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GREEN BUILDER®

November/December 2024 / www.greenbuildermedia.com

STATE OF THE INDUSTRY

Our annual deep dive into the data looks at trends, buyer sentiment and market potential. Where is the industry headed?

ALSO IN THIS ISSUE

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Housing Scene

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HOMEBUYING^{AND} PARENTHOOD: Rising Costs Are Driving Families to Delay Both

Half as many families are buying homes like they did in the 1980s. They can't afford both kids and housing.

just finished reviewing a [report](#) from the National Association of Realtors, which has found that only 27 percent of recent homebuyers have a kid under 18 in the household. That's a shocking drop from previous years, declining 30 percent from 2023. In 1985, 58 percent of home buyers had kids.

To put that in context, you have to look at the spiking costs to raise children. That price has blown way past what is considered "affordable." The Department of Health and Human Services puts that amount at 7 percent of a family's income. But many families already pay about 30 percent of their monthly income toward childcare—more than they spend on housing.

The report contains dozens of other eye-opening takeaways. Here's a sample:

- Recent buyers who purchased new homes were most often looking to **avoid renovations** and problems with **plumbing or electricity** at **42 percent**. Buyers who purchased **previously-owned homes** considered them a **better value** at **31 percent**.

- The **median distance** between the home that recent buyers purchased and the home they **moved** from was **20 miles**. This is down from the 2022 report of 50 miles but remains elevated from the distance of 15 miles seen from 2018 to 2021.

The desire for owning a home is still strong in younger

generations, but families with children see their prospects slipping away. What can be done, if anything?

Oddly, the path to greater homebuying power for young generations may require those in the building industry to support progressive programs they might not normally endorse or even think about it. These might include subsidies, after-school programs and the like, to reduce family expenditures, laying the financial groundwork for a home purchase. A middle class family that can't save the 10 percent down payment for a new home will remain in the rental category indefinitely.

Another angle is to help families that are stretched thin financially at the homebuying stage by offering them high-performance homes. Reducing energy and water bills can remove a lot of stress for families that can't control other inflationary costs.

Hard choices, but solutions do exist. Buying a home is not the same as buying a car or a new lawn mower. It's a lifestyle choice that has to balance with other dreams and intentions. For Americans to have both, they need a new sense of shared responsibility, not more roadblocks. **GB**



Matt Power
Editor-in-Chief

matt.power@greenbuildermedia.com

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Moving
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VISION House® Austin: Designed for Resilience



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To learn more about this this future-looking project, visit:

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AI Enters the Recycling World

A new robotic sorter offers cities a faster, more-efficient way to process renewable goods.

Sorting through aluminum for recycling in Chicago just got easier, courtesy of AI. Startup EverestLabs has developed a robotic sorter that uses 3D depth-sensing cameras as it works on a recycling conveyor line. Within 12 milliseconds, the AI software can tell what the objects are and what types of packaging they contain, and communicate with the robot to recover the item immediately. The unit can sort recyclables about three times faster than a human, according to EverestLabs CEO J.D. Ambati.

The sensors can also measure an object's size, density and weight, enabling the unit to further classify how to sort various materials. Aluminum is the most-common type of recyclable found, but it's at the bottom of Chicago's recycling effort. The company notes that the city's recycling rate is only 9 percent; the nation's rate is about 30 percent. In contrast, nations like Brazil and Germany are at 100 percent.

Recycling aluminum can reduce greenhouse gas emissions by up to 95 percent compared to raw material extraction. This makes AI-based



A 'sorted' effort. EverestLabs' robotic sorter uses AI to identify recyclables from regular waste on an assembly line—a far more efficient process compared to human hands. CREDIT: COURTESY OF EVERESTLABS

sorting systems valuable for environmental goals, Ambati notes. Chicago's goal is to divert 90 percent of its waste to landfills by 2040. **GB**

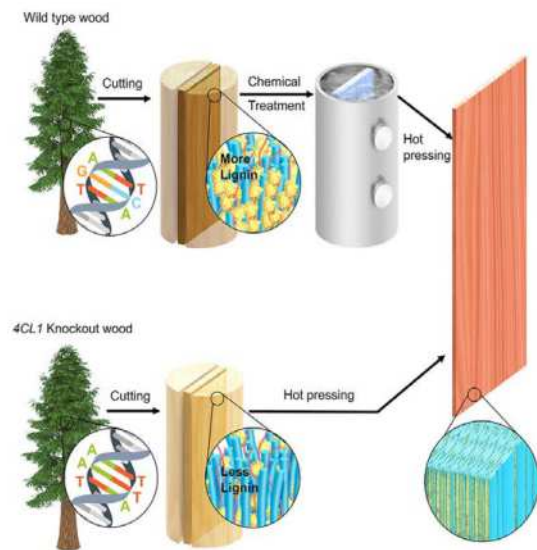
Science Tests Sustainable Stability

The University of Maryland's stronger, more-durable and greener form of wood could give builders a new way to do business.

Scientists at the University of Maryland have created a form of genetically engineered poplar wood that is as strong as chemically treated wood or aluminum in terms of tensile strength. The finding could revolutionize green construction practices, according to Yiping Qi, associate professor at the school's Department of Plant Science and Landscape Architecture.

Researchers used base editing to alter a genome in poplar trees that deals with the production of lignin, a polymer that stabilizes the structure of cell walls in plants and aids in the transport of water and nutrients. The genetically modified compressed wood is denser and more than 1.5 times stronger than untreated natural wood. Its tensile strength is comparable to aluminum used in construction.

The conventional process of transforming wood into the stronger genetically engineered variety—which results in a reduction in lignin—is energy intensive and requires use of numerous chemicals that can harm the



New and improved. Conventional delignification, above, uses chemicals that consume a lot of energy and create significant waste, posing sustainability issues. Genome-edited poplar trees with lower lignin content, below, reduce environmental impact and offer a more-sustainable solution for processing engineered wood.

SOURCE: UNIVERSITY OF MARYLAND DEPARTMENT OF PLANT SCIENCE AND LANDSCAPE ARCHITECTURE

environment. UM's technique prevents the lignin's development, making it more environmentally friendly, Qi notes.

Research findings are available at [ScienceDirect.com](https://www.sciencedirect.com) **GB**

Companies Going Silent About Greenwashing

Firms worldwide are making fewer false environmental statements, but there are still some repeat offenders.

Greenwashing—the making of false or misleading statements about the environmental benefits of a company’s product or practice—decreased by 12 percent worldwide during the year ending in June 2024. This is the first such decrease in six years, according to research from ESG data technology firm RepRisk. The company notes that the decline is likely the result of increased regulatory measures and companies engaging in “greenhushing”—where they do not communicate sustainability efforts—out of fear of pushback from stakeholders, especially consumers, investors and regulators.

While the prevalence of incidents has fallen, the number of severe greenwashing cases has increased by 30 percent, indicating there is still work to be done, according to Philipp Aeby, RepRisk’s CEO and co-founder. The research also indicates that 30 percent of all companies linked to green-



washing in 2023 were also flagged in 2024.

Decreases ranged from 4 percent in the United Kingdom, to 20 percent in the European Union. In the U.S., greenwashing actually increased by 6 percent from 2023 to 2024, after a 10 percent drop from 2022 to 2023. One possible explanation for the divergence is an increased politicization of environmental, social, and governance (ESG), where some companies have become more cautious about promoting their green credentials, while others are opposed to considering ESG criteria in investments, according to RepRisk. **GB**

Hurricanes Helene and Milton Still Causing Damage

The storms are over, but the environmental effects will be felt for years.

In addition to billions of dollars in property damage, the two hurricanes that hit Florida in late September and early October—Helene and Milton—have created an environmental nightmare for residents of Florida, Georgia and neighboring states. The storms hit some earth-hazardous areas, including a retired nuclear power plant, several paper mills, fertilizer factories, and oil and gas facilities. Waste materials and contaminated water flowed throughout the regions, as well as lethal bacteria such as *e. coli*, putting survivors further at risk.

Researchers at Rice University say it’s not the first time this tragic situation has happened, nor will it be the last. In a report in *The Conversation*, the researchers called for tighter regulations on the storage and release of chemical pollutants, and greater access to disaster-related



Unseen hazards. Biological and chemical threats posed by floodwaters include *e. coli* from overflowing sewage systems and toxic soil pushed into clean drinking water areas. **CREDIT: ISTOCK/BILL MC MANUS**

information. “Hazardous releases remain largely invisible due to limited disclosure requirements and scant public information,” they wrote. “Even emergency responders often don’t know exactly which hazardous chemicals they are facing in emergency situations.”

In addition, the climate crisis, driven by the burning of fossil fuels, is increasing the frequency and intensity of extreme weather events, and likely contributed to the hurricanes’ development, according to a report in *Inside Climate News*. Such events have long-term implications, with environmental damage effects still being felt 15 years later, the report notes. **GB**

Renewable Energy Production Triples Over 10 Years

Most of the growing interest in wind and solar is occurring in the Southeast.

The United States produced more than three times as much solar, wind and geothermal power in 2023 than it did in 2014, with growth in all 50 states, according to “[Renewables on the Rise 2024](#),” an online dashboard by thinktank Environment America Research & Policy Center (EARPC), and Frontier Group.

“Renewables on the Rise 2024” compiles information from various sources to detail progress over the past decade in six areas—wind, solar, electric vehicles, electric vehicle charging, energy efficiency and battery storage—that will be key to transitioning to a future powered entirely by clean and renewable resources, according to Johanna Neumann, EARPC senior director. The findings have “exceeded even the sunniest expectations,” she says.

Findings include Texas, California, Iowa, Oklahoma and Kansas as the top five states for total renewable energy generation. In 2023, 15 states



Ever-greater news. The benefits of solar panels, wind turbines, electric vehicles and battery storage are reaching people in all 50 states at an exponentially growing rate. CREDIT: ISTOCK/FREERK MEYER

produced 30 percent or more of the electricity they used from renewables, up to power more than 4.6 million average U.S. households. **GB**

Residential Smart Water Meter Boom Ahead?

A new study predicts a 67 percent increase in sales by 2033, courtesy of water conservation needs.

The market for residential smart water meters is expected to grow from \$3 billion in 2024 to \$5 billion by 2033, according to a report by marketing and advisory firm Guidehouse Insights. Market growth is attributed to the technology’s increasing appeal to water utilities looking to reduce costs and manage water usage as the demand for water conservation rises. AI-powered platforms are also reshaping how meter technology is quickly and effectively processing data collection for billing, while identifying potential issues.

A rising demand in water conservation is driving the market for smart water meters as shifting climate patterns result in water scarcity and severe droughts in arid regions, the report notes. While barriers to smart water meters remain—including privacy and security issues and high initial



Thinking ahead. Smart water meters such as the Flo by Moen are expected to boom in popularity due to water conservation efforts and the emergence of AI technology. CREDIT: COURTESY OF MOEN

investment costs—urbanization and emerging automatic meter reading (AMR) and advanced metering infrastructure (AMI) solutions will drive the market over the next decade. Industry players wanting to increase adoption must implement strong security measures while investing in high end communication networks.

The report is available on the [Guidehouse Insights website](#). **GB**

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EDITORIAL OFFICES

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

GENERAL INFORMATION

admin@greenbuildermedia.com

GREEN BUILDER MEDIA LEADERSHIP

Sara Gutterman CEO
sara.gutterman@greenbuildermedia.com
303-246-8890

Ron Jones President
ron.jones@greenbuildermedia.com

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

ADVERTISING SALES

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

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?

For assistance, please contact
Mary Kestner, Production Manager
mary.kestner@greenbuildermedia.com

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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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This holiday, give a gift that keeps on giving – to the Earth! With climate disasters and record-breaking heat waves becoming the new normal, Green Builder Media is offering two eco-friendly gift ideas that spread joy while making a difference for the planet.



Scan for more details.

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What Now?

Our **2025 State of Sustainable Building** report has a different angle this year, due to given economic conditions and the results of the Presidential election.

2025

BY SARA GUTTERMAN

Green Builder Media's annual State of Sustainable Building study has a different flavor this year than it did in 2023: Builders are optimistic, consumers are wary, and green building is unstoppable.

Despite persistently high housing costs, inflation and mortgage rates, the housing market remains strong. Production builders are growing even larger, gaining market share and reporting healthy profits, even as they adopt more rigorous green building practices. Construction professionals, consumers, manufacturers and

other stakeholders are playing a role in the decarbonization of homes and buildings.

No doubt, with the upcoming administration change, some green building professionals will be concerned about probable rollbacks of energy codes, emissions reduction requirements, and environmental protection policies.

However, most green building progress happens at a local, municipal and state level, and there are powerful forces at play that will ensure its continued momentum. **Let's dive in and look at some of those key factors.**

1 The regulation of embodied and operational carbon emissions from homes and buildings in the U.S. is poised to explode as states and municipalities implement policies to meet 2030 climate goals. Examples of cities that have set aggressive zero carbon emissions targets by 2030 include Aspen, Colo., Burlington, Vt., Madison, Wisc., San Francisco, and Santa Monica, Calif. Other cities like New York City, Los Angeles, San Diego, Washington D.C., Boston, Seattle, and Houston have set 40-50 percent emissions reduction goals by 2030, and aim to reach net zero emissions by 2050.

These cities are relying largely on energy efficiency improvements, electrification of buildings and transportation, and adoption of renewable energy to reach their climate goals by 2030. As they inch closer, they're deploying a variety of codes, regulations and policies that will lead to the rapid decarbonization of homes and buildings, driving up demand for high-performance products like HVAC systems, water heaters, windows, doors, insulation, lighting, and appliances, as well as solar, storage, and demand side energy management systems.

On target. Cities such as San Francisco plan to meet a self-imposed 2030 deadline for net zero emissions through energy efficiency improvements, electrification of buildings and transportation, and adoption of renewable energy. CREDIT: FLICKR/BEN SALTER



2 Most green building codes, regulations and policies are developed and enforced at the municipality and state levels. This allows for tailored approaches that address the unique environmental, economic and social needs of specific regions. Cities and states often lead the charge in green building initiatives, setting standards for emissions reductions, energy efficiency, electrification, water conservation, sustainable materials, resiliency, and indoor air quality to reduce the environmental impact of new and existing structures. This localized control empowers municipalities to respond to local climate challenges, such as water scarcity or extreme temperatures, and to drive innovation in sustainable building practices.

Local authority actions. Cities typically handle green building initiatives, setting standards for emissions reductions, energy efficiency, water conservation, sustainable materials and more. CREDIT: ISTOCK/YURIY T



3 Energy efficiency saves builders and consumers money. A growing number of large production builders are figuring out how to construct homes that are ENERGY STAR or Zero Energy Ready Home (ZERH) certified in order to access 45L tax rebates and incentives. Even with increased upfront investments for high-performance products such as HVAC systems, water heaters, appliances, lighting, insulation, and windows, builders are finding ways to make money by tapping into these incentives. From a homeowner perspective, energy-efficient homes, especially those with demand-side energy management systems, solar, and storage, yield lower monthly utility bills and higher resale values.



Dollar sense. Homes with demand-side energy management systems, solar, and various energy efficient appliances are financial boons to builders and owners alike. CREDIT: ISTOCK/SOLSTOCK



Powering down. In many markets, renewable energy is now available at a lower cost per megawatt-hour than coal or natural gas plants. CREDIT: ISTOCK/VANIT JANTHRA

4 Renewable energy has reached a critical milestone, whereby solar and wind (and, in some markets, hydro) are now cheaper than fossil fuels in many regions. This shift is due to advancements in technology, economies of scale, and declining costs of renewables and battery storage systems.

Over the last decade, the cost of solar power has dropped by about 80 percent, while wind energy has become increasingly affordable due to larger and more-efficient turbines. In many markets, renewable energy projects can now provide electricity at a lower cost per megawatt-hour than coal or natural gas plants. In addition, renewables come with low operating costs since, unlike fossil fuels, they don't require fuel extraction, transport, or emissions management. Battery storage is also advancing rapidly, making it possible to store and supply renewable energy even when the sun isn't shining or the wind isn't blowing.

5

Climate commitments will continue to be driven forward as aggressively as ever by progressive mayors, governors and individuals who understand the economic, environmental and social benefits of climate action—as well as the grave risks of inaction. In cities across the world, mayors are taking the lead by setting aggressive emissions targets, implementing renewable energy projects and investing in sustainable infrastructure.

