Award-Winning Coverage of Sustainable Construction, Products and Lifestyles

GREEN BUILDER®

July/August 2023 / www.greenbuildermedia.com

THE ESG ERA HAS ARRIVED

HASTENED BY THE CLIMATE EMERGENCY, the building industry is fast-tracking Environmental, Social and Governmental metrics. We'll look at the bright lights in this effort, as we unveil this year's selection of Eco-Leaders.

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SAM RASHKIN

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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.

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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?

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AS EXTREME HEAT GETS WORSE, WILL BETTER BUILDINGS SAVE US?

If we continue down this road, our homes may be the last line of defense.

It occurred to me, as I watched Arizona facing down 110 degree temperatures for two straight weeks, that we might be witnessing the beginning of the end. How hot can it get, I wondered, before human beings simply can't survive? I found a recent study that suggests that at 122 degrees (Fahrenheit), a person may survive prolonged exposure, but "it's nasty." Go higher than that for any length of time, and our bodies fail. Along the way, we get more aggressive, depressed and anxious.

Of course, 122 degree survival may be overly optimistic. In many places, the effects of extreme heat take effect even sooner, thanks to the dew point. In other words, 100 degrees in Washington, DC, feels more soul crushing than 110 degrees in Phoenix. Once temps hit 130 degrees, it's lights out for most mammals, whatever the humidity and dew point. Now might be a good time to point out that, according to Nature, "Of the 4 billion species estimated to have evolved on earth over the past 3.5 billion years, 99 percent are gone."

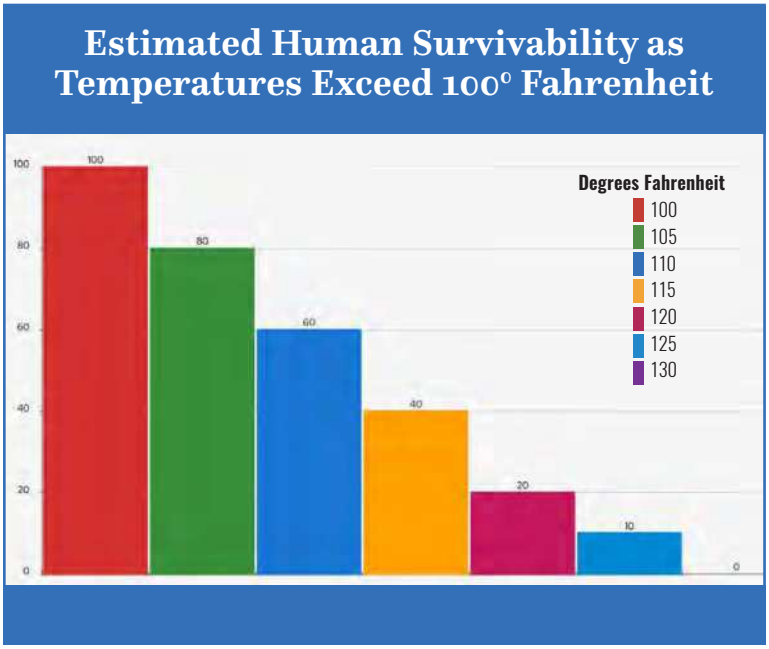
Could parts of the U.S. hit 130 or 140 degrees or higher on a regular basis? Scientists are not sure.

No modeling, not even AI, has been able to synthesize the myriad of data required to answer that question. How much weight do we give the ocean's finite ability to absorb heat? How does increasing methane pollution change the equation? Don't forget to include before and after data on the total square miles of reflective ice sheets, melting by the day? Also, will particulates from wildfires make things worse?

We're left playing defense, creating buildings that will serve as sanctuaries from the heat. We have the cooling technology, but the more inefficient the home, the more power it needs. Only 2 percent or fewer existing U.S. homes operate at net zero efficiency. That means we'll need a massive, pulsing power grid, straining under its fossil-fuel turbines, to keep 98 percent of our homes cool.

We have the right technology to defy the heat in our homes, but will we have enough reliable grid power to keep them habitable? Texas logged 720 hours of localized power outages in 2022. Louisiana was second worst with 697 hours down. Both states face extreme risk from heat waves.

Clearly, in coming years, we'll need to vastly reduce housing's dependency on centralized power (unless it's coming from solar or wind). For existing homes, that means more and better insulation and cool roofs. For example, we've written about how 1-inch R-6 polyisocyanurate sheet foam on top of a waterproofing membrane and Oriented Strand Board (OSB) roof deck can lower the surface temperature of the attic side OSB by 30-40 degrees. Homes should also get solar-ready wiring upgrades, low-E windows, and an HVAC upgrade to high efficiency heat pumps and hybrid or solar hot water heaters. For new homes, it's all of the above, with a "net zero" benchmark for every project plan.



Hot zone. As ambient outdoor temperature passes 100 degrees Fahrenheit, the survivability window for human beings is quite narrow. For "at risk" groups such as the elderly, the window shrinks further still. With prolongued exposure past 130 degrees, few, if any would survive. IMAGE COMPILED USING AI ANALYSIS.

Green Builder's 20-year mission has become a lot more urgent. We're not waiting for builders to catch up. We're creating a set of Environmental, Social and Governmental (ESG) guidelines to track real change and overcome greenwashing.

As an industry, we can do our part, but we can't change human behavior. That has to come from within, and maybe it's bigger than us. Let's stay focused on what we can do: buy millions of Americans some time; a safe place perhaps, to ride out the coming climate catastrophe for a while, maybe for a long while. Maybe that will give us all time for a mental reset about the destructive, wasteful practices that we have the power to change. GB

Matt Power
Editor-in-Chief
matt.power@greenbuildermedia.com

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2023 ECO-LEADERS
Green Builder® Media

LG Electronics Stakes its Claim as an **Eco Leader**

LG Electronics has set strong commitments to Environmental, Social, and Governance (ESG) leadership.

Supporting LG's Better Life for All ESG vision, the global tech giant is pursuing a six-part strategy that addresses:

1. **Carbon Neutrality**–achieving carbon neutrality and using renewable energy
2. **Circularity**–reusing resources from waste for enhanced circularity
3. **Clean Technology**–designing products and services with the environment in mind
4. **Responsible Workplace**–leveraging ESG risk management to support a responsible supply chain
5. **Diversity & Inclusion**–embracing diversity to create a healthy organizational culture
6. **Design for All**–offering products and services that increase convenience and comfort

LG plans to achieve carbon neutrality by 2030 by reducing 50% of greenhouse gas emissions through process improvements and the adoption of renewable energy and energy savings technologies. The remaining 50% will be offset using the United Nations' Certified Emission Reduction (CER) program.

LG has joined the RE100 (Renewable Energy 100) global initiative, pledging to convert all of its business sites worldwide to 100% renewable energy, gradually increasing use of electricity from sources such as solar and wind power, by 2050. As a leading member of the U.S. EPA's Green Power Partnership, LG Electronics USA already uses 100% renewable energy in its factories, warehouses and office locations.

The company also has taken a strong stance on circularity. LG is actively committed to utilizing more recycled plastic and increasing the collection of electronic waste. Since 2021, LG has set a goal to use a cumulative total of 600,000 tons of recycled plastic by 2030. LG aims to achieve a recycling rate of 95% for waste at its production facilities by 2030. Additionally, LG set its goal to expand the collection amount of e-waste up to 8 million tons by 2030 (on a cumulative basis from 2006 to 2030).

While driving the electrification movement, LG is designing for decarbonization, reducing carbon emissions from the use of TVs, monitors, refrigerators, washing machines, dryers, room air conditioners and HVAC systems. The company has set a global target to reduce greenhouse gas emissions from product usage (Scope 3) by 20% by 2030 compared to 2020. These targets have been scientifically validated and verified by the Science-Based Targets initiative.

PRODUCT SPOTLIGHT:

LG is designing products for decarbonization. For example, the ***LG Heat Pump WashTower™***: leverages LG Dual Inverter Heat Pump technology to reduce energy consumption by drying in a low temperature throughout the drying cycle. The ***LG Inverter Heat Pump Water Heater*** combines heat pump technology with LG's advanced smart control systems, saving up to 70 percent compared to conventional electric water heaters. The ***LG STUDIO Induction Slide-In Range*** delivers performance, efficiency and flexibility with an UltraHeat™ burner (up to 4.3Kw), multifunctional cooking modes.

LG

Water Shortage Curtails Phoenix Home Construction

Diminishing groundwater has led to restricted building permits, making it harder for builders to thrive in one of the nation's most-booming housing markets.

H_2O hardship. Housing construction in and around Phoenix could slow to a trickle unless more water is found. CREDIT: ISTOCK/GREGORY CLIFFORD

Citing a critical shortage of groundwater, Arizona officials have restricted new housing construction in and around most of Phoenix. The action is an attempt to slow population growth in the nation's fifth-largest metropolitan area, according to the Arizona Department of Water Resources (ADWR).

ADWR will no longer issue certificates of Assured Water Supply (AWS), which are required for new development. An AWS mandates a builder to prove that there is 100 years of available water for their project, which includes groundwater.

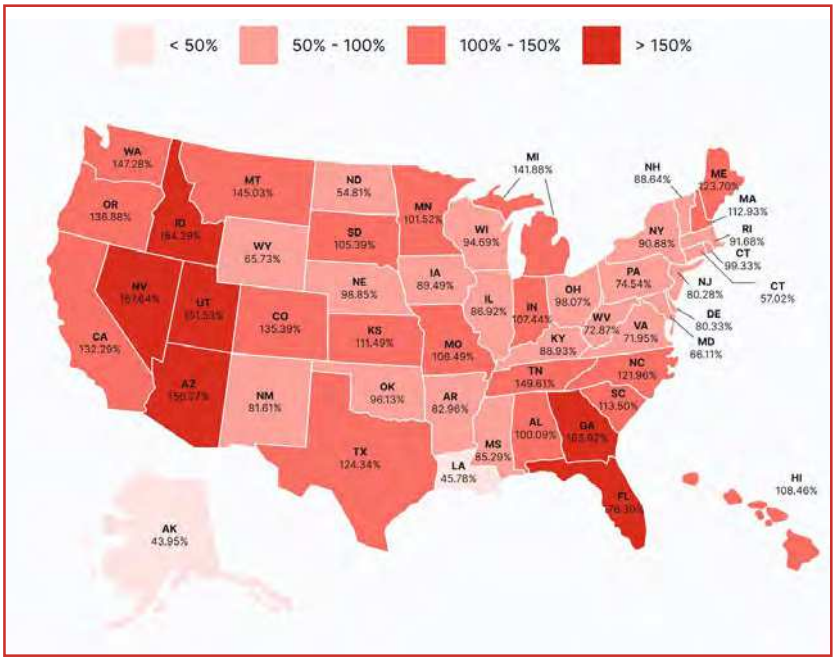
Existing or planned construction already with AWS certification will not be impacted. Developers will otherwise need to find other water sources before they are allowed to build, according to ADWR.

That could be difficult. There are 4.6 million residents in the 5,600-square-mile Phoenix Active Management Area, which has some of the nation's most-stringent water conservation requirements but will experience 4.86 million acre-feet of unmet demand for groundwater supplies over the next 100 years if current conditions remain, ADWR notes. These include record heat, and a nearly 60 percent growth projected population by 2055, according to data from the Maricopa Association of Governments. Alternative water sources such as the Colorado River or area reservoirs are already diminishing, and more-extreme measures such as importation of desalinated ocean water are currently too expensive, according to a report by Arizona State University.

While they acknowledge that water availability is a problem, builders feel they are being singled out in addressing it. Spencer Camps, vice president of the Home Builders Association of Central Arizona, notes that their industry is the only one with a 100-year supply requirement, despite the fact that new homes have doubled in water efficiency in recent years. **GB**

THE HIGH PRICE OF HOUSING, 2013-2023

Painful gains. Home prices have skyrocketed since 2013. In six states (Arizona, Idaho, Florida, Georgia, Nevada and Utah), a buyer in 2023 could acquire only one-third of the same home they could buy 10 years earlier. SOURCE: LIFEANDMYFINANCES



EVs Well on Their Way in Norway

Eighty percent of cars sales are now electric—and that's been a very good thing.

Eight out of 10 cars sold in Norway in 2022 were electric, putting the country well on the path toward zero fossil fuel-powered cars within 10 years, according to a report from The New York Times. The result is a significant drop in carbon emissions since 2009—about 30 percent in the capital city, Oslo, for example—and quieter streets. Also, unemployment has not skyrocketed, and the nation's electric grid hasn't collapsed.

Norway is well ahead of the U.S. in terms of electric vehicle (EV) sales. The U.S. hopes for a 50 percent new EV sales rate by 2030. Norway passed that mark in 2019. The sale of internal combustion engines will end in 2025.

Although Norway is far smaller than the United States—the country is about the size of California geographically, and its 5.5 million population is only twice that of Chicago—it's still a model of what can be done if clean energy mandates are met, according to Christina Bu, secretary general of the Norwegian EV Association. Some people, she notes, treat the conversion to EVs—and acknowledgement of climate change—as a grim sacrifice. "It's not like that here," Bu notes. "It's actually something that people embrace." GB

Taking charge. Electric vehicles in Norway have been on the way in, and fossil fuel-based ones on the way out, for almost 15 years. The environmental benefits and lack of detrimental economic effects are a role model for the rest of the world. CREDIT: ISTOCK/ANOUCHKA

California's Fire Codes Are Working

A higher proportion of newer homes vs. older ones escaped the state's disastrous Camp Fire. That's good news as wildfire danger grows each year.

Homes built to new codes in California were almost three times more likely to have survived wildfires over the past 15 years than the older homes that were not, according to a report by Associated Press. Fifty-one percent of the 350 houses that were subject to modern day fire-mitigation survived the Camp Fire that obliterated the towns of Paradise and Concow in 2018. Only 18 percent of the 12,100 homes constructed before 2009—when the current requirements took effect—escaped relatively unscathed.

The findings by The McClatchy Group support the idea that those new codes—unpopular due to their requirements for materials used, methods of construction, and defense zones around houses—are a good thing after all. The Camp Fire destroyed more than 18,000 structures, at a cost of $15 million, and killed 85 people, according to the California Department of Forestry and Fire Protection (CAL FIRE).

Grim reminder. Scenes like this—in which only the home's fireplace remained—were all too common after California's Camp Fire in 2018. But many newer houses survived, thanks to the state's stricter building codes. CREDIT: ISTOCK/KATHY KAFKA

On the downside, only 3 percent of the homes in the path of the Camp Fire, and 6 percent of California's total housing stock, have been built after 2008. An estimated 3 million homes lie within various fire hazard severity zones around the state, according to CAL FIRE. Retrofitting older homes is pricey, and many owners would rather take their chances with any fires that come, the agency notes.

Still, the California code is becoming a model for other fire-prone states, with some implementing similar requirements on new housing. Most draw heavily on comments from builders, as well as fire professionals, according to McClatchy. GB

GREEN BUILDER®

Volume 18, Issue 4
July/August 2023
Published by Green Builder® Media

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

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

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

Problems with your subscription?
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MISSION STATEMENT: "Our mission is to effect meaningful, positive change for a better world. As advocates for sustainability, we provide mind-expanding information that catalyzes and inspires commitment to sustainable living."

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HERE'S A SAMPLE OF WHAT'S INSIDE:

"Healthy, affordable housing should be universally available and attainable for all Americans. It should not be an afterthought or a zoning concession."

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ng ESG

BY GREEN BUILDER STAFF

If you haven't yet heard of ESG, you will. ESG stands for Environmental, Social, and Governance, a framework that is increasingly being adopted by various industries, including building. It's a set of standards for a company's operations that socially conscious investors use to screen potential investments.

In the building industry, manufacturers are beginning to take notice of ESG for several reasons:

- Investor and stakeholder demand for ESG initiatives is on the rise.
- This demand is causing a shift towards sustainable green building products.
- Companies adopting ESG principles are more attractive to investors.
- ESG adoption can unlock higher investment potential.
- The building industry is responsible for 39 percent of global greenhouse gas emissions.
- Adoption of green building practices and ESG principles is a response to reduce these emissions.
- The industry is aiming to decarbonize and move towards net zero emissions.

