as energy- and water-efficient as those found in higher-priced projects.

Thermal expanse. The home's base structure includes expandable cork insulation, which provides temperature control, has accoustic and anti-vibration qualities, and is carbon negative in its environmental impact.

FLOOR PLAN



COURTESY OF HEARTH DESIGN BUILD

The structure by Almont, Colorado-based Hearth Design Build—currently, one of three at Gunnison Valley—emphasizes sustainability and a way for local families to obtain affordable housing. "Each build is an opportunity to address the challenges that face our community, such as the housing crisis, climate uncertainty and social inequity," says Hearth Design Build owner Cillian Liam Barrett, the project's architect. "We view our buildings as priceless assets that can empower homeowners to move beyond the conditions that allowed them to qualify for our program and give back to their community. Our aim is to facilitate the environments that create net-positive people, not just buildings."

STARTING WITH SUSTAINABLE THINKING

The Gunnison Valley home had a pretty basic beginning. HHGV hired Barrett to design and build a straw bale home for a selected homeowner. "[They] had wanted to go in a more environmentally conscious direction for some time," Barrett says, "and it married well with my professional background and ambitions."

There were a number of challenges. Gunnison's ultra-low winter temperatures—January is typically minus 22 degrees Fahrenheit—and its relatively warm 82-degree F average in July, made construction of-performance, energy-efficient, and environmentally friendly house a mind bender.

To maximize temperature control inside the house, Barrett made the home as airtight as possible. The structure achieved a blower door test score of 0.30 ACH50, well below the state's average score for 1,200-square-foot homes. The home also relies upon a heat recovery ventilation (HRV) system, which uses a heat pump to recover energy and control humidity, and also provide continuous fresh, filtered air. The house, ultimately, is freeze proof should there be a systems failure, and can be kept at 70 degrees F indoors when it is minus 20 degrees F outside, according to Barrett.

The Gunnison Valley home also features a double-stud, super-airtight but vapor-open, thermal envelope containing a continuous smart membrane, air control layer on the exterior. Meanwhile, there is a 20-inch wall cavity filled with materials such as untreated framing lumber, straw bales, and cellulose insulation that can absorb, distribute, and release moisture. The wall system is made up almost entirely of recycled paper fiber—the largest

DOLLAR WISE. Solar powered lighting runs as long as desired, at minimal cost—especially when compared to the rates from the high-priced local power utility.

CREDIT: CILLIAN LIAM BARRETT/HEARTH DESIGN BUILD

Key Components

ALTERNATIVE BUILDING SYSTEMS: Pre-fab sheathing-less wall structure; airtight vapor open thermal enclosure; crawlspace-sourced air to water tank; all-in-one Magic Box environmental conditioning system with balanced ventilation; ClayWall interior wall cladding system.

APPLIANCES: Whirlpool, Samsung

BUILDING ENVELOPE: Pro Clima membranes and tapes (and Vana)

CABINETS, SHELVES, MILLWORK: WeBuild vocational trades program, Crowley, Colo.

CAULKS AND SEALANTS: Pro Clima

COUNTERTOPS: WeBuild vocational trades program, Crowley, Colo.

DECKS: Local lumber

ELECTRICAL: Sawtooth Electrical, Sawyer Electrical, Schneider

EXTERIOR FINISHES: Sherwin Williams paints

HOME CONTROLS: Minotair PentaCare RV/HVAC

HVAC/DUCTS: Minotair PentaCare HRV/HVAC

INSULATION: Applegate cellulose, Amorin cork, Havenlock wool

LANDSCAPING: Local soil and wood chips, donated

LIGHTING: Schneider Electric

PAINTS AND STAINS: LimeStrong Artisan Limestrong pigments; Sherwin Williams paints

PLUMBING/PLUMBING FIXTURES: Mesa Mechanical

RENEWABLE ENERGY SYSTEMS (SOLAR, WIND, ETC.): Solar: Nunatak Energy and Equitable Solar Solutions

ROOF: Locally rolled rusted steel; Recla Metal, Montrose, Colo.

VENTILATION: Minotair PentaCare HRV/HVAC

WATER HEATING: Rheem Proterra hybrid hot water heater

WATER MANAGEMENT (INDOOR/OUTDOOR): Phyn water monitoring sensors

WINDOWS, SKYLIGHTS, PATIO DOORS: Alpen Windows, Longmont, Colo.

OTHER: Govee temperature and humidity sensors throughout the building and envelope; AirThings indoor air quality monitoring (CO_2, PM2.5, VOC and Radon); Emporia Energy energy monitors for consumption and production on all circuits; BEAM tool from "Builders for Climate Action" carbon accounting for materials

Warm feelings. Each home relies on solar power, which is proficient enough to keep anything inside from freezing, even in sub-zero temperatures.

amount and most environmentally friendly insulation available.

The structure has the area's healthiest indoor air quality thanks to a balanced HVAC unit the size of a mini fridge, and by prohibition of all petrochemical foams for insulation, according to Barrett.

The building's envelope consists of a hybrid of local lumber, straw bale and cellulose insulation, with clay and lime plaster finishes. Sheep's wool was used in place of spray foam around the windows and doors. Such products also helped the structure sequester more carbon in construction materials than is emitted by the construction—a true net zero.

"We specify materials and techniques that make our homes climate solutions, not just "less bad," Barrett says. "Our homes sequester more carbon than they omit by time of occupancy."

OUTSIDE INFLUENCES

Besides the environmental benefits, a family now living in the home typically sees a mere double-digit electric bill—from a completely electric-powered house—in the month of January. The house produce enough excess solar energy to completely power the company's next onsite build, and for current homeowners to drive 50 miles a day in an electric vehicle (EV) using a 5 kilowatt photovoltaic system.

This home (and its two onsite companions) are future-proofed for rainwater collection and water reuse, with

Joint effort. Volunteers with construction experience worked together to quickly build energy efficient Gunnison Valley homes.

The last(ing) straw. A key component of Habitat for Humanity Gunnison Valley homes is straw bales, which are used as an all-natural and easily obtainable form of insulation. It's also highly fire resistant and, under the right circumstances, can last decades. PHOTO: HABITAT FOR HUMANITY GUNNISON VALLEY

easily augmented waste and supply water systems. They're also Americans with Disabilities Act (ADA) compliant, and adaptable for use by all people, in all conditions, at any stage of life, Barrett notes.

Overall, the project offers a level of performance and comfort for about $230 per square foot or less, which is on par with the average for the state of Colorado.

"We consider the project a 'Net-Positive Homestead' in a holistic sense," he says. "It is designed to be an abundant regenerative resource for our homeowners and for the community context in which it was created."

The project helps supply the local construction industry and educational institutes with real-time performance and impact data, enabling them to learn effective building and material science.

And, residents can produce food with permaculture-focused landscaping and greenhouses provided through partnerships with local food resiliency groups and high school students.

All of this greatly impressed the judges of Green Builder's 2023 Green Home of the Year (GHOTY) competition—enough to make HHGV the year's Grand Overall Winner.

"[The project] does a great job at implementing a simple form that, with the right materials, allows for a low-cost high performance and beautiful home," says GHOTY judge Nathan Kahre, who is innovation and initiatives manager at EnergyLogic, an applied building science company based in Berthoud, Colorado. "The information gained from this project will help other builders and developers work towards low-carbon, high-performance homes that are cost effective." **GB**

What's next?

CILLIAN LIAM BARRETT, OWNER AND ARCHITECT OF HEARTH DESIGN BUILD:

"We are breaking ground on our fourth carbon negative, energy positive home in April. We will be focusing on reducing our carbon emission even further, and working with market leaders in smart home technology to make building science and construction impact more understandable to homeowners and the general public."

All images by Ted L. Clifton/Zero-Energy Plans

Right angle. A 10 kilowatt photovoltaic system is positioned only on the south-facing portion of the garage roof to obtain maximum sun exposure.

Solid effort. Walls within Hillside Farm contain graphite-enhanced polystyrene (GPS) structural integrated panels (SIPs), which can cut household energy use by up to 50 percent.

Multifaceted Mission Accomplished

A classic customer request turned into a prime example of sustainable building.

To say that Linda Massey was a typical customer of Clifton View Homes (CVH) would be underselling her. The Oak Harbor, Washington resident asked CVH to build a retirement home that would provide her with a "completely independent and secure life experience." Such a home would need to be net zero, ENERGY STAR certified, and accommodate different facets of healthy living. "My wants were simple," she admits. "I wanted a home that would be more comfortable than my old one, all on one level, and use less energy."

Tough as glass. The house features U-0.17 triple-glazed Vinyltek windows, which help save energy and control indoor temperature during summer and winter.

From the Judges

"Nice 'normal looking' house style makes extensive use of passive solar heating and low-cost ventilation cooling."

Project Stats

NAME: Hillside Farm House, Oak Harbor, Washington

BUILDER: David Wallace, Clifton View Homes, www.cliftonviewhomes.com

ARCHITECT/DESIGNER: Ted L. Clifton, Zero-Energy Plans, www.zero-energyplans.com

PHOTOGRAPHER: Ted L. Clifton

Key Components

ALTERNATIVE BUILDING SYSTEMS: ICF foundation (Nudura); SIP walls and roof (Premier Building Systems).

APPLIANCES: Kitchen Aid

AUTOMOTIVE (ELECTRIC CAR CHARGING, ETC.): Tesla Model S car, 50 amp 240V outlet, Tesla level 2 charger; LG 14 kWh storage batteries (2–expandable to 4 batteries), Silfab SLA-310 solar panels, SolarEdge inverter, module optimizers, 9.92 kW system, expandable to 22 kW

BUILDING ENVELOPE: SIP walls and roof, GPS foam for higher R-value (R-29 walls, R-47 roof assemblies); below-grade walls, all ICF from Nudura

CABINETS, SHELVES, MILLWORK: Custom bird's-eye maple, from WoodHouse Custom Cabinets in Anacortes, Wash.

CAULKS AND SEALANTS: Brands vary by location: *Titebond* for most adhesive applications, ASI for exterior silicone applications, GE Advanced with Mildecide for most interior applications

COUNTERTOPS: Granite by Northwest Granite & Flooring

DECKS: Natural Cedar, no finish (left to go gray)

DOORS AND HARDWARE: Entry door custom made by Craftsman Door Company, Ore.; Other exterior (glass) doors by Vinyltek Windows & Doors, Delta, British Columbia; basement door and garage man-doors by Codel; interior doors by Simpson Wood Doors

ELECTRICAL: Siemens panel and breakers

EXTERIOR FINISHES: All-natural cedar, left to gray naturally

FLOORING: All interior floor covering is porcelain slate-look tile from Daltile

GARAGE DOORS: Avante Legacy, Liftmaster opener

HOME CONTROLS: Intermatic speed control on range fan/HEPA filter balanced combination, 24-hour timer for nighttime cooling

INSULATION: GPS foam in SIPs, Icynene spray foam under floor over basement

LIGHTING: Varies, 100 percent LED

PAINTS AND STAINS: Sherwin Williams all zero-VOC

PLUMBING/PLUMBING FIXTURES: Kohler

RENEWABLE ENERGY SYSTEMS (SOLAR, WIND, ETC.): (2) LG 14 kWh storage batteries (expandable to 4 batteries), Silfab SLA-310 solar panels, SolarEdge inverter, module optimizers, 9.92 kW system, expandable to 22 kW

ROOF: New-Ray metals standing-seam steel roofing

STRUCTURAL COMPONENTS: Simpson Wood strong-wall sheer walls, hangers, etc.; Boise Cascade Glue-Lam Beams, Truss Joist main floor system

VENTILATION: Fantech HEPA filter, range fan (installed in balanced combination), Panasonic WhisperGreen bath fans, whole house fan, using set-back feature and motion sensor operation

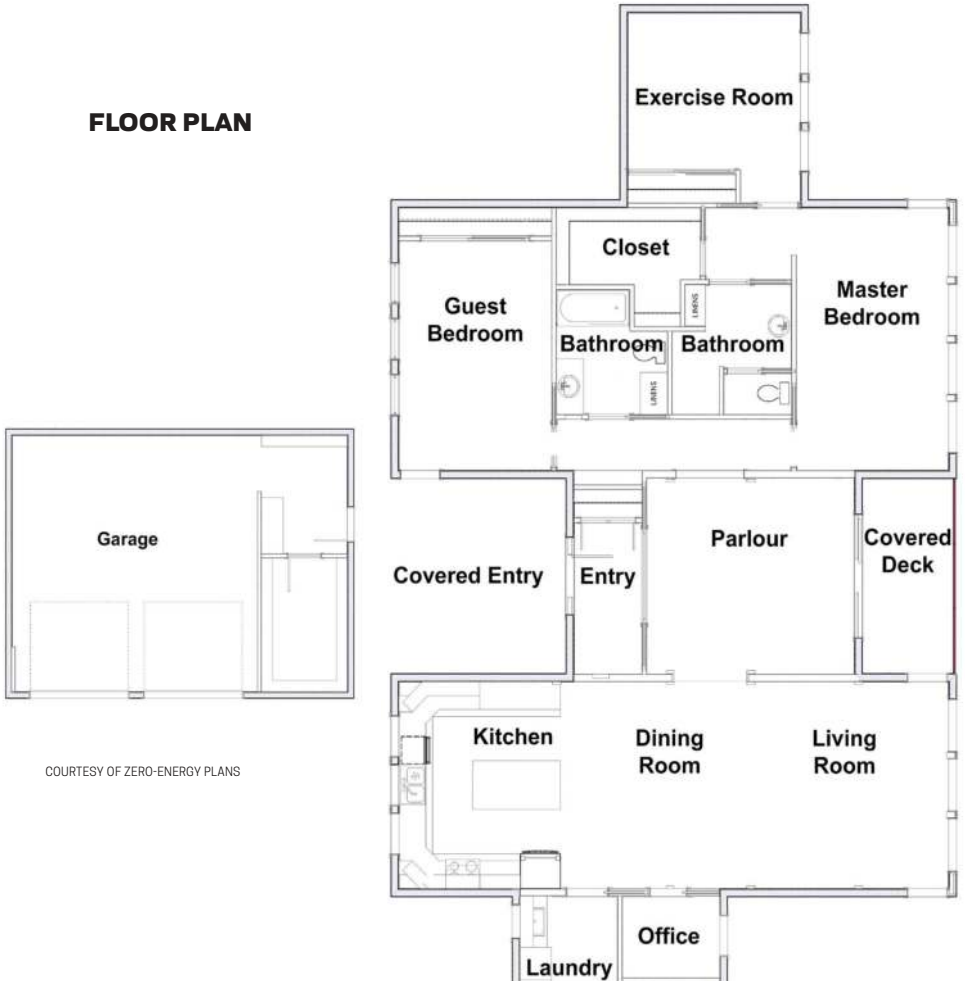
WATER FILTRATION: Gutterglove rain gutter protections, Norwesco storage tanks, RMS floating filters, CMBE constant pressure booster pump, ONC filtration system, Viqua ultraviolet disinfection system

WATER HEATING: Enertech Hydron Module GSHP, home heating and water heating from same GSHP unitWater Management (indoor/outdoor): Phyn water monitoring sensors

WINDOWS, SKYLIGHTS, PATIO DOORS: Vinyltek triple-glazed windows and doors from Delta, British Columbia. U-values average 0.17.

OTHER: Greenhouse by Charley's Greenhouse Supply, Mount Vernon, Wash.

FLOOR PLAN



COURTESY OF ZERO-ENERGY PLANS

Challenge accepted. According to project architect Ted Clifton, building the home—nicknamed the Hillside Farm House—was easier than it sounded. "We knew we could build the kind of house [Massey] was looking for," he notes. "She wanted her final home to set an example for how homes should be built, and it was a natural fit for us, both from the design perspective, as well as its construction."

The project's success stems largely from meeting the customer's needs in clean energy, water usage, and greenhouse gas emissions.

PLENTIFUL POWER

The grid-tied home generates 100 percent of its energy over the course of a year, and has enough battery power to survive lengthy power outages, while leaving the power profile to the grid relatively flat on a daily and seasonal basis.

The 10 kilowatt photovoltaic system powers the house—it covers only the south-facing portion of the garage roof, and there is about twice that amount over the main house still available for PV—and the owner's Tesla *Model S*. The latter was a smart side effect of the home's green construction, according to Massey. "Early in the design process, we went for a ride in [Clifton's] Tesla to visit a few potential building sites," she notes. "The car was so smooth, and quiet! He explained how he was charging his car at home, never having to go to the gas station. I now have my own Tesla."

The system is also large enough to power up several neighbors' homes during an emergency. It also helps the home achieve a Home Energy Rating System (HERS) Index score of minus 18, and Energy Star certification from the U.S. Environmental Protection Agency (EPA).

WATER WORKS

Although the owner desired a single-level home for her senior years, the hillside location was perfect for the added bonus of a daylight basement.

The basement provides a perfect location for water storage, and is a place for farm implements, and semi-conditioned food storage. The basement room housing the ground source heat pump (GSHP) unit and domestic hot water (DHW) tanks will always be warm, and the isolated room with one water tank will always be cold.

With 25,000 gallons of rainwater storage in the insulated concrete form (ICF) basement, the home will provide for 100 percent of its annual domestic water needs, and will irrigate fruits and vegetables that are being grown in raised-bed gardens, a screened-in fruit tree forest, and a greenhouse. "Realizing I would have all this water available, I started looking into adding a greenhouse, and raised-bed gardens for raising my own vegetables," Massey says. "Everything just came together, one idea after another."

Overflow from the rainwater system is captured in an infiltration trench, where it helps keep moisture in the soils above the ground-source heat pump loops, increasing their efficiency, while eliminating runoff.

The house is also tied to a small local water district, allowing the home to provide water to its neighbors in the case of a major emergency.

EMISSIONS OBSOLETE?

Zero volatile organic compounds (VOCs) were in any of the products used to build the home, and zero carbon will be emitted in the operation of the house or the car. "We suspect there will be a net reduction in carbon from the site due to the products grown in the farm," says Clifton. "If I counted right, that is seven zeros, a couple of which are better than zero."

"Better than zero" is also a term that judges from Green Builder's 2023 Green Home of the Year (GHOTY) competition can apply to the overall Hillside Farm House project. But that's not surprising, considering the builder involved, according to GHOTY judge Nathan Kahre, who is innovation and initiatives manager at EnergyLogic, an applied building science company based in Berthoud, Colorado. "Clifton View Homes designs and builds amazing homes that are so far beyond the majority of the building community," he says. "The community couldn't even envision the stepping stones it takes to get to this level of construction." **GB**

What's next?