Most urban centers, which account for a significant portion of global carbon emissions, are on the front lines of climate change, experiencing the direct impacts of extreme weather, sea-level rise, superstorms, flooding, wildfire, and drought. Many local leaders recognize that inaction is not an option, as the costs of climate inaction—disrupted economies, public health crises, and damaged ecosystems—far outweigh the investments needed to combat climate change.



Hard lesson. Cities, one of the biggest contributors to climate change, are also experiencing its critical impacts, such as superstorms and mass flooding.

CREDIT: ISTOCK/ONURDONGEL



Smoke screen. Companies that are setting net-zero goals include surprises such as Philip Morris International, which topped Forbes' 2024 list of net zero leaders. CREDIT: SIMON DES CC 4.0

6 **Businesses are also stepping up, understanding that sustainability is a moral duty and a strategic advantage.** Companies across sectors are setting net-zero goals, reducing emissions, and investing in clean technologies to future-proof their operations. Many companies realize that consumers, investors, and employees increasingly value corporate social and environmental responsibility, which drives brand loyalty, enhances reputation, and attracts top talent.

7 At the individual level, people are increasingly adopting sustainable practices in their homes and daily lives. The goal is to reduce waste, conserve energy and choose eco-friendly products. Public support for climate action has never been higher, and communities are pushing for stronger policies and solutions that address the climate crisis head on. **GB**



The big picture. Sustainable practices such as home gardens are increasingly important to Millennials and Gen Zs because of the long-term implications to the environment. CREDIT: ISTOCK/ALEKSANDR NAKIC

BY THE NUMBERS:

SEVEN WAYS

THINGS ARE LOOKING UP FOR BUILDERS



The 2024 State of Sustainable Building COGNITION survey reveals that builders are in a better position this year when compared to 2023.

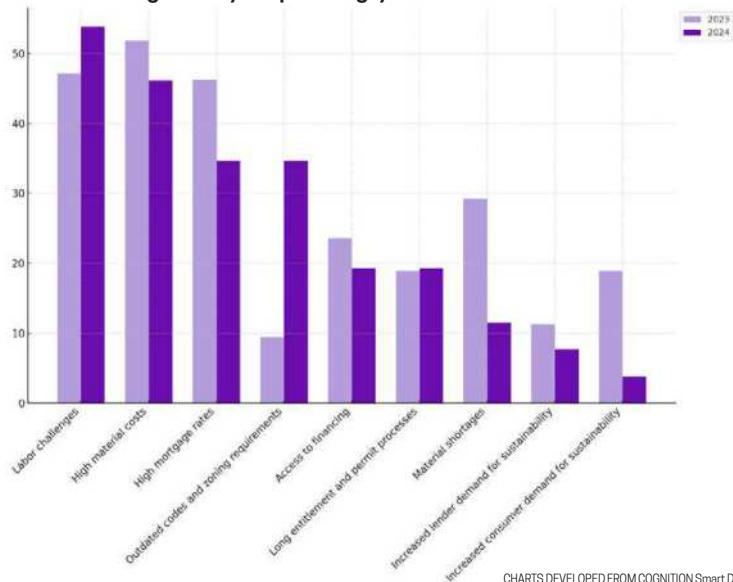
Overall, builders have a positive sentiment with respect to market conditions: While they recognize that home prices and mortgage rates remain high—fueling affordability concerns—they claim that low inventory, cooling inflation, a robust jobs market, and solid housing fundamentals give them confidence that the housing market will remain strong.

Builders also report that they are addressing affordability challenges by standardizing their options to streamline costs, buying down mortgage rates for homebuyers, and building smaller homes at lower price points in secondary and tertiary markets.

More than 75 percent of builder respondents feel optimistic about the long-term prospects of the housing market. Nearly 85 percent of them point to a solid construction backlog that they believe will carry them into 2025 and beyond.

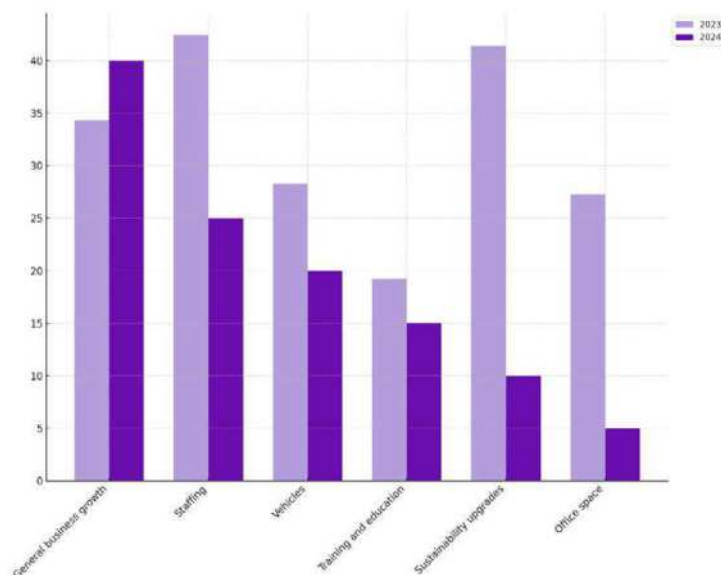
Here are other signs that the future is a brighter one for builders:

Which is negatively impacting your business the most?



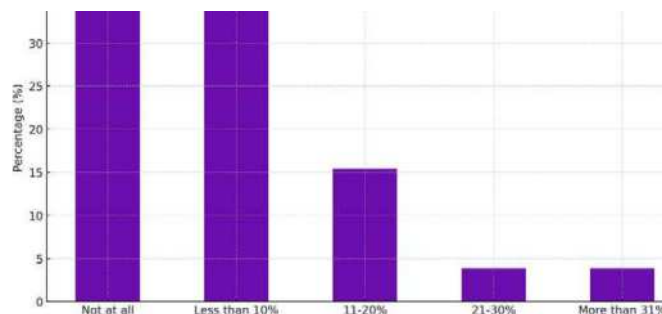
Improved outlook. Builders say that they've been less impacted in 2024 by material shortages, high material costs, high mortgage rates, and challenges accessing financing.

Have inflation and high interest rates caused you to curb spending in any of the following areas in your business?



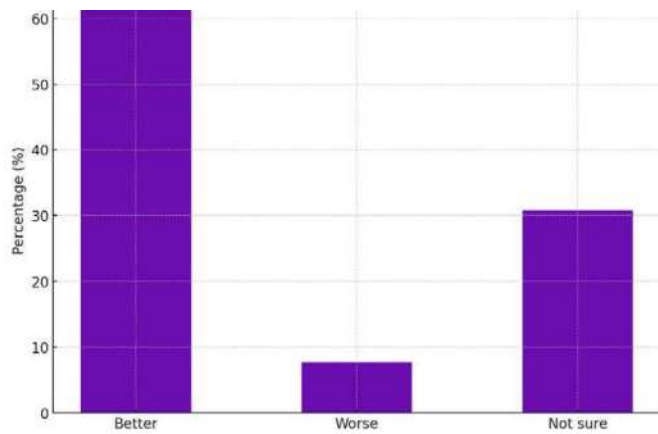
Money to spend. Respondents are also struggling less this year. In 2023, more than 40 percent of builders claimed that they had to cut back on sustainability upgrades. In 2024, that number plummeted to 10 percent.

How much have inflation and high interest rates caused you to cut back on monthly business spending?



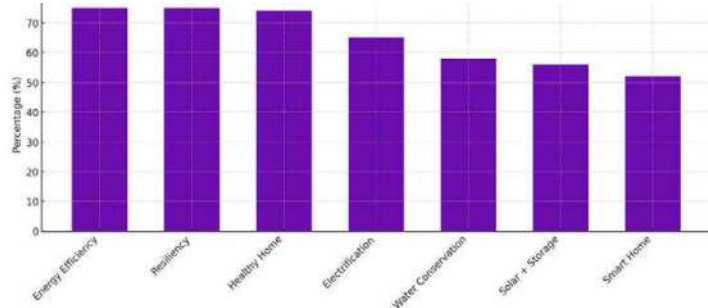
Expenses down. In 2023, most builders reported that they had to cut back on monthly business spending by 11-20 percent. In 2024, 40 percent said they didn't have to cut back at all.

Do you think the economy is getting:



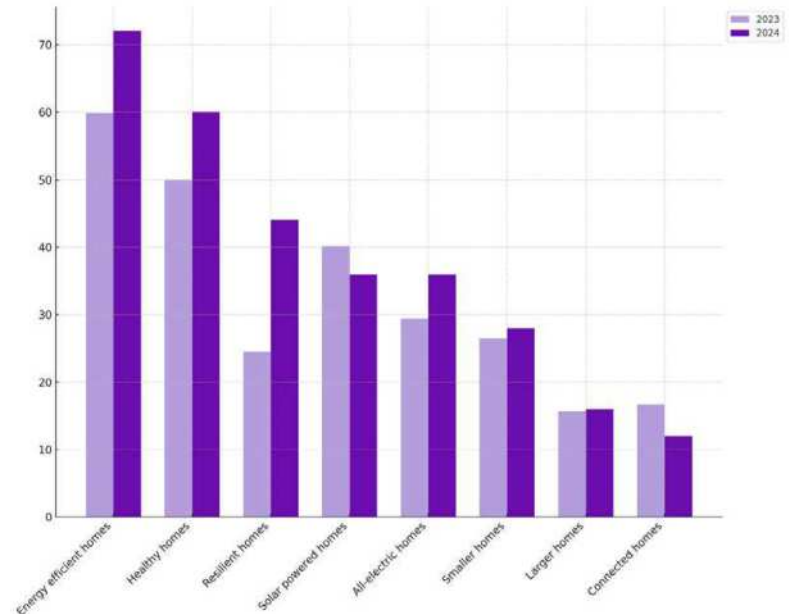
Optimism rules. Builders are generally feeling bullish about the economy. Approximately 60 percent believe things are getting better. Less than 10 percent believe conditions are worsening.

Are your clients willing to pay more upfront for sustainability upgrades if they will lower the ongoing cost of homeownership over time?



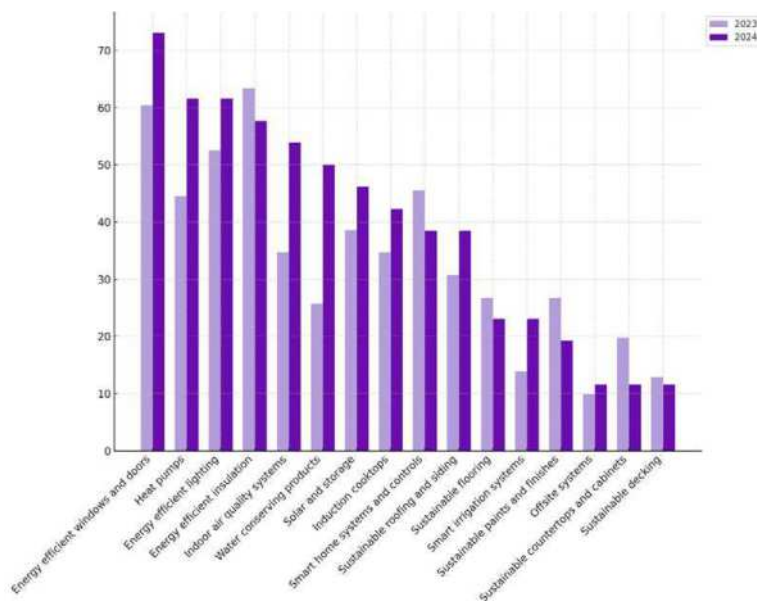
Open to upgrades. Builders assert that their homebuyers are willing to pay for sustainability upgrades like energy efficiency, resiliency, healthy home, and electrification if they will lower the cost of homeownership.

How has consumer demand changed in your market? Do buyers want:



Popular attributes. Builders report a year-over-year increase in demand for sustainability features like energy efficiency, healthy homes, resiliency, and electrification. **GB**

Are you seeing increased demand for any of the following?



Efficiency first. Builders say buyers are asking for more products like energy efficient windows, doors, lighting, heat pumps, solar + storage systems, induction cooktops, and more.



BY THE NUMBERS:

Nine Signs of Tighter Times Ahead for Consumers

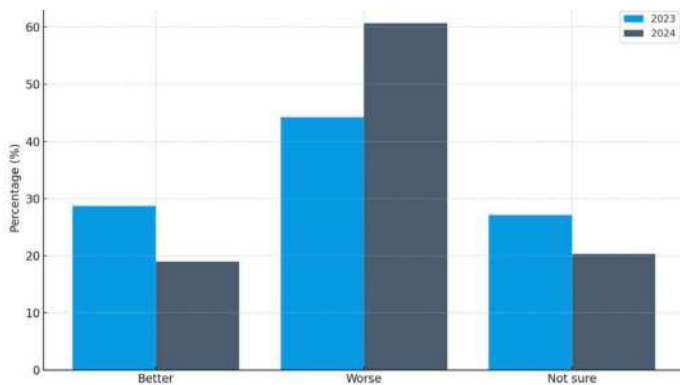


CREDIT: ISTOCK/ARTISTGNDPHOTOGRAPHY

C Optimism waning. Insurers are less optimistic this year than builders. They're certainly feeling the pinch of inflation, high home prices, and elevated interest rates.

Nonetheless, consumer interest in sustainable homes continues to grow. In fact, financial conditions are driving increased awareness about operating and maintenance costs, and more frequent and intense climate events are amplifying awareness about the benefits of resilient building. These two dynamics are translating into an enhanced willingness to invest in upgrades like energy efficiency, electrification, healthy home, water conservation, resiliency, smart home, and solar + storage.

Overall: Do you think the economy is getting:

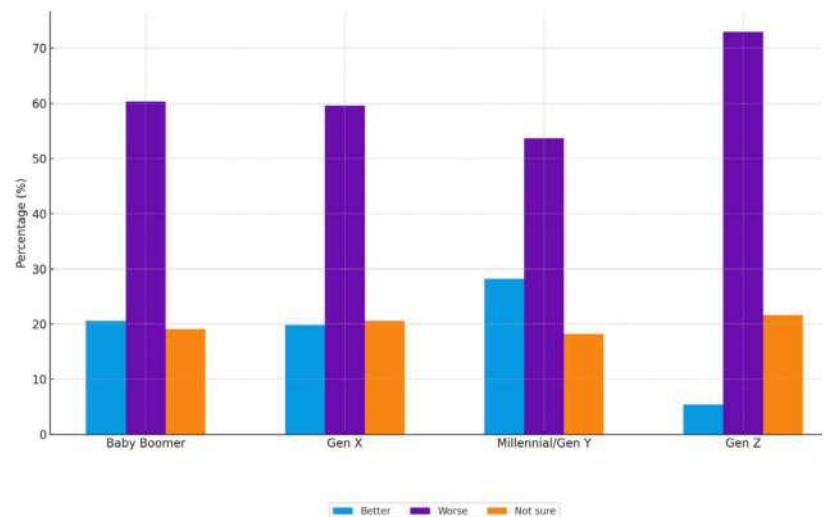


CHARTS DEVELOPED FROM COGNITION Smart Data

Pessimism rises. Unlike builders, 60 percent of consumers think that the economy is getting worse—nearly 15 percent more than last year.