The motivation behind adopting ESG principles is a mix of altruistic and profit-driven incentives. On one hand, there's a stated desire to reduce environmental impact and improve social equity. On the other, companies see the business benefits of ESG adoption, such as increased investment opportunities and positive brand sentiment. Our Eco-Leaders this year embrace both of these philosophies.

There is currently no standardized ESG certification for manufacturers in the building industry. To address this, Green Builder Media has started a working group to create a set of standards for ESG for product makers, builders and other key players in the business.For more information about the working group and its efforts, you can visit the **ESG for Building website**.

2023 ECO-LEADERS Green Builder® Media

DuPont

Strong employee satisfaction leads to a successful workplace—a key factor in this company's push to accomplish environmental goals.

STATS

60

Percentage of electricity from renewable sources expected by 2030

3

Number of parts to DuPont's sustainability strategy (Innovate, Protect, and Empower)

BY VICTORIA MUHARSKY

A global leader in innovative sustainable technologies, DuPont has proven that sustainable product design driven by environmental, social, and corporate governance (ESG) criteria is critical to mitigating climate change and moving the needle towards a carbon neutral future.

The three pillars of DuPont's sustainability strategy–"innovate for good, protect people and the planet, and empower people to thrive"–emphasize the interconnectedness between people and the planet, and the role corporations play in climate mitigation.

DuPont has taken a proactive approach to sustainability by conducting an ESG materiality assessment to identify environmental and social risks to the company. Using information collected from that assessment, DuPont has set nine aggressive sustainability commitments for 2030.

DuPont aims to align its entire innovation portfolio with United Nations Sustainable Development Goals (SDGs) and deliver climate solutions to its customers. Notably, six out of seven of DuPont's 2022 award-winning products have a robust sustainability component.

DuPont has also pledged to incorporate circular design principles into its manufacturing process to increase the energy efficiency of its products and to minimize waste across its value chain.

By improving the energy efficiency of its products, DuPont has achieved a 35 percent reduction in its scope 1 and 2 emissions in 2022, eight years ahead of schedule, surpassing its original reduction target of 30 percent. Instead of halting progress and congratulating itself on a job well done, DuPont has set a new reduction target of 50 percent by 2030, with the ultimate goal of reaching carbon neutral emissions in 2050.

Team effort. Grounded in science, DuPont Performance Building Solutions and Corian Design are working alongside those who also seek a sustainable tomorrow to develop solutions for managing the air, water and thermal performance of buildings and residences. COURTESY OF DUPONT

Speak easy. Actions such as regular mandatory safety meetings and town halls conducted by facility managers and functional leadership are taken to gather valued input from employees. COURTESY OF DUPONT

50 million

Gallons of water processed each minute using DuPont technologies

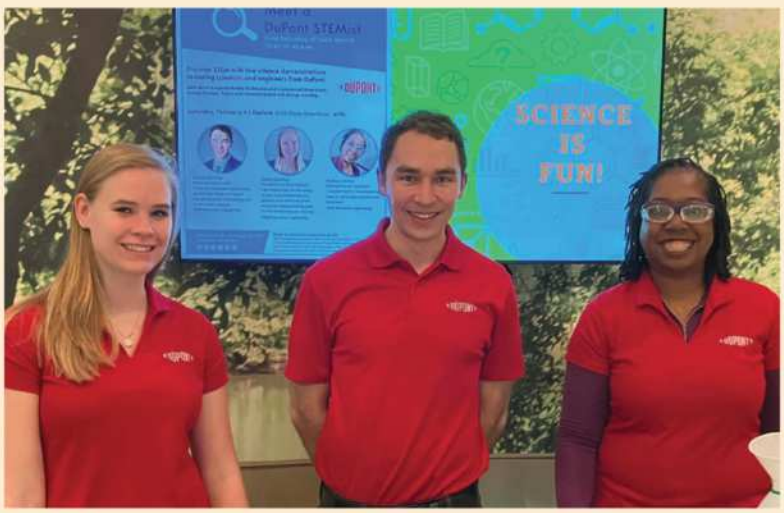
> "We're pleased how our teams are making meaningful progress to achieve our sustainability commitments and make a positive impact for our customers, employees, shareholders and communities."
>
> **— Ed Breen, DuPont executive chairman and chief executive officer**

As a part of its emissions reduction strategy, DuPont has joined the RE100 Global Initiative and pledged to obtain 100 percent of its electricity from renewable energy sources by 2050. To ensure progress on this initiative, DuPont has set an intermediary goal of obtaining 60 percent of its electricity from renewable sources by 2030.

DuPont's core value of empowerment is the driving force behind its sustainability commitments and ESG integration. The company is dedicated to creating a diverse and talented workforce to push the envelope of innovation and deliver the products necessary for a thriving community.

DuPont has received several awards recognizing its exemplary workplace environment. For instance, Forbes has identified DuPont as one of the most female-friendly companies for the past two years. Employee satisfaction continues to remain at an all-time high, with 88 percent of DuPont employees reporting that the work is meaningful. DuPont regularly engages with its internal and external stakeholders to enhance ESG integration and improve stakeholder relationships.

DuPont has positioned itself as a global leader in ESG by creating a strategic roadmap to deliver on 2030 sustainability commitments. A sign of ESG excellence is the ability of the company to disclose specific ESG material risks rather than make generic, industry-wide disclosures.



One big family. DuPont's emphasis on a diversified workforce—by age, gender, ethnicity and more—has earned it numerous "Best Place to Work" awards over the years. COURTESY OF DUPONT

DUPONT™

2023 ECO-LEADERS
Green Builder® Media

Kohler Co.

Sensible water use, sustainable product development and open-armed employee management are key elements of the company's "Believing in Better" philosophy.

STATS

560 billion

Gallons of water saved by *KOHLER WaterSense*-labeled products in the U.S. since 2007

62%

Reduction in global operational net greenhouse gas intensity since 2008

BY GREEN BUILDER STAFF

For 150 years, Kohler Co. has empowered people with learning about sustainability. Heading into the next century and a half, the kitchen and bath products manufacturer plans to do more of the same by "Believing in Better."

Kohler's latest Environmental, Social and Governance (ESG) report highlights efforts to advance the company's environmental sustainability, diversity, equity and inclusion (DEI), and social impact strategies. Those efforts include:

- **Greenhouse gas (GHG), water, and waste intensity reductions.** In 2022, Kohler achieved a 16 percent reduction in GHG emissions, a 10 percent reduction for water, and 23 percent reduction in waste.
- **Global operational energy use intensity reduction.** Kohler has reached a 41 percent reduction total since 2008, including an increase from 30 percent in 2021.
- **Extra-efficient water savings products.** The company's U.S. Environmental Protection Agency (EPA) WaterSense-labeled products helped contribute to 88 billion gallons of water saved in 2022, and more than 560 billion gallons saved since 2007. Kohler's Kitchen and Bath division continued to lead in WaterSense offerings by certifying 85 new products across toilets, bathroom faucets and showerheads.
- **Diverse hiring.** Kohler exceeded its 2022 goal for diverse hiring. Fifty-three percent of new U.S. hires, permanent and exempt, represented diverse backgrounds.
- **Associate engagement.** Kohler in 2022 hosted more than 300 associate-led global community engagement activities, up from 80 in 2021, and increased the number of business resource groups (BRGs) available to associates. These include Bold Ability, which promotes creation of a disability-friendly workplace; Young Professionals of Kohler; Women@Work; and BRGs tailored to various ethnicities, populaces and support groups.

Ice man. Antarctica explorer Robert Swan traveled to the South Pole using specialized equipment such as a Kohler generator fueled by hydro-treated vegetable oil. CREDIT: ©JEFF-STASNEY .

Strategic science. Kohler's "Believing in Better" ideals extend into its business strategies and operations, resulting in employee-generated ideas and actions for improvement across the organization.

CREDIT: WIKIPEDIA/ASHER HEIMERMANN CC3.0

"We were founded on the belief that as our presence grew, so did our responsibility to our planet, communities, and people. This is why we continue to embed our founding principles into our environmental sustainability and social impact framework based on the notion that our best can always be better."

—David Kohler, Kohler chief executive officer

25

Metric tons of waste diverted from landfills via Abstra and Crackle collections recycled tile sales since 2019

- **Lives impacted**: Kohler positively impacted more than 1 million lives in 2022 and more than 17.1 million since 1990 through its "Safe Water for All" campaign, and various educational, arts and industries programs. That includes products from Innovation for Good (IfG)—the company's in-house incubator for products with a social purpose—such as a porcelain pour-flush toilet (*KOHLER Rinse*) for communities without access to piped water and electricity.
- **GHG emissions education efforts**. Kohler subsidiary Clarke Energy was part of a consortium that won the 2022 Water Breakthrough Challenge sponsored by England's Water Services Regulation Authority (Ofwat) with a demonstration of an innovative carbon capture and conversion system. Meanwhile, Kohler subsidiary Mira launched *HeatCapture*, a double-wall stainless steel heat exchanger, to help United Kingdom builders and developers comply with new reduced emissions regulations.
- **Special effort**. Kohler partnered with polar explorer Robert Swan on his 2022 excursion through Antarctica to the Geographic South Pole, where he relied only on renewable energy sources. Kohler equipped him with a customized generator fueled by hydro-treated vegetable oil (HVO). The off-grid sustainable system provided the energy needed to operate Swan's base camp and provide battery charge to his mobile equipment.

"We're proud of the progress we've made to bring more innovative, inclusive, and environmentally sustainable solutions to more people," says Laura Kohler, chief sustainability and DEI officer. "Our passionate associates and leadership are integrating our Believing in Better philosophy into business strategies and operations, which generates ideas and actions for improvement across the organization."

Water saving mission. Through its Innovation for Good (IfG) incubator, Kohler has supplied its *KOHLER Rinse* seated porcelain pail-flush toilet—which does not require electricity or piped water to function—to more than 6,300 people in western Honduras since 2017.

COURTESY OF KOHLER

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2023 ECO-LEADERS Green Builder® Media

LG Electronics USA

There are a half-dozen ways to successfully manage an ESG strategy. LG is working on all of them.

STATS

600,000

Tons of recycled plastic to be used in new home appliances by 2030

6

Number of key ESG initiatives in the company's "Better Life for All" strategy

BY GREEN BUILDER STAFF

When it comes to having an environmental, social and governance (ESG) vision, LG Electronics' overall goal is simple: "Better Life for All." The company's six-part ESG strategy—carbon neutrality, circular economies, clean technology, responsible supply chains, an inclusive organizational culture and accessible products—are aligned with United Nations Sustainable Development Goals (SDGs), which place sustainability at the center of efforts to combat worldwide climate change, poverty, hunger, violence and other challenges as early as 2030.

According to LG Electronics USA Senior Vice President John Taylor, the company's goals include achieving carbon neutrality by 2030 through continuous reductions in greenhouse gas emissions (GHGs) during the production stage, achieved through process improvements and the adoption of energy-saving technologies.

LG has also joined the RE100 initiative, committing to fully offsetting electricity consumption of all worldwide facilities with renewable energy by 2050. The company's U.S. operations, including factories, warehouses and offices, already use 100 percent renewable energy.

The company is actively committed to utilizing more recycled plastic, increasing the collection of electronic waste, and contributing to a circular economy for future generations. Since 2021, LG has set a goal to use a cumulative total of 600,000 tons of recycled plastic by 2030. LG aims to achieve a recycling rate of 95 percent for waste at its production facilities by 2030. Additionally, LG plans to increase the collection amount of electronic waste from 4.5 million tons in 2021 to 8 million tons by 2030.

HQ honor. The North American headquarters for LG Electronics USA won the U.S. Green Building Council (USGBC) Leadership Award in 2021 for a highly efficient design that maximizes energy conservation, generates clean electricity on site and helps reduce carbon emissions. COURTESY OF LG ELECTRONICS USA

Green and smart. The LG *ThinQ* smart home platform caters to green builders. LG's smart home ecosystem of connected products include heat-pump water heaters, induction cooktops, ENERGY STAR-certified refrigerators, and more. COURTESY OF LG ELECTRONICS USA

"The 'LG Better Life 2030' plan embraces carbon neutrality, a circular economy, greener products and services, responsible supply chain, accessible innovations and a better, more-inclusive society."

10

Number of times LG has been named ENERGY STAR Partner of the Year

For its employees, LG Electronics established corporate-level diversity, equity, and inclusion (DEI) policies in 2022. "All employees and partners have the right to pursue happiness regarding dignity, value, and work as human beings," Taylor notes. Various systematic measures have been implemented to enable all employees to "carry out their work and develop their potential to the fullest without experiencing any discrimination or any others disadvantages on account of gender, race, education or religion."

LG also fosters meaningful relationships and contributes to the well-being of local communities by actively engaging with internal and external stakeholders; participates in solving social and environmental problems through technology-based products and services; promotes an eco-friendly social contribution program that encourages a healthy future for all stakeholders; and helps young people with their aim of enhancing the competencies of future generations.

The company ranks 13th out of 100 corporate patent owners in leveraging technology to address sustainability and social challenges, according to a just-released report, **"Exploring the Global Sustainable Innovation Landscape: The Top 100 Companies and Beyond,"** by LexisNexis Intellectual Property Solutions.

"Now more than ever, the intersection of innovation and sustainability is creating opportunities for companies to make a difference in addressing some of the world's most pressing issues," says LG Electronics North America CEO Thomas Yoon. "LG's 'Better Life for All' ESG mission builds on our longstanding role in the UN Global Compact and aligns with SDG initiatives driving positive impact for people, communities and the planet."

Science squared. LG Electronics is committed to practicing a circular economy by continuously expanding use of recycled materials as the company works toward a goal of using an accumulated total of 600,000 tons of recycled plastic by 2030. COURTESY OF LG ELECTRONICS USA

2023 ECO-LEADERS
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Meritage Homes

After a head start, Meritage Homes is shifting its ESG efforts into a higher gear.

STATS

14,106

Number of single-family Meritage homes delivered in 2022

100

Percentage of Meritage's 2022 homes that were ENERGY STAR certified

BY VICTORIA MUHARSKY

A common phrase heard among architects is "the greenest building is the one that already exists." Even so, with the housing crisis being more acutely felt by the American people, the nation is increasingly in need of new housing units.

If the future entails the production of new homes, which it inevitably does, those homes should be built following sustainable building practices to minimize environmental impact. Cue Meritage Homes.

Meritage, a public production builder in the U.S., has been at the forefront of sustainability for several years and has most recently secured its role as an environmental, social, and corporate governance (ESG) industry leader. From as early as 2009, Meritage has recognized the importance of providing American families with energy efficient, resilient, and cost-effective homes.

The staff at Meritage continue to explore innovative ways to deliver on their mission: "Life. Built. Better." For example, in the last decade, Meritage has managed to continually improve the average Home Energy Rating System (HERS) Index ratings of its homes.

Increased energy efficiency was made possible through the addition of solar panels, multispeed HVAC systems, U.S. Environmental Protection Agency (EPA) WaterSense-certified fixtures, low- to zero-volatile organic compounds (VOC) materials, spray foam insulation, and smart thermostats, among other sustainable home features.

Meritage is committed to working with its suppliers to enhance the supplier's ESG capabilities and, in turn, source more sustainable products to further improve energy efficiency.

Additionally, year after year, Meritage has continued to increase the number of homes built to ENERGY STAR certification standards. In 2022, 100 percent of the homes Meritage produced were Energy Star certified.

Impressively, Meritage has built more than 100,000 Energy

Identical advantages. All Meritage Homes emphasize environmental positives—especially a home's ability to more-efficiently use energy thanks to smarter construction, spray foam insulation, and ENERGY STAR-certified appliances.

COURTESY OF MERITAGE HOMES

Safety first. Meritage Homes' ESG strategy leans heavily on social elements, such as diversity, equity, and inclusion (DEI), talent acquisition and retention, workplace health and safety, and customer satisfaction.

COURTESY OF MERITAGE HOMES

"When it comes to ESG, there is no finish line, and our commitment to these efforts is evergreen."