TED CLIFTON, ARCHITECT AND BUILDING DESIGNER OF HILLSIDE FARM:

"We just finished a home on the historic Coupeville waterfront that looks like it may have already been there for a hundred years or more. While it does not have the rainwater system of the Hillside Farm house, it shares many of the other systems and features, and the same level of thought. We have a few others already under construction, and four or five more 'in the hopper.'"

FROM LEFT:

Green living. Landscaping around Richmond Residence is drought-resistant, meaning less water will be needed for irrigation.

Sensible siding. Wood siding used throughout the residence comes from Forest Stewardship Council (FSC)-certified trees, which are from responsibly managed forests.

Behind the walls. Walls are filled with Greenfiber cellulose insulation, which helps maintain desired temperature and reduce overall energy use.

Great pane. Triple-pane glass allows for natural lighting and cross ventilation, and helps the house meet its net zero energy goal.

A Step Ahead

A small environmental footprint makes this water- and energy-independent home a smart sign of things to come.

When a city averages 36 inches of rain per year, the word "drought" doesn't come to mind. That's the situation with Portland, Oregon, where rainfall has remained consistent over the past five years, while most of the state's Central and Eastern regions are seeing record lows.

But, there's no harm in embracing the "what if?" philosophy—which is why residential construction and design firm Green Hammer enthusiastically accepted a request for a home that would be self-sufficient in its use of water and energy.

Project Stats

NAME: Richmond Residence, Portland, Oregon

BUILDER: Green Hammer, www.greenhammer.com

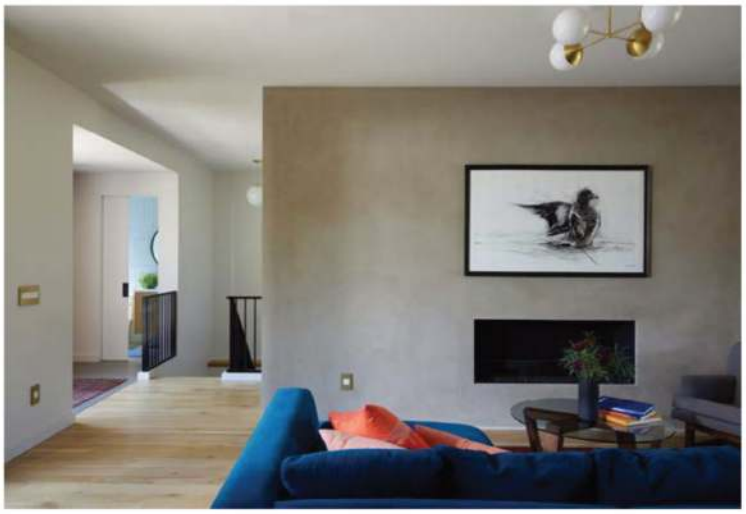
ARCHITECT/DESIGNER: Green Hammer

DEVELOPER: Melissa Medeiros, Landline Design, www.landlinedesign.com

PHOTOGRAPHER: George Barberis/George Barberis Photography

From the Judges

"A great example of a zero-water home in an urban setting."



Key Components

ALTERNATIVE BUILDING SYSTEMS: Advanced Framing

APPLIANCES: Hood vent (Vent-a-Hood); induction cooktop, oven and dishwasher (Miele); Microwave (Sharp); refrigerator (Sub-Zero, panel ready); washer and dryer (Miele)

AUTOMOTIVE: Tesla charger

BUILDING ENVELOPE: Siga air sealing products

CABINETS, SHELVES, MILLWORK: Bathroom/kitchen cabinets: Custom, rift cut white oak; laundry room cabinets: IKEA (Veddinge) door and drawer front.

CAULKS AND SEALANTS: Hannoband expanding foam tape

COUNTERTOPS: Bathroom and kitchen: PentalQuartz

DECKS: CaliBamboo, composite BamDeck 4G

DOORS AND HARDWARE: Pocket door: Cavity Sliders; Bi-pass door: Emtek Bipass Door Hardware; Swing Door: Emtek, Stuttgart Lever with Square Rosette; Exterior door: Zola Door Hardware

ELECTRICAL: Ceiling Fan: Big Ass Fans, Haiku *Indoor Ceiling Fan with Light*

EXTERIOR FINISHES: Sustainable Northwest Wood (custom FSC cedar siding)

FIREPLACE: Ethanol Fireplace (EcoSmart, *Flex 50SS*)

FLOORING: Zena Forest Products, FSC Oregon white oak (engineered)

GARAGE DOORS: Pacific Overhead Doors (Apollo Insulated Aluminum)

HVAC/DUCTS: HRV D (Zehnder, ComfoAir 350); heating and cooling equipment (Fujitsu ducted heat pump [first floor]); Taco X-pump block (in-slab radiant heat [basement, main bath]); bath timer: Leviton, Decora; Make-Up Air Damper (MUA): Broan, Universal Auto Make-Up Air Damper; Make-Up Air Filtration (MERV 13 inline filter boxes); garage exhaust (Panasonic WhisperSense w/ WhisperControl motion sensor); Floor Grille (Supply; Shoemaker, LDW—Linear Side Wall); Make-Up Air Grille: Shoemaker 1000S – Sill Supply Grille

INSULATION: Greenfiber cellulose

LANDSCAPING: Landscape lights: WAC Lighting, Ledge LED 12-volt *Path Light*; Dripline: Landscape Products, EZ-ID CD; Hydrawise software and controller: Hunter, Pro HC; PVC Pipe: solvent weld, pressure-rated; Slabs: Mutual Materials Hardscape, Architectural slabs

LIGHTING: Stair pendant: Cedar and Moss, Alto Rod; Living room mount: Cedar and Moss, Alto Compass; Dining room pendant: Cedar and Moss, Alto 6-inch Waterfall; Kitchen Island pendant: Cedar and Moss, Fjord Rod pendant; bathroom sconce: Cedar and Moss, Vista 2; primary bathroom sconce: Cedar and Moss, Timberline Sconce; Primary bedroom sconce: Cedar and Moss, Articulated Ridge Sconce; Outdoor Lights: Tech lighting, Pitch; Bathroom sconce: Cedar and Moss, Swift; Bedroom sconce: Cedar and Moss, Ridge Sconce; Interior and exterior LED: Lithonia Lighting, *Wafer Integrated LED Recessed Kit*; Undercabinet light: Aspect LED, Narrow Tape Light; Closet light: GE, *LED Direct Wire Under Cabinet Light*

PAINTS AND STAINS: Exterior stain: Timber Pro; Paint: Benjamin Moore, *Aura*

PLUMBING/PLUMBING FIXTURES: Kitchen and laundry faucet: Brizo, Litze in Luxe Gold; Kitchen Sink: Blanco, Diamond Super Single Silgranit Sink; Bath faucets: Brizo, Litze Single Handle Wall Mount Lavatory; Bath sinks: Kohler, Verticyl Rectangular Undermount sink; Shower head: Brizo TempAssure® Thermostatic Shower Only—Less Handles; Toilets: Toto Aquia IV 1G Elongated Bowl; Shower drains: QM Drain, Mist (Tile-In) Linear Drain; Laundry sink: Blanco Liven Laundry in Silgranit; Soaking tub: Zen Bathworks Ofuro Bathtub/Kyoto; Outdoor shower: Signature Hardware Stainless Steel Exposed Outdoor Shower

RAINWATER FILTRATION SYSTEM: Conservation Technology

RENEWABLE ENERGY SYSTEMS (SOLAR, WIND, ETC.): Silfab 9.6kw solar array; Generac battery and inverter

ROOF: Taylor Metal Easy Lock Standing Seam Metal Roof

SPECIALTY PRODUCTS: Rainwater tanks: (3) 3,000-gallon concrete tanks by Willamette Graystone.

STRUCTURAL COMPONENTS: Framing: 2-by-8 FSC; Sheathing: FSC plywood; Roof: Trusses; Floor: Trusses

VENTILATION: Zehnder *Q450 HRV*

WATER HEATING: Gen4 SanCO$_2$ Heat Pump;Tankless Backup Water Heater: *Rheem, RTEX; Circulator: ACT D'MAND Builder Series 1 speed pump 100 model*

WATER MANAGEMENT: Conservation Technology

WINDOWS, PATIO DOORS: Zola Windows and Doors

FLOOR PLANS

COURTESY OF GREEN HAMMER

Through an integrated design-build process, Green Hammer designed and built such a dwelling in Portland's urban and trendy Richmond neighborhood. The two-bedroom, 1,757-square-foot home is "right-sized" for the owners: a young couple interested in minimizing their environmental footprint, according to Green Hammer co-design director Jonathan Lundstrom.

"The project's unique zero-energy, zero-water goals made it an excellent fit for Green Hammer," Lundstrom says. "The thoughtful intention of the owners to explore how to reduce the project's overall impact was inspiring."

THE LANDFILL IS OFF LIMITS

This home, nicknamed the "Richmond Residence," replaced the original 1908 one-story house, which was energy inefficient, contained toxic chemicals, and had little natural light and a rigid layout, Lundstrom notes. The owners decided to reduce material waste by carefully deconstructing the existing home, salvaging content for reuse, and limiting the dispersal of hazardous material in the air, water, and soil. The house has earned a Safe + Sustainable Site Certification from environmental real estate nonprofit **Earth Advantage**.

It's also received praise from the judges of the 2023 Green Builder Home of the Year (GHOTY) competition, in which the Richmond Residence won in the "Drought Ready" category. "I appreciate the time and effort to successfully deconstruct an existing home," says GHOTY judge Nathan Kahre, who is innovation and initiatives manager at EnergyLogic, an applied building science company based in Berthoud, Colorado. "So much waste can be diverted from the landfill with thoughtful processes."

BUILDING A HOME THE "RIGHT" WAY

Green Hammer took a "right-sized" approach to living space planning to ensure that it provides necessary functional areas and amenities without oversizing the home. This also allows the project to achieve the resiliency measures desired, Lundstrom notes.

The sustainable elements are numerous:

Cedar siding clads the residence with a community-oriented front porch and simple south-facing gable roof. Both are a modern interpretation of the neighborhood context.

Opening directly from the living room

are two sliding doors leading to covered porches on both the front and back.

Thoughtful placement and triple-pane glass allow for natural lighting and cross ventilation, while meeting energy efficiency goals and fostering an indoor-outdoor connection to nature.

The all-electric home is designed to consume as little energy as possible, producing its own electricity from a 9.3 kilowatt solar array.

"Not only is the project pursuing zero net energy, but with ample storage of rainwater, it's also 'zero water,'" Lundstrom says. "The project will be almost entirely independent from the municipal water supply, reducing the strain on an increasingly concerning resource."

The home was designed with a 9,000-gallon cistern to satisfy 100 percent of its annual potable water needs through rainwater harvesting, on-site water filtration, low-flow fixtures, and right-sized plumbing design.

And, the landscape has a drought-tolerant design that significantly reduces the water needed for irrigation.

IT'S ALL ABOUT AIR

The home received **Earth Advantage Platinum + Zero Energy** certification for its highly effective airtight enclosure, a super-insulated envelope, thermal-bridge-free construction, triple-pane windows, all ENERGY STAR appliances, LED light fixtures, Forest Stewardship Council (FSC) certified wood, and a high-efficiency mini-split heat pump.

An ultra-efficient heat recovery ventilation (HRV) system keeps the indoor air quality clean and healthy with enhanced filtration of incoming outside air. By removing fine particulates and contaminants such as smoke, the continuous ventilation contributes to the resiliency of the home during the Pacific Northwest wildfire season, Lundstrom notes.

Adding to the house's comfort and the low energy consumption is a heat pump water heater that uses CO_2 as the natural refrigerant. The heat pump water heater powers an in-floor radiant system on the lower level, which provides domestic hot water for the home and a soaking tub in the backyard. **GB**

What's next?

JONATHAN LUNDSTROM, CO-DESIGN DIRECTOR AT GREEN HAMMER:

"One of our current projects is a historic renovation of a 1920s Willamette Heights cedar shake home. We are completely upgrading the building envelope to provide an insulated and airtight assembly, including triple-pane windows designed to match the home's historic style. We also just broke ground on a Net Zero Energy passive house in Camas, Washington, and are starting design on a Net Zero-ready cabin in Lostine, Oregon."

CREDIT: MARK ADAMS/MARK ADAMS PHOTOGRAPHY

Standing alone (soon). The Hillside Retreat's roof is oriented, pitched and pre-wired to accommodate a solar array system designed to make the home independent from the city's electrical grid.

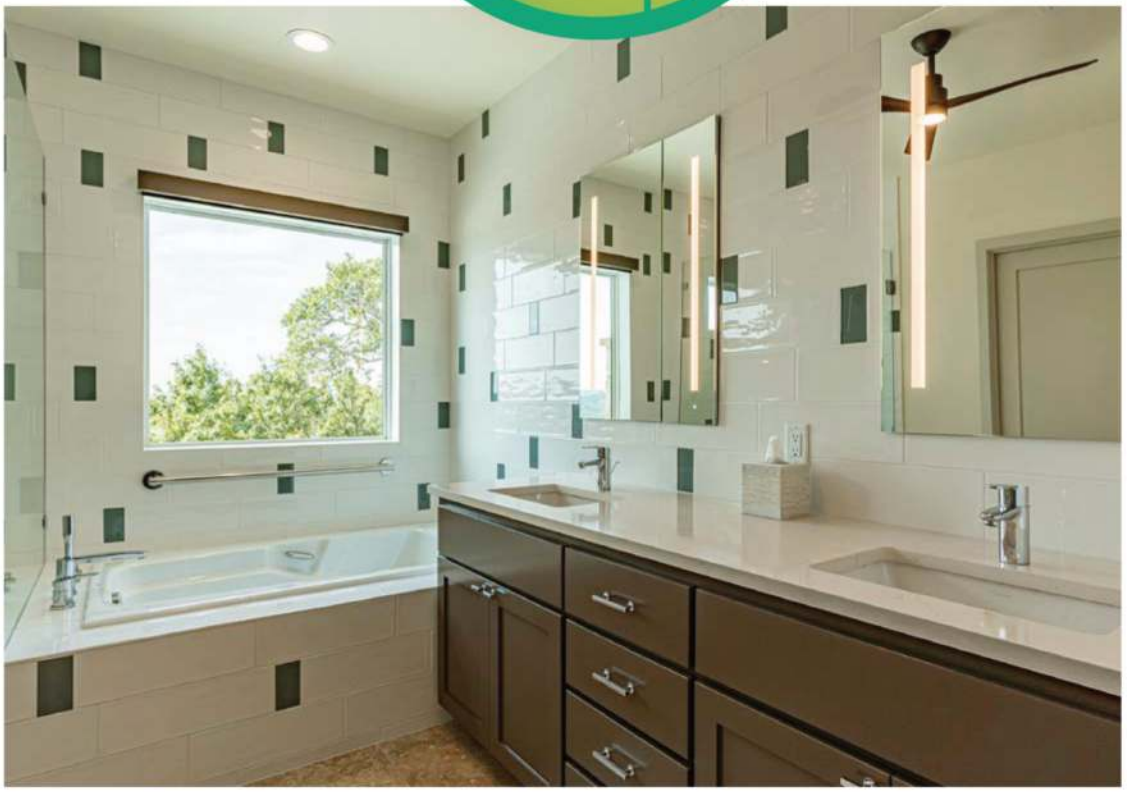
Weather monitor. ENERGY STAR-rated Ultrex double-pane windows cut costs by more than 30 percent in cold climates, and reduce cooling costs by almost 40 percent in warm climates.

Repeat Performer

Design experience was the key in meeting a second-time client's request for an even greener home.

HOME OF THE YEAR
GREEN BUILDER
2023
General Excellence

If once was good, twice will be great. That's the position Barley|Pfeiffer Architecture found itself in when a client from 2007 returned to the Austin-based firm, wanting it to create an even more-sustainability-driven home.



Sustainability showcase. Natural lighting, drawers with environmentally friendly waterborne varnish, and water saving fixtures make the bathrooms a prime example of green thinking.

From the Judges

"Great job pairing climate specific architecture with an excellent understanding of building performance and quality construction techniques."

Project Stats

NAME: Hillside Retreat, Leander, Texas

BUILDER: Neal English, English Partners Inc.

ARCHITECT/DESIGNER: Alan Barley and Peter Pfeiffer, Barley|Pfeiffer Architecture, **https://barleypfeiffer.com**

LANDSCAPE ARCHITECT: Gregorio Jimenez, Southeast Landscape & Irrigation, **https://southeastlandscapetx.com**

INTERIOR DESIGNER: Taylor Clouse, Love County Designs, **https://lovecountydesign.com**

PHOTOGRAPHER: Mark Adams, Mark Adams Photography

Key Components

APPLIANCES: Fisher & Paykel (double dishwasher drawer); Bosch (30-inch wall oven, speed oven, warming drawer and induction cooktop); GE (28.5 cubic foot French door refrigerator); Kohler Dickinson undermount kitchen sink; LG Signature (front load washer/dryer combination unit; 5.8 cubic foot mega capacity washer; 9.0 cubic foot mega capacity TurboSteam gas dryer); Robern (36-by-40 double door AiO medicine cabinet, 29-by-40 AiO double door medicine cabinet [2]; 24-by-40 AiO mirror [2]); pre-manufactured chimney style vent hood. Suggested: Thermador Masterpiece Series with Remote Location Blower Fan.