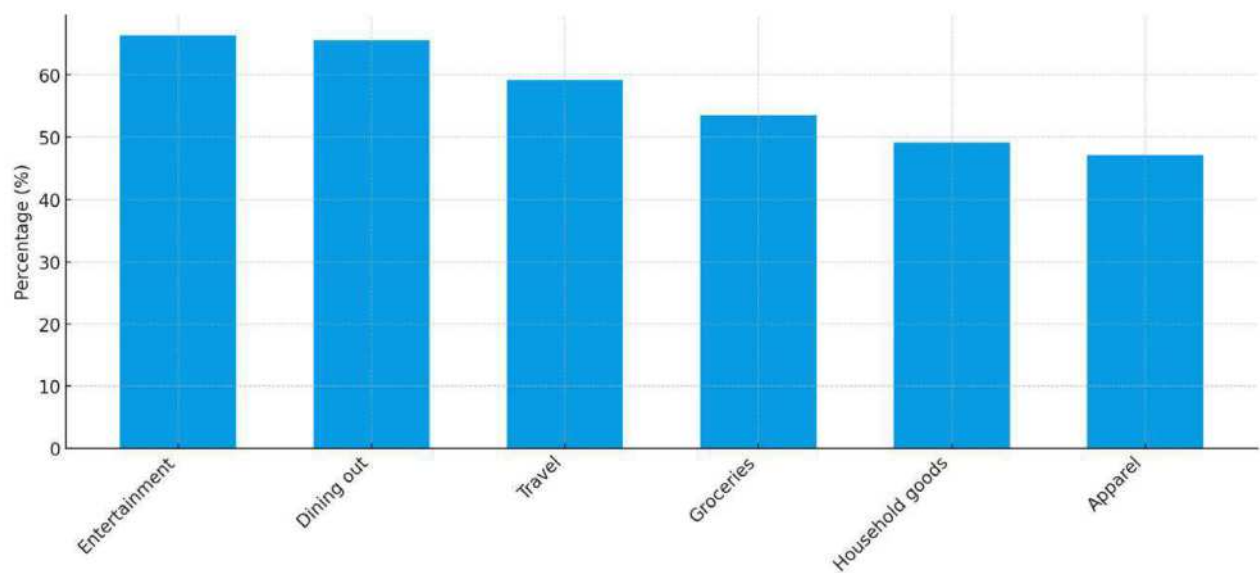
Watching and worried? Consumers continue to be concerned about making ends meet.

Generational: Do you think the economy is getting:



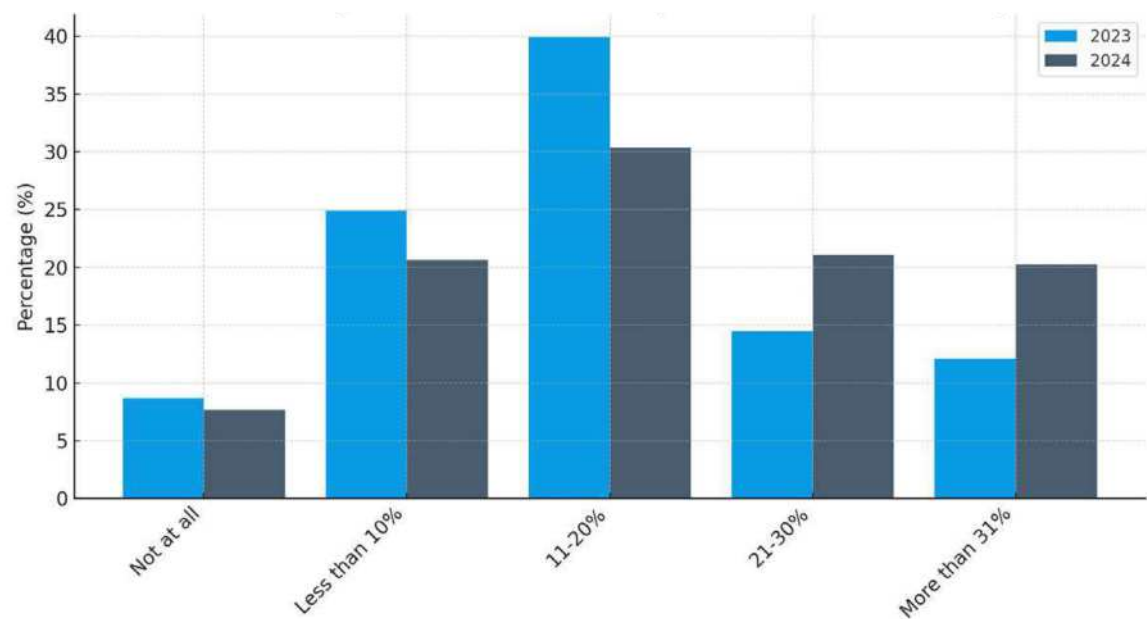
Optimism waning. In 2023, Gen Zs were the most optimistic about the economy. However, in 2024, their perspective shifted dramatically. Now, they're the most pessimistic generation about the state of the economy.

Have inflation and high interest rates caused you to curb spending in any of the following areas?



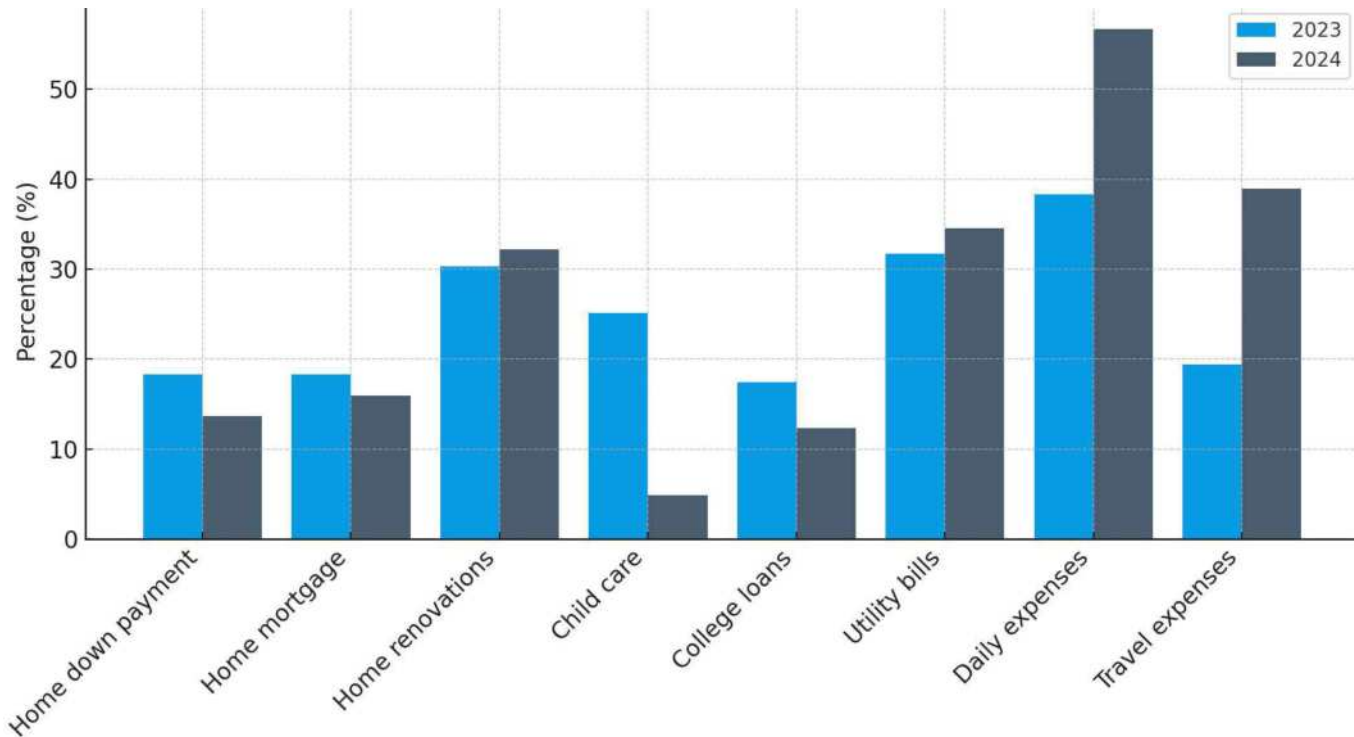
Lack of excitement. Consumers report that they’ve had to curb spending this year in areas like entertainment, dining out, travel, and groceries.

How much have inflation and high interest rates caused you to cut back on monthly household spending?



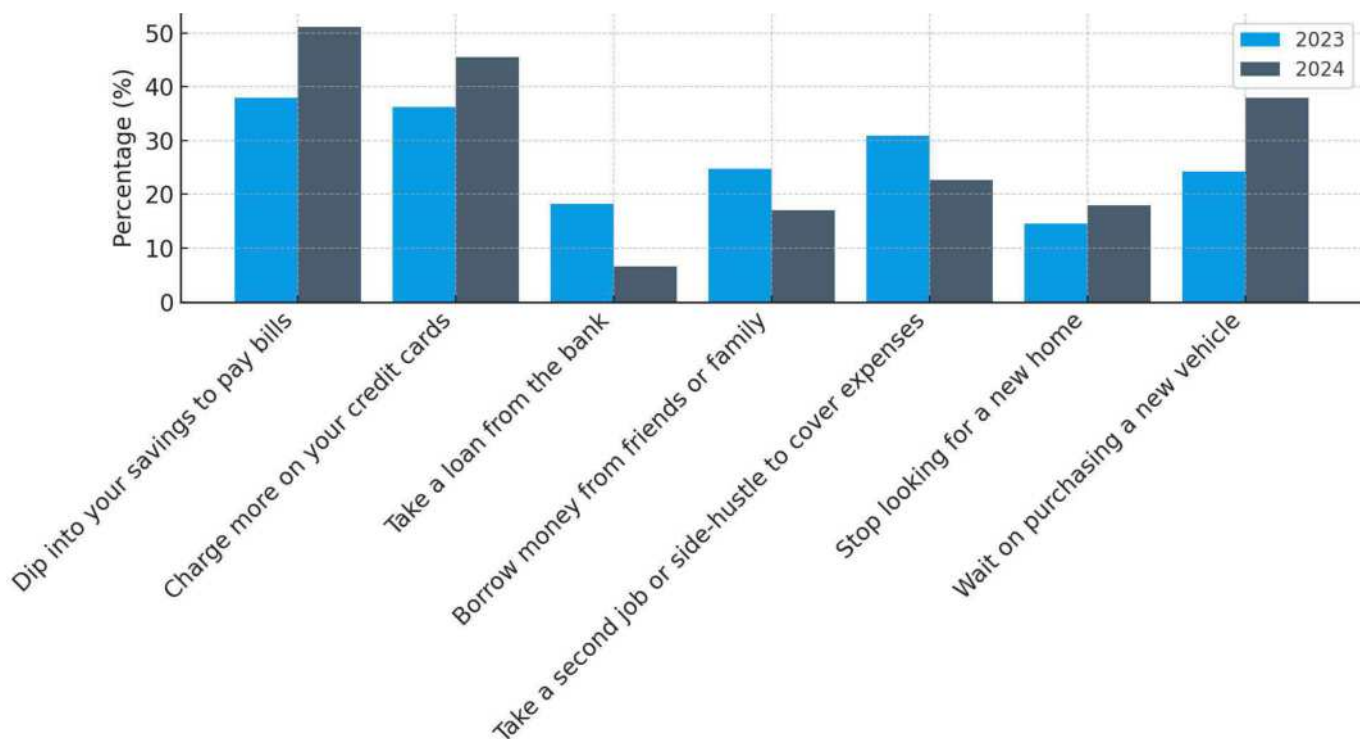
Cash crunch. More consumers have had to cut back on household spending this year by 21-30 percent or more than 31 percent.

Are you having trouble affording?



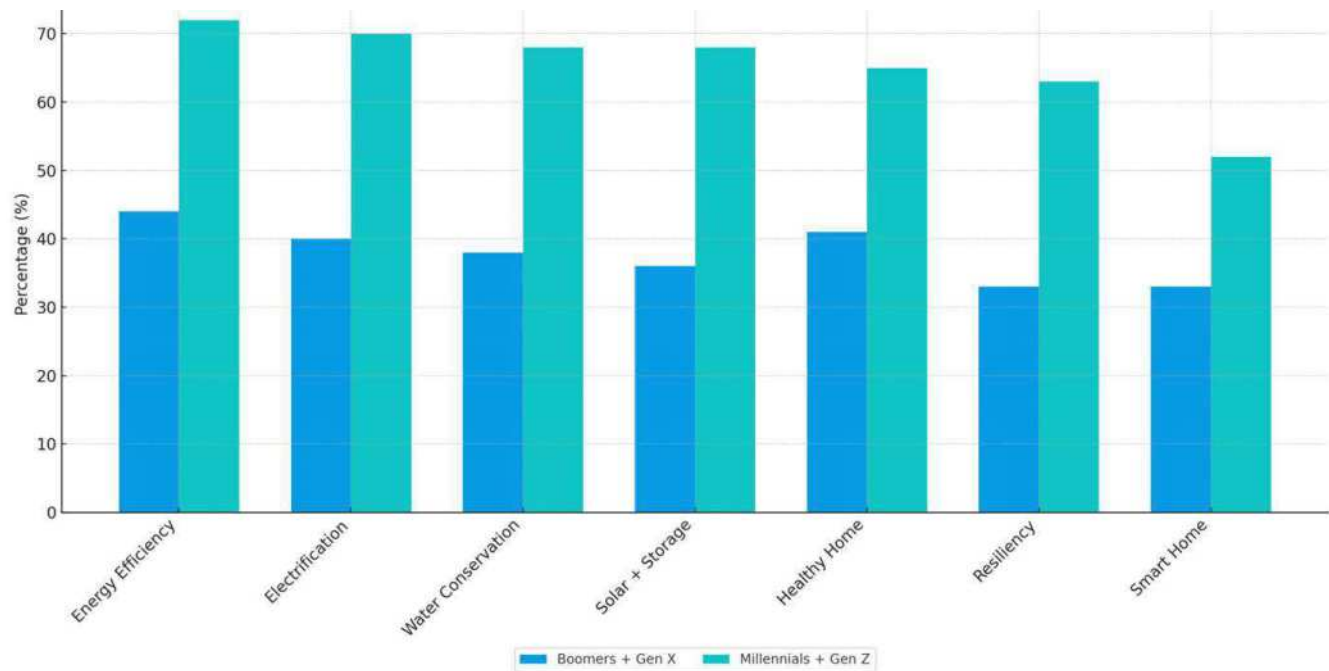
Hard choices. Consumers are having to spread out an increasingly smaller amount of money among necessities.

Due to current financial conditions have you had to:



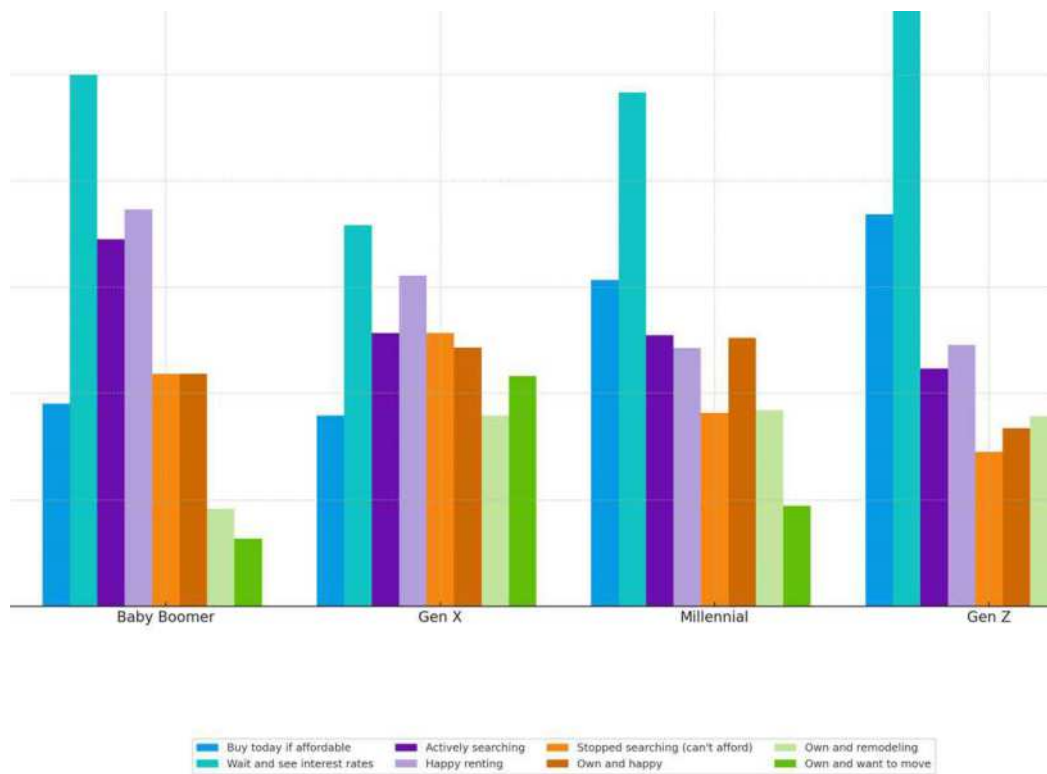
Smaller savings. Consumers also report that they're dipping into their savings to pay the bills and charging more on credit cards this year than last year.