—Stephen J. Hilton, Meritage Homes executive chair, and **Phillippe Lord, Meritage Homes chief executive officer**

53

Meritage Homes' average HERS Index score in 2022

Star-certified homes since 2009. The company's long-term commitment to sustainability has earned it several awards.

In 2023, the EPA recognized Meritage for its contribution to energy efficient construction with the Energy Star Market Leader Award. This was the 10th time Meritage was honored with this award.

In that same year, Meritage received the Energy Star Partner of the Year–Sustained Excellence Award for the 10th time.

Beyond its evident commitment to the environment and energy efficient housing, Meritage has crafted an ESG strategy to dial in their presence within the "S" and "G" categories of ESG.

Meritage, with the help of a third-party consultant, identified the following social material topics: diversity, equity, and inclusion (DEI), talent acquisition and retention, employee wellness, workplace health and safety, affordable housing, community engagement, and customer satisfaction.

The company's annual ESG Action Plan outlines the specific strategies Meritage has or will implement to manage these material risks.

For example, in terms of talent acquisition and retention, Meritage has partnered with nonprofit organizations, institutions, and foundations such as INROADS, WayUp, and the Society of Women Engineers to recruit diverse talent to the homebuilding industry.

Meritage has developed a multi-tiered governance structure to oversee the implementation of its ESG strategy. This includes a diverse board of directors, several oversight committees for the board, an internal ESG council, and the Environmental, Social, & Sustainability (ES&S) Committee.

While Meritage may not publicly disclose its ESG targets and goals, it continues to lead the homebuilding industry in ESG rankings and exemplify how a robust ESG strategy informed by company specific material risks can improve value creation for shareholders.

A winning hand. A long history of building stylish, energy efficient housing has resulted in Meritage Homes winning more than 20 ENERGY STAR-related awards since 2009.

COURTESY OF MERITAGE HOMES

2023 ECO-LEADERS
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Rheem Manufacturing

The company continues to decrease carbon emissions and prioritize sustainability in its business strategy.

STATS

40,000+

Metric tons of waste diverted by global factories in 2022

350+

Rheem Sustainability Standout products identified in 2022

BY GREEN BUILDER STAFF

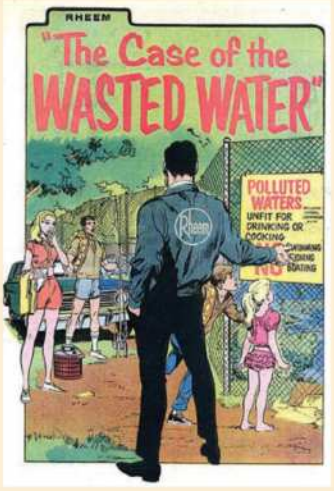
Rheem has made a significant commitment to sustainability and environmental, social, and corporate governance (ESG) since 2019. The company's three pillars of its "A Greater Degree of Good" initiative—"Intelligent Products," "Responsible Processes" and "Inspired People"—guide comprehensive efforts to advance United Nations Sustainable Development Goals (SDGs) and achieve ambitious global sustainability goals by 2025.

By definition, the Environmental aspect involves how a company impacts and interacts with the natural world, including factors such as carbon emissions, pollution, resource efficiency, and biodiversity. An example would be Rheem's development of environmentally sustainable products, manufactured in ways that consume fewer resources while generating less waste and lower emissions. To date, the sale of higher-efficiency Rheem products has prevented 21.8-plus million tons of carbon dioxide-equivalent emissions, a positive climate impact equivalent to taking more than 5 million cars off the road for a year.

In 2022, Rheem made progress on its goal to reduce greenhouse gas (GHG) emissions across its global manufacturing operations by 50 percent by 2025 compared to its 2018 baseline. Also, to support a goal of achieving Zero Waste to Landfill by 2025 within all global manufacturing operations, the company conducted six waste audits across three countries. The audits revealed that the various sites achieved an average landfill diversion rate of more than 85 percent and diverted more than 40,000 metric tons of waste last year.

The Social element pertains to how a company interacts with employees, vendors, suppliers, customers, and people in surrounding communities, including employee treatment, company ethics and values, human rights, and customer protection.

Showing leadership. As part of its ESG Governance actions, Rheem prioritizes sustainability in its business strategy, stakeholder engagement, government affairs and communications. COURTESY OF RHEEM MANUFACTURING



Classic lesson. Rheem's efforts to educate consumers and employees about water usage go back decades and took various forms, such as this free, publicly issued comic book from 1970. COURTESY OF RHEEM MANUFACTURING

350,000+

Plumbers, contractors, and influencers trained on sustainability

> "By training the trade, building valuable partnerships, promoting regulatory progress and empowering consumers to live more sustainably, we're amplifying our impact for good."
>
> **—Chee Wee Gan, Rheem senior vice president of strategy and sustainability**

Advancing the adoption of sustainable heating, cooling and water heating products and practices is critical for protecting the environment, and Rheem's partners in the industry play a pivotal role. Plumbers, contractors and key influencers worldwide are trained on the sustainable products Rheem sells, and on practices that make a difference for the planet. The training elevates sustainability in HVAC, water heating and refrigeration and helps prepare the industry's workforce for the future.

In 2022, Rheem brought sustainability training to more than 160,000 people—more than the prior three years combined. The company also achieved, years ahead of schedule, its goal to train 250,000 plumbers, contractors and key influencers on sustainable products or sustainable installation, and recycling best practices by 2025.

Governance defines how a company's leadership is structured, political affiliations, stakeholder incentives, executive compensation, success metrics, and levels of transparency. Rheem is committed to good governance, including the highest standards of ethics and compliance, and prioritizes sustainability in its business strategy, stakeholder engagement, government affairs and communications. The company shares its progress against goals in its annual **Sustainability Progress Report**.

"We are committed to driving change in the industry to make a lasting impact on our environment, both for this generation and those to come," the company notes. "Making sustainability a cornerstone of our government affairs efforts is one of our best opportunities to do so. We work with governments in the U.S. and around the world to achieve positive long-term sustainability outcomes."

Powerful investment. An example of Rheem's addressing is its investment in onsite solar at its Mexicali, Mexico water heater manufacturing plant, which offset nearly 800,000 pounds of carbon dioxide equivalent emissions in 2022. COURTESY OF RHEEM MANUFACTURING

2023 ECO-LEADERS
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Schneider Electric

For this global energy management giant, sustainability timing is everything.

STATS

44 million

People with access to green electricity in 2022

440 million

Tons of saved and avoided CO_2 emissions for Schneider Electric customers since 2018

BY GREEN BUILDER STAFF

Schneider Electric prides itself on being ahead of the curve. The company began monitoring its green efforts in 2005; in 2020, it became first to measure its overall sustainability performance using a Global Biodiversity Score. This was followed by the "Schneider Sustainability Impact" (SSI) program, which established six long-term commitments as set forth in the United Nations' Sustainable Development Goals (SDG), and are monitored quarterly for progress. Those efforts helped Schneider Electric rank No. 1 on the Corporate Knights Global 100 Index of Most Sustainable Corporations for 2021.

Schneider Electric's six commitments, which cover a five-year-period from 2021 to 2025, include:

- **Climate**, which includes helping customers prevent millions of tons of carbon emissions annually, and working with its top 1,000 suppliers to reduce their CO_2 emissions by 50 percent by 2025. Schneider Electric also just named six companies as winners of its first-ever Sustainability Impact Awards, for leadership in decarbonizing their own operations or on behalf of their customers.
- **Resources**, such as increasing green material content to 50 percent within its products by 2025. By then, the company also wants all primary and secondary packaging to be made from recycled cardboard instead of single-use plastic.
- **Trust**, such as working only with strategic suppliers who provide "decent" work to their employees (e.g., full and productive employment, civil rights at work, fair wage and social protection), and raising the level of confidence of Schneider's employees to report unethical conduct if witnessed. The company has established a "Green Line" global helpline for external concerns, and a "Red Line" as an internal alert system for employees to report any concerns.

Record of success. Schneider Electric's worldwide efforts at sustainability go back almost two decades. The company recently announced $72.5 million in energy automation services upgrades tied to its facility in Monterrey, Mexico, to help bring a consistent energy supply to area. COURTESY OF SCHNEIDER ELECTRIC

Advantageous advice. Under its six-commitment Schneider Sustainability Impact (SSI) program, the company plans to improve its green energy-related operations by up to 50 percent by 2025. COURTESY OF SCHNEIDER ELECTRIC

"We firmly believe that companies that want to do well must also do good—and vice versa."

—Gwenaelle Avice-Huet, Schneider Electric chief strategy and sustainability officer

50%

Goal for gender diversity hiring by 2025

- **Equal**, as in increased gender diversity in hiring, front-line management and leadership teams, as well as providing access to green electricity to 50 million people by 2025.
- **Generations**, such as doubling the hiring opportunities for interns, apprentices and new graduates, and training people in energy management.
- **Local**, with Country and Zone presidents establishing local commitments that impact their communities.

The company's efforts are also steps toward meeting a 2015 voluntary climate change control plan set by the Paris Agreement. That agreement, which calls for more than 200 participating nations to achieve individual global emissions reduction targets by 2030—with full carbon neutrality by 2050—would help limit Earth's temperature rise to 1.5 degrees Celsius, preventing disastrous climate impacts by the end of the century.

While acknowledging the company's major progress in all areas, Schneider Electric Chief Strategy and Sustainability Officer Gwenaelle Avice-Huet notes that nations overall aren't working fast enough. This was underscored by the Intergovernmental Panel on Climate Change's Sixth Assessment Report released in March.

"This report reminds us that there is still a very short window of time to act," Avice-Huet says. "The good news is that solutions to reduce emissions are already available. Every day, every week, and every quarter matter, and we're doing everything to accelerate our efforts methodically, systematically, and collaboratively."

Powerful knowledge. Schneider Electric's sustainability impact commitments include training people in proper energy management. COURTESY OF SCHNEIDER ELECTRIC

2023 ECO-LEADERS
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Sunnova

If all goes according to plan, customers will have energy independence in their future.

STATS

1.34 million
Metric tons of CO_2 avoided in 2022

59
Percentage of growth year over year

BY VICTORIA MUHARSKY

The transition from fossil fuels to renewable energy and the electrification of the built environment is made possible by Sunnova; a leading Energy as a Service (EaaS) provider that offers a comprehensive, sustainable, and streamlined approach to energy services for homes and businesses.

Sunnova is driven by its mission of "powering energy independence" and has sought to make the transition to renewable energy equitable for all Americans. In 2021, as a part of its solar justice journey, Sunnova conducted an environmental, social, and corporate governance (ESG) materiality assessment to identify potential risks and opportunities to its business. The results of the assessment were used to craft sustainability commitments for 2023 and 2025.

In 2022, the company identified 42 ESG-related risks and opportunities in a detailed climate scenario analysis. Sunnova's ESG Steering Committee chose to pursue three specific climate topics —heatwaves, hurricanes, and electric vehicle (EV) adoption—for further assessment. It also recently disclosed a complete Scope 3 emissions inventory and hopes to submit an application for a net-zero science-based target by the end of this year. Sunnova's sustainability commitments are informed by commonly used reporting frameworks such as the Global Reporting Initiative (GRI), Sustainability Accounting Standards Board (SASB), Task Force on Climate Related Financial Disclosures (TCFD), and the UN Sustainable Development Goals (SDGs).

The company has chosen to align with these frameworks to ensure its stakeholders have access to decision useful information. Providing stakeholders with transparent information is key to the successful implementation of an ESG strategy.

Sunnova has gone to great lengths to demonstrate the progress it has made on its 2023-2025 sustainability goals.

Lofty goal. With a risk assessment plan underway, Sunnova hopes to empower the public with enough renewable energy that it can fully function off the grid. COURTESY OF SUNNOVA

House rules. Sunnova's Code of Conduct calls for dealers to understand a potential customer's suitability for solar, including the condition, age, and physical integrity of the roof where a solar system is to be installed. COURTESY OF SUNNOVA

"Our unwavering focus remains on providing an unparalleled energy service as we strive to meet the evolving needs of our customers, while making a meaningful impact on the world." **—William J. Berger, Sunnova chair, president, and chief executive officer**

33

Percentage of Sunnova's board of directors who are women

For example, one of its more lofty sustainability goals for 2023 is to expand its customer base and scale access to solar technology. Specifically, Sunnova has committed to building a customer base whose systems will offset 52 million tons of carbon dioxide equivalent over the course of the system's life.

As of 2022, Sunnova has amassed a customer base of systems that will offset 38,773,613 metric tons of carbon dioxide equivalent over the system's lifetime. This marks a 74.5 percent completion rate towards the company's goal.

Social sustainability goals for 2025 include reducing voluntary employee turnover to 15 percent, improving racial diversity in mid-level management by 20 percent, and contributing 2,500 employee volunteer hours to organizations that align with Sunnova's ESG goals.

Sunnova has completed its 2023 goal of enhancing supplier engagement by providing its Tier 1 suppliers with the supplier code of conduct and a sustainability due diligence questionnaire. Sunnova is committed to quantifying its suppliers ESG impact to identify areas of improvement, assist its suppliers with their ESG journeys, and bolster ESG performances across their value chain.

Sunnova has received high marks from various ESG ranking agencies such as MSCI, with an AA ranking. Additionally, Sunnova has secured an Institutional Shareholder Services (ISS) ESG prime status ranking. Sunnova continues to be an ESG frontrunner within the renewable energy sector.

Giving back. Community engagement, such as employee volunteer activities, is encouraged by Sunnova management—and appreciated by localities.
COURTESY OF SUNNOVA

2023 ECO-LEADERS
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Thrive Home Builders

The company's first-ever ESG report serves as a wakeup call to the rest of the green housing industry.

STATS

1,023

Tonnage of carbon emissions reduced by *Thrive Carbon-Wise* building approach in 2022

377

Number of affordably priced homes built in Colorado from 2008-2022

BY VICTORIA MUHARSKY

ESG reporting has not been readily adopted across the homebuilding sector. Especially among smaller- or medium-sized production builders that are privately operated. Colorado's leading high performance homebuilder, Thrive Home Builders, is attempting to reverse that trend and lead by example with the release of its inaugural **2022 Environmental, Social and Governance (ESG) Report**.

Thrive's commitment to ESG is fueled by its desire to produce resilient, energy efficient and healthy homes for its surrounding communities in and around Denver. The company's tagline, "Homes that do more," aligns with its ESG vision and its commitment to build a house that benefits the environment, building occupants, and the community at large.

"Our ESG strategy can be summed up in three steps," says Thrive Home Builders Chief Sustainability Officer and Founder Gene Myers. "Quantify and offset our corporate carbon emissions; design and construct fossil fuel-free homes that are powered 100 percent by renewable energy; and quantify and offset the embodied carbon in the homes we build."

Thrive has differentiated itself from other locally based, privately owned homebuilders by producing 100 percent of its dwellings to the certification standards of the U.S. Department of Energy (DOE)'s Zero Energy Ready Homes (ZERH) program. All of its homes also have LEED and ENERGY STAR certifications, and are Indoor airPLUS qualified.

High energy. Thrive Home Builders' first all-electric home communities in Denver's Loretto Heights district, the *E-PWR Lite* and *E-PWR Rise Collections*, are pre-selling. The developments—the first two of four planned in the *E-PWR* series— are expected to attract homebuyers and partners, and pave the way for building innovation. COURTESY OF THRIVE HOME BUILDERS

STAR quality. Thrive Home Builders' houses are LEED and ENERGY STAR certified, ensuring that they are energy efficient and environmentally responsible. COURTESY OF THRIVE HOME BUILDERS

$80,627

Total donations to local charitable projects in 2022

> "The real impact that we as builders can have on climate action is to reduce the operational and embodied carbon emissions of the homes we build."
>
> **—Gene Myers, Thrive Home Builders founder and chief sustainability officer**

From 2013 to 2021, Thrive constructed 1,225 ZERHs, making them one of the top such builders in the U.S.

Thrive's dedication to energy efficiency and healthy homes has earned it several prestigious awards. In 2018, Thrive was recognized as a LEED Power Builder for its commitment to the green building movement. In 2022, for the seventh consecutive year, Thrive received the Indoor airPLUS Leader Award.