BUILDING ENVELOPE: Wall drainage plane products (building paper: 30# high grade ASTM D226 saturated felt paper; building wrap: DuPont Tyvek Commercial Wrap D ; rain screen: MortarNet with insect barrier by Mortar Net Solutions [or equal]; Sill seal at sole plate: Dow Sill-Seal continuous foam strips; sheet metal flashing: 26 gauge Galvalume sheet metal; door pans: plastic pan such as Jamsil Guard molded ABS plastic door sill pan flashing; rubber membrane flashing at windows and door: DuPont Flex Wrap at window sills, DuPont Straight Flash or Carlisle Coatings and Waterproofing CCW 705, 40 ml, 6-inch-wide strips at heads and jambs; at wall base and corners, ridges and valleys, roof bracket mounting plates: Carlisle Coatings and Waterproofing CCW 705, 40 ml self-adhering rubberized membrane

CABINETS, SHELVES, MILLWORK: Robern medicine cabinets

CAULKS AND SEALANTS: Tremco Sealants and Waterproofing Vulkem 116

COUNTERTOPS: Recommended Silestone

DOORS AND HARDWARE: Simpson Mastermark Series Viewsaver Thermal French with double pane clear glass

FURNITURE: Robern mirrors

HVAC/DUCTS: Bryant

INSULATION: Rigid insulation board (XPS Rigid Board at exterior walls around conditioned spaces and garage; Dow [or equivalent] Styrofoam residential sheathing); EPS Rigid Board at vaulted ceilings; Spray foam insulation: Icynene Pro-Seal polyurethane spray foam; Icynene Classic Plus polyurethane spray foam

LIGHTING: Texas Sun & Shade (motorized rolling shutters and motorized interior Lutron shades)

PAINTS AND STAINS: Cementitious siding, soffits, and ceilings (Sherwin Williams Loxon Masonry Primer and Coating [A24-300 Series] or Duration Exterior Latex Coating in Satin/Gloss finish); wood trim, ceilings, siding, etc. (Sherwin Williams Woodscapes semi-transparent water-borne polyurethane stain); stone veneer sealer: EcoProCote Agri-Soy Penetrating Clear Sealer in a satin finish); paint finish locations at interior (Gypsum board: Sherwin Williams Duration Home Interior Latex in matte finish or ProMar 200 in flat finish); Wood, water based (cabinets, millwork, doors and trim): (Sherwin Williams Premium Wall and Wood Interior Latex Primer; Emerald Urethane Trim Enamel); clear and stain finish location at interior (stained finish wood – Alkyd or oil based) (Sherwin Williams Wood Classics waterborne polyurethane varnish in satin finish); clear finish wood – acrylic: (Sherwin Williams Wood Classics waterborne polyurethane varnish in satin finish)

PLUMBING/PLUMBING FIXTURES: Bathrooms (Aquia® IV One-Piece Toilet - 1.28 GPF and 0.8 GPF, elongated bowl (3); Kohler Ladena under-mount sinks (2) in master bath; Kohler Ladena or similar in other 2 bathrooms; Supreme® Pedestal Lavatory (1); Eurostyle Cosmopolitan size small bathroom faucets (5); Grohe Rapido® SmartBox and Grohe SmartControl® Dual Function trim; Grohe Rapido® SmartBox and Grohe SmartControl® Single Function trim; Power and Soul Cosmopolitan 190 (fixed)(2); Power and Soul Cosmopolitan 130 (hand held) (3); TOTO Enameled Cast Iron Bathtub; Eurostyle Cosmopolitan 4 Hole Bathtub Faucet with Handshower); Kitchen (Kohler Dickinson Apron Sink with Duostrainer; Ladylux3 RealSteel Pro Single-Handle Kitchen Faucet); laundry room (Kohler Park Falls Utility Sink with Duostrainer; Grohe Concetto model); garage (Grohe Concetto model; Elkay Lustertone Classic Stainless Steel Single Bowl Undermount Sink; Elkay Deluxe 31/2-inch Drain Type 304 stainless steel body, strainer basket rubber seal and tailpiece)

RENEWABLE ENERGY SYSTEMS: Solar array planned for with roof design

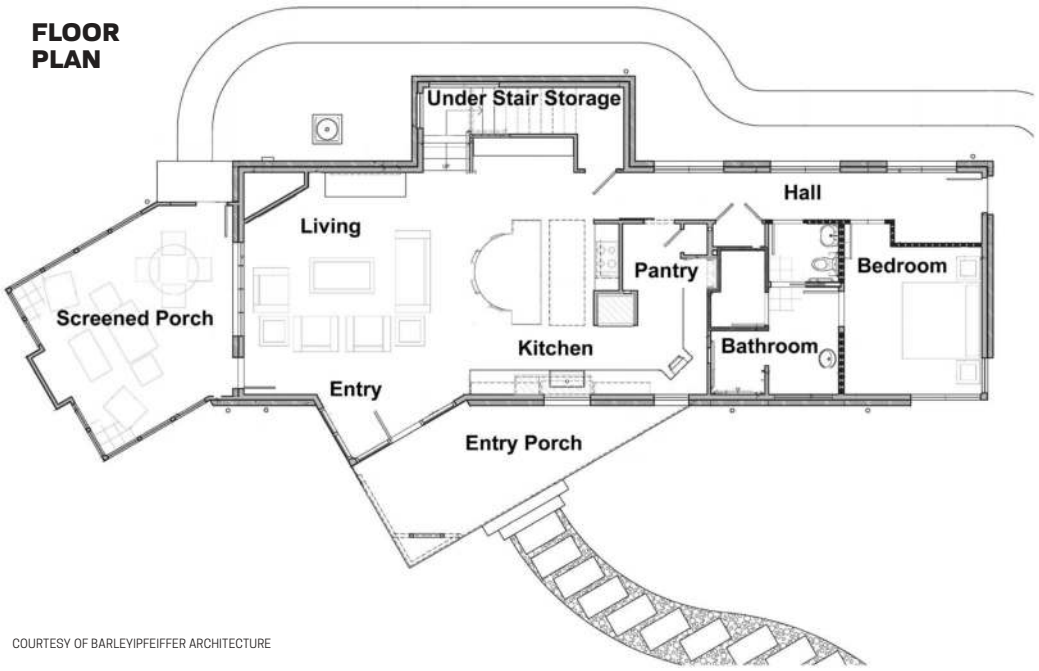
WATER HEATING: Rinnai Sensai RU180i 180,000 BTU tankless hot water heating unit with sealed combustion and forced exhaust

WINDOW COVERINGS: Phifer SeeVue stainless steel wire mesh insect screens, removable 18 gauge aluminum frames; exterior storm shutters: Rollac Shutter DuraComfort shutters with high-density foam insulation and metallic finish; motorized rollers shades at interior: Lutron Roller 100 roller shades, outside mount

WINDOWS, SKYLIGHTS, PATIO DOORS: Casement and fixed: Marvin Integrity Ultrex-wood series; slider window: Marvin Aluminum Clad Ultimate; Wall windows: Western Series 900

OTHER: MESA home security system

FLOOR PLAN



COURTESY OF BARLEYIPFEIFFER ARCHITECTURE

"We had the unique honor of this being the second home to design for these former oil company executives turned environmental-activists clients," says Peter Pfeiffer, principal of Barley|Pfeiffer Architecture. "After experiencing the benefits of living in a Barley|Pfeiffer Architecture home when they were younger, they were inspired to live with an even smaller carbon footprint with this enhanced and improved version, located closer to shopping and medical services to minimize their required driving."

The clients, now an older couple, found a challenging "leftover" lot in a closer-in, built-out community in the suburbs of Austin, Pfeiffer notes. The property, with a south-facing hillside abutting a ravine, came with the bonus of having a building pad already prepared by previous owners.

And thus, the project nicknamed "Hillside Retreat" was born.

DESIGN STRATEGIES

According to Pfeiffer, the client's desire to nestle into the natural Texas landscape, while capitalizing on faraway views of the Hill Country, melded seamlessly with the goal of being environmentally responsible through utilizing "climate responsive" design and "high performance" building strategies.

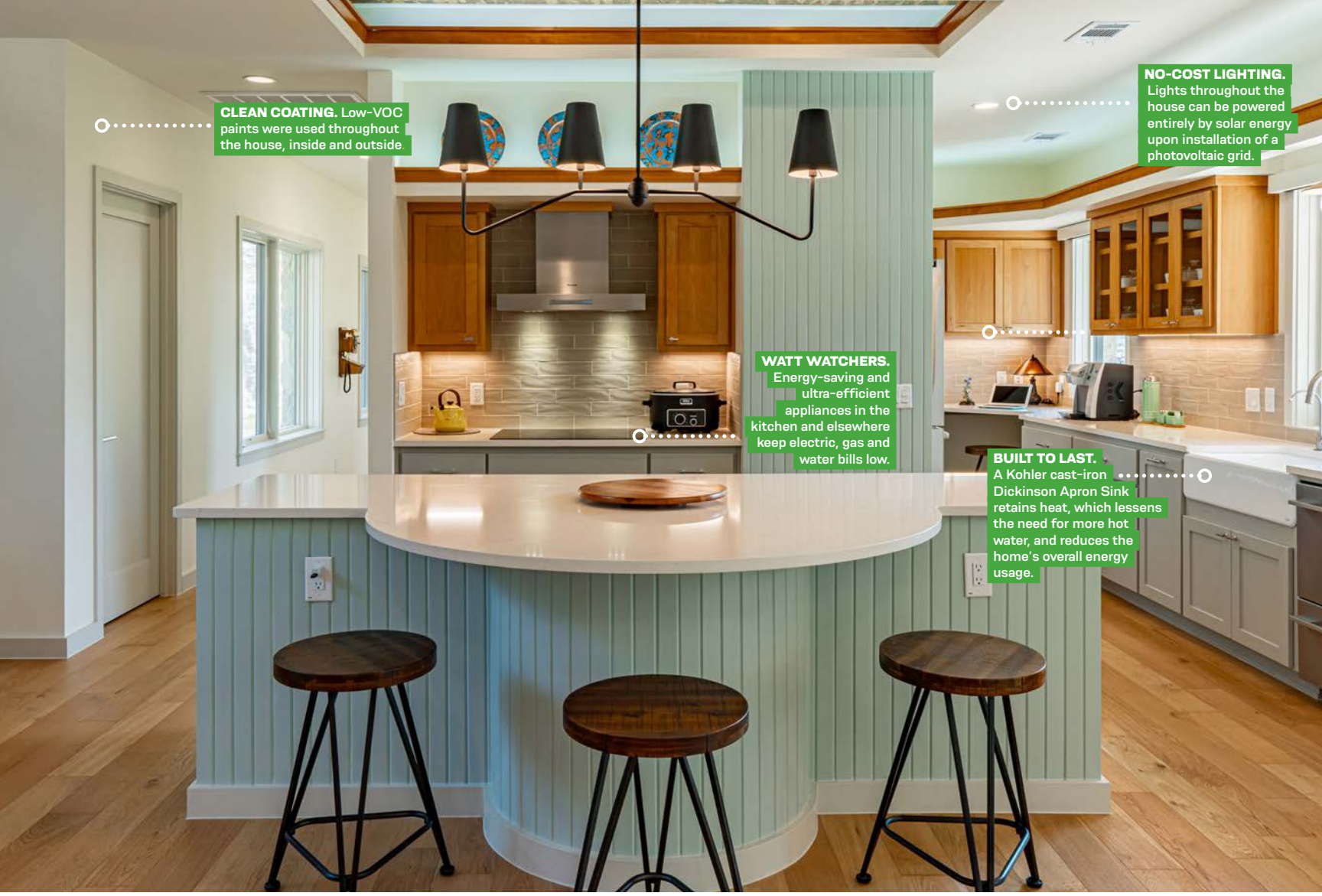
Built into the home design from the very first concept sketches were passive solar cooling strategies in response to the hot Texas sun and to the site's cooling prevailing breezes. "We then incorporated enhanced natural ventilation strategies inside the structure with the design and placement of a 'thermal siphoning' stair tower, balanced daylighting and window shading via extensive sun-angle calculations," Pfeiffer explains. "[There were also] elegant connections to the surrounding woods via a wonderful screened-in porch/semi-outdoor living room perched over the adjacent ravine."

HIGH PERFORMANCE BUILDING STRATEGIES

The home's "shading umbrella roof" incorporates a floating ventilated radiant barrier system in conjunction with a humidity limiting/indoor-air-quality enhancing sealed attic.

Furthermore, the roof is designed, oriented, pitched, and pre-wired to accommodate future installation of an extensive photovoltaic solar array system—one large enough to make the home independent from the local utility grid, Pfeiffer notes. Likewise, the roof, gutters, downspouts, and installed network of collection pipes were designed to facilitate a rainwater system large and sophisticated enough to allow disconnection from the city water system.

"This exemplifies how a climate



"We had the unique honor of this being the second home to design for these former oil company executives turned environmental-activists clients...they were inspired to live with an even smaller carbon footprint with this enhanced and improved version."

—Peter Pfeiffer, principal of Barley|Pfeiffer Architecture

responsive approach results in a home that exceeds the expectations of its owners, making for an extremely healthy indoor environment while reducing the long-term cost of ownership associated with maintenance, utilities, and climate control," Pfeiffer notes. And, in a nod to "mainstreaming" green building, the home's transitional exterior design is a complement to the existing neighborhood housing.

The Hillside Retreat—winner of Green Builder's 2023 Green Home of the Year competition in the General homebuilding category—could complement the area for quite a while, according to GHOTY judge Nathan Kahre, who is innovation and initiatives manager at EnergyLogic, an applied building science company based in Berthoud, Colorado. "The flexible floorplan, along with future opportunities for solar and water collection," Kahre says, "will allow for long-term occupancy and use of the home by multiple generations."GB

What's next?

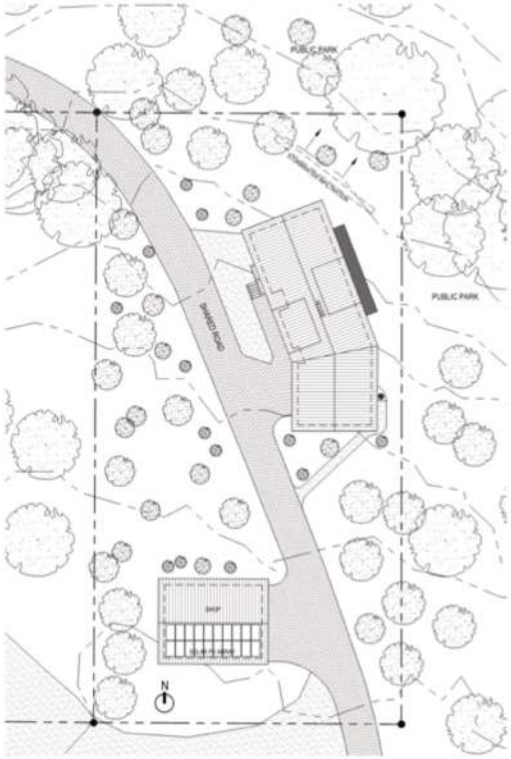
PETER PFEIFFER, PRESIDENT, BARLEY/PFEIFFER ARCHITECTURE:

"We have several interesting residential and commercial projects—clients desiring climate responsive and energy efficient projects that are thoughtfully designed and beautifully executed."

HOME OF THE YEAR

GREEN BUILDER 2023

Off-site Construction



Split decision. A shared road splits the Pond View House parcel in two, leading to separate locations for the dwelling and a workshop. CREDIT: (BUNDLE) DESIGN STUDIO

Indoor elements. ENERGY STAR-rated appliances, dual-pane windows and non-VOC coated cabinets are sustainable highlights of the kitchen. CREDIT: SHEILA SAY/SHEILA SAY PHOTOGRAPHY

SHEILA SAY/SHEILA SAY PHOTOGRAPHY

Pond Views and Privacy

An unusual parcel shape leads to a slew of successful Passive House features.

Take a retiree with big plans for a smaller home, and combine him with a much-maligned piece of property, and you have what has become known as the "Pond View House."

From the Judges

"This project sits lightly on the earth…it looks like the design team has made great efforts to help the project blend into the surrounding public spaces."

Project Stats

NAME: Pond View House, Bellingham, Washington

BUILDER: Kota Construction, **www.kotacon.com**

ARCHITECT/DESIGNER: Dan Welch and Zach Jorgensen, [bundle] design studio, **www.bundledesignstudio.com**

INTERIOR DESIGNER: Lori Radder

PHOTOGRAPHER: Sheila Say, Sheila Say Photography, **www.sheilasay.com**

Room with a natural view. Water saving fixtures, and natural lighting and heat, make the home's bathrooms comfortable and eco-friendly. CREDIT: SHEILA SAY/SHEILA SAY PHOTOGRAPHY

"The owner was downsizing from a very large house and moving closer to his family to spend more time with his grandchildren," explains Dan Welch, founder of [bundle] design studio, the South Bellingham, Washington infill project's architecture and design firm. "He had a desire to build a low environmental impact home that was very comfortable with healthy materials and indoor air quality."

[bundle]'s portfolio focuses on Passive House and high-performance net-positive energy projects. The customer's specifications were "perfectly in line with [our] philosophy and existing work," Welch notes.

HERE, THERE, OR ANYWHERE

The Pond View House seemingly had everything going for it in terms of location—close to city amenities while within walking distance of a forested city park, scenic pond and popular recreational trail—but remained undeveloped for years. Various owners were discouraged by the existing public driveway, which cut diagonally through the site to provide access to an additional five homes.