Are you willing to pay more upfront for sustainability upgrades if they will lower your ongoing cost of homeownership over time?



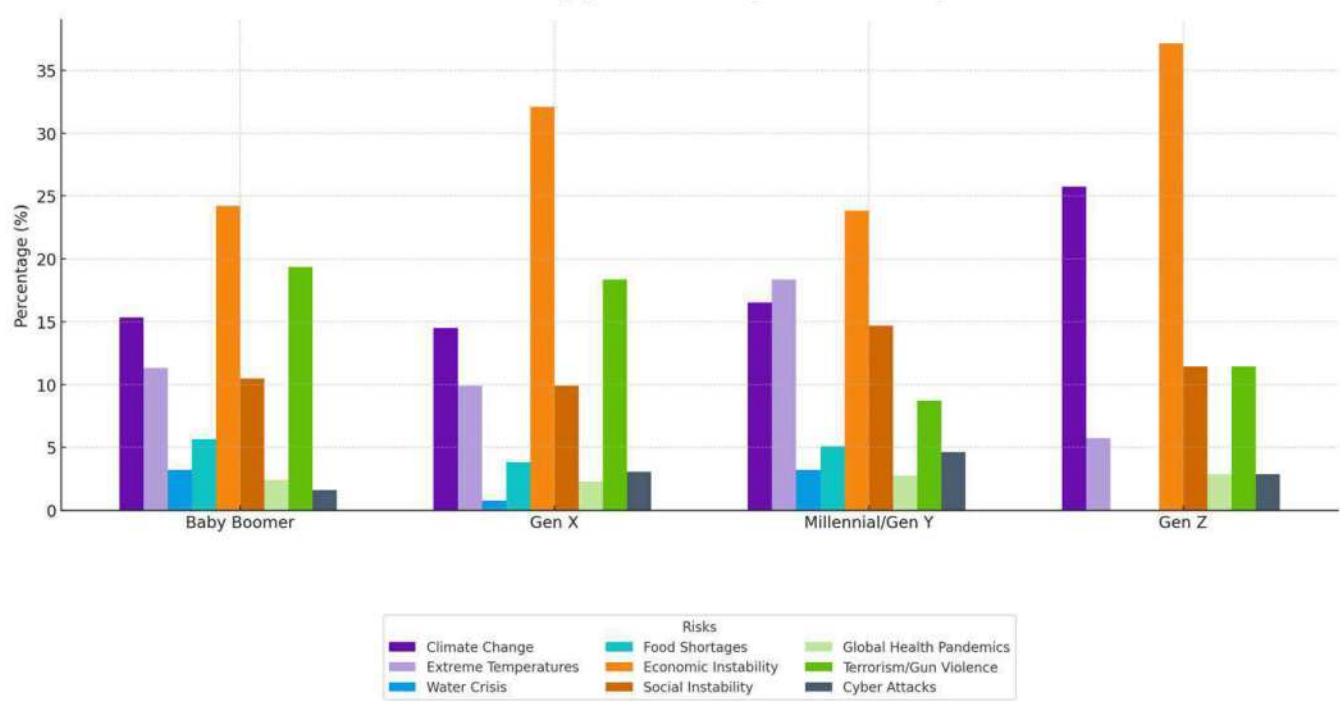
Value minded. Millennials and Gen Zs are more inclined to invest in these sustainability upgrades than Boomers and Gen Xers.

Which of these statements best describes your attitude about owning a new home?



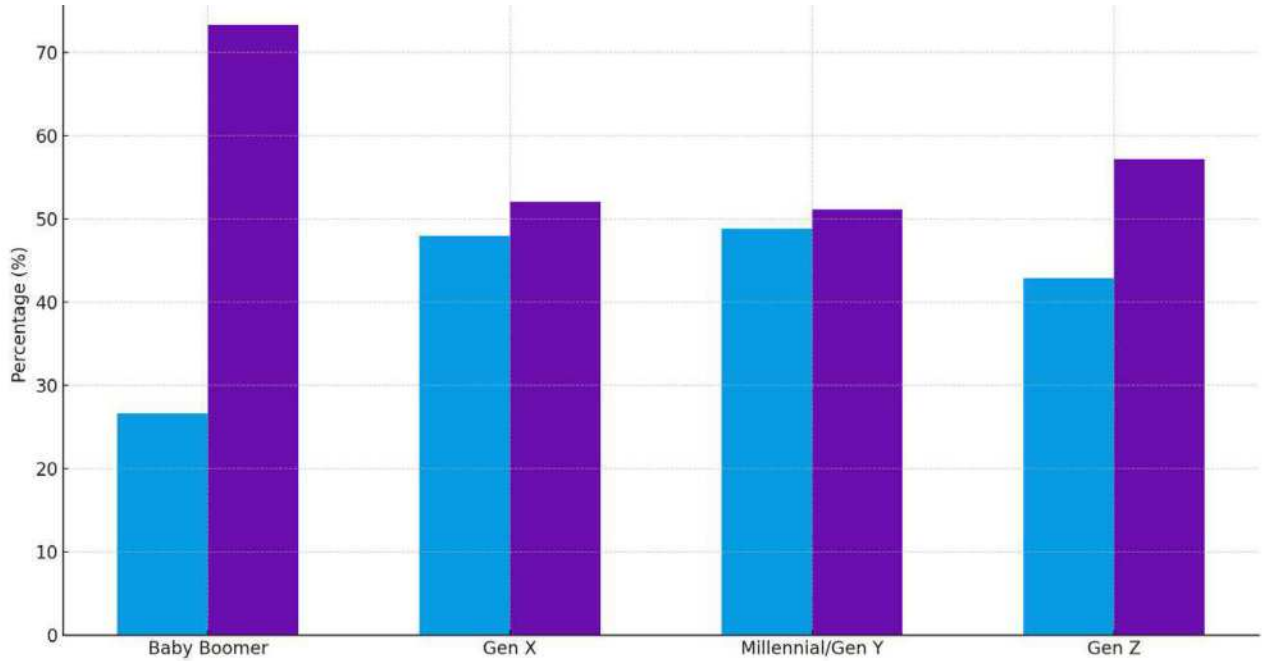
Affordability is key. Younger generations report that they would buy a home if they could afford something in a good neighborhood. But they have been forced to stop searching because they simply can't afford one.

What is the top global risk of highest concern to you?



Risky thinking. This year, survey respondents cited economic instability as their top concern, with failure to mitigate and adapt to climate change following behind. Fears of terrorist activity, physical attacks, and gun violence rose among Boomers and Gen Xers.

Which are you more focused on when purchasing a home?



Value minded. For the first time, all four generations responded that, when purchasing a home, they focus more on long-term value and operating costs rather than upfront price and cost per square foot. **GB**



The Road Ahead

CREDIT: ISTOCK/DA-KUK

LOOKING AHEAD TO 2025 AND BEYOND, we can expect to see the continued decarbonization of the built environment, largely in response to the trifecta of:

- **Environmental reality.** We've hit 1.5 degrees Celsius warming and we're quickly heading to 2 degrees C, which is considered the tipping point when it comes to planetary survival. Given that homes and buildings in the U.S. account for 40 percent of our nation's energy use, 70 percent of electricity use, and 40 percent of carbon emissions, there is no doubt that progress will continue on local, municipal, and state levels to bring the built environment in line with climate targets.
- **Social reality.** There are high levels of climate anxiety, especially among younger generations. COGNITION Data indicates that 77 percent of Millennials and Gen Zs consider the future to be frightening due to climate change, and 56 percent believe that humanity is doomed because of climate change.
- **Financial reality.** Many investors, lenders, supply chain partners, and other stakeholders now believe that strong sustainability strategies reduce risk for companies and stakeholders.

AN EVOLVING TRANSFORMATION

The transformation of the regulatory landscape is already underway. For example, in July 2024, California implemented one of the most ambitious embodied carbon regulations in the U.S., mandating the disclosure and reduction of embodied carbon for all commercial buildings over 100,000 square feet. This regulation affects around 45 percent of California's commercial real estate market and is projected to cut carbon emissions by approximately 6 million metric tons annually by 2030. While these regulations are focused on commercial buildings for now, they're inevitably going to make their way into the residential sector.

Furthermore, California will enforce carbon data disclosure requirements in 2025 for businesses with over \$1 billion in annual revenue, including Scope 3 emissions by 2026. These Scope 3 emissions, which include embodied carbon from building materials, represent an often-overlooked yet significant portion of the carbon footprint for real estate portfolios—accounting for up to 50 percent of total emissions for some companies.

On the other coast, Boston's Planning & Development Agency (BPDA) approved a zero-carbon emissions requirement earlier this year for certain types of new and existing building projects filed after July 1, 2025. Recognizing climate change as "the existential threat of our time," the BPDA asserted that "it's up to cities to lead" and that zero-carbon zoning initiatives are "something that cities must do." The new zoning requirements will also require real estate developers



Regulatory climate relief. California's embodied carbon regulations affect 45 percent of its commercial real estate market and is projected to cut carbon emissions by approximately 6 million metric tons annually by 2030. CREDIT: ISTOCK/ CHONESS

to report on their projects' embodied carbon, which includes raw material procurement for products, manufacturing, transportation, construction, demolition, and waste disposal.

A TIME FOR NEW TOOLS

Because of these emerging regulations, new risks will materialize for builders, developers, building owners, and other stakeholders throughout the building industry, such as non-compliance fines, permitting delays, and reputational damage.

Yet, many builders and developers still lack the tools to measure, let alone mitigate, embodied carbon, underscoring the need for enhanced carbon accounting tools that evolve alongside new mandates that can provide real-time insights.

Fortunately, such tools are being developed, such as new ANSI standard 1550, "Standard for the Calculation and Labeling of the Embodied Environmental Impacts of Dwelling Units Using the Environmental Performance Index." This standard will define the scope for calculating embodied carbon and provide a methodology for conducting calculations for residential projects. The standard is under development and is expected to be released sometime in 2025.

DECARBONIZATION ESSENTIALS

There are three key tenets that will facilitate the ongoing decarbonization of the built environment.

The first tenet centers on addressing performance through climate responsive design, building science, and green construction, following best practices such as:

- Implementing passive heating, cooling, and ventilation strategies
- Enhancing energy efficiency and thermal comfort
- Converting to all-electric
- Designing for health and wellness
- Adopting renewable energy
- Installing advanced technologies for control optimization
- Inspecting, testing, and measuring performance throughout the build and ongoing operations

The second tenet involves the meticulous specification of low-carbon products (for example, those with Environmental Product Declarations [EPDs]) from low-carbon companies. In a very short timeframe, EPDs have transformed from obscure to vital. According to a recent COGNITION survey:

- Approximately 85 percent of builders currently specify products with EPDs. Of those builders who aren't currently specifying products with EPDs, 50 percent say that they'll start doing so within the next year, and 45 percent say they'll start doing so in the next few years. Less than 5 percent say that they won't specify products with EPDs.
- When asked why they specify products with EPDs, the top three responses were understanding product roadmaps, regulatory requirements, and consumer demand.



By the rules. Boston's Planning & Development Agency has implemented a zero-carbon emissions mandate that requires real estate developers to report on their projects' degree of raw material procurement for products, manufacturing, transportation, construction, demolition, and waste disposal.

CREDIT: FLICKR/CHRIS RYCROFT

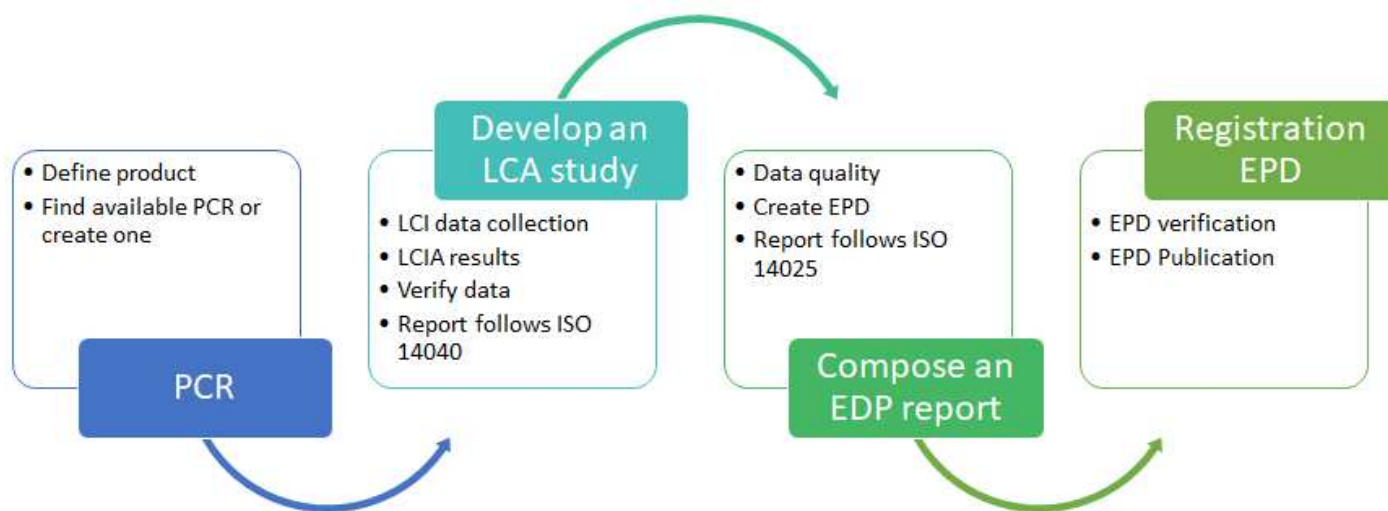


New rules ahead. ANSI's upcoming standard 1550 will define the scope for calculating embodied carbon and provide a methodology for conducting calculations for residential projects.

CREDIT: Courtesy of ANSI.



Powering up. Converting to an all-electric vehicle is key to an ongoing decarbonization of the built environment. CREDIT: ISTOCK/RGSTUDIO



Path to sustainability. Eighty-five percent of builders specify products with EPDs; half of the ones that do not plan to do so within the next year.

CREDIT: DVECHEVE CC 4.0

- More than 60 percent of builders assert that they're seeing an increased demand for products with EPDs by consumers. Another 20 percent respond that while consumers might not be asking specifically for EPDs, they're looking for product certifications and information to verify sustainability attributes.

The third tenet includes purchasing carbon offsets to reach the "last mile" of eliminating carbon emissions, since there simply aren't enough low carbon products, construction and waste management practices, or transportation and packaging solutions to build net zero carbon homes or structures today.

A carbon offset is a transaction that removes CO₂ or other greenhouse gasses from the atmosphere to compensate for emissions made elsewhere. One carbon offset is equivalent to taking 1 metric ton of carbon out of the air. The most common carbon offset projects today focus on emissions reductions (like landfill gas capture), forest management and conservation, biodiversity protection, renewable energy, biochar, and direct air capture.

High-quality carbon offsets address additionality, provide robust and timely data, eliminate double accounting, ensure permanent carbon removal, provide accurate reporting, and offer well-defined pricing, benefits and results. **GB**

IN RESPONSE TO GROWING DEMAND FROM STAKEHOLDERS THROUGHOUT THE BUILDING INDUSTRY, Green Builder Media has launched the COGNITION Carbon Offsets Marketplace to streamline access to carbon offsets.

Through the COGNITION Carbon Offsets Marketplace, the purchasing of carbon offsets doesn't have to be difficult or expensive. For example, the average estimate for employee commute emissions is 7 kilograms (kg) per day (or 2.55 metric tons annually), and office emissions is estimated to be 18 kg per day (or 6.57 metric tons annually). The combined total purchase of 9.12 metric tons of carbon offsets annually can counterbalance an employee's commute and office emissions, which only equates to an investment of \$91 if offsets are purchased from GBM's Impact Light portfolio (priced at \$10 per metric ton).

In another example, according to the Environmental Protection Agency (EPA), the average American home emits 14 metric tons of CO₂ annually. It costs \$140 per year to abate emissions entirely.