Most notably, Thrive is the exclusive builder in the U.S. to have received 12 Grand Housing Innovation Awards from DOE. Recipients of this award must demonstrate their continued resolve to develop innovative pathways to constantly improve ZERHs.

Thrive has tackled the social aspects of ESG with the same drive seen with its commitment to environmental concerns. The company has long-held beliefs that income should not be a barrier to owning an all-electric ZERH, and actively builds affordable housing units. Since 2008, Thrive has produced 377 affordable homes in Colorado, with the average price of all homes sold being $210,480; the national average home price nationwide was $540,000 in 2022, according to Statista Research Department.

Thrive has also partnered with several charitable organizations such as HomeAid and the Home Builders Foundation to help at-risk community members and combat the affordable housing crisis in Denver.

The implementation of ESG has enabled Thrive to further differentiate itself from its competitors. With the release of its ESG report, Thrive has demonstrated to industry peers that identifying ESG-related material risks and developing innovative ways to address those risks is important to stakeholders, and ultimately enhances financial performance.

Valuable asset. Community-positive efforts are a significant part of Thrive's ESG strategy. Here, the company is donating $103,000 to the Home Builders Foundation, a local nonprofit that modifies houses to make them more accessible for people with long-term physical disabilities. COURTESY OF HOME BUILDERS FOUNDATION

thrive HOME BUILDERS
Homes that do more.

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Trane Technologies

For Trane Technologies, integrating an ESG means successfully meeting all three parts of the roadmap.

STATS

93 million

Metric tons of CO_2 emissions reduced from customers' carbon footprint since 2019

40%

The portion of all greenhouse gas emissions worldwide generated by buildings

BY VICTORIA MUHARSKY

Trane Technologies has made the bold commitment to achieve carbon neutral operations by 2030. "As a global climate innovator, Trane Technologies has clear ambitions," notes company Chair and Chief Executive Officer Dave Regnery. "But ambition alone is not enough—we take action every day to enhance our positive impact." For Trane Technologies, that everyday impact materializes in the form of ESG considerations.

The company has developed a strategic environmental, social, and corporate governance (ESG) roadmap to ensure sustainability and social concerns are embedded in the decision-making process. The integration of ESG enables Trane Technologies to make substantial progress on its 2030 commitments.

While a 2030 deadline for carbon neutral operations is ambitious for any manufacturer, Trane Technologies has upped the ante with the "Gigaton Challenge"–a commitment to remove 1 billion metric tons of greenhouse gas (GHG) emissions from its customers' carbon footprints.

In 2020, Trane recognized that emissions from product usage were 20 times that of its operational footprint. With this knowledge and its desire to be an industry leader for climate mitigation, Trane has superseded industry standards and developed a three-prong approach to tackle these more impactful emissions.

The strategy includes updating product design to be more energy efficient, using electricity as the main fuel source, and switching to lower global warming potential (GWP) refrigerants.

On the right 'Trane'. Trane Technologies has a reputation as a global climate innovator, with a portfolio of environmentally responsible products and services that bring efficient and sustainable climate solutions to buildings, homes and transportation. COURTESY OF TRANE TECHNOLOGIES

Packaged goods. To help the Neiman Marcus Group improve energy efficiency and reduce carbon emissions at its historic Bergdorf Goodman building, Trane Technologies replaced the structure's inefficient absorption chillers with electric units. This reduced CO_2 emissions by 642 metric tons, the equivalent 138 gasoline-powered passenger vehicles driven for one year. One of the protectively wrapped e-chillers is shown here, prior to installation. COURTESY OF TRANE TECHNOLOGIES

"From our board of directors to each member of our global team, we are propelled by our purpose to boldly challenge what's possible for a sustainable world."

—Dave Regnery, Trane Technologies chair and chief executive officer

62,274

Hours donated by employees in 2022, up 96 percent from 2019

Trane has already made substantial progress by removing 93 million tons of emissions, the equivalent of 9.3 percent of total target emissions since 2019.

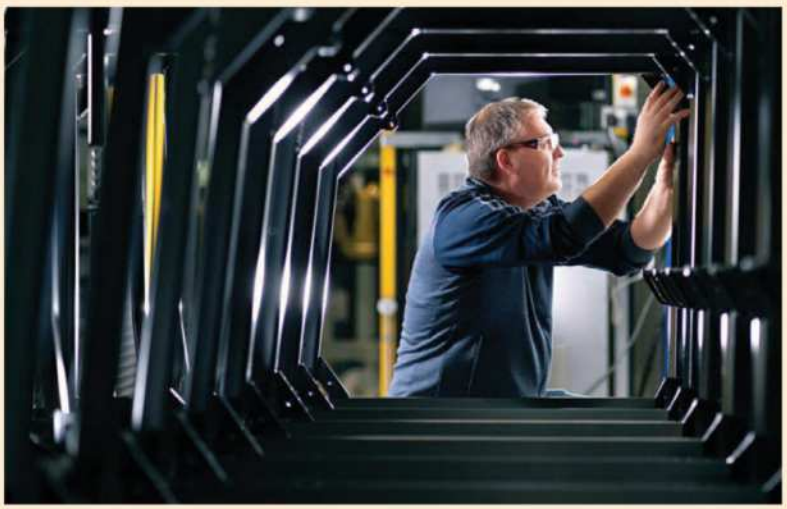
Trane Technologies' extensive ESG strategy utilizes the UN Sustainable Development Goals (SDGs) along with principles from leading ESG reporting frameworks, such as the Global Reporting Initiative (GRI) and the Sustainability Accounting Standards Board (SASB), to implement social and governance policies within its organization.

Just as seen with its environmental commitments, Trane Technologies has ambitiously set social and governance targets for 2030—most notably, a diversity, equity and inclusion (DEI) target that increases the number of racially diverse salaried employees to 50 percent of the company's entire salaried U.S. workforce by 2030.

Trane Technologies is equally committed to gender parity, with 5 out of 13 board positions being held by women.

Many companies will choose to focus on the first pillar of ESG, environmental concerns, instead of crafting a robust ESG strategy equally concerned about the E, S and G material risks. Unlike those companies, Trane Technologies continues to exemplify what a true ESG leader is, with its attention to all three pillars of ESG.

Leading by example, Trane Technologies continues to push the boundaries of ESG commitments to transform the manufacturing industry and progress to a low carbon economy.



Trading knowledge. Maintaining a technical workforce is difficult. Trane Technologies addresses the issue through actions such as educational boot camps, scholarships for dependents, and managerial employee engagement workshops.

COURTESY OF TRANE TECHNOLOGIES

TRANE TECHNOLOGIES®

2023 ECO-LEADERS
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Trex Company

A carefully planned ESG strategy now makes Trex one of a kind.

STATS

12

Percentage of management roles filled by ethnically diverse employees, compared with 10 percent in 2021

3

Number of women on Trex's board, accounting for one-third of all directors

BY GREEN BUILDER MEDIA

Although Trex Company has split in two—the wood alternative decking manufacturer sold its commercial products segment in late 2022, leaving Trex Residential as its flagship—the company's environmental, social, and corporate governance (ESG) mission remains. Trex's recently released annual ESG report highlights how the manufacturer continually integrates sustainable thinking across all areas of the business as it advances its most-material ESG priorities.

- **There is a focus on circularity and energy efficiency.** In 2022, the company upcycled nearly 340 million pounds of waste polyethylene (PE) film, retaining its position as one of the largest recyclers of PE film bags, wraps and packaging in North America. Trex has diverted and recycled more than 5 billion pounds of recycled PE film since its founding more than 30 years ago. The company is working to reduce its energy use and climate impact and is positioned to make further progress in developing a strategy for reducing greenhouse gas (GHG) emissions.
- **Trex prioritizes employee safety and career growth.** Driven by its proactive focus on improving health and safety, Trex in 2022 achieved a 50 percent decrease in its lost-time incident rate (LTIR) compared with 2021. The company also continued to invest in employee learning and development, expanding the portfolio of education for leadership, team building, occupational safety and other topics. In addition, Trex refreshed its onboarding process to provide more support for new hires on core values, workplace safety and business approach.

Sustainable example. During construction of the company's new corporate headquarters in Virginia in 2022, more than 12,750 pounds of Trex scrap material was diverted from landfill and recycled into its manufacturing operations.

COURTESY OF TREX COMPANY

Trash into treasure. Trex Company prides itself on investing in employee learning and development, and a greater focus on workplace safety.

COURTESY OF TREX COMPANY

40,000+

Hours of leadership, onboarding and professional development training completed by employees

> "Trex was founded on sustainable principles and continues to make sustainability a priority. We are committed to finding new ways to improve our ESG performance in the years to come."
>
> **—Bryan Fairbanks, Trex Company president and CEO**

- **Diversity in leadership continues.** Efforts to foster diversity and inclusion with a particular focus on management positions continued. In 2022, the company's proportion of women and ethnically diverse employees in management increased to 30 percent and 12 percent, respectively. Women also held three of nine positions on the board of directors in 2022.
- **Governance and ethics remain resolute.** The company continued to emphasize to employees at all levels the imperative of working with integrity without exception, and ensuring business activities align with Trex values. The company's governance processes ensure oversight of ESG and sustainability priorities at board level and among senior leadership.
- **Continual support of communities where Trex operates.** Trex supported a broad array of charitable organizations through donations and volunteering in 2022. The company and its employees contributed more than $300,000 to the United Way and other community-based organizations. Meanwhile, the company's *NexTrex* community recycling programs enlisted more than 3,300 schools and civic organizations to help divert nearly 2 million pounds of plastic film from landfills.

"Our success is not only driven by the quality and durability of our products, but also by their sustainability credentials," says Trex Company President and CEO Bryan Fairbanks. "An increasing number of our customers care about sustainability and try to choose products with this in mind."

Circular thinking. The manufacture of ever more environmentally friendly composite decking and railing remains at the top of Trex's operational goals for 2023 and beyond. COURTESY OF TREX COMPANY

Honorable Mentions

These companies just missed the final cut, but still deserve applause for their eco-leadership actions.

The AZEK Company

Outdoor living products maker AZEK prides itself in providing a diverse, equitable and inclusive (DEI) workplace, where "everyone feels empowered to bring their full, authentic selves to work." Approximately 60 percent of the executive team and 50 percent of the board of directors are gender and/or race/ethnically diverse; both percentages are among the industry's highest in their respective categories. The company has added implementation and adherence to an ESG as a component of individual performance under AZEK's 2022 management annual incentive plan. Meanwhile, the company has launched its *FULL-CIRCLE PVC Recycling* program to collect and repurpose construction site and remodeling PVC scrap into AZEK and TimberTech products. Ninety-nine percent of the scrap generated in its manufacturing facilities is reused; approximately 96 percent of the water used is recycled through a closed loop water filtration system. AZEK has achieved a 23 percent reduction in carbon emissions from 2019 to 2021, primarily due to increased use of recycled material in raw material inputs.

Johnson Controls

Health and technology go hand in hand at Johnson Controls. The company's *OpenBlue* platform, which began as a way to uplevel and monitor systems such as heating, ventilation, and control (HVAC); has since morphed into a tool with the ability to apply data from inside and outside of buildings, helping customers manage operations systemically. Meanwhile, Johnson Controls' Office of Diversity, Equity and Inclusion is focused on equity to ensure that all employees can access the opportunities, resources, support and networks they need to develop and succeed at their jobs. This focus will "continue to help fuel and create a culture of inclusion where the voices of every employee are heard, their contributions are acknowledged, and every employee can bring their most authentic self to work." The company has been ranked as one of the World's Most Ethical Companies for 16 years, with honors coming from professional groups such as EcoVadis, Sustainalytics, CDP, Corporate Knights, and the Financial Times, among others.

LP Building Solutions

LP's mantra of "do the right thing always" is no better heard than with its interactions with local communities. The company offers support in several ways: giving funds through LP and the nonprofit LP Foundation; donating products; volunteering or engaging with local stakeholders; and supporting indigenous communities and specific community members. The LP Foundation, in particular, has donated more than $20 million to local nonprofits and schools. Another $500,000 annually is allocated for disaster relief, grants, and sponsorships. LP employees are encouraged to give back to their communities by volunteering their time, skills and expertise through LPsponsored volunteer events or by pursuing volunteer opportunities in their own time. Employees—and their input—were also a major part of the company's ESG 2021 priority assessment, which identified the company's most-critical sustainability topics: meaningful impact on financial returns; reputational importance to LP; probability of negative outcome; LP's ability to control, influence and mitigate; importance to stockholders and importance to non-owner stakeholders.

Mohawk Industries

For several years, Mohawk Industries has emphasized carbon reduction as a primary ESG goal, and that hasn't changed (the plan still calls for a 25 percent cut in emissions by 2025). But Mohawk is two years ahead of schedule with its reduced water usage goal (30 percent cut by 2025—already achieved), courtesy of automation, analytics and remote monitoring systems. The company has also dealt with an emissions problem in the form of their diesel-fueled trucks, resolved somewhat through equipment upgrades and better monitoring of driving practices. An internal service support network helps ensure that the vehicles are properly maintained. Meanwhile, Mohawk has implemented a Supplier Code of Conduct (in conjunction with its overall human rights policy), to ensure its suppliers do not engage in practices such as child labor, forced compulsory labor, or create a workplace with coercion and harassment. A safe, hazard-free work environment is also ensured through expanded training, more effective audits and promoting best practices.

Nice North America

This smart home automation system manufacturer, through its longstanding "NiceLoveEarth" program, focuses on reducing environmental impact in two ways: decreasing the direct impact of production and commercial activities, and creating devices that minimize the environmental impact of the buildings in which they are installed. Reducing greenhouse gas emissions is a key issue; by 2025, Nice aims to be self-sufficient or use 100 percent renewable energy from certified sources and reduce carbon emissions by 50 percent. Also by 2025, the company expects a 30 percent increase in the number of women in leadership positions, to reduce the gender pay disparity by obtaining equal salary certification, and to implement a workplace health and safety management system for all manufacturing plants. Other goals to achieve by 2025 include reducing energy consumption during product use and standby, increasing the number of products powered by solar panels or batteries, and partnerships with research organizations and universities for research and development into materials and technologies with a lesser environmental impact.

Tarkett North America

Tarkett has a history of making the old new again. In 2010, the company became the first flooring manufacturer to utilize an end-of-use recycling program, *ReStart*. From 2010 to 2022, the program collected close to 114,800 tons of post-installation and end-of-use flooring, including vinyl, linoleum and carpet. A combination of new internal and external recycling technologies and a rejuvenation of the *ReStart* program, has Tarkett on track to more than double the total pounds it recycles in 2023 compared to 2022. Meanwhile, the company began using postconsumer PVB film from recycled windshields and safety glass in its modular carpet tile backing; from 2004 to 2022, Tarkett reused 40,500 tons of PVB films from 39.5 million windshields. New technologies are underway to make end-of-use vinyl flooring and carpet recycling easier, and the company is working with external recycling partners to separate post-consumer carpet, allowing each component to be recycled. Ultimately, the goal is to see recycled material used in new products as recycled raw ingredients.

Watts Water Technologies

Watts specializes in using its know-how to bring water to places that lack it. During the company's World Water Day campaign last March, Watts sponsored four Planet Water Foundation (PWF) projects in Cambodia, Indonesia and Vietnam. Each location received turnkey community-based solutions that improve outcomes for young children around safe drinking water, hygiene intervention and sanitization. Water-health and hygiene behaviors were introduced and reinforced through Planet Water's education programs, and each school received an *AquaSan*, a surface disinfection system that meets World Health Organization standards. Watts has worked with PWF since 2016 to provide clean water to approximately 60,000 people in Cambodia, China, Colombia, India, Indonesia, Mexico, Philippines, Thailand and Puerto Rico. But then, water management has always been Watts' specialty. In 2022, Watts became the first company to complete verification for The Water Council's WAVE: Water Stewardship Verified program, indicating it has assessed all water-related risk, identified the highest water-related impacts using credible water-related data, and implemented best practices in improving water-stewardship performance.