Due to the constraint of the existing driveway, the site design was split, with the house situated on the east overlooking the park and the shop on the west to provide easy access and privacy from existing homes, according to Welch. "The owner's goal was to create a home that allowed for single floor living with additional rooms for guests and family," he says. "The design takes advantage of the site's existing downhill slope to the northeast by providing all the primary living spaces on the main floor with a daylight basement, providing additional guests and mechanical space

Key Components

APPLIANCES: Bosch

WATER RESISTIVE BARRIER: Henry Blueskin

CABINETS, SHELVES, MILLWORK: Smith and Vallee

COUNTERTOPS: Quartz

DECKS: Thermory wood decking

DOORS AND HARDWARE: Westeck

ELECTRICAL: Express Electric

EXTERIOR FINISHES: Metal siding, cedar siding, fiber cement siding

FLOORING: TMBR Flooring, Big Sur

GARAGE DOORS: Overhead door

HVAC/DUCTS: Daikin heat pump

INSULATION: Thermacork exterior insulation; Greenfiber cellulose cavity insulation

LIGHTING: West Elm, CB2, Etsy

PAINTS AND STAINS: Benjamin Moore; White Dove

PLUMBING/PLUMBING FIXTURES: Kohler

RENEWABLE ENERGY SYSTEMS (SOLAR, WIND, ETC.): Barron Heating

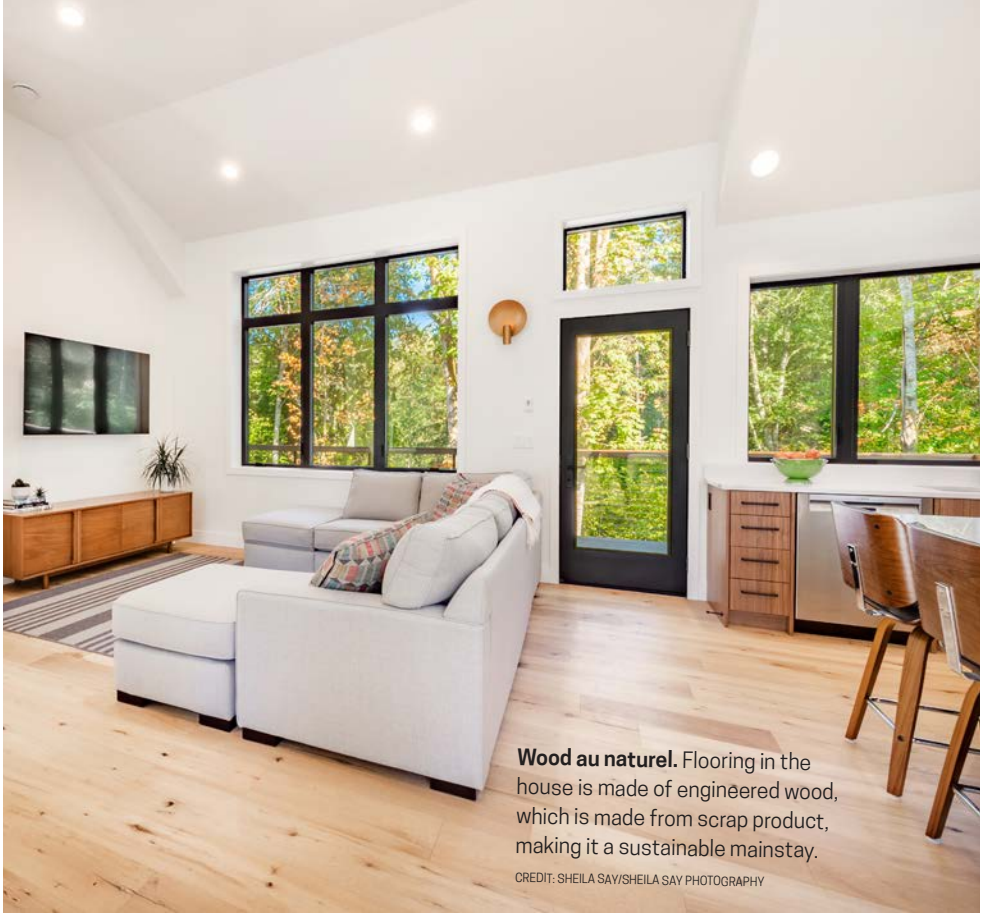
ROOF: Precision Roofing

VENTILATION: Zehnder CA350

WATER HEATING: Rheem HPWH

WINDOW COVERINGS: Bali motorized blinds

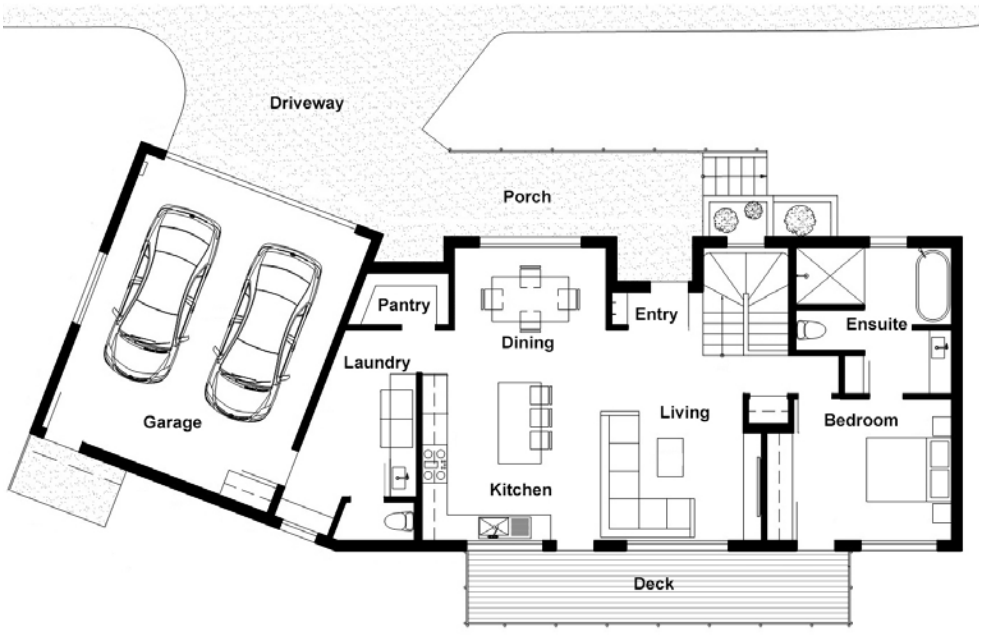
WINDOWS, SKYLIGHTS, PATIO DOORS: Westeck windows



Wood au naturel. Flooring in the house is made of engineered wood, which is made from scrap product, making it a sustainable mainstay.

CREDIT: SHEILA SAY/SHEILA SAY PHOTOGRAPHY

FLOOR PLAN



COURTESY OF [BUNDLE] DESIGN STUDIO

on a reduced footprint."

Limited openings to the west reduce intrusive headlights and increased privacy from the public driveway. To the east, the living spaces open to the forest with tall windows, doors, decks, and patios that overlook the pond.

POND HOUSE, PASSIVE GUIDELINES

Building a home utilizing sustainable construction materials and methods was also a key priority for the owner, Welch notes. The Pond View House uses Passive House principles, including continuous insulation, airtight construction, high-performance windows and doors, thermal bridge-free detailing, and heat recovery ventilation.

Being crafted with simple lines, zero-VOC finishes, Passive House air tightness, and steel siding will ensure the home is durable, comfortable, ages beautifully with time, and has very low operating costs, Welch adds.

The home's carbon footprint is significantly reduced thanks to all-wood framing made with engineered wood, and trusses for floors and roof systems. Carbon-sequestering cork—a renewable resource that doesn't require the harvesting of a tree—is used for exterior insulation, while cellulose is for interior cavity insulation.

The two-bedroom home is of modest size, reducing the amount of materials needed, Welch adds.

The house, and an accompanying workshop, are also all electric, thanks to a photovoltaic array that supplies most of the energy needed during the year. The shop's roof, in particular, is orientated directly south with a slope optimized for maximum solar capture. Building assemblies and features such as an energy-saving HVAC enable the project to actually end up net positive in terms of electricity generated.

KINDNESS TO MOTHER NATURE

Because the new house is directly adjacent to a forested park, the owner wanted to be considerate of the natural setting, Welch notes. Disturbed land was restored with native plants and trees, and incorporates large infiltration trenches that allow the stormwater to return to the forest.

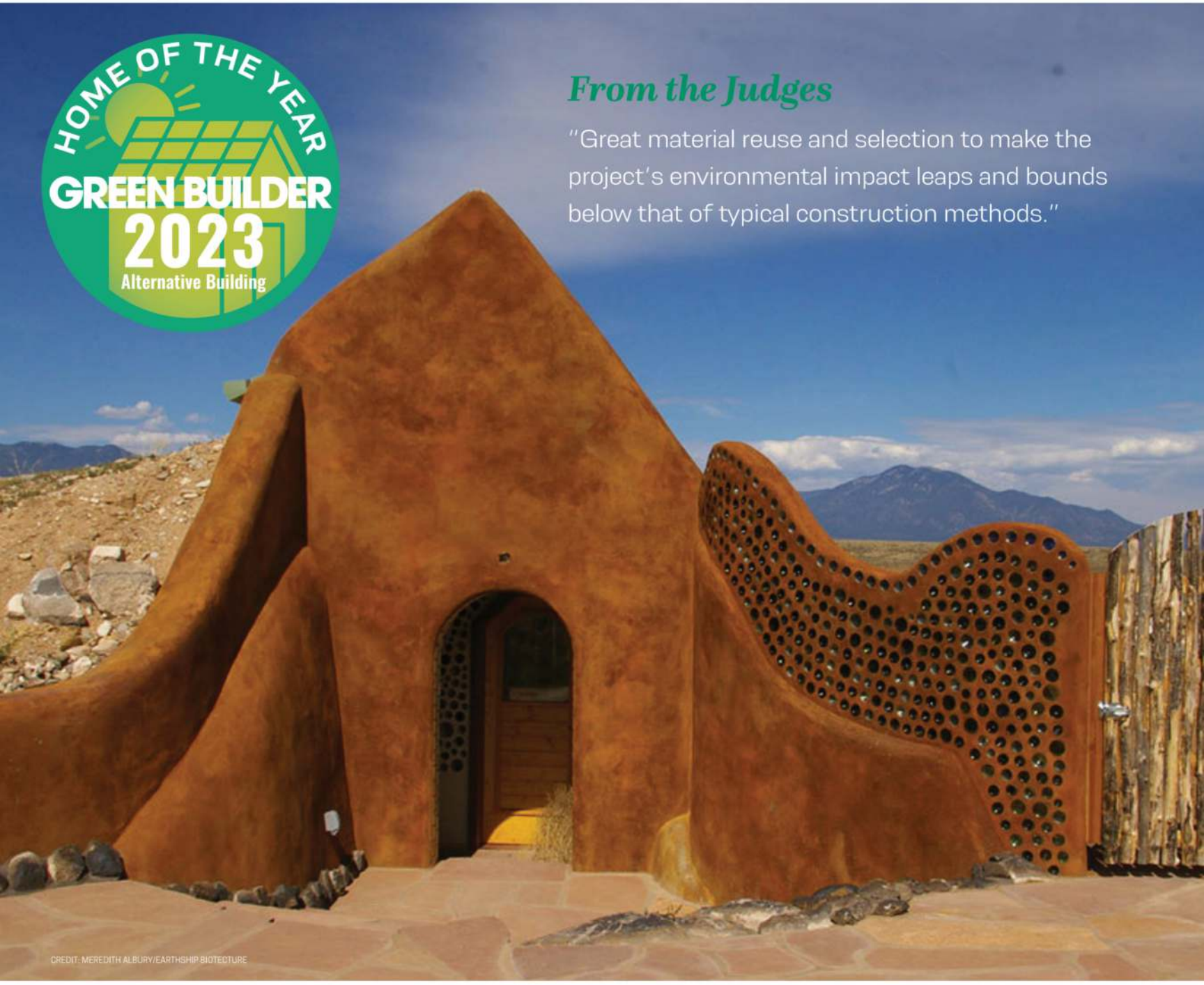
All of these qualities make for a good "how to" lesson, according to Theresa Gilbride, a building energy efficiency researcher at Pacific Northwest National Laboratory in Richland, Washington, and a judge for Green Builder's 2023 Green Home of the Year (GHOTY). The Pond View House is the year's winner in the Off-site Construction category. "The home's Passive House principles are a great example to other building professionals," she notes. **GB**

What's next?

DAN WELCH, PRINCIPAL AT [BUNDLE] DESIGN STUDIO:

"We have numerous Passive Houses on the Washington San Juan islands; a few Passive Houses around Bellingham, Washington; a few building envelope renovations to achieve net-zero energy; and a handful of smaller additions."

On the Ground



CREDIT: MEREDITH ALBURY/EARTHSHIP BIOTECTURE

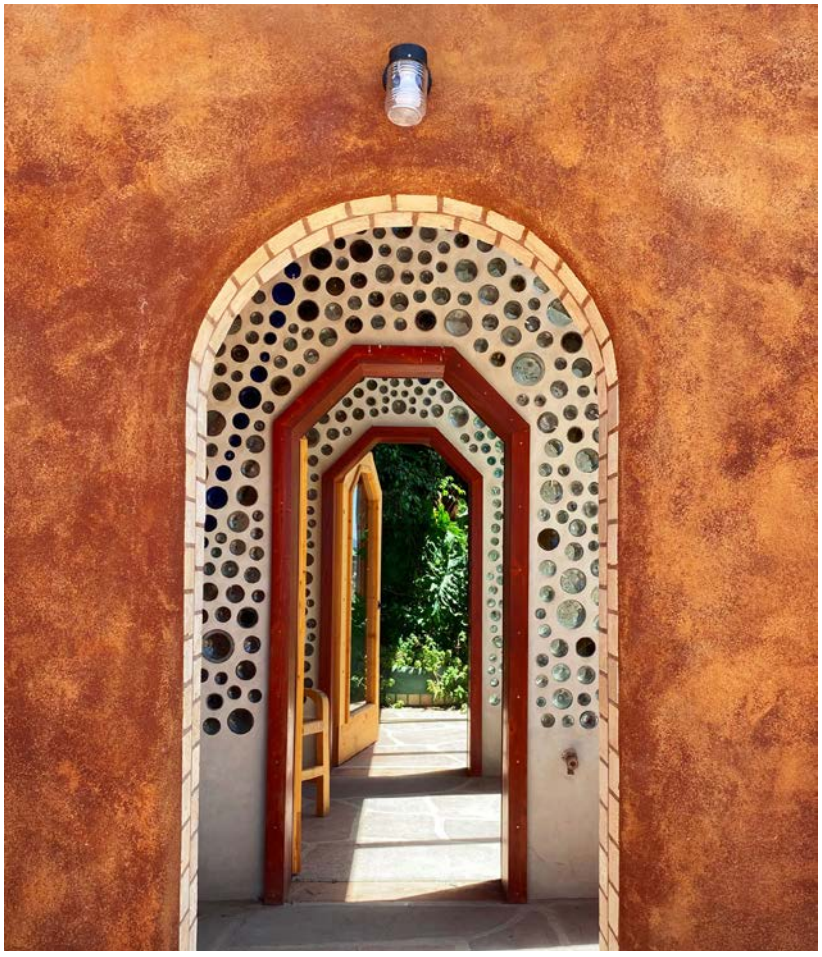
From the Judges

"Great material reuse and selection to make the project's environmental impact leaps and bounds below that of typical construction methods."

"One unique thing is that we bring the power system to the barren site. It's in a box, and we hook it up, plug in our tools, and build the home with the power system that is ultimately going to run the building."**—Michael Reynolds, Earthship Biotecture founder and biotect**

Floor

There's a lot of 'good Earth' in the all-natural Truchas Earthship.



Grand entry. Wooden doorways and framing are made in-house by Earthship Biotecture crews.

When he designs a home, Michael Reynolds, founder and "biotect" of Earthship Biotecture, addresses six "major issues of sustenance for humanity": comfortable shelter, electricity, water, containment and treatment of sewage, treatment of garbage, and food. Those items, he says, "must be addressed in each building in today's world if we are to escape the confines and problematic issues of infrastructure."

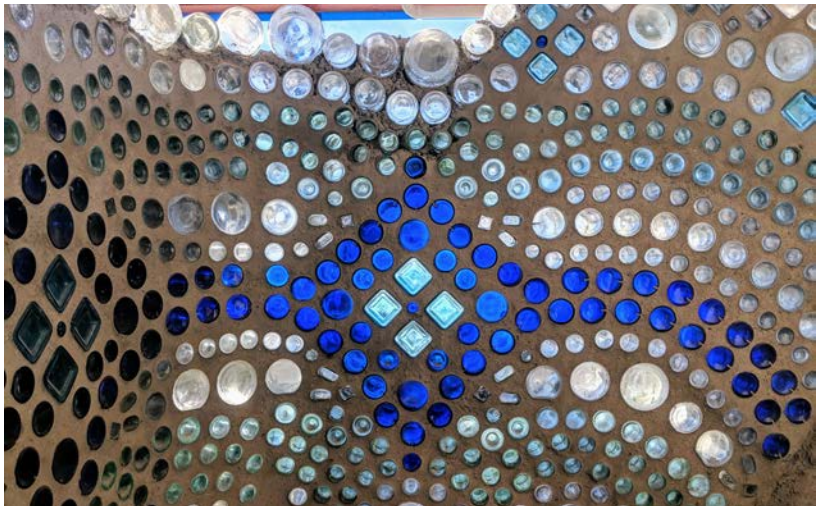
Project Stats

NAME: Truchas Earthship, Tres Piedras, New Mexico

BUILDER: Earthship Biotecture, www.earthshipglobal.com

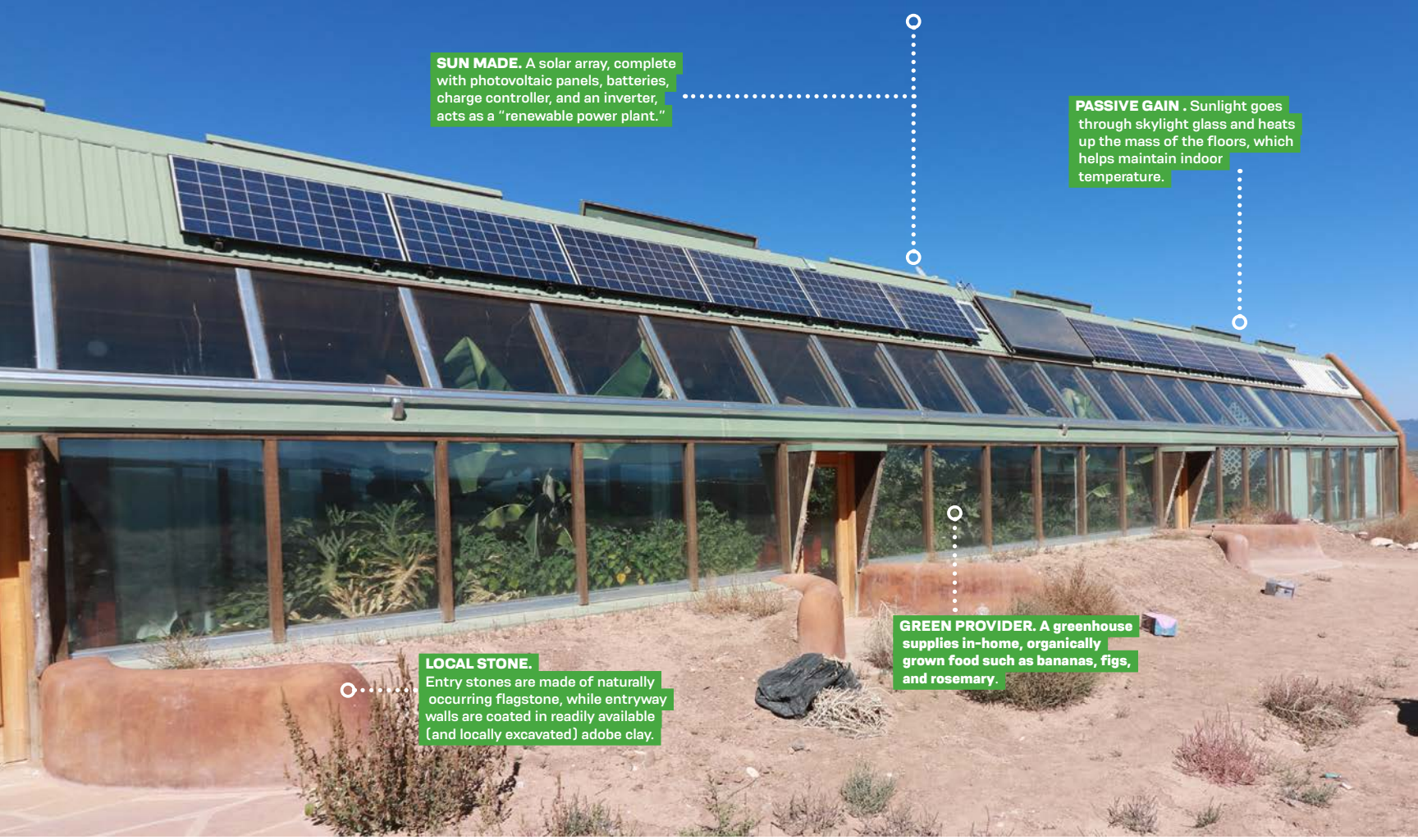
ARCHITECT/DESIGNER: Michael Reynolds, Earthship Biotecture,

PHOTOGRAPHER: Meredith Albury, Earthship Biotecture



Solid state. Walls within the home are made from reclaimed materials such as glass bottles, aluminum cans and rubber tires, which also act as natural—and effective—insulation.