Check out the [COGNITION Carbon Offsets Marketplace](#) for more information and to purchase carbon offsets to mitigate emissions. **GB**



VISION House® LAS VEGAS

Crossing the Rubicon

Strip scene. Green Builder Media and Beazer Homes' VISION House Las Vegas project will be located in ever-growing Henderson, Nevada, which is on the outskirts of colorful Las Vegas.

CREDIT: COURTESY OF CADENCE



DIGGING DEEP

Halfway through construction, three models for the **VISION House Las Vegas** project rise in the Nevada desert.

BY MICHELE LERNER

Building three model homes simultaneously might be a problem for a smaller builder, but for Beazer Homes, it's just an efficient way to build. "We often try to have two framing crews working on homes on nearby lots at the same time, but for our VISION House Las Vegas project, we're trying to get three crews at once from our trade partners if we can," says Justin Anderson, director of operations for Beazer Homes Las Vegas. "This is the exception rather than the rule, but we've expressed the importance of this project with all of our trade partners."

Green Builder Media and Beazer Homes have partnered to build VISION House Las Vegas: Crossing the Rubicon. The project includes two model homes and a deconstructed model to demonstrate what's behind the walls in Beazer's Zero Energy Ready Homes (ZERHs). Anderson anticipates all three models will be complete in December, well ahead of the goal to demonstrate the project during February 2025's Design and Construction Week, which brings thousands of building industry professionals to Las Vegas.

The VISION House Las Vegas homes will be built at the 2,200-acre master planned community of Cadence in Henderson, just outside of Las Vegas. They will showcase Beazer's READY homes, which will meet the U.S. Department of Energy (DOE)'s ZERH requirements. The DOE estimates homes built to this standard are 40 percent to 50 percent more efficient than a typical new home, and there are stringent requirements for certification.

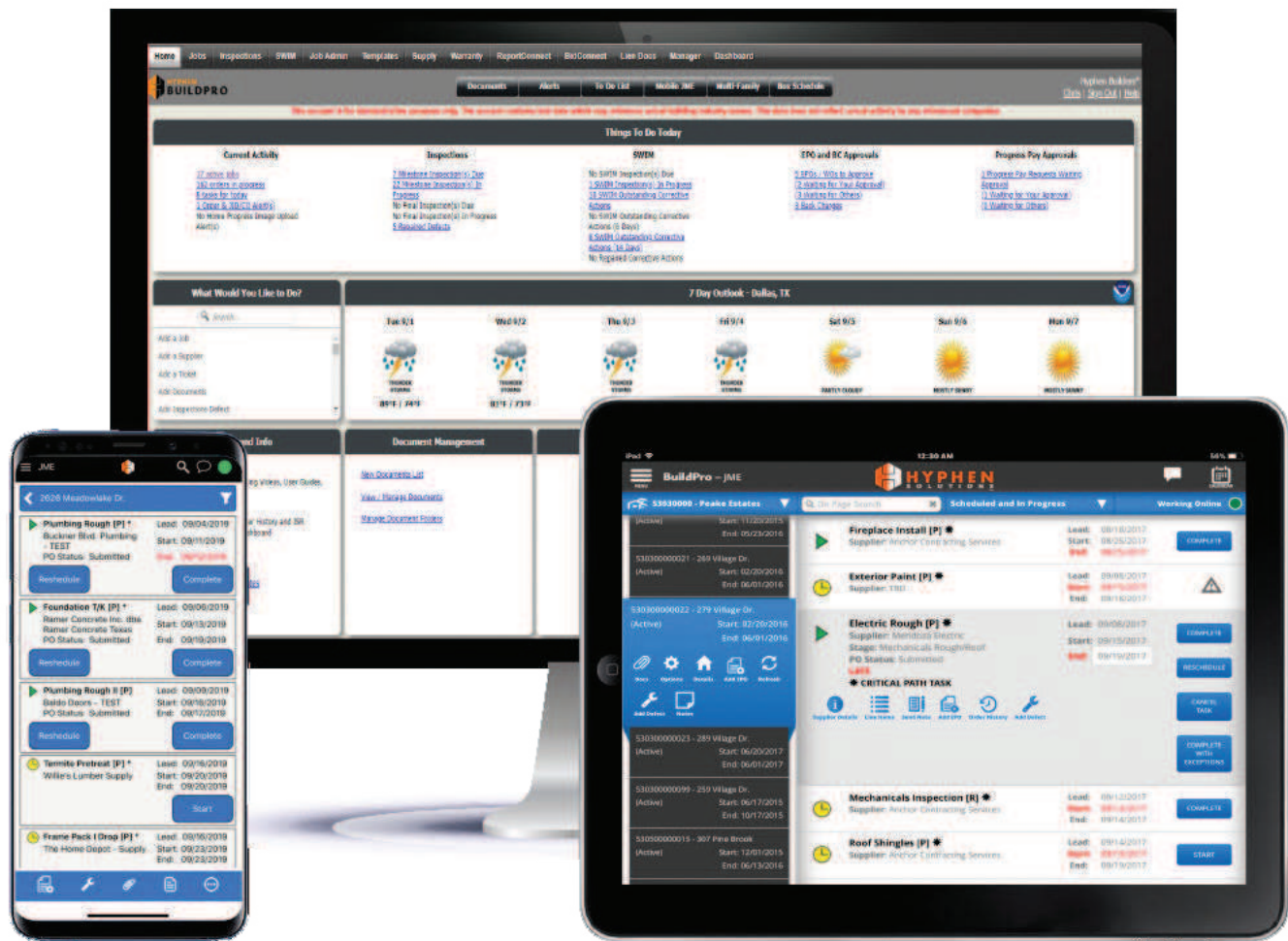
"We put as much information together as we can ahead of any project to create efficiencies in the schedule," Anderson says. "That way, when it's time to start building, it's just 'go' time for everyone. Our normal schedule to build a model home is 60 to 75 days and we're right on track with these three models."

The Aurora will be the standard model home, with The Vision built as an upgraded home and The Nexus as a deconstructed home to provide building professionals and consumers with a deeper understanding of what goes into building a sustainable production home.



Supply sensibility. Most of the materials Beazer uses—especially lumber—are delivered the day they're needed or the night before, which reduces the amount that needs to be stored onsite.

COURTESY OF BEAZER HOMES



Contact first. Product deliveries are managed via Hyphen Solutions' *BuildPro* software, which includes built-in notification windows to help trade partners arrange delivery with suppliers. CREDIT: COURTESY OF HYPHEN SOLUTIONS

CONSISTENT COMMUNICATION

Keeping construction costs low while maintaining Beazer's high standards for quality depends in part on managing schedules to avoid delays and for accurate planning. Beazer uses *BuildPro* scheduling software from Hyphen Solutions to stay on track.

"One of the nice things about *BuildPro* is that most of our vendors are signed up as users, so they're very familiar with it for things like notifications and payments," Anderson says. "We have a published schedule so that our framing crews, plumbers and other vendors can see what's coming up and plan accordingly."

Even when Beazer builds 200 or 300 units in a market, each job site has an assigned vendor. Typically, Beazer has three or four vendors in each trade category.

"Everyone with access to *BuildPro* has visibility into what others are doing," Anderson says. "Each vendor gets notifications so they can forecast their labor needs to stay on track while there are so many moving parts."

Schedules are typically published one month at a time and posted a couple of weeks before each month begins.

"There's a weekly calendar of starts and schedules to give everyone visibility into what's coming up," Anderson says. "That way, there's no panic attack when someone looks at it on a Saturday and sees that we're doing 50 starts this month. We have a projection and tracking for every month."

"Vegas is like a small town, so all the trades know each other—the concrete guys know each other, the plumbers know each other—so we don't have just one Beazer partner for this market," Anderson says.

Trade specialist availability is a mixed bag, according to Anderson. "The contractor base is broad here," he notes. "Although, you have some of the bigger shops that only do commercial work on the Strip and don't come out to residential communities."

Staying in close contact with a variety of vendors and providing them with accurate information helps Beazer keep their projects on track and on budget.

"Many of the drywall installers in Vegas also provide painters, so they can communicate with each other," Anderson says. "They know when to stock and stage the drywall so it's ready to hang and then they have the painters lined up right behind them."

COOL TECH FOR STREAMLINED CONSTRUCTION

Beazer's roots go back to a 17th century English builder named George Beazer, and the company has built homes in the U.S. for nearly four decades. Still, Beazer embraces innovative technology that improves its construction practices and the performance of its homes, such as a highly detailed scheduling software.

"The civil engineers we work with use GPS coordination to place the footprint of each home," Anderson says. "That's a lot easier than



Hot topic. The extremely dry desert climate requires builders to take special precautions during construction, such as staying extra hydrated and working earlier hours when it's cooler. CREDIT: COURTESY OF BEAZER HOMES



Built to specs.

Beazer homes are built to the U.S. Department of Energy (DOE)'s Zero Energy Ready Home (ZERH) standards, which includes being exceptionally energy efficient, having better indoor air quality, and a renewable energy-ready design. CREDIT: COURTESY OF BEAZER HOMES

trying to be accurate with a 300-inch tape measure, which is the way it used to be done.”

The company isn't using robotics yet, Anderson says, but it does work with a third-party firm that uses drones to take images of each roof to check on property installation.

“Most companies have a quality assurance manager, but the drone gives you a full view outside the scope of a roofer,” he notes.

MEETING THE DESERT CHALLENGE

Building in the dry desert climate of Las Vegas can be very different than other climates, says Anderson. He comes from a Midwestern climate where snow, ice, rain and freezing temperatures had a big impact on construction sites.

“On the plus side, we get very few rain days to wash us out and no snow days,” Anderson says. “On the other hand, wind is a big issue here, even when it's hot. We can get 30-mile-per-hour winds on a day when it's 110 degrees, which makes everyone feel like they're working in a convection oven.”

The wind and dry air require special steps to mitigate dust—an operational priority not only to ensure a smooth, clean customer experience but to keep all visitors to the site breathing easier.

“Dust can make it harder for workers to breathe as well as



Vehicle limits. Because of the high amount of dust in the air, contractors and suppliers offload equipment and products curbside, and rocks are positioned to avoid tracking additional dust everywhere. CREDIT: COURTESY OF BEAZER HOMES

being messy, so we use water strategically to create a crust on the dirt,” Anderson says. “We ask contractors and suppliers not to drive up to the house. Instead, they offload equipment and supplies at the curbside. At the entrance to a community, we place chunky rocks to avoid tracking dust everywhere.”

Beazer’s first principle is safety, and they’ve built a culture around the idea that everyone who steps foot on a jobsite needs to go home to their families each day. In the hot and dry desert climate, this means not only keeping an immaculate job site and following safety procedures to the letter. The Las Vegas team also takes special steps to make sure everyone on the site stays hydrated and aware of the signs of heat exposure. Even with the compounding risk of environmental hazards, Anderson’s team has been recognized several times for their attention to detail as it relates to safety. In 2023, Construction Manager Mischelle Biedler was honored with the company’s national safety award in honor of her ability to “walk the walk” by truly owning the accountability for each employee and trade’s safety.

“We post signs everywhere, but we go beyond that with pictures of people drinking water and sitting in the shade to

remind everyone that they need to do that,” Anderson says. “We have signs and photos that encourage people to tell someone if they don’t feel well. Everyone brings cases of water in their trucks, and we encourage managers to mention that the water is available at every meeting.”

While the imperative to stick to tight schedules is important, Anderson says there’s nothing that tops safety. “If you fall ill because you forgot to take a break and drink some water, that doesn’t do anyone any good.”

MANAGING MATERIALS

Beazer saves time and money with a highly sophisticated materials management system.

First, they streamline the choices available to buyers. “Instead of the Design Center offering every piece in a catalog, we know what works with what we’re doing. We offer two or three options for a black fixture, for example,” Anderson says. “We pass that information onto our vendors so they know they won’t have to waste time searching for one obscure part.”

For example, Beazer has a national partnership with Moen, and the local Moen representative can work with each division to make sure the offerings are in stock, Anderson says.

“We communicate our business plan with our vendors so they see what’s been added, what we’re working on now, and what we’re starting next,” Anderson says. “We’re pretty accurate with our projections, too.”

Timing for material deliveries is managed through the *BuildPro* software, with built-in notification windows that each project manager must complete with each vendor.

“For example, we know the roofing company needs a 15-day lead time to get materials in place and that installing the roof is a two-day task,” Anderson says. “We get multiple notifications about who to alert for each house we build. If someone’s on vacation and they miss the notification date, you’re alerted, and you know that you need to reach out to trade partner right away. The trade partners then arrange delivery with their suppliers.”

Most of the materials Beazer uses are delivered the day they’re needed or the night before, which reduces the amount that needs to be stored onsite. “We can be a lot less worried about theft if materials aren’t sitting around the construction site,” Anderson says.

Lumber is one of the few materials stored onsite because Beazer uses so much of it when building multiple houses at once. Anderson says even lumber tends to be delivered in batches, so they don’t have a six-month supply sitting around.

KEEPING CREWS ON TAP

Working with multiple vendors for each trade, with a diverse base rather than a single source, helps Beazer stay on track with its timeline and financially.

“This helps us avoid the issue of a problem with one particular vendor,” Anderson says. “If one vendor has trouble with its manufacturer or if someone leaves and takes all of their good labor with them, we have other vendors to turn to.”

Vendors bid for Beazer’s projects, knowing that they face competition, Anderson adds.

Deep and transparent communication helps Beazer have consistent labor teams available at each stage of construction. “A lot of the vendors want all of our work, so we have real conversations with them so they can hire more people if need to and so they can tell us when they’re at capacity,” Anderson says.

Pulling together the supplies and expert contractors to simultaneously build multiple quality homes requires focus and discipline, he says.

“Most of all, it’s just important to keep communicating,” Anderson says. “You need to let everyone know what has to happen, what you want to happen and what would be great if it happened. Then, they will meet your expectations.” **GB**

Who’s On Board?

Westlake
Royal Building Products™

MOHAWK
BUILDER+MULTIFAMILY

Whirlpool
CORPORATION



SHERWIN-WILLIAMS

DUPONT

greenfiber
creators of **SANCTUARY**

sunnova

SPAN

resideo

BROAN
NuTone
COME HOME TO FRESH AIR



MOEN

POWERED BY myQ

daltile

Windsor Door

Organized Living

VISION HOUSE® AUSTIN

Passive Principles

Dedication to good design and quality enhance product selections at the VISION House Austin.





BY MICHELE LERNER

Alan Barley and Peter Pfeiffer, co-owners of Barley|Pfeiffer Architecture in Austin, Texas, are big believers in layering. They start with a deep study of the site they're working with and design a home that complements the location and their client's preferences. Next, they layer in sustainable products and systems that will enhance the performance of a well-designed and carefully built home.

Exterior products such as James Hardie fiber cement siding, a metal roof from Fabra, decking from Timbertech, a building envelope system from Henry, a Carlisle company, windows from Andersen, and cutting-edge GE appliances take the VISION House Austin to a new level of performance that will stand up to the intense Texas climate.

Barley and Pfeiffer start with design based on natural principles and time-tested building techniques such as overhangs to create shade and positioning each house appropriately on its site. They also focus on innovations that have made it easier to build a resilient, sustainable, high-performance house.

Total package. The VISION House Austin is being designed with numerous environmental elements in mind, including roofing, windows and appliances. CREDIT: COURTESY OF JUSTIN MOORE, WHITE ELEPHANT GENERAL CONTRACTORS

“We have a number of products that we have experience with that we start with for any project,” says Joel Effland, project manager for the VISION House Austin with Barley|Pfeiffer Architecture. “Then we work with the clients and the builder to make decisions that will keep the budget in check.”

At VISION House Austin, designed by Barley|Pfeiffer Architecture and built in partnership with Green Builder Media for homeowners Robert and Judi George, the architects are working with Justin Moore, owner of White Elephant General Contractors in Austin. Their close collaboration on product choices, starting at the earliest design phase, strengthens each step of construction.

“Technology and new innovative products are great, but everything has to be installed correctly from the beginning with attention to detail or it doesn’t matter,” Moore says. “For example, if you buy the best new HVAC system but you don’t install it right, it can still sweat and cause mold.”