Going into 'Retreat'. The *Retreat Patio* model is part of Thrive Home Builders' *Concord Patio* homes collection, one of three featured at Sonders Fort Collins.

COURTESY OF THRIVE HOME BUILDERS

THE SONDERS PROJECT

A GREENER WAY OF LIFE

Sonders Fort Collins, a master-planned community on the cutting edge of wellness and sustainability, has recently opened to residents. Here's what they're getting for their money.

BY ERIN ARRINGTON

Nearly 20 years ago, when Actual Communities Inc. began to plan what would eventually become Sonders Fort Collins, it did so with the aim of building a sustainability focused master planned community in a city with values that mirrored its own.

"We try to build communities, not just do land development," says Bill Swalling, Actual Communities Inc.'s principal and founder.

Along the way, Actual Communities expanded its vision of how the community would serve its residents. In addition to utilizing community-wide and home-level sustainability strategies, Sonders would be a place where homeowners could age in place, and a community that promoted connection and wellness. In late 2022, construction across the community ramped up, and the first residents of Sonders moved into the 225-acre, 330-home development.

Solo style. Individuals who purchase the *Retreat Patio* model can choose to make the garage bay into a detached, self-contained dwelling on the property.

COURTESY OF THRIVE HOME BUILDERS

MINIMAL RESOURCE CONSUMPTION COMMUNITY-WIDE

Sonders was designed to be a place that provides proximity to nature at all times, as well as natural opportunities to connect with neighbors and other community members. All of the homes front or back to green belts, and the community includes an extensive trail system that weaves throughout Sonders. There are three distinct parks, each with different amenities that range from a community garden to solar flowers that produce energy for the community, to electric vehicle charging stations.

The community also implemented resource management measures that help curtail the development's water and electricity consumption. Sonders Fort Collins functions as a pseudo-microgrid, with a heavy emphasis on energy generation and storage within the community. The homes are outfitted with solar systems which produce an estimated 60-80 percent of their energy use. For any electricity not produced onsite, residents of Sonders have the opportunity to purchase 100 percent renewable energy from the local utility company.

For maintenance of the significant portion of Sonders dedicated to green space, the developers collaborated with Hines Inc., an irrigation design company that specializes in maximizing water efficiency. The irrigation system reduces the need for human intervention and maintenance by making soil amendments specific to plant types. The irrigation system works in tandem with xeriscaping, a method that can virtually eliminate the need to irrigate by exclusively using plants native to the region. The irrigation system also extends to residents' yards, combating the tendency of homeowners to overwater their lawns.

"That top 4-6 inches of soil—it's like a natural water tank we're building in the soil by maintaining healthy, living soils," says Nate Hines, president of Hines Inc. "Part of the way we facilitate that is through the irrigation system. We're able to deliver amendments to the soil and organic nutrition through the irrigation system, so we don't have people running around pumping chemical fertilizers into the soil."

HEALTHY AND EFFICIENT HOMES

Among the collaborators involved in the Sonders project is Thrive Home Builders, a Denver-based company that builds energy-efficient and healthy homes throughout Colorado. The 220 homes at Sonders built by Thrive are LEED® Certified, EPA Indoor airPLUS Qualified, solar powered and Zero Energy Ready. Among these houses are two model homes that demonstrate the highest standards of healthy and sustainable home building. The design of Thrive's homes complements the energy-saving measures implemented across Sonders as a whole.

In addition to the solar power systems, homeowners have the option to have a battery storage system installed, which allows them to charge the battery with solar energy during off-peak hours and utilizing it during peak hours. If a solar power system is overproducing at any given time—and not charging a home's battery storage system—the extra energy will go back onto the grid through net metering and be shared with the closest adjacent home.

But just as important as Thrive's energy generating and energy storage systems are the techniques used to make their homes a "tight envelope," says Bill Rectanus, Thrive's chief operating officer. "I think the biggest and most cost-effective area is the building envelope... well insulated, good windows and doors; and making sure that house conserves as much energy through retaining the heating and cool air we put into that home."

Thrive Home Builders also prioritizes the air quality of its homes. To that end, Thrive homes have specifically chosen building materials, including paint, carpet, and wood products, which are low in formaldehyde and other harsh chemicals. Each Thrive home is also outfitted with an active radon ventilation system to combat the higher-than-typical levels of radon that naturally occur in Colorado's soil.

AN INNOVATIVE PARTNERSHIP

Sonders is an age-targeted community, and the homes were designed to meet the unique needs of that demographic. The Sonders project is partnering with Colorado State University, which includes working with CSU's Institute for the Built Environment (IBE).

According to CSU's website, IBE researched evidence-based best practices for specific design and construction features that "would contribute to healthy, sustainable, age- and disability-friendly homes" as part of its **Lifelong Homes Initiative**. The guidelines were incorporated into the homes built by Thrive through subtle universal design choices that increase accessibility. These features include 36-inch-wide passage doors; 48-inch-wide hallways with optional nighttime navigational lights; power outlets set 24 inches above the floor; finish materials in wet spaces that prevent slippage without sacrificing aesthetics; and more.

Elbow room. The homes at Sonders by Thrive include subtle but significant accessibility features, such as extra clearance in front of appliances. COURTESY OF THRIVE HOME BUILDERS

CSU at large will also play an ongoing role in the community's campus-style Learning Center, which features Art, Body and Idea studios, as well as a variety of other amenities for residents. By making the Learning Center a centerpiece of the community, Sonders prioritizes not only the ability to age in one's own home, but to have ongoing access to community and learning opportunities.

CSU students have also been given the opportunity to learn from Thrive's green building practices. Recently, 20 students with the CSU U.S. Green Building Council (USGBC), a national organization that advocates for sustainable and green building practices, toured the Sonders community at the Retreat Model during its construction.

Safety measures. Thrive Home Builders incorporated a number of best practices established by the Institute for the Built Environment, which calls for aspects that contribute to healthy, sustainable, age- and disability friendly homes. These include four-foot wide hallways with optional nighttime navigational lights, power outlets that are two feet above the ground, and finishing materials that prevent slippage. COURTESY OF THRIVE HOME BUILDERS

Members of the USGBC student club met with leaders from Thrive to learn directly from a home builder producing high performance homes.

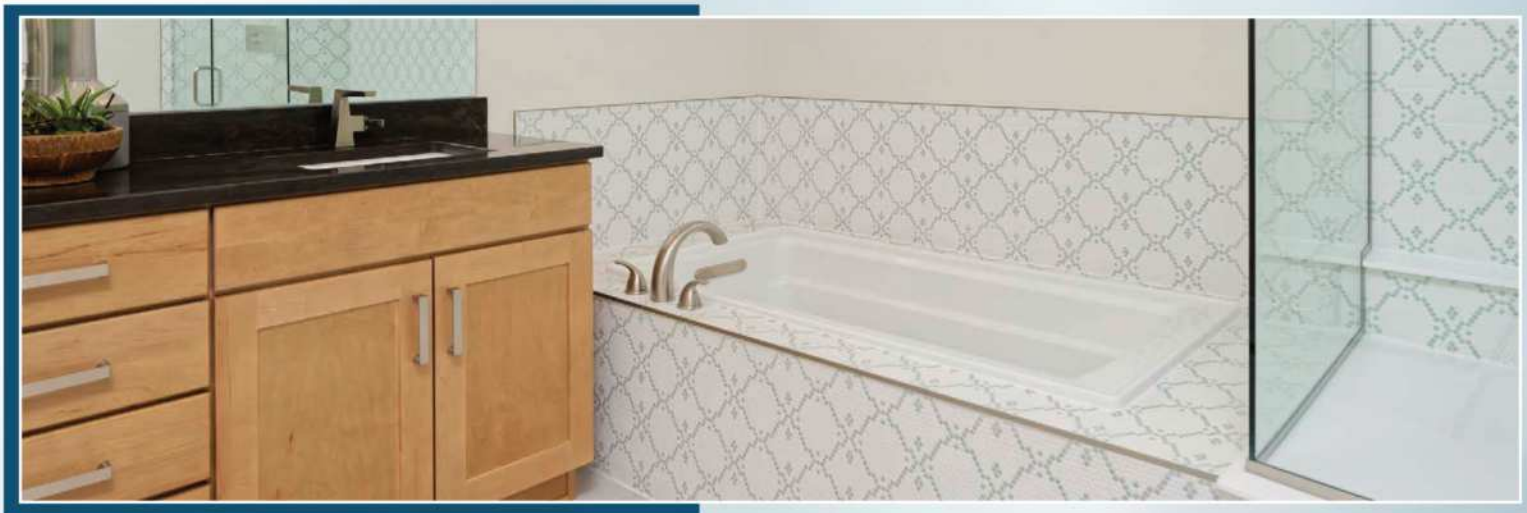
"This educational session was designed to expose student members to a wide range of green building options to have a hands-on learning experience, visit a construction project that is actively incorporating green building and sustainable practices, and to develop relationships for future internship and employment opportunities," says Shadia Lemus, director of marketing and communications for Thrive Home Builders.

Thrive's senior quality assurance manager has also been working with Dr. Svetlana Olbina, associate professor in CSU's Department of Construction Management, to develop field experience for her senior sustainability course. As part of the course, Olbina's students were led on a detailed site tour through one of the model homes and took part in a training which focused on technical aspects of building physics and construction logistics to help further the students' understanding of the practical applications of what they are learning in their in-class coursework.

Bright thinking. Spacious dual-pane windows help bring ample natural light into the homes while maintaining energy efficiency. COURTESY OF THRIVE HOME BUILDERS

Block strength. All homes include standard in-wall blocking at showers, bathtubs and toilets for potential future grab bars.

COURTESY OF THRIVE HOME BUILDERS



Durable surfacing. The primary bathrooms in Thrive's homes offer seamless zero-step showers with integrated benches and shampoo shelves. The finish materials for wet spaces were specifically selected to avoid slippage without sacrificing aesthetics.

COURTESY OF THRIVE HOME BUILDERS

Multipurpose property. Every home in the Sonders community has the option to incorporate *Thrive Carbon-Wise*. This building approach reduces a home's carbon emissions, such as through clean-generated, all-electric energy to heat, cool and provide lighting. COURTESY OF THRIVE HOME BUILDERS

Clean living. Every house in the Sonders community has the option to incorporate *Thrive Carbon-Wise*, Thrive Home Builders' carbon reduction effort which includes using clean energy to build and power the homes. COURTESY OF THRIVE HOME BUILDERS

CONNECTING TO THE CUSTOMER

Sales at Thrive's three home collections—the *Parkview Townhome Collection*, *Harmony Courtyard Collection* and *Concord Patio Collection*—have begun picking up momentum. While the Sonders community is age-targeted, Thrive says they've seen many audience demographics interested in the community who are drawn to the resort-style amenities and proximity to Old Town Fort Collins.

"One of our most recent sales was to a former Thrive homeowner, who was moving from the Denver metro area to Northern Colorado," says Lemus. "This homeowner believes in the Thrive brand and quality of home so much, they wanted their low-maintenance, single-level forever home to be a Thrive home."

Overall, Thrive's homebuyers include a primary audience of those typically interested in age-targeted homes, followed by a secondary audience of Gen X and millennial individuals whose values align with those of Sonders. All of the homes at the entrance of the Sonders community have been purchased. Several homes that have been purchased are under construction, and more homeowners are expected to move in through the summer months. **GB**

THE IMPACT OF INSULATION

At the Sonders project, Thrive Home Builders is leaning on Owens Corning insulation to help meet the community's energy efficiency, healthy home, and net-zero requirements.

A smart install. Sonders Project homes utilizes Owens Corning insulation for high-performance results in walls and attics, meaning lower energy costs.
COURTESY OF OWENS CORNING

Natural selections. Owens Corning's future goals include continued enhancement of its industry-leading insulation, roofing and composites products to make them even more environmentally friendly to builders, homeowners and businesses. COURTESY OF OWENS CORNING

BY SAMANTHA CARLIN

In the front range of Colorado, Fort Collins experiences cold winters and extremely hot summers. High-performance insulation helps modulate temperatures and offset energy demand, resulting in increased energy efficiency and cost savings.

However, temperature control isn't the only benefit insulation has to offer. Indoor air quality is extremely dependent on the quality and functionality of insulation. In Colorado, the spring and summer months are synonymous with wildfire smoke. A tight building envelope keeps indoor air quality at healthy levels and provides relief during smoky days.

As a valuable partner to Thrive Home Builders over the years, Owens Corning is providing the insulation needs for the Sonders project.

Owens Corning Marketing Leader for Residential Insulation Trey McNamee says the company is "excited to be part of a project that is aligned with our stance on high performance, sustainability, and using new innovative materials to achieve those objectives."

Specifically, the homes will be decked out with Owens Corning's *ProPink Loosefill Insulation*. The product is extremely versatile and achieves high-performance results in walls and attics. It fits every cavity, installs quickly and is a cost-effective option for powerful insulation.

The *ProPink* insulation at the Sonders project will keep residents comfortable, and heating and cooling costs down, according to Owens Corning. The product utilizes High-Performance Fiberizing Technology, which allows consumers to reach the exact R-value—a measurement of how much resistance the insulation has to heat flow—needed while using less material.

Similar to the project goals, Owens Corning is dedicated to creating products that enhance the health of residents and the environment. For example, *ProPink* insulation is free of harmful chemicals and is resistant to moisture, fungus and mold growth.

With the highest recycled content rate in the insulation industry, *ProPink* contains 55 percent reclaimed material. The product is one of 14 certified by SCS Global Services as being made with 100 percent renewable electricity.

"These certified products provide commercial architects, specifiers, builders, and homeowners with lower-carbon product options as they seek to build more sustainable structures," notes Owens Corning's Senior Vice President and Chief Sustainability Officer David Rabuano, in the company's 2022 annual sustainability report. "They also help architects design buildings with reduced life cycle impacts."

Owens Corning also has Environmental Product Declarations (EPDs) to provide transparency on their products regarding environmental and human health impacts over long-term use.

"Owens Corning takes its role as a corporate citizen very seriously," the company notes. "It aims to lead the charge as an ethical company with an industry-leading approach to environmental awareness and action." **GB**

A CITY THAT FITS

The developers of Sonders were drawn to Fort Collins's carbon neutrality goals and reputation as a city for retirees.

Natural selections. The developer's vision of Sonders aligns with the priorities of the City of Fort Collins, including in their commitment to resource conservation. COURTESY OF THRIVE HOME BUILDERS

BY ERIN ARRINGTON

According to Dan Nickless, principal at Actual Communities Inc., Fort Collins, Colorado, is not an easy place to entitle land. The city is essentially landlocked, and it has high standards for developers who want to build within city limits. For example, while many places have a one-year warranty where developers do improvements on their projects for the city, Fort Collins has a two-year minimum. The municipality also has stricter product requirements, such as wider street sections and a minimum of four product types within a community.

In addition to its more-stringent building requirements, **Fort Collins has signaled its commitment to sustainability through its Climate Action Plan**, the main goal of which is to be 20 percent below its 2005 levels of greenhouse gas emissions by 2020, 80 percent by 2030, and carbon neutral by 2050.

But for Nickless and Bill Swalling, who is also principal at Actual Communities, Fort Collins' high bar for developers is seen as less of an obstacle and more as a sign that the city's priorities align with their own and, particularly, with the vision of the Sonders project.

"For us, we saw it as an opportunity where we would have limited competition and the ability to demonstrate the value that we think we're creating within the community," Nickless says. "And that goes a long way with a city council or a planning staff or planning commission in having some congruent thought processes. We'd want to do the same kind of community they do."

According to Swalling, Actual Communities also considered Fort Collins' reputation as being a great place to retire when deciding where the Sonders project would be located.

"A friend of mine introduced us to Fort Collins, and it looked to me at that time that Fort Collins was going to be kind of an up-and-coming community," Swalling says. "It had been rated as one of the best small cities to live in the U.S. for a number of years. And if you looked at all the acknowledgements they had received over the last while, it looked like an area that would be receptive for our high quality, high amenity projects." GB

TEAM LEADERS

PRIMARY BUILDER Thrive Home Builders

DEVELOPER Actual Communities Inc.