Envirofriendly kitchen. Appliances within the kitchen are entirely solar powered, wood cabinets are in-house made, and walls and flooring consist of naturally developed brick and tile.



Which brings us to "The Truchas Earthship," a net zero, passive solar home in the Greater World Community, a sustainable development on 640 acres of natural habitat preserve in Tres Piedras, New Mexico. The Earthship incorporates natural and reclaimed materials in its construction: The main building blocks are recycled automobile tires that have been reclaimed through a partnership with the local landfill. Other repurposed products such as glass bottles, aluminum cans, plastic bottles and cardboard are used in the structure's walls, doorways and elsewhere. Locally sourced lumber and other building materials are utilized in the construction.

It's par for the course. "I've responded, over a period of 50 years, to the problems of civilization on this planet," Reynolds says. "I've incorporated my own solutions, trying to make a building that would be appropriate and responsive to the modern day issues of climate change, overpopulation, and dwindling resources."

SUSTAINABLE—AND SENSIBLE—CONSTRUCTION

The Earthship's heating and cooling functions are provided through passive solar and natural ventilation strategies, without electric heat or the use of fossil fuels. Windows have floor to ceiling glazing; all of them face south. The north, east, and west walls are surrounded by a dirt berm. Tire walls act as a large mass and hold the heat in when the sun shines on them. And, insulation prevents cool air from getting in and the warmth from escaping.

In winter, the sun enters through skylight glass and heats up the mass of the floors and walls. In the summer, with the sun high in the sky, the building stays cool with the constant temperature of the earth. Cooling is provided with natural ventilation through buried cooling tubes and operable vent boxes.

The cooling tube is a corrugated metal tube near the bottom of the wall and goes through the back berm of dirt. Cool air comes in through that tube. Hot air is pushed out of the skylights as the heat rises.

A 2.5 kilowatt solar array attached to the south facade of the structure provides electricity within the home. Effectively, the building has its own "renewable power plant" with photovoltaic panels, batteries, charge controller, and inverter, Reynolds notes.

ASSETS OF IRRIGATION

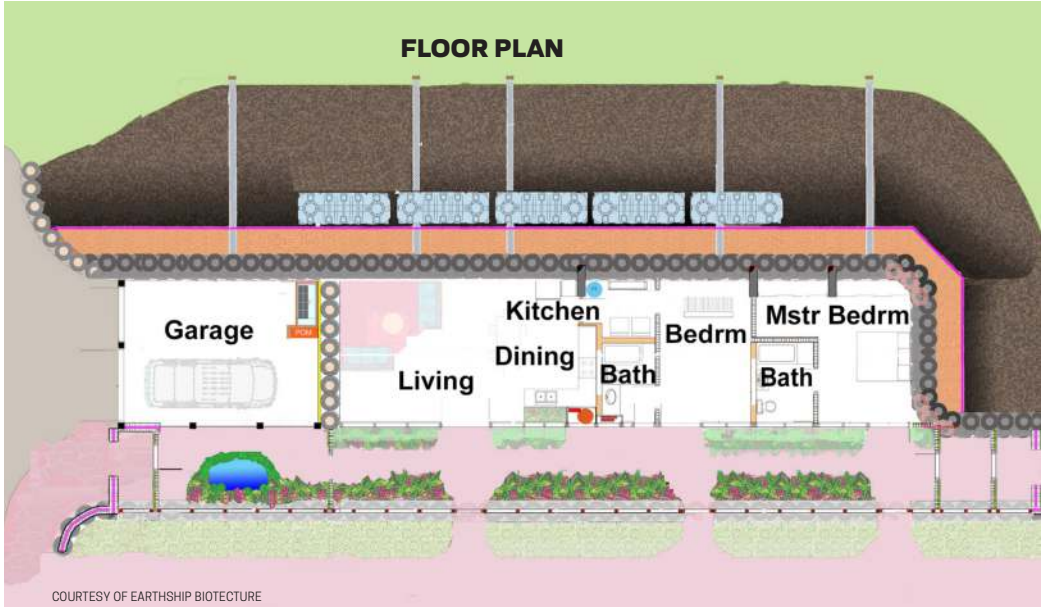
All water for use within the structure is provided by a catchment system on the roof. The system is supported by inground, insulated cisterns that feed the water into the building via gravity, to be processed by an interior water management system manufactured by Earthship Biotecture.

Graywater from showers, sinks, and washing machines flows to interior botanical cells.

Plants treat the water until it's clean enough to be collected in a well at the end of the planter and pumped, on demand, to the toilet tank for flushing.

The Earthship also features a

Good as green. Plants throughout the Earthship provide food, filtered graywater for toilets, and cleaner indoor air. CREDIT: MEREDITH ALBURY/EARTHSHIP BIOTECTURE



COURTESY OF EARTHSHIP BIOTECTURE

690-square-foot interior double greenhouse at the south side of the building for in-home, organic food production. An exterior septic system and leach field provide the final processing of blackwater to be utilized to feed and nourish exterior landscaping in the high desert climate.

In terms of being a green home, the Earthship is a pretty complete package. As a result, the home was named winner of Green Builder's 2023 Green Home of the Year (GHOTY) competition, in the Alternative Building category. "[The project] addresses all space heating and cooling needs via passive solar with thermal mass design, and all plug loads with solar [photovoltaic] and batteries," says GHOTY judge Theresa Gilbride, a building energy efficiency researcher at Pacific Northwest National Laboratory in Richland, Washington. "Also, the extensive use of recycled materials may mean lower upfront cost if labor is reasonable." GB

Key Components

ALTERNATIVE BUILDING SYSTEMS: Solar power system, thermal solar heating and cooling system, rainwater catchment system, on-site sewage treatment system, indoor food production system, and use of 45 percent recycled materials, including used automobile tires, aluminum cans, glass bottles, cardboard, and plastics.

APPLIANCES: All standard, running off solar system

BUILDING ENVELOPE: Earth-rammed automobile tires forming thermal mass, insulated on the exterior with R-45 polystyrene and R-80 polystyrene in the roof

CAULKS AND SEALANTS: Dap Alex Plus

ELECTRICAL: Power Organizing Module – lithium iron batteries; Schneider Electric inverter, Schneider Electric Charge Controller; solar panels

EXTERIOR FINISHES: Standard adobe plaster

FLOORING: Flagstone and tile

FURNITURE: Handpicked and refurbished second-hand furnishings and heirlooms

HVAC/DUCTS: Natural convection via cooling tubes and skylights

INSULATION: R-80 polystyrene in the roof and R-45 polystyrene surrounding the walls

LIGHTING: LED lights

PAINTS AND STAINS: Alize, a natural clay based paint that is made in-house.

PAVERS: Flagstone

PLUMBING/PLUMBING FIXTURES: Standard toilets and sinks

RENEWABLE ENERGY SYSTEMS (SOLAR, WIND, ETC.): Solar Roof: Precision Roofing Pro-panel Metal

SPECIALTY PRODUCTS: Stained glass achieved with colorful bottle bricks, made in-house; Interior, non-load bearing aluminum can walls encased in adobe plaster and cement plaster

STRUCTURAL COMPONENTS: Automobile tires used in a three-foot compression mass wall

VENTILATION: Natural convection with Earth tubes and skylights

WATER FILTRATION: Water Organizing Module – 50 micron filter, 500 mesh filter, 1,000 mesh filter; D/C aquatic pump; Doulton High Flow Ceramic Water Filter Amtrol water pressure tank

WATER HEATING: Solar hot water heater, with a Rinnai propane-demand backup water heater

OTHER: Food production in the greenhouse, including bananas, fig trees, and rosemary

What's next?

MICHAEL REYNOLDS, FOUNDER AND BIOTECT OF EARTHSHIP BIOTECTURE:

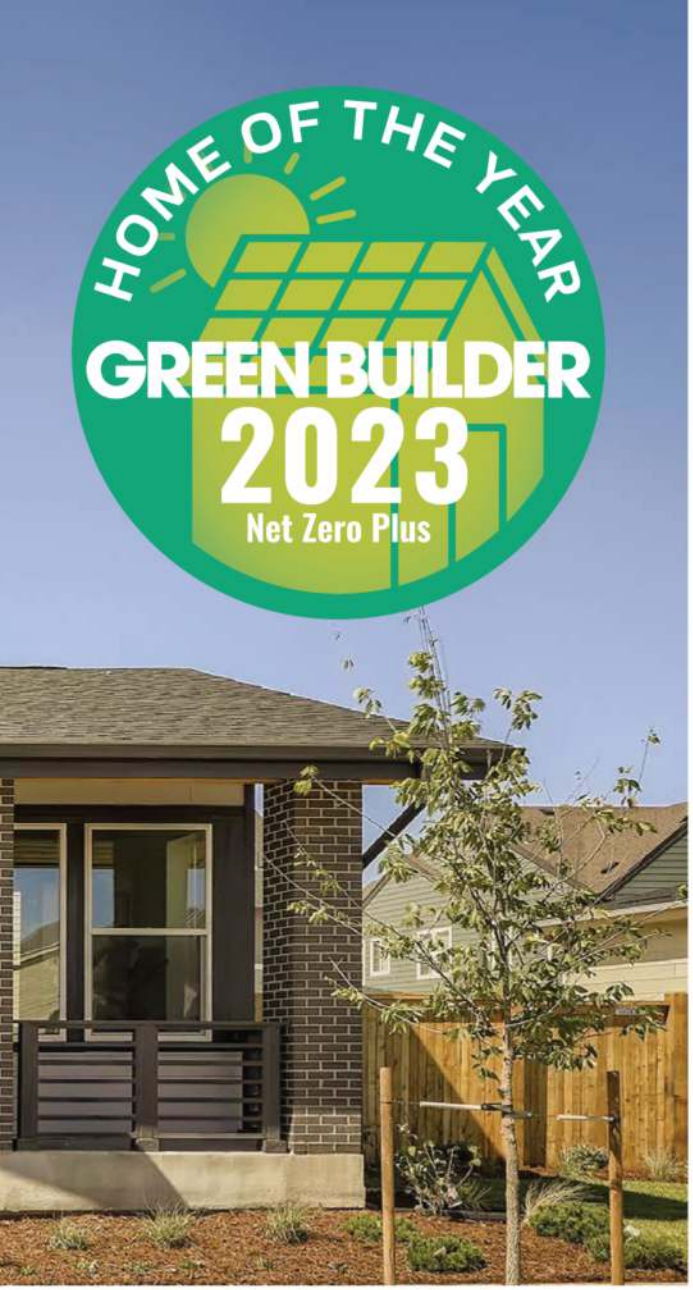
"We're looking at projects in Italy and Japan, but our most important project is the new model that we call 'The Refuge,' which is going to be easy to build and to fund. We're going to try and blanket the earth with it."

All Images by Zachary Cornwell/Zachary Cornwell Photography

From the Judges

"A nice-looking home with lap and brick siding, and a craftsman feel with a stained wood gabled front porch roof and heavy columns, and mid-Century, modern-styled upper windows."

Budget maker. ENERGY STAR-certified appliances and LED lights help bring a Panacea home's monthly utility costs to about $1 per day.



A Perfect 'Panacea'

The latest iteration in Thrive Home Builders' sustainability line raises the bar ever higher.

After spending two decades helping to complete Denver's master-planned Central Park neighborhood—site of the old Stapleton Denver International Airport, and now home to more than 30,000 residents among 12 neighborhoods—Thrive Home Builders decided to offer "the best of all worlds" with its ultra-sustainably crafted "Panacea Collection."

According to Thrive, the award-winning community—Panacea is Green Builder's 2023 Green Home of the Year (GHOTY) for the Net Zero Plus category—the goal was to "incorporate all of the building science we have acquired over the two decades of building in the development. We envisioned homes that encapsulated the 'best of all worlds.'"

The homes have the best of nature with adjacency to the Rocky Mountain Arsenal National Wildlife Refuge; the best of the city with close access to Denver International Airport and downtown via light rail; and luxury that treads lightly on the environment with net zero energy, backup battery power, fossil fuel free homes, and the best of indoor air quality, energy efficiency, health, and water conservation.

Project Stats

NAME: Panacea Collection – Central Park Denver, Denver, Colorado

BUILDER: Thrive Home Builders, **www.thrivehomebuilders.com**

ARCHITECT/DESIGNER: Seth Hart, DTJ Design, **https://dtjdesign.com**

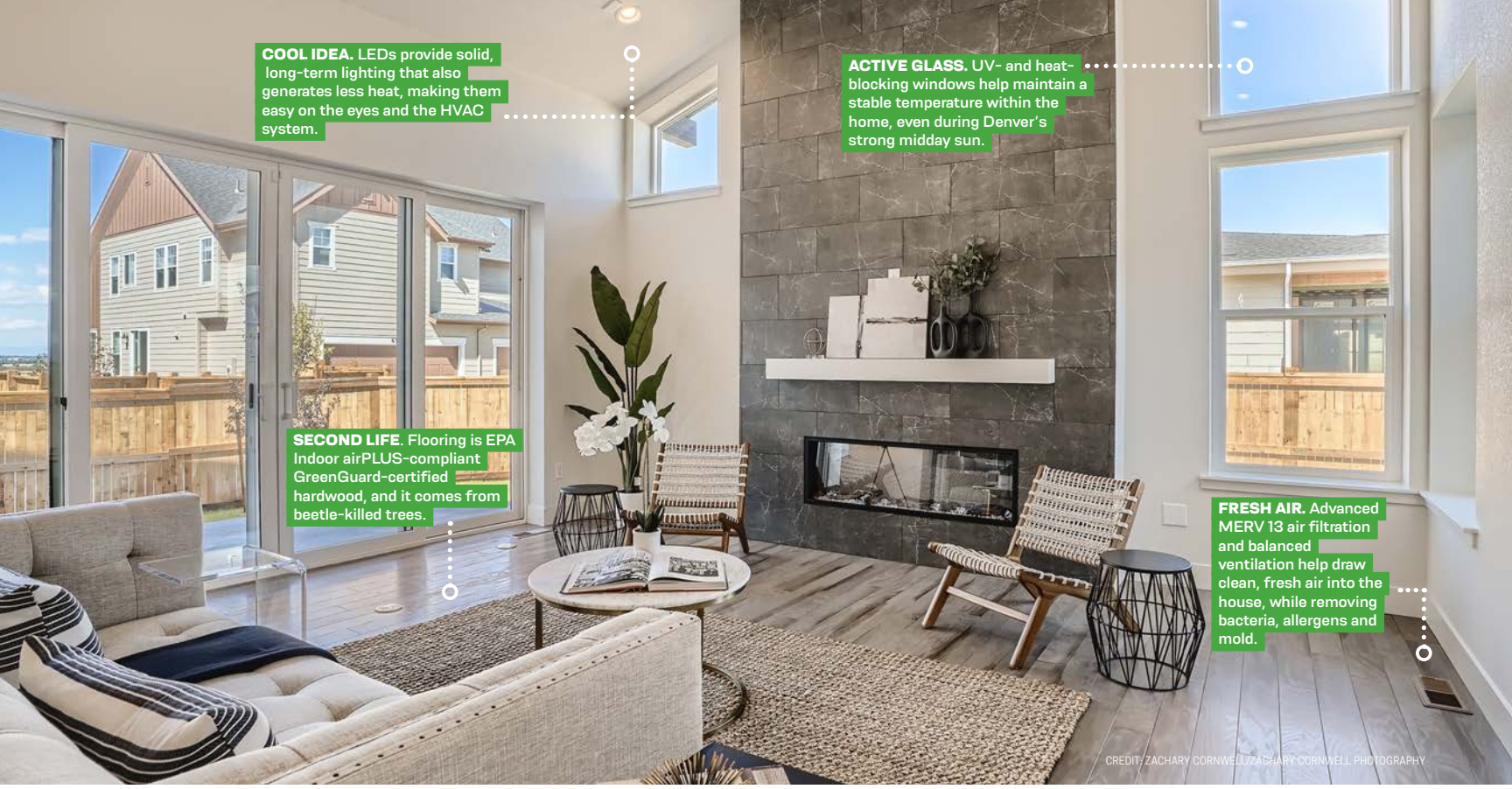
DEVELOPER: Brookfield Residential, **www.brookfieldresidential.com**

LANDSCAPE ARCHITECT: Valerian, **https://valerianllc.com**

PHOTOGRAPHER: Zachary Cornwell, Zachary Cornwell Photography, **https://zacharycornwellphotography.com**

Breathe easier. Thrive Home Builders uses no- and low- volatile organic compound (VOC) interior and exterior paints on all projects, improving air quality and eliminating paint odor faster.

Shower better. U.S. EPA WaterSense-certified low-flow faucets, showerheads and other fixtures are online inside and outside of the house.



CREDIT: ZACHARY CORNWELL/ZACHARY CORNWELL PHOTOGRAPHY

Panacea is *Green Builder*'s 2023 Green Home of the Year (GHOTY) for the Net Zero Plus category. It's an upgrade of a similar Panacea project and GHOTY award winner from 2019.

According to Thrive, the goal this time around was to "incorporate all of the building science we have acquired over the two decades of building in the development. We envisioned homes that encapsulated the 'best of all worlds.'"

The homes have the best of nature with adjacency to the Rocky Mountain Arsenal National Wildlife Refuge; the best of the city with close access to Denver International Airport and downtown via light rail; and luxury that treads lightly on the environment with net zero energy, backup battery power, fossil fuel free homes, and the best of indoor air quality, energy efficiency, health, and water conservation.

Panacea's key to success—the community sold out last fall—has been Thrive's POWER OF ZERO® green building approach. "It means cost savings for homeowners, a healthy, beautifully designed energy-efficient home, and the comfort of knowing that the home was built with the most-innovative techniques and air quality systems in the industry," notes Thrive Home Builders CEO Stephen Myers. "We bring together award-winning architecture with the highest level of health and energy features."