Moore and the architects are dedicated to combining new innovations with their decades of experience to create a home that embraces the natural world and contributes to sustainability.

SYNERGY FROM INSIDE OUT AND OUTSIDE IN

While the exterior architecture of the VISION House Austin takes into consideration the breezes and weather patterns of the site, Barley and Pfeiffer choose products that complement the design and add resilience, durability and comfort to the home. The building envelope from Henry includes *Blueskin* weather barrier insulation and a spray foam insulation to improve performance.

“The weather barrier insulation is easy to install,” Moore says. “So is the flashing from Henry that will seal the house.”



A tight situation. Insulation from Henry Company helps protect the VISION House Austin and the garage from water, air and moisture intrusion.

CREDIT: COURTESY OF HENRY COMPANY

Metal roofs, when installed properly, are by far the most logical roofing system for central Texas, Effland says. They chose Fabral Roofing for the VISION House Austin metal roof.

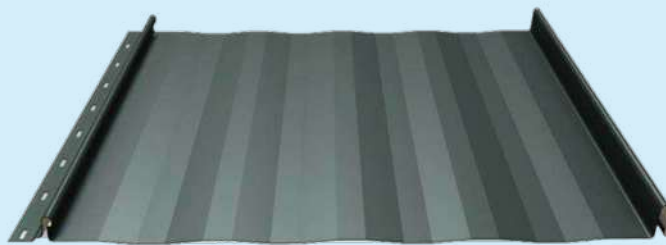
Barley, Pfeiffer and Moore specified a concealed fastener, “snap-lock” style roofing panel which prevents the typical long-term failure of

exposed fastener metal roof, and the need to install mechanical seams. In addition, they specified a panel with additional ripples running between the ridges, called striations, which make the panels much stronger, reduces the risk of heat-related “oil canning,” and qualifies for a hail resistance discount on homeowners’ insurance. They chose a thicker, 24-gauge steel to increase strength and longevity, which also allows solar panels to be mounted directly onto the metal roof with an S51 clamp without any additional structural members.

Another important aspect of this metal roof is the finish. “We specified a mixture of aluminum and zinc alloys called Galvalume,” Effland says. “This finish is more durable and corrosion resistant than galvanized metal roofs and does not fade nearly as much as painted finishes.”

However, the most important part of the roofing system is the installation, Effland emphasizes. “We design our metal roofs to be lifted up off the roof deck with 1-by-4 lath, and we ventilate that air cavity from a space between the drip edge and fascia boards,” he says. “This air space, combined with the Galvalume finish, acts as a solar heat radiant barrier and effectively places the entire home under a shading umbrella.”

These combined features form a roof system that will last 50 years or more, compared to the approximately 15 years that a typical composition shingle roof will last, Effland says. The Fabral metal roof is hail resistant, fire resistant, fade resistant, corrosion resistant and energy efficient.



Top of the line. Fabral’s metal roof is hail resistant, fire resistant, fade resistant, corrosion resistant and energy efficient. CREDIT: COURTESY OF FABRAL

Another resilient product that Barley and Pfeiffer frequently choose is cementitious trim and siding. For the VISION House Austin, they chose James Hardie siding, trim and soffits.

“It’s our go-to for exterior applications in most of our home designs,” Effland says. “It’s more durable and requires less maintenance than traditional wood siding, which will fade and rot over time no matter how well it is installed, finished or maintained.”

In addition, James Hardie siding is much more dimensionally and thermally stable than PVC or vinyl sidings, he says. It’s classified as a non-combustible material, which drastically increases a home’s ability to defend against wildfires—which is important in Texas and other locales.

“James Hardie’s thicker *Artisan* siding is certainly a luxury finish, offering deeper shadow lines in the lap siding, and a cleaner, more-contemporary finish in shiplap,” Effland says. “Additionally, pre-primed

Hardie siding products, once painted with a topcoat, shed water away from a home, instead of absorbing water like most stone, brick or stucco veneers do. This reduces the vapor drive into the home, keeping the home dryer and improving indoor air-quality.”



Air purifier. James Hardie’s thicker Artisan siding reduces vapor entering the home, keeping the inside dryer and improving indoor air quality.

CREDIT: COURTESY OF JAMES HARDIE

Moore, Barley and Pfeiffer chose Andersen windows for the VISION House Austin.

“The Andersen 100 series windows and doors are a phenomenal value to our clients,” Effland says. “The composite/fiberglass construction offers supreme strength and durability. It is much more thermally stable and UV resistant than vinyl, is immune to potential insect- or moisture-related rot associated with wood windows, and is more energy efficient than a lot of aluminum or steel framed window systems.”



Good as glass. The home uses Andersen composite/fiberglass windows, which are more energy efficient than many aluminum or steel framed window systems. CREDIT: COURTESY OF ANDERSEN

FEATURES AND FINISHES FOR A LOW-MAINTENANCE LIFESTYLE

From the beginning, Judi and Robert George were interested in managing the electrical loads in their home, Effland says.

“They wanted a large solar array, battery backup power, electric vehicle charging, and the ability to control and monitor where their electricity would and would not be used in their home during a power outage,” he says. “This is exactly the functionality that the Savant power systems were designed to offer. We are very happy to have them on board as a sponsor for this project.”



Power packed. A Savant power system provides the owner with a solar array, battery backup power, electric vehicle charging, and the ability to control and monitor where electricity is and is not used.

CREDIT: COURTESY OF SAVANT

GE Appliances and Savant are partnering to create a smart home management system for the VISION House Austin that will track energy use for each appliance and throughout the home, Effland says.

“One of the coolest new products is the GE combined heat pump washer and dryer,” Moore says. “Instead of pumping the moist air outside and then bringing in fresh air, the heat pump dryer converts the moisture back to water and drains it. It’s energy efficient but it also saves space because you can fit an extra cabinet in the laundry room with only one machine.”



Dual purpose. GE’s combined heat pump washer and dryer are part of a smart home management system for VISION House Austin that will track energy use for each appliance and throughout the home. CREDIT: COURTESY OF GE

In addition to managing their energy use, the homeowners' lifelong commitment to sustainability means they want the latest technology for energy efficiency.

Trane's variable speed heat pump, which uses only the electricity needed for a comfortable house based on the weather, will be connected with the Trane *ComfortLink II* thermostat to automatically calibrate for optimal performance. Automating features simplifies life for the homeowners of the VISION House Austin, who share the goal of enjoying a low-maintenance lifestyle.



Easier lifestyle. Trane's *ComfortLink II* thermostat automatically calibrates the home's variable speed heat pump for optimal performance.

CREDIT: COURTESY OF TRANE ARCHITECTURE

Another automated system improves the indoor air quality for the home. The *Fresh Air Ventilation Control (FAVC)* system from Field Controls pairs a motorized damper in a home's fresh air intake duct with the fan in the HVAC air handler, opening the damper and turning on the fan for the required number of minutes per hour to meet current ventilation requirements. The system also monitors up to four different exhaust fans in the home, crediting their run times toward the required ventilation.



Hard worker. The Fresh Air Ventilation Control (FAVC) system from Field Controls monitors up to four different exhaust fans in the home, crediting their run times toward the required ventilation. CREDIT: COURTESY OF FIELD CONTROLS

"We typically monitor the kitchen ventilation hood and the dryer, as well as the exhaust fan in primary and secondary bathrooms," Effland says. "Additionally, the FAVC is capable of monitoring the outside air, automatically shutting off the ventilation if it is too hot or too humid. These features greatly reduce the risks associated with over ventilating a home in a hot and humid climate such as ours, lowering the amount of work a home's HVAC system must do, and it does so without introducing any additional ductwork, fans, compressors or filters."

PRODUCT SELECTION—THREE CHECKPOINTS

When selecting products for the VISION House Austin or any other home, the team focuses on quality, how well systems and products work together and in a specific location, and finances.

"We work with the clients and the builder to keep the budget in check throughout the process and do check-ins at two or three points to make sure we're on track," Effland says.

- The first checkpoint occurs during the preliminary design phase, which typically includes five pages of drawings and four pages of specs.
- A second checkpoint occurs when the builder—Moore, in this case—reviews the design and estimates costs based on historical data.
- A third checkpoint—when builders get bids from subcontractors—takes place after the construction drawings and structural engineering are in place.

"If we're over budget, we re-evaluate and determine the best way to bring the project back in line," Effland says. "If we're under budget, we can consider upgrading certain features."

Tracking costs consistently from the beginning and at several points along the way before construction begins provides an opportunity to avoid "value engineering" a home later in the process or finding that it can't be built as planned, Barley says.

"We can find quality products at multiple price points," Effland says. "For example, we can choose all fiberglass windows, wood and fiberglass, or aluminum windows."

At the VISION House Austin, *Andersen 100 Series* windows and doors, made with Fibrex material, were chosen for their longevity and ability to stand up to the Texas heat.

Matching preferences with practicality is another important element of product selection.

"Many homeowners prefer wood floors, but we try to steer them toward engineered hardwood floors because they're extremely durable and more sustainable than traditional hardwood," Barley says. "They can be glued directly to the foundation or to the concrete floor, or you can put in some more layers of substrates under them to make them a little softer on the feet. But of course, with more material comes more expense, so this has to be matched to the budget."

Engineered floors can also be easier to install and waste less wood, Moore says. This also keeps the price down. At the VISION House Austin, AHF's engineered wood flooring products will be installed, along with Crossville Tile's ceramic and porcelain tile.

"Engineered floors are also healthier because you're not putting chemicals down on the floor finishes right before clients move in," Pfeiffer says. "Even if water-based polyurethane is used on hardwood

floors that are finished in place, it still stinks. Ideally, you should let it dry and harden for two weeks, but no one ever has time to do that. They move in three days later and they're basically living in a chemical bath."



Wood substitute. Engineered floors, such as those from AHF, can be easier to install and waste less wood than typical wood flooring.

CREDIT: COURTESY OF AHF.

BALANCING AESTHETICS AND THE BEST PRODUCTS

Sometimes, aesthetics can clash with building science. For example, Effland says ultra-modern style doesn't typically lend itself to being very efficient.

"Floor-to-ceiling glass and zero overhangs are things that immediately take a hit on efficiency and the overall durability of a house," he says.

Even so, architects can improve a home's performance with design elements matched with the right technology.

"Sometimes a house needs to be sited with windows facing west because there are good views in that direction," Barley says. "Or your client loves contemporary houses that are boxy, but we can find ways to reconcile those things."

For example, a home can be designed with a roof overhang that shades the window in the summertime and lets sunlight in in the wintertime, Pfeiffer says, or with carefully positioned windows for natural ventilation. Choosing the right Andersen windows for the climate is important, too.

"One of the most important things to do is to design with a detached garage, which avoids contributing to heat gain in a house and is better for indoor air quality," Pfeiffer says. "That keeps all the chemicals from the garage out of the house."



It's all cool. A detached garage avoids heat gain in a house and is better for the main home's indoor air quality. CREDIT: COURTESY OF JUSTIN MOORE, WHITE ELEPHANT

GENERAL CONTRACTORS

Insulation from Henry helps protect the VISION House Austin and the garage from water, air and moisture intrusion.

"We seal the attic and use spray foam insulation to keep out the heat and humidity, along with dust and pollen that can filter down from the ceiling," Pfeiffer says. "We elevated the house higher off the ground than usual to prevent dust and bugs from getting in more easily, too."



Sealed shut. Henry Company's building envelope includes *Blueskin* weather barrier insulation and spray foam insulation to improve performance. CREDIT: COURTESY OF JUSTIN MOORE, WHITE ELEPHANT GENERAL CONTRACTORS

Getting the most from the chosen products for any house starts with paying attention to construction details in the design phase.

"Sometimes builders put the air handler in the garage and then send conditioned air all the way across the house to the primary bedroom," Pfeiffer says. "We put the air handler towards the center of the house so there's less resistance to the air flow. That's why we're such big believers in doing a comprehensive design from the beginning, including where we want ducts installed in the trusses instead of it being an afterthought."



Where goes the air? Barley/Pfeiffer's design includes giving priority to where to place air ducts for best effectiveness, instead of making it an afterthought. CREDIT: COURTESY OF JUSTIN MOORE, WHITE ELEPHANT GENERAL CONTRACTORS

The combination of smart design and smart products can make sustainability more accessible to more homeowners.

"An important word that doesn't get emphasized enough in green building is passive," Pfeiffer says. "For the past 15 years or so, the emphasis in the green building movement has been too much about expensive technology that limits green homes to wealthy people and that require homeowners to do maintenance they may not be willing to do."

As new innovations and automation become commonly applied and more homes are designed thoughtfully to take advantage of nature, sustainability can become more attainable for every homeowner. **GB**

PRE-GAMING

PEST

CONTROL



Building science and specific products work together to maintain a healthy environment. Health, particularly focused on indoor air quality, is part of the VISION House Austin from initial planning through construction and beyond. For example, the house is sealed with Termistop's *Termi-Mesh Termite Control System*, which keeps ants and termites from entering from the foundation, says Justin Moore, owner of White Elephant General Contractors in Austin.

"Before I insulate, I'll sprinkle non-toxic bug resistant chemicals to prevent bugs from getting in the house," Moore says. "This is just one of the smart details that can be done to improve and maintain indoor air quality before the homeowners even move in."

Over time, defecation from bugs is a top contributor to poor indoor air quality, according to the U.S. Environmental Protection Administration (EPA). Preventing insects from entering the house also reduces the need for pesticides.

Bugs be gone. Termistop's *Termimesh* is a non-chemical pretreatment process designed to stop termite problems before they begin.

CREDIT: COURTESY OF TERMISTOP USA

Other steps taken to set the house up with good air quality even before the introduction of an ERV include vacuuming all construction dust and debris from inside the wall cavities before they're sealed, sealing the interface between the foundation and the walls, sealing the attic, and doing a duct blower test on the air conditioning system as well as a door blower test.

"We avoid using glossy paint on interior walls because it allows moisture to collect behind it, just like wallpaper can," says Joel Effland, project manager for the VISION House Austin. "We also pay careful attention to the exhaust vents and how well they're ducted. We put them on timers, so they automatically go on and off to filter out bad air and not waste electricity."

Metal ducting is more durable than flexible ducts, is cleaner and seals better, says Alan Barley, co-owner of Barley|Pfeiffer Architecture in Austin. "It provides better air flow and uses less energy in addition to contributing to better air quality."

WILDFIRE RESISTANCE

Barley|Pfeiffer Architecture in Austin, Texas, takes a two-pronged approach to building homes that will be resistant to wildfire impacts.

"First, we make sure the landscaping around the house is all Texas-native plants that will thrive in this climate," says Joel Effland, project manager for the VISION House Austin. "The owners aren't planning on doing any yardwork, so we can plan a simple fire-resistant site."

The second approach is to choose exterior materials that are highly resistant to wildfire, such as the metal roof from Fabral and the James Hardie fiber cement siding, which is designed to be resilient for specific climate zones.

"One of the first product choices we made was TimberTech's PVC decking, which has a Class A fire rating, and is an ignition-resistant material," Effland says. "The aluminum framing and substructure is noncombustible."



Flame retardant. TimberTech's PVC decking has a Class A fire rating and is an ignition-resistant material. CREDIT: COURTESY OF TIMBERTECH

The non-vented attic can prevent embers from getting sucked into the house, and the soffits and fascia that are composite materials also improve fire resistance, says Alan Barley, co-owner of Barley|Pfeiffer Architecture.

SPONSORS



Narrow Perspective

A Passive approach can also be enticingly unconventional.

Project Stats

NAME: 18th Street Passive House, Vancouver, British Columbia

BUILDER: Duane Svendsen, WEST-ECO Panelized Building Systems, <https://westecopanel.com>

ARCHITECT/DESIGNER: Nick Bray, Nick Bray Architects, <https://nickbray.ca>

INTERIOR DESIGN: Designs by KS, Vancouver, British Columbia, <https://designsbyks.com>

PHOTOGRAPHER: Nick Bray

From the Judges

"Excellent building performance meets incredible design."

BY GREEN BUILDER STAFF

EDITOR'S NOTE: Our January/February 2025 issue features our annual Green Home of the Year competition, with profiles of the winning construction projects. Here's an example of the types of homes we'll be judging, featuring a runner-up from last year's event.