PEOPLE

GENE MYERS
Visionary of Sonders Fort Collins and founder of Thrive Home Builders

BILL RECTANUS
Chief operating officer of Thrive Home Builders

ERIC SUNG
Director of design at Thrive Home Builders

Part 2 of a 3-part
SPECIAL REPORT

Challenges ahead. Millennials have become the prime homebuying group. But they face a slew of challenges, including finances, affordability, the economy, and even home design.

CREDIT: iStock/Rudzhan Nagiev

ROADBLOCKS AND PATHWAYS

Millennials aspire to own a home, but there are obstacles to overcome. Green Builder's survey data offers insights into problems and potential solutions.

BY MICHELE LERNER

When Vicky Weber and her husband needed to move 90 minutes from their previous community near Chicago, they knew tradeoffs would be required even though they already owned a home.

"We bought a little starter home in 2016, but three years later we moved to Lake County in the northern suburbs of Chicago," says 30-year-old Weber, **a children's book author** and writing coach. "We couldn't afford even a starter home in the town we preferred, so we bought a house in a town about 15 minutes away."

Besides swapping locations, Weber and her husband, who now have two children under the age of two, compromised by buying a fixer upper.

"We chose a house that was a little bigger than we needed and that needed work rather than buy another starter home and have to move again in a few years when we had kids," Weber says. "We were extremely frugal so we could afford the payments and to make some improvements."

Like many millennials, affordability was the biggest headwind Weber faced. Even though most millennials (86 percent) prefer to own a home than to rent, Green Builder's most recent survey of homeowners and buyers found that 24 percent of millennials say they're waiting on the economy to improve before they buy.

But while it may seem wise for someone to wait if they're uncertain about their job, their income, or whether they will stay in a home or community for several years, it may also have negative consequences. Home prices may continue to rise and mortgage rates may not fall as some prospective buyers hope. Rents may continue to increase in most markets, cutting into the ability of many renters to save for homeownership. Meanwhile, homeowners' housing payments reduce their loan balance and build equity.

AFFORDABILITY CONUNDRUM

Unless they're flush with cash, a prospective buyer will typically need to make concessions to afford a house—especially their first one. Julie Navitka, 39, owner of the **Successfully Sustainable blog**, opted for a fixer upper like Weber but chose an affordable older neighborhood in Winnipeg, Manitoba, Canada.

"In Winnipeg, many people don't want to live in or purchase a home that's centrally located because the homes are older and require more maintenance or upgrades, and because some people view the city center as dangerous," Navitka says. "There are some less-than-ideal areas, but in my opinion, too many people based this belief on rumor rather than experience."

Often, the priorities of millennial buyers run counter to affordability, says Kelly Mangold, principal of RCLCO, a real estate consulting firm based in Bethesda, Md.

"Millennials tend to look for more space because they have a growing family or want outdoor space," Mangold says. "School quality is also important, and so is living in a mixed-use community with amenities within walking distance."

One pathway out of the affordability roadblock could be a planned community in a more-distant location, as long as there's a town center nearby, Mangold says. She says young buyers are often willing to live on a smaller lot with more density as long as the home has access to parks, trails, and a few restaurants and coffee shops.

"People's priorities changed when they stopped needing to commute to work every day, so they're more willing to 'drive until you qualify' today than they were a few years ago," Mangold says.

Green Builder's COGNITION data found that the spaces where millennials spend the most time at home are outside, in a home office, and in their living room rather than the kitchen. Another pathway to affordability could be a smaller, more-efficient floor plan that emphasizes outdoor space and the home office, Mangold says.

"Builders can also consider going for a nice look while maybe cutting corners on high-end features," Mangold says. "It can be more cost-effective to focus on the things that are more noticeable and that make a house more comfortable to live in."

CLIMATE WORRIES AND REMEDIES

Location considerations are about more than affordability, though. Fifty-eight percent of of millennials said they considered moving due to climate change, according to Green Builder's survey, and 61 percent said they're concerned about climate change impacting the value of their home. When shopping for a new home, 30 percent of millennials said exposure to climate events would be one of the top three negative factors weighing against a purchase.

And yet, migration patterns show that Texas and Florida, two states prone to hurricanes, extreme heat and other climate events, continue to experience the most in-migration.

"The concept of 'intertemporal discounting' refers to the idea that we value things in the present more than the future, especially when we're making choices," says Ezra Markowitz, PhD, a professor at University of Massachusetts Amherst who researches environmental decision-making. "People are concerned about climate change but most events such as a major hurricane are rare. Even things like more torrential rain and sunny day flooding are not that frequent in any given place."

Markowitz says people tend to assume that a hurricane or major flood won't occur again in the same place, or they think someone will solve the issue before it impacts them.

Rough start? As a compromise between high cost and nearby locale, many millennials are choosing fixer uppers for their first homes.

CREDIT: ISTOCK/VIKTORCVETKOVIC

"The perceived physical and financial risk doesn't loom large enough," he notes. "If anything, people assume there will be a slow change in their property values that won't directly impact them."

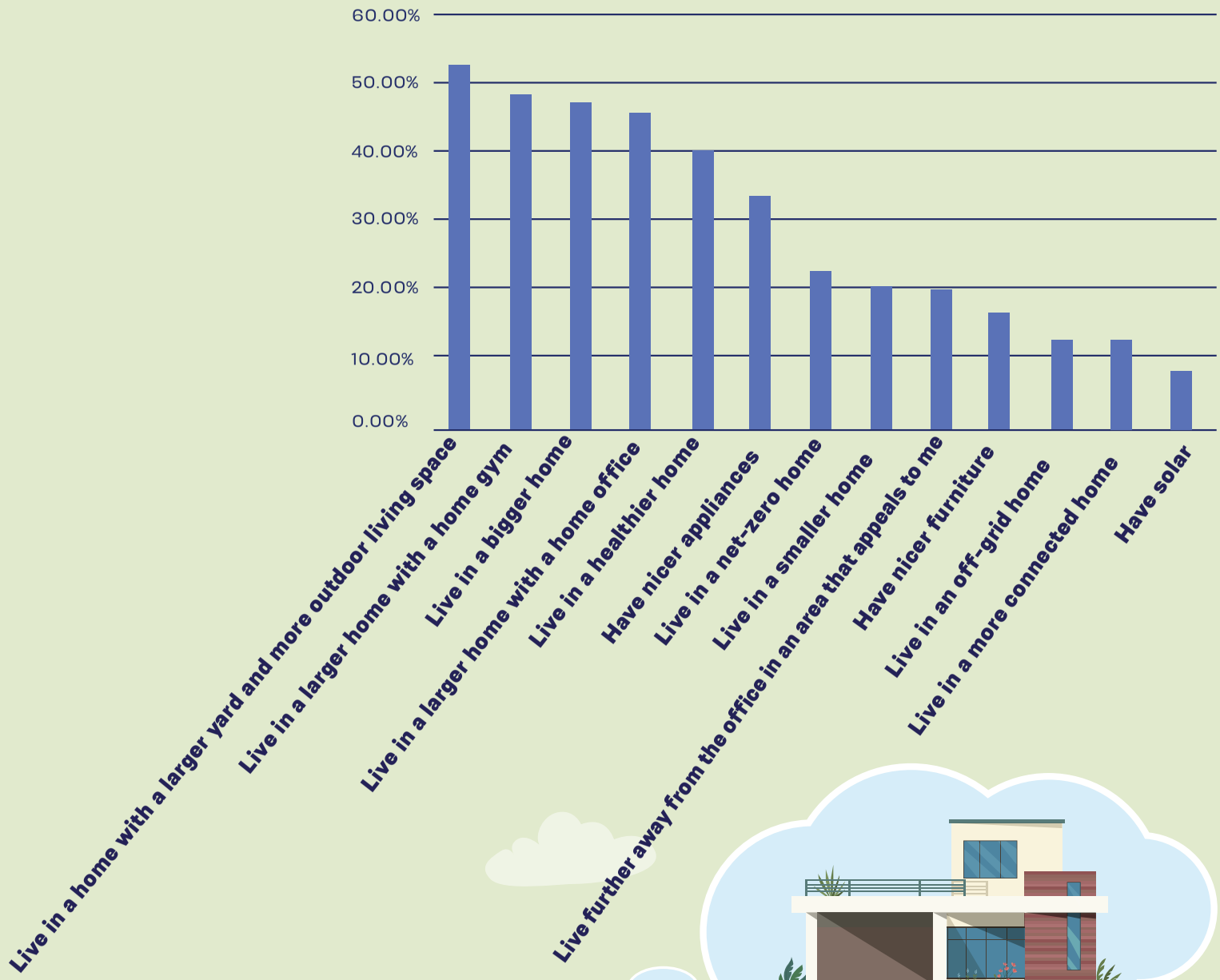
To combat that lack of urgency, Markowitz says groups such as Climate Central that provide risk information for things like wildfires, floods and sea level rise should continue to share tools with builders, real estate agents and consumers.

	Boomers	Xers	Millennials	Gen Zs
Would you prefer to own or rent a home?	79% own	82% own	85% own	80% own
Have you considered moving due to climate change?	34% yes	46% yes	58% yes	61% yes
Are you concerned about climate change impacting the value of your home?	42% yes	53% yes	61% yes	62% yes

Hot topics. The desire to own a home is consistent across the four current consumer generations. But as respondent groups become younger, concerns about climate change grow.

SOURCE : GREEN BUILDER MEDIA

Would you like to:



The bigger, the better. Millennials have many desires when it comes to home ownership. But nothing beats their overall desire for more elbow room. SOURCE: GREEN BUILDER MEDIA

When it comes to buying a house or retrofitting one with features that are resilient to climate events, Markowitz says that consumers often want sustainable features but aren't always willing to pay for them.

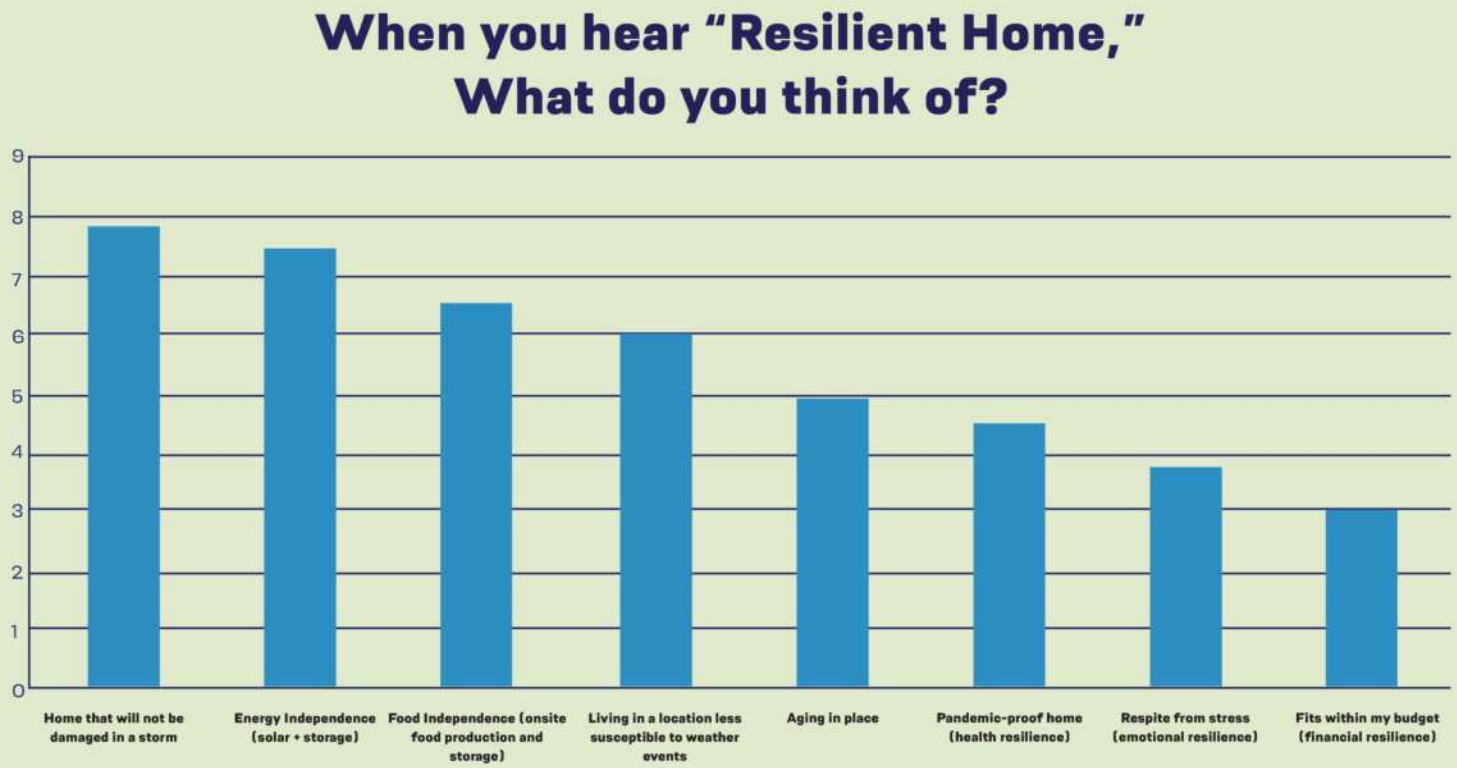
"Many things that are good for sustainability and resilience are also good for the pocketbook, but sometimes they're not that good right now," Markowitz says. "The upfront cost of solar panels or triple-pane windows can be daunting, but almost everything has a payback over time. Builders often tell people what the breakeven point is over a certain number of years, but that only works for some people. Others just don't hear it."

The challenge, according to Markowitz, is that the upfront cost is immediate and has an emotional weight as well as a financial one. He recommends offering rebates and incentives into the initial cost as a solution.

"Maybe builders can front the money and then get repaid themselves later," Markowitz says. "Builders can also use different language, such as saying 'you'll be making money in five years' from solar panels rather than talking about paying off a debt."

Mangold suggests that builders educate buyers on the sustainability and resilience features in their homes, especially if there's a premium for these features.

"In one model home, a builder cut out part of a wall to show the difference between the insulation in that home versus the average home," Mangold says.



Destruction over dollars. Among millennials, having a durable home is almost twice as important as having one that is considered affordable.

SOURCE: GREEN BUILDER MEDIA

SHARE IT BOOMER

First priority. Many baby boomers consider helping their millennial offspring in efforts to buy a home—after they have settled their own affairs.

CREDIT: ISTOCK/ZINKEVYCH

The struggle to find an affordable house in the face of high prices and high mortgage rates can be particularly frustrating for millennials related to baby boomers who are sitting on a gold mine of home equity, especially if they own more than one property. Twelve percent of baby boomers own at least one investment or vacation home in addition to the home they purchased in 2022, according to the National Association of Realtors' 2023 Profile of Buyers and Sellers. Many of those parents and grandparents intend to support the next generation if they can, even though most don't plan to sell any time soon. After all, they don't want to give up a low mortgage rate and become buyers themselves in an expensive housing market.

According to a recent survey from Bank of America, Gen Xers and baby boomers who say they'll actively help younger family members plan to:

- Give the next generation money to buy a home or give them their home to sell (38 percent)
- Pass down their home for the next generation to live in (36 percent)
- Offer to live together in a multigenerational space (12 percent)

Other options for boomers to consider, which weren't mentioned in the survey, include co-signing a mortgage, financing a purchase with a low-interest intrafamily loan, or a rent-to-own arrangement for a gradual transition to homeownership for the younger generation and some income for the older generation.

DELAY IN THE GREAT CONVERSION

Ending dependence on fossil fuels in residences by converting homes to all-electric systems is a top priority for sustainability experts and has been codified by many jurisdictions. But Green Builder's survey found that buying an all-electric home is a low priority for every generation, including millennials. When ranking features of a healthy home, less than one percent placed an all-electric home in first, second or third place. Most (60 percent) ranked an all-electric home as the 14th-most important out of 15 options.

The obstacle for many: the cost to convert.

"We have gas heat, gas cooking and a gas fireplace, so even though I would rather have an all-electric house, I have no idea what it would entail or cost to change it," Weber says. "I'd love to have solar panels, but we live in a homeowner's association that rules what we can do and how. No one has solar panels."