ALL IN WITH ALL ELECTRIC

Each solar-powered Panacea home focuses on clean indoor air, health,

Key Components

ALTERNATIVE BUILDING SYSTEMS: Double 2-by-4 Advanced Framed Wall System

APPLIANCES: Samsung

AUTOMOTIVE (ELECTRIC): Standard 220 V for future charging station

BUILDING ENVELOPE: 9.5inch-thick R-39 wall, U-0.25 Windows, R-50 Attic, 2.51 ACH50

CABINETS: Merillat Masterpiece

COUNTERTOPS: MSI Quartz

DOORS AND HARDWARE: Kwikset

ELECTRICAL: Schneider Electric Square D.; Wiser App

EXTERIOR FINISHES: LP siding

FIREPLACE: *Simplifire*

FLOORING: *Shaw Coretec Plus*

GARAGE DOORS: Midland

HOME CONTROLS: Diaken One – Stat and Skybell HD Doorbell

HVAC/DUCTS: Diaken

INSULATION: Johns Mansville

LIGHTING: Kichler

PAINTS AND STAINS: Sherwin Williams ProMar 400 Zero VOC

PLUMBING/PLUMBING FIXTURES: Delta Faucets

RENEWABLE ENERGY SYSTEMS (SOLAR, WIND, ETC.): Solar

ROOF: Precision Roofing: Owens Corning

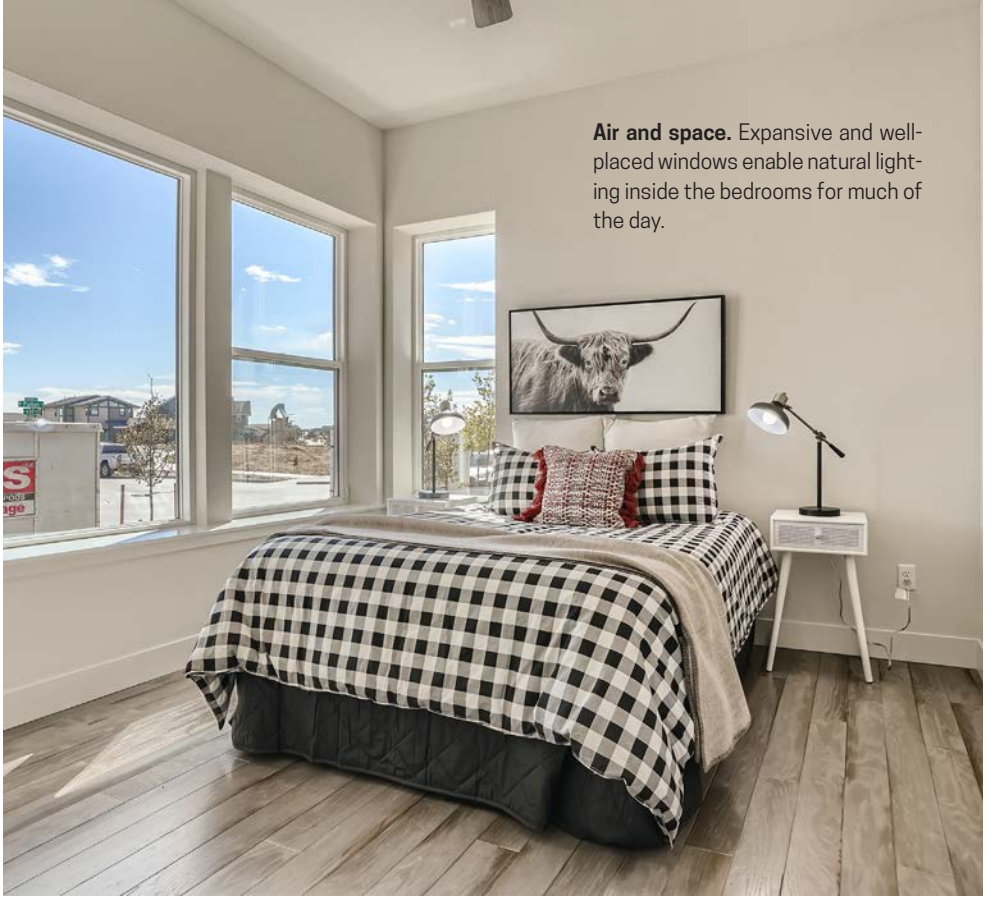
SPECIALTY PRODUCTS: Enphase IQ Battery 10T Battery Backup; Schneider Electric Wiser App energy monitor

VENTILATION: Balanced system with Panasonic and Whisper Green Exhaust

WATER FILTRATION: Insinkerator

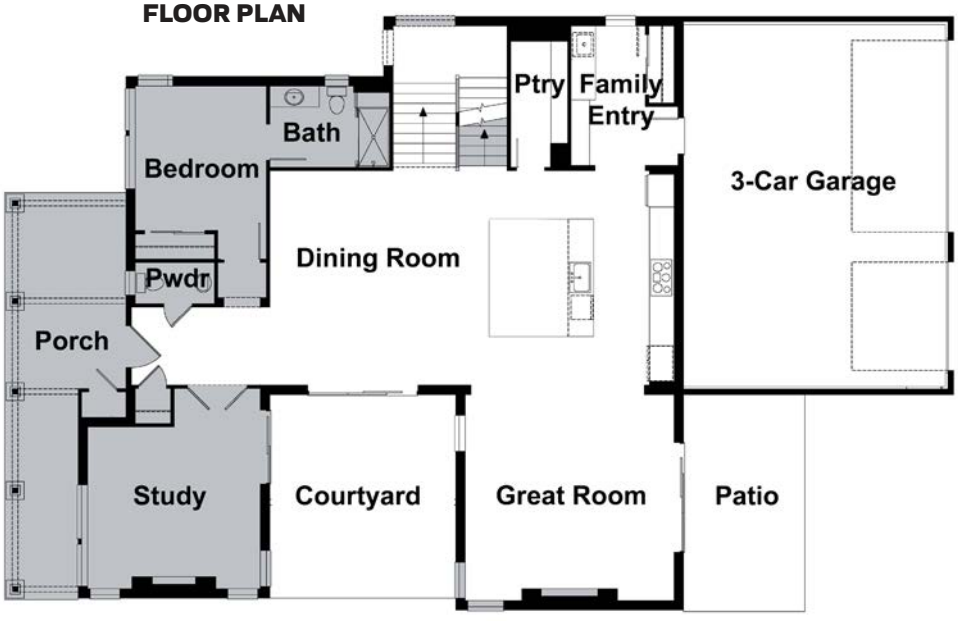
WATER HEATING: Navien

WINDOWS, SKYLIGHTS, PATIO DOORS: Milgard



Air and space. Expansive and well-placed windows enable natural lighting inside the bedrooms for much of the day.

FLOOR PLAN



COURTESY OF THRIVE HOME BUILDERS

What's next?

STEPHEN MYERS, CEO OF THRIVE HOME BUILDERS:

"Our next major focus will be on the Sonders community in Fort Collins, Colorado. These solar-powered homes will save homebuyers money on their energy bill year after year. Each home will be LEED certified and will use Thrive Carbon-Wise, a new approach that reduces embodied and operational carbon to produce a healthy house for the homeowner and the planet. Thrive also has a goal of being a carbon neutral builder by the end of 2023."

and sustainability. They feature trademarked Zero Energy construction and LEED's top tier Platinum certification. Homes within the Panacea Collection also have a Home Energy Rating System (HERS) Index score of 9, which result in greater comfort, lower operating costs, and higher resale values.

A typical all-electric home in the collection, with 5 bedrooms, 5.5 baths, two floors and 5,000 square feet total, would have a monthly energy bill of about $30, which is $6,150 less than a non-solar dwelling of the same style and size. Over 30 years, a homeowner would save an estimated $300,000 in energy costs.

The U.S. Department of Energy recently named Panacea as one of its Zero Energy Ready Homes for 2022. Thrive is also a 2022 U.S. Environmental (EPA) Indoor airPLUS Leader Award winner.

"We take pride in building advanced, healthy new homes," Myers notes. "These days, there has never been a more critical time to consider the indoor air quality of a home and truly help homeowners breathe easier."

EVEN GREATER GOOD

Each home's superior health features are enhanced by active radon systems, advanced MERV 13 air filtration, and balanced ventilation to draw clean, fresh air into the housing, and remove bacteria, allergens, and mold.

Sustainable features include ENERGY STAR certified structure, R-39 walls and an R-50 attic; windows with a U-factor of 0.23 and an SHGC rating of a miniscule 0.21; A 9.88 kilowatt photovoltaic system and 10 kilowatt hour backup battery; all-LED lighting; U.S. EPA-certified low-flow WaterSense fixtures; and Energy Star-rated appliances.

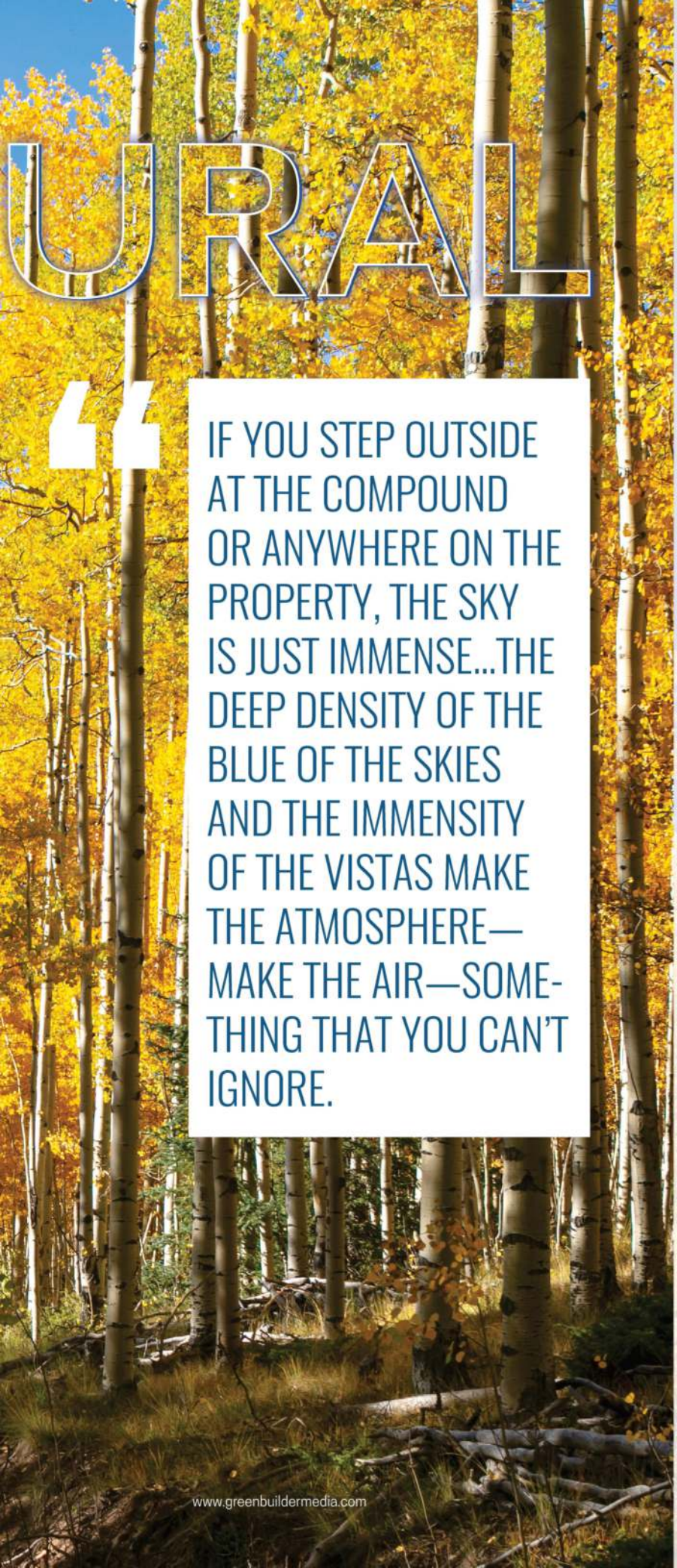
"Panacea also represents an important step along Thrive's journey to carbon neutrality," Myers notes. "Net zero energy, all-electric homes have a zero operational carbon footprint. We see this as setting a precedent for carbon neutral homes of the future."

Green Builder 2023 GHOTY judge Theresa Gilbride, who is a building energy efficiency researcher at Pacific Northwest National Laboratory in Richland, Washington, believes the Panacea Collection offers a lot to one facet of the homebuying public. "It would definitely appeal to move-up buyers, especially families," she notes. "Building professionals could find plenty to emulate in Thrive, which is making very efficient homes." **GB**

ALL PHOTOS BY PATRICK COUCH

ARCHITECT AIR

MARIPOSA MEADOWS



URAL

> IF YOU STEP OUTSIDE AT THE COMPOUND OR ANYWHERE ON THE PROPERTY, THE SKY IS JUST IMMENSE...THE DEEP DENSITY OF THE BLUE OF THE SKIES AND THE IMMENSITY OF THE VISTAS MAKE THE ATMOSPHERE—MAKE THE AIR—SOMETHING THAT YOU CAN'T IGNORE.

As he designed and built an off-grid sustainability compound in the midst of 1.7 million acres of pristine Colorado wilderness, Ron Jones incorporated the art of designing with air.

BY JIM FOLKMAN

In 2016, Ron Jones, founder and president of Green Builder Media, embarked on a labor of love when he began the design of **Mariposa Meadows**, a sustainable event venue and retreat, which will have its grand opening in summer 2023.

The challenges of the nearly seven-year undertaking got Jones thinking about its parallels with the vagaries of the building industry. In a mood to reminisce, he called his good friend and industry leader, Jim Folkman, for a chat.

The conversation recalled their four-plus decades of work in the industry, which they refer to as a "tapestry," where strength and innovation emerge from the collective experiences of the most engaged and driven members. Many building projects, the two agree, result in unintended consequences—ranging from delightful to bleak. But all projects are subject to dynamics that are hard to discern at the outset.

Following is the edited conversation between these two building sages, in which Folkman's interest in his friend's capstone project teases out important issues such as the role of buildings in nature, the challenges of off-grid building, and the curious story of the rock that reburied itself five times.

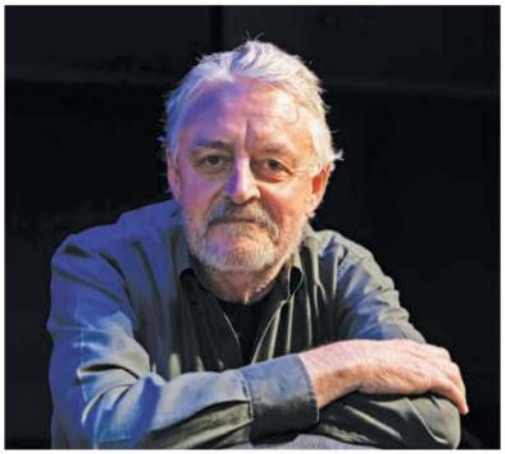
To hear the full discussion, **download Ron's podcast**.

Folkman: The Mariposa Meadows Vision House project is most remarkable. I want to commend you on that. But it brings me to a question about how the building industry is full of unintended consequences. What were your intentions with this project and how do you think those have played out for you?

Jones: The intention of Mariposa Meadows, from the standpoint of Green Builder Media, was to come up with a location or a venue, if you will, where we could host people from inside and outside the industry for workshops, and collegial gatherings where we could ruminate on things and relax without any sort of outside pressure—and really assess some of the important things in the world.

Over the years, we had conducted a number of very successful leadership meetings. Generally, we held them at places like Sundance in Utah or Devil's Thumb (in Colo-

> I BEGAN TO KNOW THAT I NEEDED TO GET A HAMMER IN MY HANDS AGAIN. I MEAN, IT'S LIKE MY RIGHT ARM WOULD ITCH ALL THE WAY DOWN TO MY FINGERS, AND I FELT THE NEED TO BUILD SOMETHING. AND SO IT WAS IMPORTANT FOR ME TO EMBRACE THIS PROJECT.
>
> —RON JONES, FOUNDER AND PRESIDENT OF **GREEN BUILDER MEDIA**



rado). And we would have industry leaders who would come in from various manufacturers or other segments of the industry, and we would expose them to special thinkers from outside the industry.

We started looking for a special place back in the 2000s. We literally scoured the West. We stumbled upon the place that was perfect and checked all the boxes for us from a builder's perspective.

Building Mariposa Meadows was an opportunity for me to see if I could really execute something that was unique and difficult in this place, and do it in such a way that it didn't detract from what was already there. I felt like it was a real obligation to understand all the elements that I could and then try to respect those to the greatest degree.

Folkman: Anything that's innovative and new, such as what you're doing at Mariposa, typically evolves. Were there any changes in your vision from point A to point B?

Jones: We were able to see the main focus in the beginning: to harvest the incredible environment there and the natural attributes and the peacefulness of it, the stillness, the quality of that place.

We have stayed on that North Star, if you will, for the entire project. But what we've had to do is be extremely flexible in terms of our approach because such a remote and difficult site has provided tremendous challenges—but also satisfaction in being able to solve those problems.

I think that the biggest evolution was in my learning how difficult a remote high-altitude project can actually be, because just the logistics of it are so incredible. The only access road is closed to normal traffic for five or six months a year. We had to find other ways to be able to access the site.

Folkman: As we have frequently discussed, unforeseen obstacles, difficulties, and challenges can frequently be turned into opportunities. Was that your experience at Mariposa?

Jones: Yes. It became bigger than this compound of buildings. I wanted the compound to be in the right relationship with the Aspen forest that it's tucked into. I wanted it to be not just in the trees, but of the trees.

A lot of the aesthetic options that we chose addressed that very well. But also the siting and the way we responded to

the topography and the orientation. Some of the natural elements made decisions for us. I like to joke that we have 122 acres and no place to park. And that's really true because you're trying to preserve every single tree.

When you think about the infrastructure for a modern building—we had to provide underground for electrical, wastewater, well water, and every power source. So it became the kind of situation that I was joking about with James (who you know has worked with me for many years) as we were trenching for yet another line. And I said, "Damn, I've seen that rock five times. We've dug that thing up over and over, and buried it so many times, it's like an old friend now!"

We had an opportunity to work with a division of the USDA, the Natural Resources Conservation Service, through a program that helped us rebuild and expand our irrigation capabilities. We have water rights off the stream that flows through the property. We were able to take that and appropriately distribute that water in a much better way so that we enhance the quality of the meadows, which had deteriorated over the decades.