Seeing a 2,000-square-foot, five-bedroom, five-bathroom residential home packed onto a 25-foot-wide infill lot that is barely larger than the house is eye-catching. But learning what lies beneath the bottom floor is definitely raises some eyebrows.

The Vancouver, British Columbia dwelling, nicknamed "The 18th Street Passive House," sits atop a peat bog, one of many areas in the city that used to be marshy wetlands (made mostly of decomposing vegetation) but were drained and used for housing development in the 1950s. The homes aren't very stable—engineers have been struggling for years to keep sewer lines from sinking and sidewalks from cracking. In the latter case, the city has even experimented

with using recycled rubber.

As a result, 18th Street Passive, completed in 2021 and conforming to the city's "incredibly hardcore" 2032 energy standards, had to be carefully constructed, according to designer by Nick Bray of Nick Bray Architects. The 18-foot-wide house rests upon columns that go 40 feet down to a solid surface. There's what *Montecristo* magazine calls a "Swiss Army knife of building technology": a system of heat recovery ventilation, heat pumps, heated concrete tiles, and solar panels that warm the house in winter. In summer, natural ventilation draws in fresh cool air and vents through the roof. A pair of wood canopies shade against the summer sun while letting in winter light.

Other sustainable features include wood siding made from trees that were cut down during the home's construction, and a Rainscreen SA air barrier/water-resistive barrier with a built-in rainscreen drainage matrix that has zero VOCs. The home also includes Structural Insulated Panel (SIPs) manufactured by Premier Building Systems for better protection against elements and a tighter envelope. As a Passive House, it consumes 90 percent less energy than a conventional building.

The house, which received Honorable Mention in *Green Builder's* 2023 Green Home of the Year competition, is, according to *Montecristo*, "an ode to design under constraint—and to the idea that what is constrained need not be boring." **GB**





Joint effort. Homeowners, contractors and architects can responsibly undertake an ADU project by being knowledgeable and interested in being successful. CREDIT: TERRY BEAUBOIS IN DISCORD/MIDJOURNEY

The Right Way to Build and Sell ADUs

BY TERRY BEAUBOIS

Whether you are a contractor, a homeowner or an architect, the process of designing and building an Accessory Dwelling Unit (ADU) is very appealing and could result in a significant increase in the number of ADUs that are created using the principles of green building.

Part of an ADU's appeal is the fact that it is smaller and therefore might be "simpler" to undertake. Some people might believe that a smaller building will automatically

translate into a project that requires less attention to design, selections, project management and financial management, than a larger, "more complicated" residential project. It also seems possible that being involved with an ADU or ADUs will be a lucrative market to approach for contractors and for homeowners wishing to increase the value of their real estate.

One important issue that can be overlooked is that some ADU projects require significant time, and in some cases, an effort more similar to a larger-

scale residential project. The reality is that an ADU can have the complexity of any home design project but just result in a smaller structure. Many components of an ADU match those of a large home project. It is actually easy to understand why that is the case. ADUs require roofs, walls, windows, doors, floors, intelligent selection of products that include a bathroom and a kitchen, and can also be required to exhibit the management and the proper decision-making and selection of an entire home—just resulting in a smaller building.



California is running into the problems that ADU projects can have.” Everyone can learn from this, and it’s of great value to those considering approaching the ADU market with high (and possibly unrealistic) expectations.”

Thinking that there will be less concern about details, decisions and selections—and that it will be much easier to create an ADU—may not be the reality. ADUs are evolving to recognize the reality and responsibilities of entering the ADU market. ADUs do lend themselves to being the perfect projects to formalize residential building into a well-organized approach to planning, design, and execution of residential design and building.

Homeowners, contractors and architects need to proceed with caution, of course, but they also need to responsibly undertake an ADU project by being knowledgeable and interested in being successful. This does not happen by accident.

CALIFORNIA IS LEADING THE WAY REGARDING ADUS

It’s a recognized statement: “California is running into the problems that ADU projects can have.” Everyone can learn from this, and it’s of great value to those considering approaching the ADU market with high (and possibly unrealistic) expectations.

While ADUs are a great opportunity, some construction companies have already gotten into serious difficulties. We can learn from what can go wrong. Over-promising, over-extending one’s abilities to deliver, and failing to successfully address and meet the demands of being involved in the ADU market are some of the outstanding problems that have occurred in California and have already been widely reported.

ONE MISPERCEPTION: THE GOVERNMENT HAS SIMPLIFIED THE REVIEW AND APPROVAL PROCESS.

This is another area where there is a difference between perception and reality regarding the ADU market. One misconception in some locations is “that somehow regulations have relaxed for ADUs,” that “pre-approved plans” are available, and that one can immediately get approval for a project and start building. This makes it seem that the front-end design and approval effort has been reduced or eliminated. But builders are finding that “pre-approved ADU plans” in some locations may not be revised.

Also, the project may be moved into the regular review and approval process (which takes much longer to go through) if any changes to the pre-approved plan are made. This can result in extensive additional review and approval time than planned or expected. Any anticipated gains expected from using pre-approved plans may be lost if your client wants to do any custom project elements that a homeowner requested. If you are trying to meet the needs of a specific client, they’re not always going to be satisfied with the pre-approved plans exactly as they exist. Check with your local review and approval agency before proceeding.

THINGS THAT WE CAN DO

There are ideas being explored to address reasonable approaches to ADUs:

- Use available technology to specifically address the design and construction of ADUs that make

Advice for Homeowners Regarding ADUs

Here are the top 10 things to consider when entering the market:

- 1. If you haven’t been involved in a real estate project that involves construction before,** build a good team of advisors before starting your project. Get recommendations and references. It may save you time and money.
- 2. Realtors, architects and engineers, contractors, and banker/financial advisors are all available** to respond to your project and help you. Your contractor and/or architect can be great guides for you and your project. Take the time to find ones that fit your business style and are highly recommended by others.
- 3. Use the same level of care and detail as you would for a full-size residential project.** Smaller building doesn’t mean “less important.” You will be glad that you did.
- 4. Treat the ADU as an investment** in your lifestyle and your financial future.
- 5. Check out your jurisdiction’s local review and approval process ahead of time.** Some local jurisdictions are still difficult on time schedules, despite offering lots of information about how quickly and uncomplicated ADUs are to build. It’s even difficult for experienced contractors and architects to get realistic “review and approval time estimates” from government review and approval agencies.
- 6. Learn as much as you can about real estate in your property’s location**—especially comparable sales (comps) and projected comps—from a knowledgeable local realtor. Good realtors know this information and can help you plan your project and help guide it to completion.
- 7. Develop a Total Cost of Ownership (TCO) approach to your project** to help guide your decisions regarding cost of materials and product selection. This will keep you from accidentally “over-building” or “under-building” for your property.
- 8. Don’t be shy. Take control of your project.** Do not let your project become a “runaway”—over budget, over time schedule and a disappointment—a project you regret.
- 9. While it is common to take the lowest bid, try to consider the “value” of experience, accurate (not cheapest) cost estimate,** and reliability of your team and subcontractors. Experienced real estate developers don’t always choose the least-expensive path. It can mean that something was “left out,” leading to unplanned “cost increases” during the project. Having a realistic bid is better for your planning and best for having a “successful project.” Selecting the “lowest bid” and then experiencing project cost increases during the building process can leave you with the wrong contractor by mistake—with good intentions, but paying more than expected.
- 10. Avoid “cutting corners.” Stay on budget and constantly assess project progress,** so that “surprises” are avoided and you are proud at project’s end. You want to feel like the project was a worthwhile financially and a positive experience for you.



Not-so-small challenge. Part of an ADU's appeal is its small size, which could—but not always—make for an easier-to-design, faster-to-build project. CREDIT: FLICKR/DANIEL RAMIREZ CC 2.0

them more manageable, better organized and more efficient for homeowners, architects, general contractors and subcontractors.

- Incorporate clear data to homeowners regarding the Total Cost of Ownership (TCO).
- Provide well-organized information regarding realistic costs of real estate, financing, architecture, engineering, government review and approvals, construction, product and materials selection, building maintenance and management.

HELPING HOMEOWNERS NOT MAKE MISTAKES

Many firms are exploring innovative ways of coaching and guiding the “decision making/selection/choice” process that can guide homeowners toward creating the ADU for their property. Still, many homeowners may erroneously think that because it is a small project, they can successfully manage it on their own. Very few homeowners will actually be capable of this.

We’ve all seen projects where homeowners overestimate their abilities and the time required to undertake their own kitchen or bathroom remodeling. They also underestimate the difficulty in doing so and end up with a project that takes much longer, costs much more, and that turns into a less-than-satisfying undertaking. This can easily happen with an ADU project.

The other error a homeowner may make is to underestimate what a reasonable bid would be for a contractor to manage an ADU project. As many of us know, the “lowest bidder” factor often results in a homeowner ending up with someone who has “underbid the project and ends up taking longer and charging more than their bid on what the project was originally estimated to be.” We’ve all experienced that in the building industry and that can be a factor in the ADU market as well.

Reliable information, reliable project participants and informed homeowners will determine how these factors play out in the ADU market. It will take all three

coming together for each project to stay on track—just like every other building type.

The other obvious element in considering the ADU market is how to apply all of the sustainable/green building data available to ADUs from the beginning—which Green Builder magazine has been providing for years—to the residential building market, revised now and oriented specifically to ADUs.

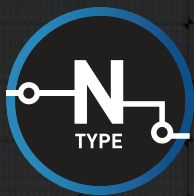
For now, seriously consider applying all or much of the information that Green Builder magazine regularly supplies you, regarding the green, sustainable aspects of residential building to your ADU practice. This will really contribute to improving the world through Green Builder, if every ADU is “green.” It will be an appealing aspect of your work, and your ADUs will have an advantage over other builders, who are not featuring sustainability and green building in their ADUs. **GB**

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



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HOUSING 2.0

RETHINKING THE PERFECT WALL [PART 1]

The new environmental separator goes beyond internal performance. It's also a safeguard against natural disasters.

BY SAM RASHKIN

This is Sam Rashkin's latest in a series of articles based on his second book, "Housing 2.0: A Disruption Survival Guide." It is intended as a roadmap for high-performance builders to become the most successful in the industry.



Critical design. A "perfect wall" in a building, such as with this project from Rauser Design, requires many variables, including local climate and penetrations to how material selections may interact. CREDIT: RAUSER DESIGN

Widely renown building scientist Dr. Joseph Lstiburek introduced us to the "perfect wall" as an effective environmental separator for keeping the outside out and the inside in. The resulting moisture risk management has become an imperative as the latest International Energy Conservation Codes (IECCs) and certification programs (e.g., ENERGY STAR Certified Home and Zero Energy Ready Home [ZERH]) are effectively transforming U.S. housing to high-performance enclosures. Consider how much better insulated and air-sealed new homes are compared to a few decades ago. This means framed walls today experience significantly less air flow and thermal flow with colder surfaces inside their cavities. Walls today have significantly less drying potential and more wetting potential that create greater moisture risk.

The secret sauce for Lstiburek's "perfect wall" is to provide adequate continuous insulation outboard the structure to provide an effective thermal break and reduce surface temperatures inside the framed cavity to mitigate condensation risk. A common variation of the "perfect wall" is shown in Figure 1.

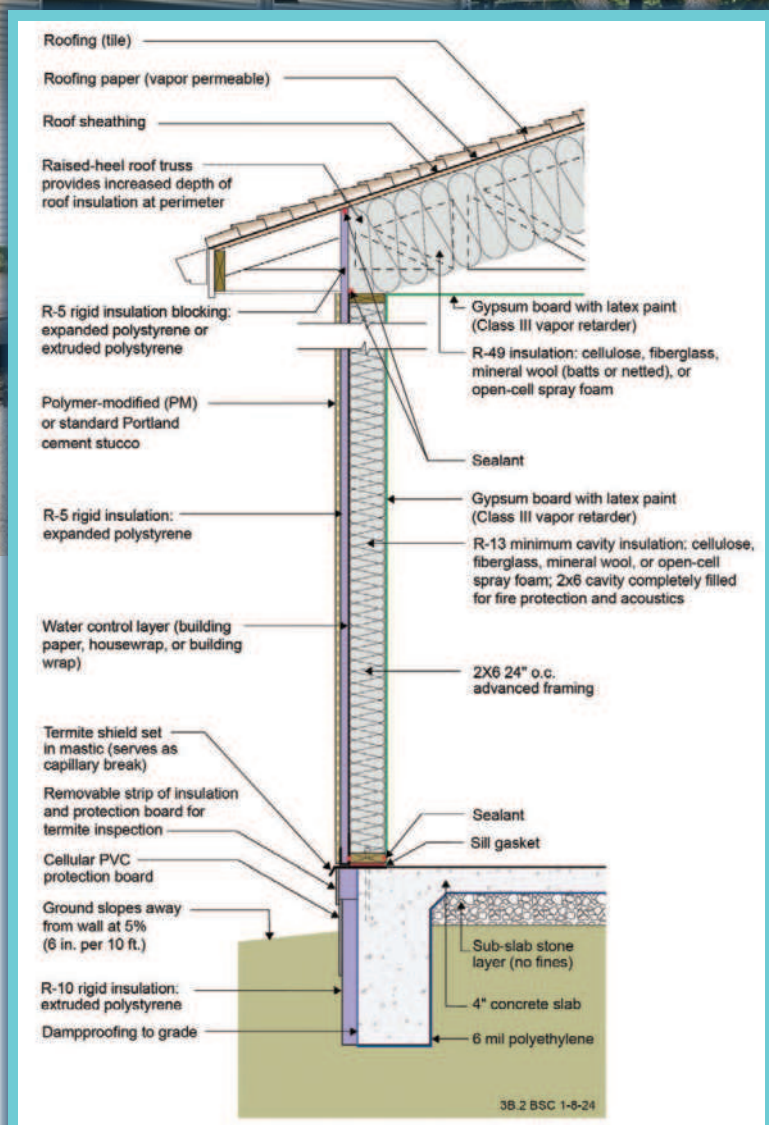
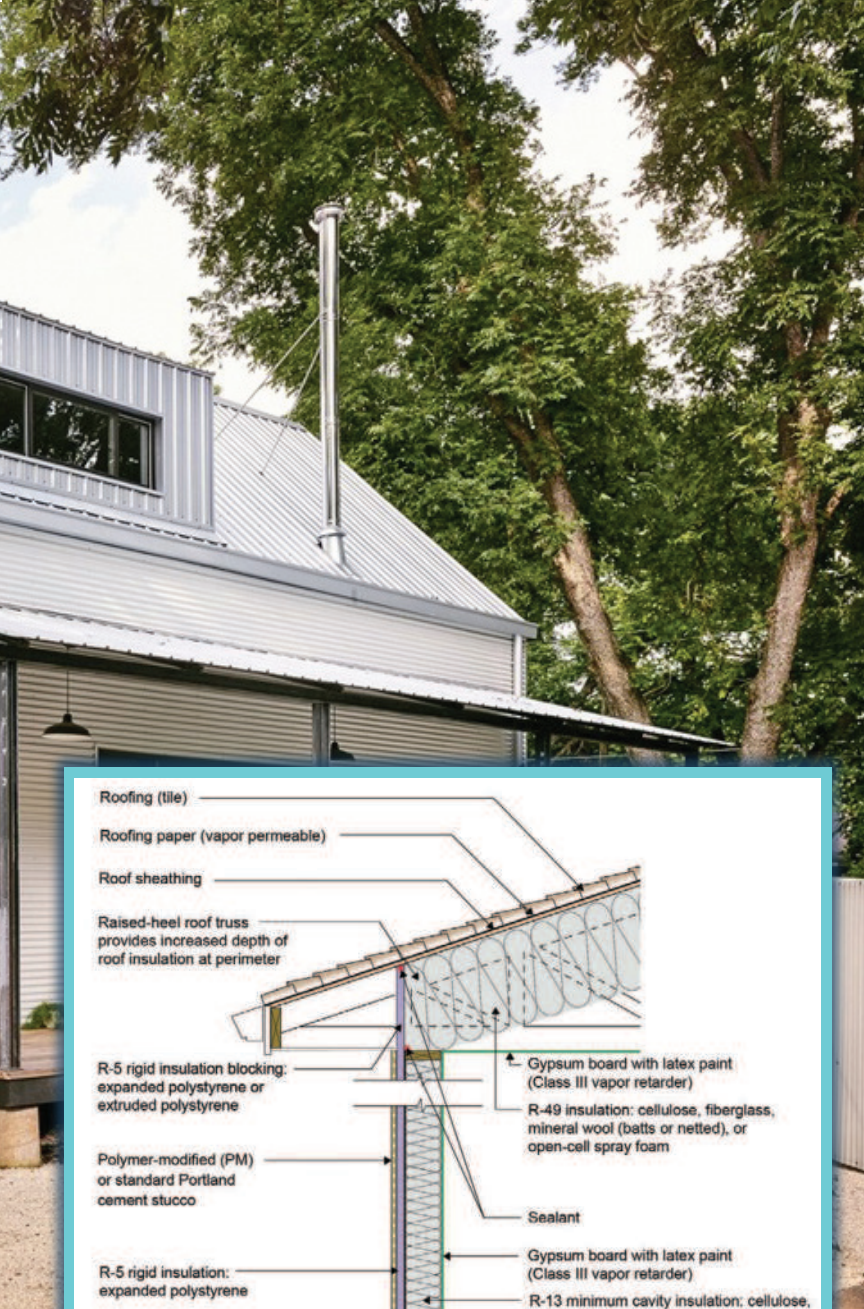


Figure 1: 2021 International Energy Conservation Code compliant assembly for Climate Zone 3B SOURCE: U.S. DOE BUILDING AMERICA SOLUTION CENTER

Unfortunately, controlling rain, air, vapor and heat flow is no longer enough. We can no longer ignore exponentially greater disaster risks and construction industry workforce challenges. They have a profound impact on what qualifies as a perfect wall.