While it's easier for newly built properties to be designed for all-electric appliances and systems from the start, another solution is for homeowner associations and jurisdictions to encourage conversions.

"Our province, Manitoba, uses electricity rather than gas for most home features now," Navitka says. "Since our electricity all comes from hydroelectricity it's very affordable."

Navitka thinks that people with gas furnaces in her area are more likely to convert their systems to electric when they need to replace it, rather than proactively.

"Unless there's a mandate to convert to electricity, I think we'll see a more gradual conversion," Mangold says. "The way to start is to educate people about the dangers of gas in their homes and to show them what it's like to cook on an induction cooktop. People are afraid to invest in a big-ticket item like an induction cooktop if all they've ever experienced is gas."

In Amherst, Mass., the library provides induction cooktops that people can borrow to test them out, says Markowitz.

While the roadblocks of affordability, building resilience to climate events, and electric conversions exist, digging into the priorities and psychology of buyers can unveil potential pathways through the obstacles. **GB**

THIS SPECIAL REPORT WAS MADE POSSIBLE WITH SUPPORT FROM THE FOLLOWING SPONSORS

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SUSSEX
Sustainable & Attainable

COURTESY OF TIM O'BRIEN HOMES

VISION House Sussex: A Grand Plan

These new model homes will offer a real-life demo of quality and common-sense housing.

BY MARC HUMINILOWYCZ

Summer has arrived in the picturesque Sussex, Wisc. community of Vista Run near Milwaukee—a mixed-use, master-planned development with 300 home sites and 60 acres reserved for community amenities. The Vision House Sussex model home, a partnership between builder Tim O'Brien Homes and Green Builder Media, will be one of five new homes in the community. When complete, it will showcase to builders and consumers how to optimize performance, sustainability, health and wellness, intelligence and resiliency at an attainable price point.

Over the spring, Tim O'Brien crews meticulously insulated every nook and cranny of Vision House to create a high-performance building, minimize heat loss and air infiltration, protect the home from moisture, and maximize its durability. This involved multiple techniques perfected over the years: enhanced insulation in the exterior walls using a "blow-in blanket" system; filling seams in walls with caulking; installing a vapor barrier; installing baffles at truss ends for proper air infiltration in the attic; sealing the wire and fixture penetrations and top plates in the attic with spray foam to thwart drafts and moisture; and filling the attic with 17 inches of loose, blown-in fiberglass insulation to minimize heat loss.

"We chose the Vista Run community for Vision House Sussex and the other four homes because it appeals to our home buyers, who are typically looking for nearby amenities like schools, shopping and proximity to the interstate

Planning ahead. The Vision House Sussex will demonstrate how to effectively and affordably optimize performance, sustainability, health and wellness, intelligence and resiliency. COURTESY OF TIM O'BRIEN HOMES

highway, along with walkable on-site trails, swimming and gathering places," says Tim O'Brien.

O'Brien adds that Vision House is being built on a developer lot that was strategically selected for the purpose of marketing the home to drive-by traffic, and for optimum solar orientation to allow for electricity generation and storage supplied by an array of solar panels on the rear (west) and front (east) sides of the home. "Vision House gives us the opportunity to provide suitable roof space for solar panels, and the developers have been pretty good at allowing panels on the front of our homes," he says.

The home is two stories, with a master bedroom on the main floor and three bedrooms on the second. As to its floorplan and design, Vision House, like every Tim O'Brien home, was designed first and foremost with specific high-performance metrics in mind. "For example, we stay away from cantilevers to avoid cold floors in overhangs," O'Brien says. "For the garage placement, we try pick the best opportunity for good solar orientations for the home by putting them on the left or right side of the house, without compromising affordability and customer preference."

Water conservation was another consideration in the design of Vision House. Although landscaping and drip irrigation in garden beds and lawns was included in the model home, Tim O'Brien Homes typically leaves this up to the homeowner. However, with the entire community on municipal water and sewer, there were two opportunities to reduce the home's water consumption and improve the quality of the water effluent. All water fixtures in O'Brien Vista Ridge homes are low-flow EPA WaterSense certified. And water softeners, required because of the hard municipal well water, are on-demand, with regeneration based on occupant use.

"In response to an EPA concern about too much softener salt making its way into watersheds, we're participating in a pilot project with the Madison Metropolitan Sewage District, using Guthrie and Frey (GF) *Ultra Series* softeners that reduce sodium chloride intake, and thereby the amount of salt going into the sewage system," says O'Brien. Using less salt and water during regeneration, the units are 40 percent more efficient than standard water softeners. This saves users money on detergents, soaps, shampoos and water use, while decreasing their home's environmental impact.

Worth its salt. Guthrie and Frey (GF) *Ultra Series* water softeners, which reduce sodium chloride intake and the amount of salt going into the sewage system more efficiently than standard models, are available if desired during the home's construction. COURTESY OF TIM O'BRIEN HOMES

PRODUCTS THAT PERFORM

With energy efficiency, indoor air quality, comfort and durability in mind, Tim O'Brien Homes carefully selected a number of market-available and cost-effective high-performance products for its Vision House. These include:

CARRIER DUAL FUEL PERFORMANCE MULTI-ZONE HEAT PUMP AND GAS FURNACE

This dual fuel system will include the only gas combustion appliance in Vision House—fan energy-saving *Carrier Performance 96* condensing gas furnace with smart electronics and multi-stage capabilities. This system, according to Tim O'Brien, will be used to heat the home only on the coldest days.

Thanks to its multi-zone heat pump, the Carrier system will reduce the home's carbon emissions by utilizing electricity instead of fossil fuels most of the time, keeping it cool in the summer and warm in the winter, down to 5 degrees Fahrenheit. As a multi-zone system, up to five multiple-style *Carrier Performance High Wall Indoor Units*, supported by one efficient outdoor inverter compressor unit, deliver warm and cool air to each room. Controlling this system is **CARRIER'S ECOBEE *THERMOSTAT WITH INTELISENSE* AND VOICE CONTROL**, which tailors itself to homeowners' schedules, comfort preferences and outside weather.

RHEEM *PROTERRA HYBRID WATER HEATER*

In the U.S., the average household spends $400 to $600 per year on heating water, which makes up about 18 percent of its total energy costs. Using less energy to operate than a classic 100-watt incandescent light bulb, the ENERGY STAR-certified Rheem *ProTerra Hybrid Water Heater* in Vision House can save homeowners up to $490 per year in energy costs. Over 10 years, that adds up to almost $5,000. Featuring heat pump technology, energy use tracking, energy saving and demand response scheduling, vacation and away mode settings, advanced diagnostics and built-in Wi-Fi technology, *ProTerra* is four times more efficient than a standard electric tank, producing fewer greenhouse gas emissions.

RENEWAIRE ENERGY RECOVERY VENTILATOR (ERV)

The energy recovery ventilator (ERV) in Vision House, which some builders describe as a "fresh air machine," continually replaces stale indoor air with fresh outdoor air cleaned of dust and allergens by replaceable filters on central heating appliances and air conditioning units. Using balanced airflows and recovering otherwise-expended total energy, warm and humid outside air is precooled and dehumidified in the summer. In the winter, cold and dry outside air is preheated and humidified. This results in less energy needed for conditioning and ventilation, as well as cleaner and healthier indoor air, better health and wellbeing, and cost savings for the occupants, and greater cost savings.

ENERGY STAR WINDOWS

The windows installed in Vision House are recognized as an energy-efficient product by ENERGY STAR, a national program run by the U.S. Environmental Protection Agency and the U.S. Department of Energy. The frames are made of vinyl, a cost-effective material that doesn't rust, corrode or decay. The glass is double pane. To reduce heat transfer, the space in between the two panes is filled with argon gas and warm edge spacers surround the perimeter. A thin, low-emissivity (low-e) coating on the exterior pane of glass limits the ultraviolet light entering the home while allowing for the passage of visible light. This coating keeps the home from overheating in summer while protecting furniture and flooring. And, weatherstripping surrounds the operable section of the window to minimize the intrusion of air, moisture and pests.

JINKOSOLAR PANELS AND SOLAR STORAGE

This energy system in Vision House Sussex, consisting of solar panels, batteries and a power inverter, will allow the homeowner to have backup electricity in case of power outages and "peak shaving"—economizing electricity rates by charging during off-peak times and using the batteries during on-peak. An array of sleek black JinkoSolar *Eagle Continental* solar panels generates a maximum system voltage of 1500Vdc, producing up to 400 watts per panel. One of the most durable solar panels on the market, Eagle Continental features a frame that will stand up to Category 3 hurricanes and tempered glass that is designed to withstand hailstones larger than a golf ball. JinkoSolar's *Eagle RS* fully-integrated, DC-coupled inverter manages the power from solar generation and stored electricity from a Li-ion lithium ferrophosphate (LFP) battery. It featurestwo energy capacity options—13.1 kilowatt hours (kWh) and 26.2 kWh—and a high-power output of 7.6 kilowatts (kW) in all operation conditions to meet a great variety of homeowner needs.

INDUCTION COOKTOPS

With a brand and model still to be determined, an induction cooktop will be part of the kitchen in Vision House. Up to 10 percent more efficient than a conventional stove, an (electric) induction cooktop gets its cooking power and precision from induction technology, which generates energy from an electromagnetic field below the glass cooktop surface to transfer current directly to magnetic cookware, causing it to heat up. With performance superior to standard cooktops, it offers fast heat (boiling water in about half the time) and superb simmering capabilities. **GB**

Photos courtesy of United Way of Long Island.

A VETERAN EFFORT

The 'Housing for Heroes' Project is a safe, stylish haven for homeless

Making the most of shade. The "Housing for Heroes" project was not well situated for solar due to the number of existing trees on the lot. To overcome that situation, the house was carefully constructed to Department of Energy (DOE)'s Zero Energy Ready Home (ZERH) criteria.

BY GREEN BUILDER STAFF

Providing homeless veterans with a home that is healthy, safe, durable, and energy efficient enough to keep down operating costs for the sponsoring agencies, even on spendy Long Island, were all part of the wish list for Rick Wertheim, senior vice president of Housing and Green Initiatives for the United Way of Long Island Housing Development Corporation. To make it happen, Wertheim built an award-winning, four-bedroom, two-bath, 1,936-square-foot group home in Medford, N.Y.

Wertheim is no stranger to high-performance home construction, having built 20 homes to the exact requirements of the U.S. Department of Energy (DOE)'s Zero Energy Ready Home (ZERH) program since joining it in 2015. In fact, every one of the five or so homes a year built by the United Way organization is certified to the program criteria, according to Wertheim.

LOCATION LIMITATIONS

Most United Way homes include solar panels on the roof and are considered net zero energy homes because they produce as much power as they use over the course of the year. This home, known as the "Housing for Heroes" project, was not well situated for solar due to the number of existing trees on the urban infill lot. However, Wertheim was still able to achieve a HERS Index score of 33 for the structure, far better than the 80 to 90 score typical of most just-to-code homes.

To achieve the low score, Wertheim constructed Housing for Heroes to ZERH criteria, which requires builders to meet the checklists for ENERGY STAR Certified Homes and the U.S. Environmental Protection Agency (EPA)'s Indoor airPLUS program. The dwelling also conforms to items such as the hot water distribution requirements of the EPA's WaterSense program; the insulation requirements of the latest International Energy Conservation Code adopted in the state; target HVAC and water heating efficiencies; third-party-verified air sealing targets; installation of Energy Star

Triple play. A "thin triple" window consisting of two glass window panes and a thin center layer of stretched clear plastic film provide insulation values similar to a traditional three-pane window.

TOP RIGHT

Interior elements. The home meets all EPA Indoor airPLUS requirements, including use of low- or non-volatile organic compound (VOC) paints, low-formaldehyde solid wood and plywood cabinets, and hard-surface luxury vinyl tile flooring.

BOTTOM LEFT

Access minded. Because its residents may have physical disabilities, much of the house is ADA compliant, with features such as lower-placed thermostats, higher-placed electrical outlets, and 36-inch bathroom doors with roll-in showers.

appliances, windows, and lighting; and ducts in conditioned space. Homes must also have solar panels installed or have the conduit and electrical panel space in place for them, even though this one is not the best candidate for such a requirement.

EFFICIENT HEAT AND AIR PREPARED

In addition, Wertheim chose some exceptionally high-performance equipment for the house. The home's space heating is provided by a ground source heat pump, a 2.1-ton system with a central air handler. The heat pump has Coefficient of Performance (COP) of 5.47 and an average energy efficiency ratio (EER) of 26.04. The system's cooling efficiency is rated at 22 SEER, far above the 13 SEER required by minimum federal standards. Rigid metal ducts are in the insulated basement or buried under 14 inches of blown insulation in the attic.

The builder uses a U.S.-made "thin triple" window consisting of two glass window panes and a thin center layer of stretched clear plastic film. The windows are primarily double-hung style and use insulated vinyl frames with an argon gas fill and low-emissivity coatings on two of the glass surfaces. These windows provide insulation values similar to a triple-pane window with a U-factor of 0.17 but without the weight.

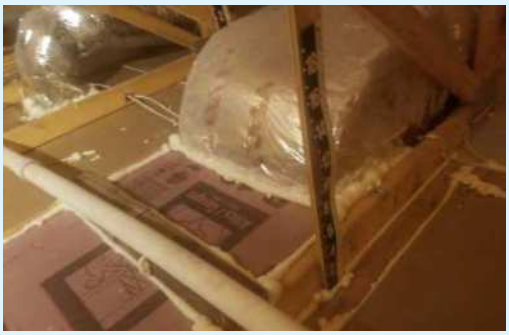
The home's walls are constructed of 2-by-6 studs installed at 24 inches on center. The walls incorporated advanced framing techniques such as 2-stud corners with drywall clips, open and insulated headers, and ladder blocking at interior wall intersections to reduce the amount of lumber needed and to provide more room for insulation.

After the studs were placed, the walls were sheathed with 1-inch-thick graphite-enhanced EPS rigid foam insulation board, then topped with 7/16-inch oriented strand board (OSB). Then the wall cavities were filled with 2 inches of closed-cell spray foam sprayed against the EPS. The remainder of the wall cavities were filled with 3.5 inches of loose-fill blown fiberglass insulation held in place by a membrane. This was covered with 5/8-inch gypsum board covered with latex paint, which serves as a class II vapor retarder. This wall assembly provides an insulation value of R-28. The exterior sheathing was covered with house wrap and PVC clapboard siding. Liquid-applied flashing was used around all doors and windows.

The truss roof used raised heel trusses to allow full space over the exterior walls' top plates for insulation. The vented attic was filled with 14 inches (R-49) of blown cellulose insulation. Soffit and ridge vents provide venting. The cathedral ceiling of the great room has scissor trusses.

The builder achieved a low air leakage of 1.44 air changes per hour at 50 Pascals (ACH 50), with exceptional air sealing practices, including spraying closed-cell spray foam directly to the backside of the rigid foam wall sheathing in each wall cavity, installing gaskets at the top and bottom plates, and installing rigid foam blocking between trusses at the eaves and gun foaming it in place. All interior wall top plates were spray foamed after the ceiling gypsum board was installed. The floors were air-sealed at the rim joists, with closed-cell spray foam where the gasketed plates and floor joists meet the foundation wall, and all floor-to-floor penetrations and bypasses were gun foamed or fire caulked.

Designed for sufficiency. Advanced framing techniques such as dual-stud corners, open and insulated headers, and blocking at wall intersections provide more room for insulation.



Sealed inside. The home has low air leakage thanks to practices such as spraying closed-cell spray foam directly to the backside of the rigid foam wall sheathing, and installing rigid foam blocking between trusses and gun foaming it in place.

The exterior walls sit on an 8-inch poured concrete foundation that is protected with a roll-on capillary break over the footings, and an elastomeric foundation waterproofing on the home's exterior. This was then wrapped with 2 inches of EPS graphite-enhanced foam insulation. The above-grade portion of the EPS was protected with fiberglass-reinforced panels.