That's just one example of learning the bigger picture and harnessing new ideas, and coming up to speed on processes that we weren't necessarily familiar with.

Folkman: We've talked over the years about a term that I don't know if you coined, but it certainly is a very appropriate one: architectural air. How was that employed at Mariposa?

Jones: We have to go outside so that we can understand what's inside. If you step outside at the compound or anywhere on the property, the sky is just immense. We're about 13 miles from the nearest light bulb, so the night skies are phenomenal. But even in the daytime, the deep density of the blue of the skies and the immensity of the vistas make the atmosphere—make the air—something that you can't ignore.

So when I was designing the buildings, we had decisions to make regarding some ceiling heights in particular. We could have dropped in ceiling joists and done ceilings that were less expensive and easier to finish. But it would have been a tremendous waste because that architectural air that's on the inside is a reflection of all of that immensity on the outside.

When you lie down in the bed and look up at the ceilings in the bedrooms, for example, you get this magical play of light—and it doesn't matter what time of day it is—but because of the light in the shadow and because of its depth, it's something that's very pleasing.

When people go into that space, they almost gasp when they realize the height. The elevation, in a very small way, is akin to what the architects of the cathedrals intended when

> WHEN YOU LIE DOWN IN THE BED AND LOOK UP AT THE CEILINGS IN THE BEDROOMS, FOR EXAMPLE, YOU GET THIS MAGICAL PLAY OF LIGHT—AND IT DOESN'T MATTER WHAT TIME OF DAY IT IS—BUT BECAUSE OF THE LIGHT IN THE SHADOW AND BECAUSE OF ITS DEPTH, IT'S SOMETHING THAT'S VERY PLEASING.

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they would have these incredible vaults and ceilings that would inspire people and make them feel closer to heaven.

Folkman: You mentioned how your priorities inform the design and system decisions of the project. Did that evolve as the project was built?

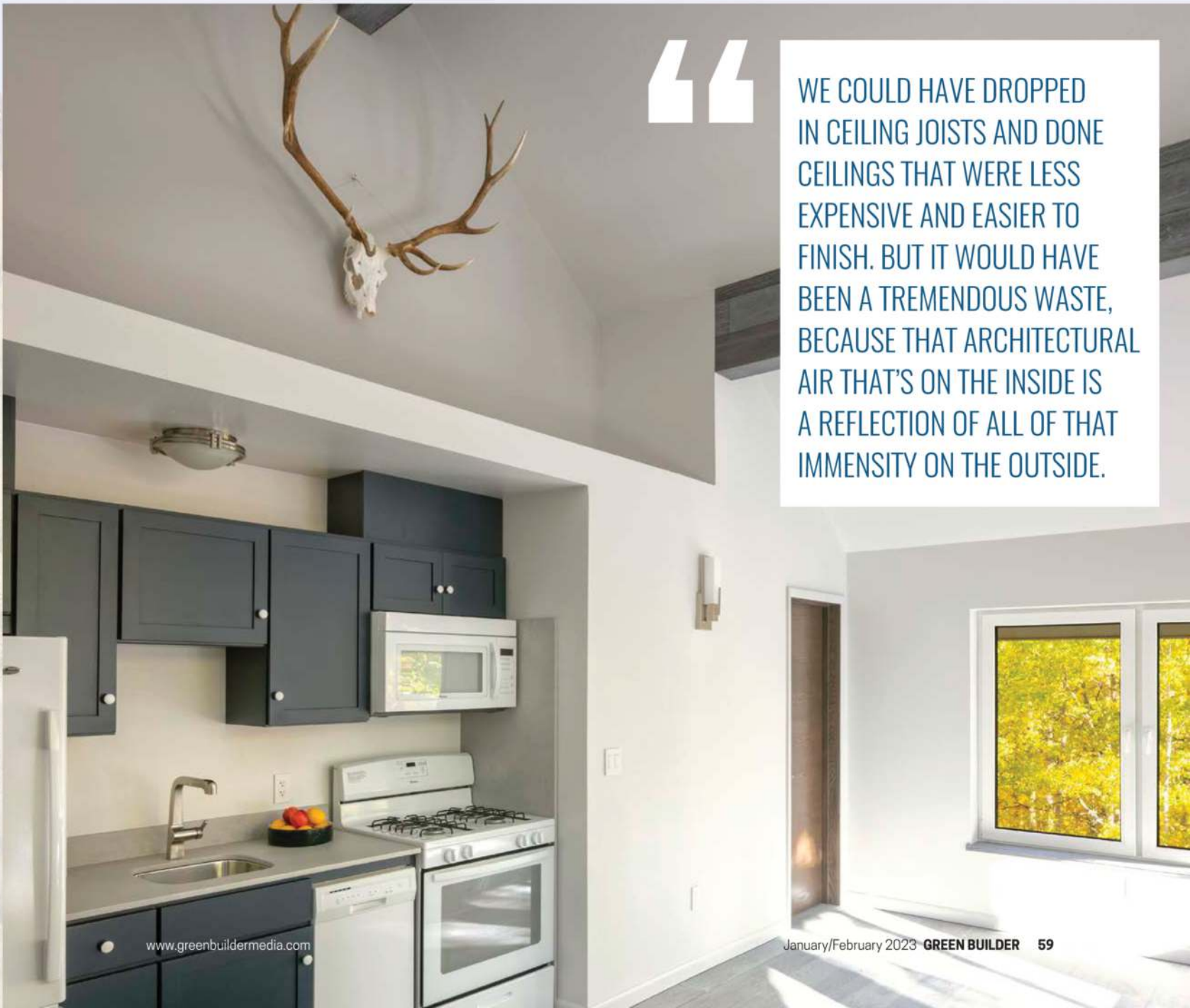
Ron: In terms of aesthetics, I've always been taken with the Scandinavian feel. That genre seems to embrace a difficult environment in a way that still makes a statement.

It was important to reduce the amount of square footage as much as possible and to still demonstrate comfort and amenities. And if I could even say the word luxury—I want people to feel like they haven't had to sacrifice anything in order to enjoy our compound.

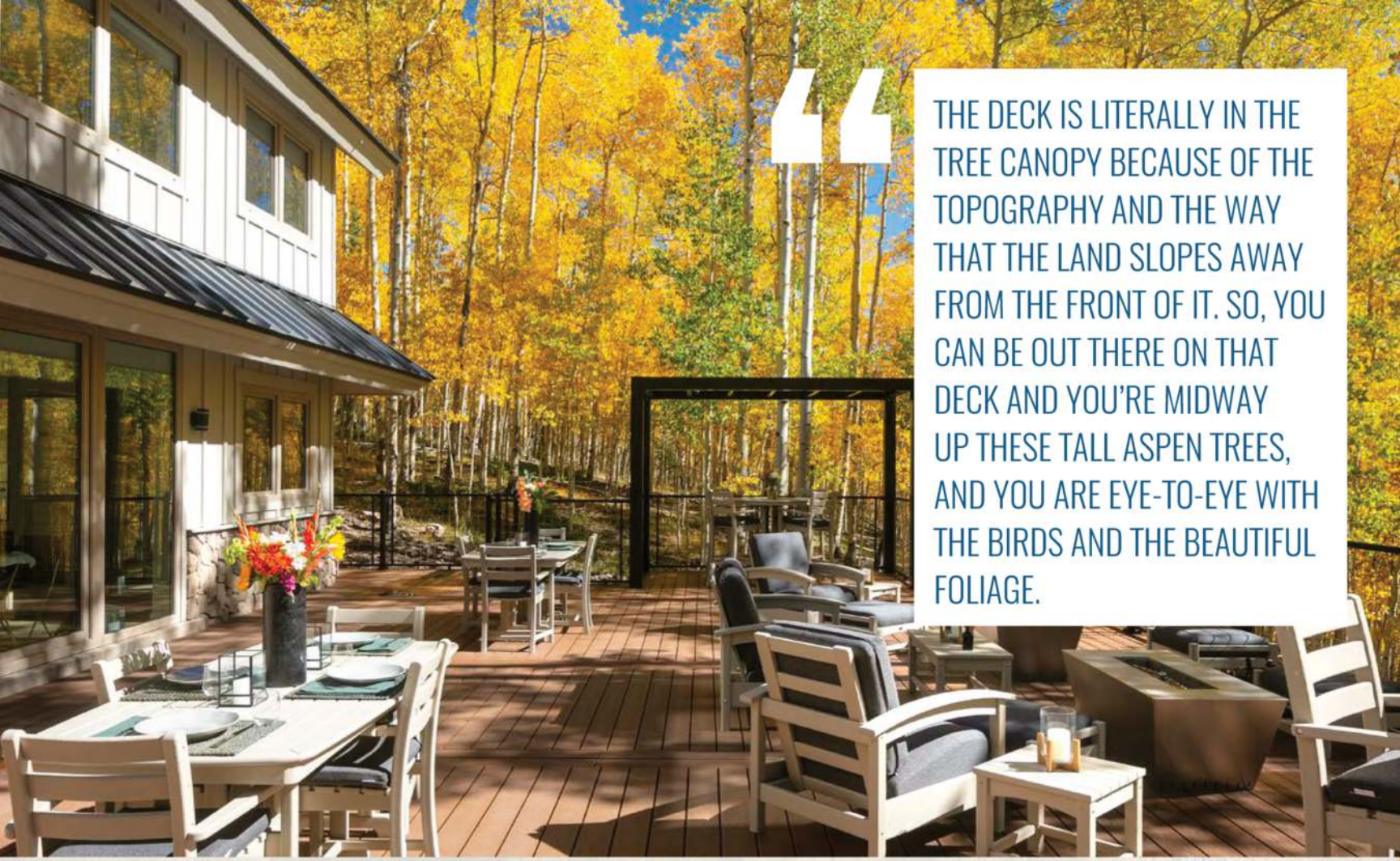
We needed to go two-story, and I was all about that anyway because I love that verticality. It allowed us to shrink the footprint. We're slab on grade because we are aficionados of radiant heat.

And we addressed that with the difficulties of excavation that we have here. (They aren't called the Rocky Mountains for nothing!) The small footprints took tremendous effort to excavate, to do the rough-ins, and so forth, to create something that was permanent and lasting and that satisfied all of our needs. But it's important to note that concrete is 80 miles from me over an 11,000-foot-high pass.

And because of the topography we needed to use a pump at all times, so by the time we place a yard of concrete, and



> WE COULD HAVE DROPPED IN CEILING JOISTS AND DONE CEILINGS THAT WERE LESS EXPENSIVE AND EASIER TO FINISH. BUT IT WOULD HAVE BEEN A TREMENDOUS WASTE, BECAUSE THAT ARCHITECTURAL AIR THAT'S ON THE INSIDE IS A REFLECTION OF ALL OF THAT IMMENSITY ON THE OUTSIDE.



> THE DECK IS LITERALLY IN THE TREE CANOPY BECAUSE OF THE TOPOGRAPHY AND THE WAY THAT THE LAND SLOPES AWAY FROM THE FRONT OF IT. SO, YOU CAN BE OUT THERE ON THAT DECK AND YOU'RE MIDWAY UP THESE TALL ASPEN TREES, AND YOU ARE EYE-TO-EYE WITH THE BIRDS AND THE BEAUTIFUL FOLIAGE.

before anybody touches a shovel, I've got $400 invested in every yard, between the ready mix and the pump. It was important to us to keep that as compact as possible.

The other issue is that we're in the middle of a natural forest. We have the blessing of it being an aspen forest, which reduces our fire risk. But as you know, fire mitigation is one of the most important things that you have to consider here in the West.

It was necessary for us to make selections on the products, especially **those for the building envelope**. So, for example, from the top down, a standing seam steel roof with no penetrations so there's no way that any embers or anything could get into the structure.

We have **fiber cement siding, soffit, and fascias, and every bit of the exterior is fire resistant**. We also used a decorative element in the form of stone cladding for the wainscot. Our window package is triple-glazed. And it really helps reduce the spread of fire from the outside to the inside.

Most people don't realize that in a situation like this, many times the heat from the outside ends up igniting the furnishings or other items on the inside. A house will burn down from the inside out. And then the last item that

I would mention is that our exterior doors are all steel, three-hour fire doors.

Folkman: I understand your intentions in regard to verticality. But I think one of the more interesting features you and I have talked about is a horizontal surface, and that's the hospitality deck and how important that is to what you're trying to accomplish at Mariposa.

Jones: The deck is almost the crown jewel of the building effort. But I'd have to start way down at the Forest Road below and turn up the driveway that rises about 120 feet over a 900-foot span, and has two hairpin turns in it. And when you make that last hairpin turn, the compound unfolds in front of you.

The forest has obscured it all the way up, and you don't see it from the road at all. But when you make that last turn, all of a sudden you see these three buildings in there—all different—but they have the same features in the same architectural style, and they have some of the same elements. You know immediately they are siblings.

They were built together and they were intended to be together, even though they're different sizes and they are at different elevations. But the unifying factor is really the hospitality deck, which is at the far end of that vista as you come in and you're immediately drawn visually to that deck, and to me, there's something implied there that says this is the place for everybody.

It's for people to gather and to be together, and to socialize and to be able to communicate and just breathe. It was important to me that we didn't remove all the trees at once. We took the trees only as necessary to create room for this

1,400-square-foot hospitality deck.

And it's literally in the tree canopy because of the topography and the way that the land slopes away from the front of it. So you can be out there on that deck and you're midway up these tall aspen trees and you are eye-to-eye with the birds and the beautiful foliage. The whole idea behind the deck is to create a common space where people can get together regardless of where they happen to be staying in the compound.

Folkman: Well, in the end, it is a way for people to have the important conversations that you want them to have about sustainability and seeing the built environment in a different way. Was that part of your intent?

Jones: Yeah, but I hope it's subtle enough. I don't think people could avoid recognizing the orientation of the buildings and the orientation of the deck to the views, the vistas, the forest and how we embrace the trees. It feels like they welcomed us there, Jim. And so I want people to use that as a fulcrum point to have discussions that go into even more difficult sorts of areas, whether they're social or political or whatever they happen to be.

It's much like sitting down to a communal dinner. When you break bread, and you share a meal, that sort of sets the level differently than just about anything you can do. And so the outdoor kitchen, which is a big part of the hospitality play there, will be very much that place where everybody gathers.

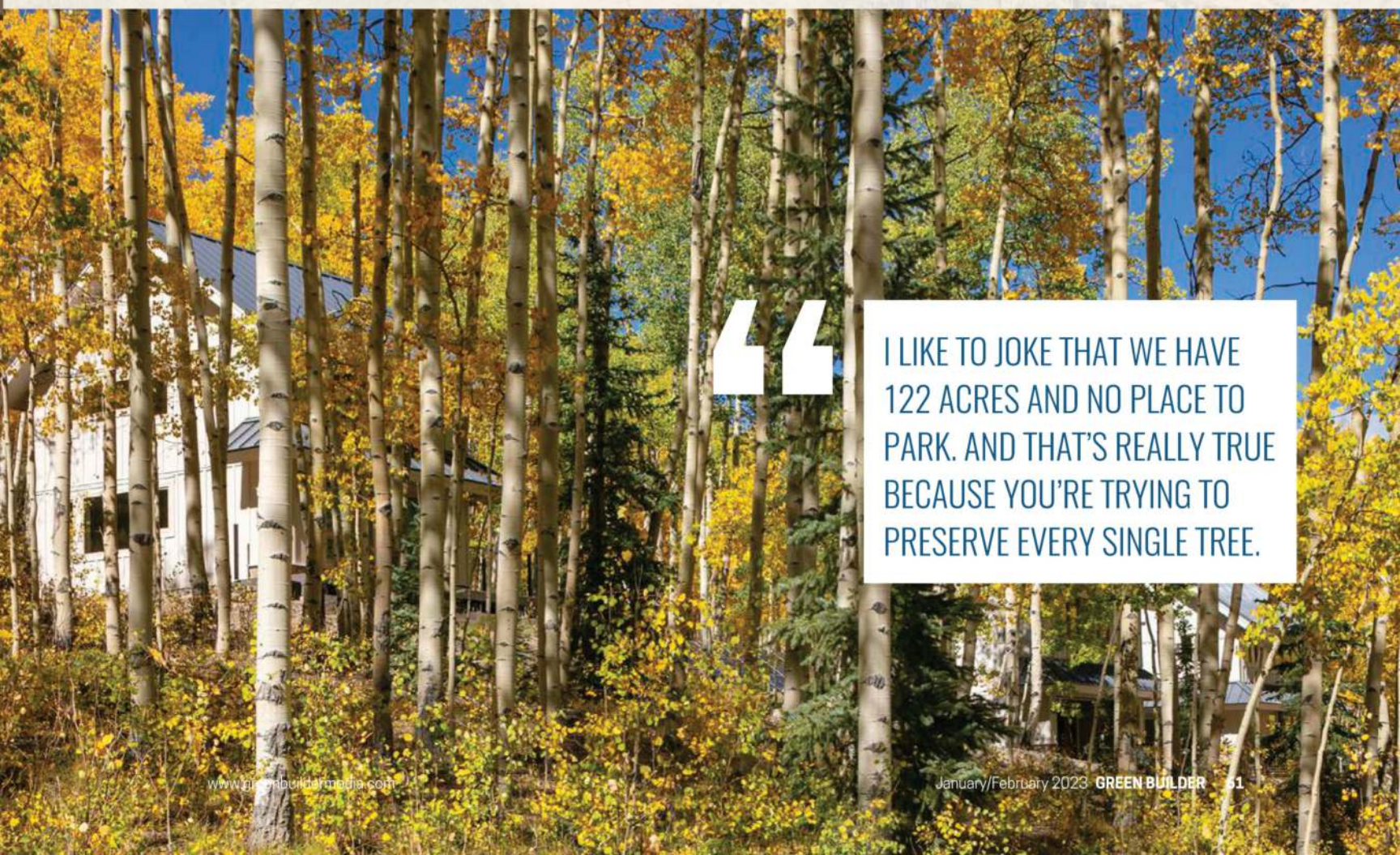
We've seen that shift in residential architecture to make it a much more inviting and welcoming space for guests and family. It's not off to the side where you just have the function of cooking and cleaning. We want very much for that to be the result on the outside, where people come and they get involved in the preparation and in the execution of creating some meals that we would share, and thereby sort of open a dialog that we might otherwise have difficulty with.

Folkman: Yeah, I can imagine. So what are your immediate intentions in terms of the future?

Jones: Well, we want to make sure that we've succeeded in the reliability of all of the systems that we've put in place and that there's no guesswork for anybody who happens to be fortunate enough to visit or stay there.

Once that happens, we'll start to bring in some of our supporters and friends and family, and have small gatherings and some intimate workshops, and use it for demonstration purposes, maybe with some of the colleges in the region and other educational groups and so forth.

Ultimately, we are looking down the road. We have our sights on a different corner of the property where we would like to put a lodge. We've talked a great deal about it, (my wife) Sara and I. We have walked it, dreamed it, chewed on



> "I LIKE TO JOKE THAT WE HAVE 122 ACRES AND NO PLACE TO PARK. AND THAT'S REALLY TRUE BECAUSE YOU'RE TRYING TO PRESERVE EVERY SINGLE TREE.

> I THINK THAT THE BIGGEST EVOLUTION WAS IN MY LEARNING HOW DIFFICULT A REMOTE HIGH-ALTITUDE PROJECT CAN ACTUALLY BE, BECAUSE JUST THE LOGISTICS OF IT ARE SO INCREDIBLE. THE ONLY ACCESS ROAD IS CLOSED TO NORMAL TRAFFIC FOR FIVE OR SIX MONTHS A YEAR.

it, and kicked it around quite a bit.

In my mind's eye I can see it, and I think we could probably do a 20- to 24-room facility there, with full food service and that kind of thing, so that we can accommodate larger groups and hold corporate retreats. That will expand beyond our current capability.

We'd like to keep it with people that have a purpose. And whether that's birders or night sky people or folks in the industry, whatever the case might be...to be able to bring people in who have a common purpose, and who want to think about things and want to perhaps come up with ideas and even possibly solutions to some of the concerns that we have in the world. That would be our largest dream.

Folkman: This is sort of the classic question: What would you do differently given what you know today?

Jones: I would have gotten there sooner!

Jim, I built my last project for a client in 2005. That culminated more than two decades of custom building for a variety of clients. And then I went into seclusion. I actually escaped to the Pacific Northwest and hid out on a couple of islands there for eight years. I wanted to be someplace where nobody knew my name, and that worked out perfectly because we could take advantage of that buffer, that separation. But we also began the search for our ideal location back in the Rockies.

I began to know that I needed to get a hammer in my hands again. I mean, it's like my right arm would itch all the way down to my fingers, and I felt the need to build something. And so it was important for me to embrace this project. I think what I would do differently has not really anything to do with the design or the product selections.

It had to do with understanding that I was no longer a prominent builder in the market. Nobody knew me here, and I didn't have any history with anybody and it was difficult to line up help. It was like starting over completely and sifting through the available human resources in order to get the help that we needed at the time when we needed it.

And so it was humbling. I was no longer one of the known high-end builders in the market like I had been. All of a sudden I'm just Joe Homeowner, and I don't represent any value beyond that. And so we had to re-establish ourselves through our ethics and through our participation, and that probably could have been more streamlined and seamless if I had thought it through better in the beginning.

We're on Mountain Time here, which means that while there are a lot of skilled people that we can call on in the wider market, they pretty much call their own shots. They work when they want to; they ski when they want to; they hunt when they want to; they fish when they want to. And so you have to learn to massage that a little bit, especially when you can only get to the site six or seven months a year.

Folkman: I can only imagine the challenges. The construction industry, of course, is always a challenge. But you were faced with some particularly interesting and difficult challenges that required innovation and a new way of thinking; a new way of doing things.

And I have to say that I think you've pulled it off, my friend. **GB**

Jim Folkman has more than 45 years of experience in the real estate development and construction industries. He served as executive director of the Home Builders Association of Central New Mexico for 21 years; helped found and currently serves as the president and executive director of **The Foundation for Building**; *co-founded and was editor of* **SuCasa**; *and helped create several residential green building programs.*

THE SONDERS PROJECT

Winning environment. The Sonders Learning Center, complete with outdoor recreation and indoor education options, is one way in which the development prioritizes the overall wellness of its residents.

COURTESY OF THRIVE HOME BUILDERS

To Your Good Health

A new community in Fort Collins puts 'lifelong home' principles to the test.

BY ERIN ARRINGTON, GUEST EDITOR

Most homes are not built with an aging population in mind. According to the U.S. Census Bureau, **nearly 1 in 4 Americans will be 65 years or older by the year 2060.** And as the average age of Coloradans and Americans goes up, the need for housing that promotes healthy and independent living for aging homeowners will only increase.

Colorado State University (CSU)'s Institute for the Built Environment (IBE) has been searching for solutions to this problem for the past few years. **IBE recognizes that** for older adults to age in place, their physical environment "must be accommodating, health promoting, and affordable." In response, the institute has developed the Colorado Lifelong Homes Certification Program, which is intended to educate and incentivize home builders who may be positioned to build more "lifelong homes."

The institute's 2019 white paper outlines the market barriers that have limited the number of aging-friendly homes that have been built thus far. It also details five focus areas that would contribute to lifelong homes: Walkability & Community, Visitability, Universal Design, Safety & Fall Prevention, and Affordability & Maintenance.

HEALTHY LIFESTYLE

A key part of IBE's research has come through a partnership with Sonders Fort Collins in Fort Collins, Colorado. This age-targeted community, currently in its initial building stages, promotes healthy living at all levels. The homes at Sonders and the community as a whole were designed with IBE's target areas at the forefront of their planning.

Sonders Fort Collins includes built-in opportunities for residents to recreate, learn, and build connections with one another. The Sonders Learning Center includes a main building, as well as three additional studio spaces built for independent and collaborative learning: the Arts Studio, the Body Studio, and the Ideas Studio. Sonders residents will have access to a variety of classes and presentations, including some held by CSU faculty.

The community also features an extensive trail system that weaves through residential areas and connects to a number of parks and green spaces, and will eventually connect to trails and sidewalks outside of the community.

The developers of Sonders were intentional about maximizing the amount of green space throughout the community. They prioritized shared spaces, such as their community garden and putting green, over large private yards that can be more difficult for homeowners to maintain.

"Those little nuances are going to be really fun within the community, because they allow the residents to gather in a lot of different places and ways," says Dan Nickless, a partner at Sonders developer Actual Communities Inc. "They build new friendships and really can start creating bonds within the community—which is what really makes a great community."

Learning tools. The Sonders Ideas Studio, part of the Sonders Learning Center, will feature a variety of lectures, presentations, and informal discussions.

Healthy world. Residents will be able to weight train, do yoga, or engage in a variety of other physical activities at the Sonders Body Studio.

COURTESY OF THRIVE HOME BUILDERS

Artistic environment. The Sonders Learning Center Arts Studio offers a chance for residents to put their imaginations to work and let their intelligence have fun.

That last point is key, Nickless adds. "You know the houses are all nice and the trees are nice," he notes, "but what makes a great community is when you have neighbors that actually like to get together once in a while and spend some time with each other."

HEALTHY HOMES

The "lifelong home" principles are also found throughout Sonders. Thrive Home Builders is constructing roughly 220 of the project's homes. Those dwellings combine the IBE's vision of lifelong homes with Thrive's tested strategies for building houses that prioritize residents' health.

Making homes accessible and accommodating to aging homeowners is a key to enabling them to live independently as long as possible. All of the homes built by Thrive are single-level with open concept floor plans, and two of the three models include living spaces that can be customized to accommodate a variety of living circumstances, such as the arrival of a family member or live-in caretaker. Wider hallways, easily accessible outlets, and other features standard for age-targeted homes are included in their design.

HEALTHY BUILDING

In addition to designing to meet the needs of aging residents, Thrive used non-toxic building materials, incorporated features that promote clean air indoors, and installed appliances that lower

Looking Beyond the Horizon

THRIVE HOME BUILDERS UTILIZES PARTNERSHIPS WITH LIKE-MINDED MANUFACTURERS TO LOOK BEYOND CARBON NEUTRALITY.

Carbon neutrality is not a new goal for Thrive Home Builders. In fact, at this point, Thrive Home Builders CEO Stephen Myers says it's the low-hanging fruit. "That's what's achievable now," Myers says. "The next level is to address the carbon footprint embedded in the house itself."

By this, Myers is referring to everything that goes into the materials and processes involved in building a home in the first place—from the energy that went into manufacturing the doorknobs, to the fuel that was used to ship the lumber. To begin addressing these hurdles, Thrive Home Builders utilizes partnerships with sustainably focused manufacturers that are also committed to making their end of the homebuilding process more sustainable.

Myers says that the average home builder isn't well set up to commit to the complex research and development needed for making the individual components of homes more sustainable. However, most manufacturers are.

"Just because the builders like us aren't necessarily spending a ton on R&D, it doesn't mean that nobody is," Myers says. "But it does mean that you have to make connections with them."

Two manufacturers partnering with Thrive Home Builders on the Sonders project are Panasonic and Whirlpool. Panasonic, whose fixtures will be used for the Sonders homes, plans to eliminate its greenhouse gas emissions entirely by 2050 and has already achieved two zero-carbon factories.

Sonders will also be using a variety of Whirlpool appliances in the homes, the majority of which are ENERGY STAR® certified and designed to use a minimal amount of energy.

As Thrive continues the search for new and innovative ways to continually lower the carbon footprint of their homes, the company hopes to pave the way for other homebuilders to make similar efforts.

Joint effort. Thrive partners with manufacturers, such as Whirlpool, that are using strategies or products—such as power- and water-saving dishwashers—to promote use of clean energy.

COURTESY OF WHIRLPOOL CORPORATION

THE SONDERS PROJECT

Artistic environment. The Sonders Learning Center Arts Studio offers a chance for residents to put their imaginations to work and let their intelligence have fun. COURTESY OF THRIVE HOME BUILDERS

the home's carbon footprint.

In the building world, Thrive has long been recognized as an indoor air quality leader. In addition to being a 2022 EPA Indoor airPLUS Leader Award winner, every Thrive home is part of the **EPA's Indoor airPLUS program** and is LEED certified.

Thrive specifically chooses building materials, including paint, carpet, and wood products, that are low in formaldehyde and other harsh chemicals.

Because of radon occurring naturally in the soil, Coloradans are also at a higher risk of radon exposure than the average homeowner, and about **half the homes in Colorado have radon levels higher than the EPA's recommended action level** of 4 picocuries per liter. Therefore, each Thrive home is also outfitted with an active radon ventilation system.

Gene Myers, the founder and former CEO of Thrive, says that high efficiency ventilation systems are critical to maintaining a home's long-term air quality. Keeping fresh, clean air flowing through homes is necessary to combat the toxins homeowners encounter in their everyday lives.

"The solution to pollution is dilution," Myers says. "What we're doing by bringing fresh air into the house is to dilute whatever contaminants are in the house."

A prospective homeowner may wonder how, if the home is built with so many great materials, contaminants get inside. "They come into the house anytime you go to the store," Myers says. "One trip can just about undo everything we did."

Thrive homes also address the IBE lifelong homes principle of Affordability & Maintenance. Thrive has learned that systems put in place to protect air quality often decrease in effectiveness over the years due to a lack of maintenance. To solve this, Thrive created Dwell. The app, which will be provided to every Thrive homeowner at Sonders, keeps track of any maintenance that needs to be performed, and reminds homeowners of when it needs to be done. Homeowners will also have the option to have a year's worth of supplies delivered to them at once.

Once the Sonders project has been well established, IBE will document and publish the results as a case study to measure the success of the strategies utilized. The Sonders project will be a key component in the future development of the **Colorado Lifelong Homes Certification Program**.

Overall, Thrive's homes at Sonders are designed to promote the health of their owners while also being easy to maintain, particularly for older residents. Like IBE, the developers of Sonders Fort Collins and Thrive hope that the innovative features in these homes will ultimately become standard practice in newly built homes. GB

What's a 'Lifelong Home'?

SONDERS FORT COLLINS UTILIZES THE FIVE FOCUS AREAS OF ACCESSIBLE HOMES OUTLINED BY THE INSTITUTE FOR THE BUILT ENVIRONMENT.

Larger in life. Thrive's elderly friendly homes include open floor plans and wide, accessible hallways. COURTESY OF THRIVE HOME BUILDERS

As they seek to identify barriers and solutions to the current lack of suitable housing for Colorado's aging population, Colorado State University's Institute for the Built Environment (IBE) identified these **five focus areas, as well as strategies for accomplishing them, that make up the qualities of "lifelong homes"**:

- **Walkability & Community**. Homeowners need access to natural space, accessible sidewalks, public transportation, and access to socializing and services.
- **Visitability**. Accessible homes should have stepless entry, generous hall and door width, accessible guest restrooms, and parking accessibility.
- **Universal Design**. The design of lifelong homes should be inclusive, welcoming, adaptable, and flexible.
- **Safety & Fall Prevention**. Interior finishes of homes may include slip-resistant flooring, accessible bathrooms, and adequate interior lighting, and be clutter-free.
- **Affordability & Maintenance**. Homes that are energy efficient, have affordable mortgage or rent, have low-maintenance landscaping, and include accessory dwelling units are better suited for aging in place.

With its homes at Sonders Fort Collins, Thrive put the majority of these principles into practice. IBE and Thrive intend to use these homes as a template that can, ideally, be replicated to create more-accessible housing nationwide.

PART TWO

Written rules. Project consultants and other specialists must provide data to the contractor in a manner that can be easily incorporated into information given to the homeowner at the end of the project.

NAVIGATING POST-PANDEMIC RESIDENTIAL GREEN BUILDING: ENGAGING THE CLIENT

BY TERRY BEAUBOIS

In addition to assisting and guiding homeowners in establishing green building priorities at the beginning of a project, contractors who can provide homeowners with a valuable, comprehensive packet of information at the end of construction will have a competitive advantage in the next few years. The responsibility and ability to do so cannot be left solely to the contractor, however. Project consultants/designers, architects, and engineers must provide data to the contractor in a way that can be easily incorporated into the information for the homeowner/building owner at the end of the project. The task of creating a comprehensive information packet needs to be negotiated into the project, if the contractor is to remain profitable.

Too often, the effort and costs of creating a complete and comprehensive set of product/equipment manuals and information about any Internet of Things (IoT) products in a building are considerable. When this is not considered in the cost of the construction contract of the building, it can significantly affect the bottom line of a project. On substantial non-residential construction, such as airport projects, these costs can run into hundreds of thousands of dollars.

DATA DELIVERED RIGHT

The days of providing print versions of a stack of equipment manuals or a CD-ROM with hundreds of PDFs to satisfy a data delivery requirement are ending. For example, more-sophisticated corporate clients for hotel/resort projects and some federal government endeavors are beginning to require information to be provided in a way that can be easily integrated into their digital building management and operation systems. This will happen at a different scale for custom home projects. But savvy homeowners are beginning to realize the value of this information in managing their home. They want contractors who can adequately—and correctly—provide it.

Green building contractors who can clearly request information in certain formats from each project consultant will be getting ahead of the game, and more efficiently and effectively create information packets for their clients. It is unfair to leave the responsibility of developing the information package solely to the general contractor. A system of information management must be created that benefits all building industry project members. It also requires us to be able to successfully communicate this to homeowners/building owners, who may not understand the value of this at the beginning of contract negotiations but will benefit from it after the completion of construction.

I will be writing further about how current developments in computer software will assist with creating, collecting and presenting this valuable building information to the homeowner/building owner in future articles. GB

Terry Beaubois is CEO of BKS: Building Knowledge Systems, in Palo Alto, California. He can be contacted at **tbeaubois@gmail.com.**

COMING NEXT ISSUE

The Year's Top Green Products and Brands

In Green Builder's annual product awards edition, our editors highlight 50 innovative selections. And in our Sustainable Brand Index survey, you tell us which companies are leading the industry in their product category.

Vantage Newsletter

The Weekly Sustainable Building Digest

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Chris Castro, U.S. Department of Energy Chief of Staff at the Office of State and Community Energy Programs, reads Vantage. **Do you?**

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The Long Arc of Progress

Ron Jones
Co-Founder and President
Green Builder® Media
ron.jones@greenbuildermedia.com

Let me begin by sharing that the December temperatures in Colorado were the coldest in decades. But the fact is not where the seemingly random pieces of this puzzle started to appear. I had already been thinking about how much I miss the wood-burning stove that was the source of so much comfort and pleasure at my former residence.

For as long as I can remember, I have been drawn to the imagery of a communal fire: the light, the warmth, the implied security. This is best illustrated in the 1981 film "Quest for Fire." The movie, based on the 1911 Belgian novel by J.-H. Rosny [sic], depicts the arduous adventures of three prehistoric humans who seek to recapture their accidentally extinguished fire source. The safety, and indeed the power, associated with those in possession of manageable combustion cannot be overstated.

Eventually, the trio returned with a live flame. But, more importantly, they learned how to ignite fuel from scratch, an advancement that greatly improved their odds for long-term survival at a time when it was far from certain.

As I was contemplating this, by seemingly random coincidence I stumbled across a photograph of a fire feature comprised of a large slab of stone that had been stood on end in a bed of gravel. It was eerily shaped like an oversized human hand, and at its base the makings of a wood fire had been laid. I mentally returned to the image several times and marveled at the metaphor it presents.

Then I accidentally came across the story of a woman from the slums of Nairobi, Kenya, who had just been awarded one of the 2022 Earthshot Prizes for her creation of a new type of cooking stove. It is reported that just shy of 1 billion people in sub-Sahara Africa alone (the number is predicted to grow to more than 1.6 billion by 2050) must do their cooking on open fires or dangerous, inefficient stoves that burn wood or charcoal, resulting in widespread respiratory problems and disastrous air quality.

"It was eerily shaped like an oversized human hand, and at its base the makings of a wood fire had been laid. I mentally returned to the image several times and marveled at the metaphor it presents."

The **Mukuru Clean Stove** sells for $10 (less than the stoves currently in use) and reduces toxic smoke emissions by 50 percent to 90 percent. The stoves burn biomass fuels that are half the price of other fuels currently in use.

A short time later, the U.S. National Ignition Facility announced to the world that the first successful nuclear fusion experiment had taken place. Long the holy grail of those seeking to produce a non-polluting, inexhaustible source of energy by replicating the power that fuels our Sun, the achievement is widely regarded as the next big thing in energy solutions, although it is estimated that it will be several decades in development.

In the meantime, those of us in the housing industry are stubbornly taking opposing sides on renewable energy, clean transportation and the electrification of homes. The pro side is rapidly gaining momentum as we attempt to address the substantial climate damage that results from carbon emissions produced by mechanical systems and appliances that run on fossil fuels.

Yet, we jealously protect our "freedom to choose," and serve the special interests that depend on our ingrained prehistoric instincts to resist change. Powerful and entrenched players scramble to preserve their markets—progress be damned. **GB**

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