IN-HOUSE ENERGY SAVERS

A whole house dehumidification system was installed for swing-season humidity control, when the thermostat was not calling for cooling. An energy recovery ventilator and exhaust fans are connected to each other and to sensors; they are controlled from a ground source heat pump control system. The heat pump air handler has a MERV 13 filter at the main return.

The home is equipped with a 50-gallon heat pump water heater with a Uniform Energy Factor (UEF) of 3.75. The geothermal (ground source) unit provides backup hot water. The water heater is in the basement and uses a central manifold distribution system with PEX piping to speed water to hot water taps.

The refrigerator, dishwasher and clothes washer are all Energy Star qualifying.

The whole home is certified to EPA WaterSense program standards, which requires water saving features such as the use of WaterSense-labeled plumbing fixtures, efficient hot water distribution, and smart or predictive irrigation. All stormwater roof runoff from downspouts is collected in a subsurface leaching pool system.

Housing for Heroes was designed to be ADA compliant, with aging-in-place features that include a universal-design kitchen with knock-out panels for future sink base cabinet modifications, lower-placed thermostat heights, higher-placed electrical outlets, 36-inch bathroom doors with roll-in showers, lever handle sets for doors, with color contrast between kitchen cabinets and the counter tops for the visually impaired. There are no stairs to enter the home; entrants instead rely upon a grade-level porch and doorway.

The home meets all EPA Indoor airPLUS requirements, including the use of low- or non-volatile organic compound (VOC) paints, and solid wood and plywood cabinets that are low-formaldehyde products. Hard-surface luxury vinyl tile flooring is used throughout the home. An indoor air sensor is provided to measure particulates, VOCs, and humidity in the home and send results to a smartphone and connected HVAC system.

AFFORDABLE AND AVAILABLE

"Healthy, affordable housing should be universally available and attainable for all Americans," Wertheim says. "It should not be an afterthought or a zoning concession."

The United Way calls dwellings such as Housing for Heroes, "attainable housing," because they are a convergence of affordable and high-performance sustainable housing. "High-performance homes are, in fact, healthier homes to live in," he says. "Not only do you get superior energy savings and comfort, but [DOE ZERHs] are detailed to provide better indoor air quality and a healthier indoor environment."

The builder is well aware that this, like all of his United Way projects, is funded with public or donated funds, and he stresses that the energy efficiency and resiliency built into these homes support the goal of responsible stewardship of those funds over the life of the project.

A GENEROUS EFFORT

This home was built on land donated by Suffolk County from a tax foreclosure of an existing home that was later torn down. Construction funding was provided by the New York State Homeless Housing Assistance Program. The group home will be operated by the not-for-profit Association of Mental Health and Wellness.

"This project is 'affordable' because it provides the taxpayers of New York with a cost-effective housing solution for homelessness," said Wertheim. "Typically, homeless individuals are placed in shelters or transitional housing facilities, like a motel. These options are costly and not conducive to a healthy lifestyle for the occupants."

BOTTOM-LINE BENEFITS

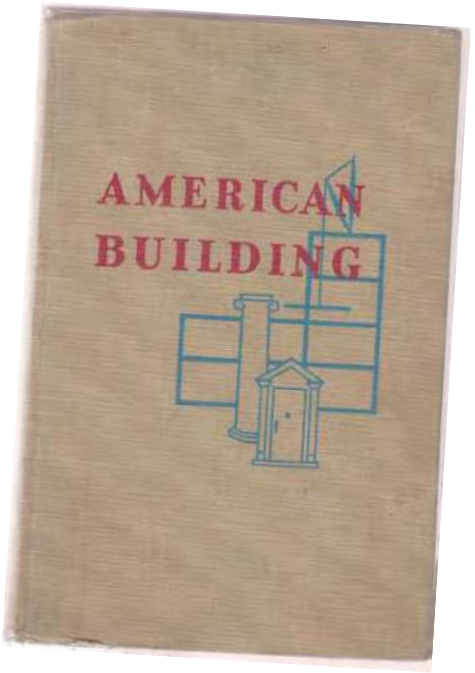
A DOE Zero Energy Ready-certified home has sustainable energy savings, lower operational costs for the Agency, and a better quality of life for the residents. When stable, supportive housing is provided, occupant health (both physical and mental) increases, and health care costs are reduced. "These cost savings to taxpayers are long term," Wertheim says.

Like all of his United Way projects, Wertheim used the construction of this home as an opportunity for training via workforce training programs that Wertheim operates through United Way. Those training programs include the U.S. Department of Labor YouthBuild program for low-income young adults, and the VetsBuild program for veterans. GB

Green Buildings

and the Forces That Shape Them

Technology, architecture and education combine to make sustainable construction more efficient than ever.



BY TERRY BEAUBOIS

Sometimes it is the combination of technological advances that allow for significant advances in the building industry. A key example goes back 75 years, with a book by James Marston Fitch, "American Building: The Forces That Shape It."

Few books have influenced the fields of architecture and construction more than the original edition of this classic. Originally published in 1948, it details the relationships between structures, their inhabitants, and the technological, environmental and historical forces that shape buildings.

Fitch's writing and work inspired me throughout my school years and professional practice to pay attention to these design elements. Similar forces are shaping sustainable green buildings, including an increase in sustainable products and improvements in computer technology that gives us access to this knowledge.

For example, the introduction of steel into construction of buildings was significant and would allow for the creation of taller buildings. But it wasn't until Otis invented the safety passenger elevator that buildings were built taller than 5 or 6 stories high. This is because people weren't willing to walk up more than 5 or 6 stories. It was the combination of steel construction and the convenience of the newly invented Otis elevator that allowed the age of high-rise buildings to begin.

ADVANCES IN PRODUCTS/MATERIALS AND COMMUNICATION TECHNOLOGY

Technology continues to have its effects on how the building industry is advancing. We are beginning to see combinations of technological advances creating major opportunities to contribute to and benefit from understanding and implementing new technologies in the creation of green buildings and their focus on sustainability. Keeping up with these developments is imperative for builders and architects. It's never been easier to access this information online and in print.

Today, there are more products and materials than ever before that allow buildings to address the issues of sustainability of people and the planet. In addition, the technology of information management has advanced to the point where computer-based tools are entering every aspect of accessing information, organizing and exchanging information. Everyone has a cell phone, our most immediate connection to advancing information. The recent success of technologies such as Zoom calls also have increased our ability to share and exchange information. The new technological advances are enhancing and streamlining the practice of green building for those who choose to avail themselves of these new technologies.

These are the forces today that are advancing green building:

1. Technological advances in products and materials.
2. Technological advances in the way that builders and architects can easily access information about these products and materials on the internet.
3. Increasing awareness of review and approval agencies that can now require sustainable, green products to be used in a building.
4. Increasing awareness on the part of clients/building owners of the benefits of sustainable, green products for use throughout their entire building.
5. These factors are leading to the creation of the next major advance in green building.

A great resource for architects and builders is **Green Builder Magazine's March/April 2023 issue**, its Sustainable Products of the Year edition. The annual salute to the best green innovations provides significant information about what products to consider for a sustainable project. Another great resource is Green Builder Media's free resource guide, **"The 2023 Homeowners' Handbook of Green Building & Remodeling."**

Additional advances in the near future will further increase each of our abilities to contribute to and benefit from the advances successfully in our own practices in green building.

THE COMING 3D INTERNET / "INDUSTRIAL METAVERSE"

This coming evolution in the capabilities of the Internet will allow websites to display and deliver actual 3D object files easily to everyone, including products and materials, just as the 2D internet can deliver 2D information today. Perfect for the building industry.

Combining the advanced technological capabilities already existing in 3D computer gaming and social media technology with the needs of business and industries, the "Industrial Metaverse" will allow builders and architects easy access to information of value to us, in a form that is easy to ingrate into our workflow and share with our clients, consultants and subcontractors. Serious businesses including Nvidia, Nokia, Google, Lowe's, Pixar, EPIC Games, and Trimble, as well as Adobe, Autodesk, Microsoft, Siemens, Sony, and Schneider Electric. More than 2,400 other companies are already working on the Industrial Metaverse technology.

The building industry is one of the most 3-dimensional ones on Earth. Imagine being able to drag and drop product information directly from a 3D website onto your digital drawings and documents, and integrate them immediately into drawings and data sheets for your projects, and clients and subcontractors.

The Industrial Metaverse will create instant access to products, materials and important related information about dimensions, clearances, installation instructions, and hookup locations that we can immediately incorporate into communications among project team members for our designs and construction projects. This will significantly increase our efficiency and effectiveness on our projects. The 3D internet/ Industrial Metaverse will be the biggest transformative advance in architecture and building since the combination of steel structures and elevators. **GB**

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

CREDIT: iStock/3DSculptor

GERM WARFARE

Breathe easier. The pandemic made disinfection of surfaces and air even more crucial than earlier efforts at indoor purification.

Here's how builders can ensure there are effective antimicrobial protections in all of their new homes.

Growing concerns about microbes and cleanliness in the post-pandemic world have sparked a rapid rise in interest in sustainable antimicrobial technologies and odor control solutions for cleaner living. To help meet needs, the construction industry is placing more emphasis than ever on incorporating these technologies into new and existing buildings.

Indoor cleanliness is critical in our homes where our families spend most of their day. There are countless surface treatments we already use specifically to help reduce the growth and spread of microbes. However, standard cleaning products and surface disinfectants often have limited residual activity in high-touch point areas—such as faucets, door frames and handles, countertops, walls, and floor tiles—once they dry. But what if homes could be developed with materials that can stay cleaner between washes by providing ongoing antimicrobial product protection?

THE HUNT FOR CLEANER BUILDING PRODUCTS

Universal preventative measures that continually reduce contaminants and never wear away could be the ideal solution. Building materials—ranging from sealants, grouts, and decorative paints to flooring, insulation, door hardware, and light switches—often stain, crack, smell, accumulate dirt, and break down prematurely, resulting in damaging, long-term consequences. This is because these products often include substances such as starches, organic adhesives, and cellulose sugars that can serve as nutrient sources, encouraging the growth of bacteria, molds and mildews.

Architects and building specifiers are therefore increasingly seeking products that feature built-in antimicrobial technologies or coatings capable of protecting materials to keep surfaces cleaner and fresher for longer. At the same time, building specifications in the construction sector are becoming increasingly stringent, requiring improved levels of durability, making the use of antimicrobial technologies to protect against premature material degradation a sound investment.

HOMES WITH 'ALWAYS ON' ANTIMICROBIAL PRODUCT PROTECTION

Silver and zinc have long been used for their antimicrobial properties in many industries because they are effective at low concentrations against bacteria, yeast, and molds. These additives work at a cellular level,

continually disrupting the growth and reproduction of microorganisms.

More recently, silver- or zinc-based additives have been incorporated into a wide range of products during manufacture to provide continuous antimicrobial protection, ensuring that surfaces stay cleaner, smell fresher, and last longer. These sustainable antimicrobials can be incorporated into products to never wash off or wear away or be applied as a coating that adheres to a surface, providing the perfect complement to routine cleaning with surface disinfection products.

Built-in antimicrobial solutions and coatings effectively act as a barrier to help reduce the growth of microbes, improving overall environmental cleanliness. Reports such as "**Anti-microbial coating innovations to prevent infectious diseases**" and "**Anti-microbial agents and microbial ecology**" confirm that statement.

Selecting a supplier with in-depth knowledge of global regulatory requirements can also help manufacturers navigate the complexities of biocidal regulations in various geographical markets. For example, it is crucial to select an antimicrobial solutions provider whose products are registered with the Environmental Protection Agency (EPA) in the U.S. or notified with the Biocidal Products Regulation (BPR) in Europe.

SUSTAINABILITY IN OUR HOMES OF THE FUTURE

The improved product integrity offered by antimicrobial protection also fits with today's environmentally conscious world, where there is an ever-increasing focus on sustainability. Using building materials treated with "always on" antimicrobial technologies makes new or renovated properties more attractive to buyers, and it has longer term benefits.

The treatments incorporated in these products provide enduring protection by slowing the growth of degrading microbes—such as molds and mildews—keeping building materials cleaner, reducing odors, and promoting longer product life. Extending the product life of the material reduces the expenses and environmental costs associated with premature repair or replacement. This translates into decreased material consumption and reduced wastage, helping to shape a cleaner, greener planet.

However you look at it, the implementation of built-in antimicrobial technologies and coatings in the construction industry is a win-win situation—from protecting properties for owners to offer greener building practices. The main aim now is to implement these sustainable products in every household around the world to ensure cleaner and more sustainable living. **GB**

This article appears courtesy of KDM Communications, a specialist scientific marketing agency offering creative design and compelling content for its clients.

Good air guardians. Products designed to provide enduring protection against microbes such as molds and mildews are expected to boom in popularity thanks to COVID-19.

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COMING NEXT ISSUE

Building Science

Our annual coverage of innovation and technology takes on new urgency this year, as we highlight housing-related research and products aimed at mitigating the effects of the worsening Climate Emergency.

CALLING ALL Next Generation Influencers!

Green Builder Media invites you to participate in our Next Generation Influencer Group of young professionals – today's and tomorrow's leaders. This diverse group has the ear of corporations, building professionals, and national policy makers who want to meet the social, environmental and economic needs of the 21st century. We will talk about what tomorrow's homes, products, and policies need to look to protect your future and keep your family safe.

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

IS THE CIRCUS IN TOWN?

Or is it just the clowns again?

In a familiar-sounding and exaggerated report boasting about its most recent display of saber-rattling, the National Association of Home Builders (NAHB) has provided yet another embarrassing helping of that same old stale messaging to the members and observers by claiming that the organization has sent a **"strong message to Congress on regulations."** Right.

The news of that powerful statement arrived in the form of an email, just one more in an endless stream of pointless, banal memos. These are intended to massage those members concerned about attempts from outside the industry to enforce rules, regulations and the kinds of requirements that virtually every industry must abide by. It's all in an ongoing effort to keep those dues dollars and other forms of financial support flowing.

Before you assume that NAHB has the ear of Congress, let alone the attention or respect of that body, this feeble message was actually delivered to the House Financial Services subcommittee. The current board chair teed up the same broken record that the association has been playing for decades and once again tried to rewrite the dictionary by substituting "affordability" for what is actually nothing more than profitability.

The testimony demonized many of the familiar targets... energy codes, Waters of the U.S., the Endangered Species Act, and FEMA. But, it added topical ingredients such as transformer standards proposed by the Department of Energy (DOE), property and casualty insurance woes, and efforts to eliminate future installations of gas stoves as part of larger electrification efforts (the latter item a transparent case of scratching the back of an ally organization, the American Gas Association).

Interestingly, NAHB attempted to make its case by taking a flaccid swipe at environmental, social, and corporate governance (ESG), claiming that such mandates "impede the housing industry's ability to increase the production of quality, affordable housing." Without explaining why, the organization promotes the notion that "supporting environmental, social and governance policies" are inherently bad for housing, but more importantly, such forward thinking must be especially dangerous for trade associations that exist primarily to preserve the status quo and do everything in their power to thwart progress.

All of this newfound wisdom is coming from an organization that lacks even enough integrity to accurately report its own membership numbers, which they have been inflating for most of this century. Consistently strangers to the truth, many trade associations are notorious for their selectivity when presenting data, and in the event that the existing evidence doesn't support their stated goals, they simply manufacture their own.

The anchor dragging and fearmongering are nothing new, the only things that really change in this pathetic saga are the names of the movements emerging in society and the programs that are created to implement the changes. Meanwhile the mainstream shelter industry as we know it is largely stuck in the 19th century, with little inclination to move forward.

If you are thinking of becoming part of an industry organization to improve your odds of success, please look at the broad spectrum of groups that you have to choose from. Associate with those who share your values and sense of responsibility for taking care of more than a financial bottom line. And in case your existing membership affiliations are up for renewal, I encourage you to ask yourself if your current alignment reflects your desire to be part of larger solutions and not just a chest-thumping part of the problem.

I suppose we can all be forgiven if we laugh aloud at the endless stream of gigantic shoes, polka dot bow ties, rubber noses and baggy pants that climb out the door of that tiny car. But, it's actually a very sad act that needs to be retired and replaced with something more up to date: an attraction based on integrity, authenticity and professional accountability. **GB**

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