DISASTER RISKS

Managing risk is about predicting the future accurately. The key is knowing how to distinguish between a soft trend (e.g., latest color preference) from a hard trend (e.g., increasing global human population). It is about knowing how to recognize certainty.

One clear hard trend is that the planet is getting warmer. According to NASA, the 10 most recent years are the warmest years on record, including 2023 as the hottest.

When predicting the future, I also care about science. As the planet gets warmer, temperature gradients increase and ocean temperatures rise. Then physics kicks in. Following the second law of thermodynamics we experience greater “more to less” driving forces (e.g., pressure, heat, and moisture flow) that, in turn, increase the frequency and magnitude of disaster events.

According to NOAA data, the frequency between the most extreme billion-dollar disasters has increased more than four times since the 1980s. This has led to six times more billion-dollar severe storms in the past two decades than the prior two decades.

Over one five-week period, five 1,000-year rain events struck the U.S. We’re not in Kansas anymore. It’s time to recalibrate what is a 1,000-year event.

Along with greater frequency comes greater magnitude driven by greater atmospheric temperature gradients and moisture absorption. This results in many-fold increases in storm size, wind speed, ocean water surge, polar ice melting, droughts, and heat storms. For example, hurricanes a few hundred miles in diameter used to be considered extreme. Now we are experiencing storms exceeding 1,300 miles in diameter. One foot of sea rise is forecasted for the next 30 years, which is more than three times greater than that experienced in the past 100 years. Similarly, we’re seeing devastating wildfires that destroy whole cities, and rainstorms that dump a year’s worth of rain in just a couple of days.

Most significantly, we can’t afford the cost of this exponentially increasing disaster risk. There is \$6.6 trillion of estimated market value for the 43 percent of U.S. homes in counties with high natural disaster risk. In September, hurricanes Helene and Milton hit the gulf coast within two weeks of each other, causing an expected \$100 billion of wind and flood damages. In response to this new reality, insurance companies are pulling out of high-risk states (e.g., California, Florida) and significantly raising costs. And this risk is not lost on the public. In one survey, 75 to 80 percent of respondents would hesitate to buy a home in areas with increased flooding, intensity of natural disasters, extreme temperatures, and rising sea levels.

WORKFORCE RISKS

The construction industry is facing a huge workforce crisis that is frequently in the news. The key challenges are availability, skill and productivity.

Regarding workforce availability, in one recent survey, 94 percent of construction firms reported they have a hard time finding workers to hire. Fifty-four percent report project delays due to this shortage.

In addition to added costs and the burden of securing workers, the increased cycle time imposes significant expense for additional overhead (e.g., rent, salaries, equipment, vehicles, construction loans, insurance) and reduced sales velocity (lost profit margins).

What is most disturbing about the workforce shortage is there is no end in sight. According to the Bureau of Labor Statistics, the average construction worker’s age is 42.5, with the Home Builders Institute reporting there are

only two workers in the construction workforce pipeline to replace every five workers that age out or retire. The result is a labor shortage Tsunami looming ahead with approximately 723,000 new workers needed each year to combat a 1.5-million-home shortage.

In addition to a critical workforce shortage, there is a substantial skill deficit among those workers that can be found. According to one survey, inadequate skills is one of the main reasons labor shortages are so severe, since most job candidates are not qualified to work in the industry. This problem is compounded in high-performance housing that require much greater skills for quality installed moisture control, insulation, air sealing, air barriers, HVAC equipment and ductwork, whole-house ventilation and smart home systems.

The final workforce issue, productivity, is a huge problem that also contributes to the housing affordability crisis. This is because home building productivity is actually going backward, with an approximately 50 percent decline since 1968 while every other industry has become more productive. The outcome is an average cycle time that has increased to 8.6 months from permit to finish construction. Analysis by McKinsey and Company suggests the U.S. construction industry is suffering from a \$200 billion labor productivity gap that could be closed by adopting 21st-century manufacturing methods.

The bottom line is there is a new imperative for the “perfect wall” to resist exponentially growing disaster and workforce risks.

THE NEW “PERFECT WALL”

The original “perfect wall” was a great revelation when introduced in 2010. It’s time to expand the scope of what qualifies as a “perfect wall” beyond building science to also include disaster and workforce risks. The risk assessment matrix in Figure 2 is a first attempt to integrate all these risk factors into a single tool. This is achieved using a “low,” “medium” and “high” assessment for each risk factor across a diverse array of wall assemblies. Importantly, wall assemblies are split into site-built and systems-built (e.g., offsite construction) to account for workforce risks.

It is important to recognize that a “medium” or “high” risk assessment for any risk factor of concern does not mean a wall assembly should not be used. It just means it is critical to manage that risk. For example, if a wall assembly is considered “high risk” relative to bulk moisture, I’m confident tried-and-true moisture control strategies with adequate quality control can manage the risk (e.g., weather resistant barriers, flashing details and capillary breaks).

What “medium” or “high” risk assessments do mean is that the extra costs to manage the greater risk must be considered for a fair comparison with other lower-risk wall assemblies. This is especially important for new innovations providing low-risk alternatives to 150-year-old traditional framing assemblies. Too often innovative wall systems are handicapped with simple bid cost comparisons with conventional wall framing that ignore

High-R Wall Options (Climate Zones 5-8)	Risk Management Issues:										
	Building Science			Disaster Resistance					Workforce		
	Thermal Bridging	Condensation in Assembly	Bulk Moisture	Flood Resistance	Impact Resistance	Earthquake Resistance	Wildfire Resistance	Pest Resistance	Availability	Skill	Productivity
Site-Built Walls											
Insulated Framed Wall	High	High	High	High	High	Low	High	High	High	High	High
Insulated Framed Wall with Exterior Insulation	Low	Medium	High	High	High	Low	High	High	High	High	High
Systems-Built Walls											
Insulated Framed Wall	High	High	High	High	High	Low	High	High	Low	Medium	Low
Insulated Framed Wall with Exterior Insulation	Low	Medium	High	High	High	Low	High	High	Low	Medium	Low
Structural Insulated Panels (SIPs)	Low	Low	High	High	Medium	Low	Medium	Medium	Low	Low	Low
Precast Insulated Concrete Wall	Low	Low	Low	Low	Low	Medium	Low	Low	Low	Low	Low
Insulated Concrete Blocks / Panels	Low	Low	Low	Low	Low	Medium	Low	Low	Low	Low	Low
Insulated Concrete Core System	Low	Low	Low	Low	Low	Medium	Low	Low	Low	Low	Low

Figure 2: Wall assembly risk assessment matrix for IECC climate zones 5 through 8.

these costs. This is an especially difficult handicap when coupled with normal builder resistance to change and lack of substantial learning curve cost savings that only come with use. Thus, this tool is an attempt to begin the process of fully integrating all the costs of risk management along with other benefits when choosing wall assemblies (e.g., reduced cycle time, reduced rework, reduced waste, superior user experiences).

HIGHER RISKS, GREATER GAINS

The strawman wall assembly risk assessment matrix in Figure 2 suggests there are much higher risks for wood framing compared to concrete wall assemblies and for site-built compared to system-built wall assemblies. No surprises.

Wood framing dominates home construction because it is abundant, easy to work with, lightweight, and renewable. However, objectively it is a poor wall assembly material because it:

- Lacks dimensional stability
- Burns
- Rots due to moisture
- Gets moldy with moisture
- Creeps under sustained loads
- Doesn't withstand impact
- Attracts destructive pests
- Warps based on temperature and humidity
- Expands and contracts based on relative humidity
- Has different strength properties depending on orientation
- Requires job site protection
- Tends to be labor intensive

Also obvious is that system-built walls substantially reduce workforce risks compared to site-built walls.

Where a systems-built assembly that doesn't use concrete is preferred, structural insulated panels (SIPs) offer an option for a more perfect wall. They enhance impact resistance, improve wildfire resistance when paired with an SIP's unvented attic, and address workforce risk factors. However, they still must manage high risks related to bulk moisture as well as flood resistance where it applies.

Remember that this assessment is just an initial attempt to compare wall options relative to a much more comprehensive set of risk factors than the original "perfect wall."



Figure 3: Aftermath of Hurricane Milton in September 2024. CREDIT: FLICKR/CALMUZICLOVER

This is just a first step. Assembling diverse stakeholders and experts to collaborate on a consensus risk assessment for wall assemblies would help provide more robust guidance. The key point is that we need to be better informed choosing wall assemblies that are more disaster resistant and workforce ready at a time when housing is confronting a massive affordability crisis. **GB**

Sam Rashkin's two-decade career as a licensed architect includes serving on national steering committees for the U.S. Green Building Council (USGBC)'s LEED for Homes, Green Builder Media's Green Builder Guidelines, the Environmental Protection Agency (EPA)'s WaterSense label, and EPA's Indoor airPLUS label. He has partnered with Green Builder Media to develop the **Housing 2.0 program**, which empowers building professionals to design and construct higher-performance, healthier and more-sustainable homes at a fraction of the cost.

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POWER PACKED

Charging ahead. Demand for advanced, reliable, and efficient electric vehicles continues to grow, as does the need for advanced battery packaging solutions. CREDIT: ISTOCK/3ALEXD

How an EV battery is packaged is as important to the environment as how the unit runs.

BY TREVOR STOUT

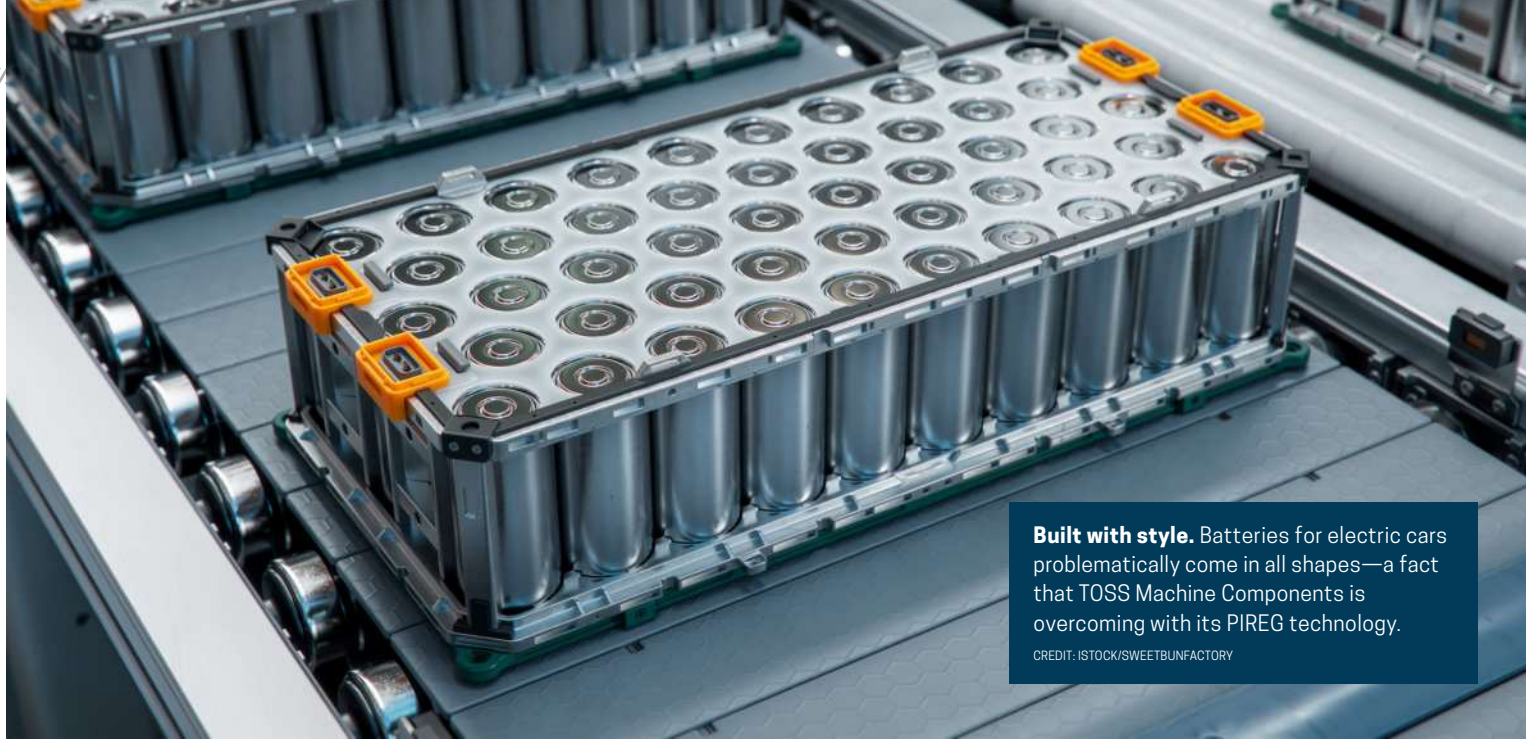
Electric vehicles (EVs) have taken the automotive world by storm, promising reduced emissions, improved performance, and a sustainable future. However, the engineering behind EVs presents a unique set of challenges, particularly when it comes to packaging the vehicle's heart: the battery.

As the global market for EVs continues to grow, so does the demand for advanced, reliable, and efficient battery packaging

solutions. Innovative impulse heat sealing technology is at the forefront of addressing these evolving needs, offering unparalleled precision, reliability, and sustainability in EV battery packaging.

UNIQUE CHALLENGES

Consumers expect their EVs to be safe, durable and efficient. Manufacturers are turning to impulse heat sealing to meet their



Built with style. Batteries for electric cars problematically come in all shapes—a fact that TOSS Machine Components is overcoming with its PIREG technology.

CREDIT: ISTOCK/SWEETBUNFACTORY

expectations while meeting the increased EV demand. The surge in demand isn't limited to EVs, either. The rise of battery-powered devices across industries, from medical devices to consumer electronics, has led to an explosion in the variety of battery sizes and shapes—which the packaging must accommodate.

EV manufacturers, constantly pushing the boundaries of design and performance, often must fit batteries into contoured spaces within a vehicle. As battery technology evolves, we are seeing more batteries being built directly into the devices they power. This trend is apparent in everything from smartphones to electric cars. Impulse heat sealing technology, with its ability to adapt to these complex shapes, is ideally suited to meet this emerging need.

SUSTAINABILITY AND SAFETY

In the world of heat sealing, there are four main technologies commonly used for sealing polymeric materials: Radiofrequency (RF), ultrasonic, constant heat, and impulse heat sealing. Each type comes with pros and cons.

RF and ultrasonic are the most expensive options. And while constant heat offers cheaper upfront costs, it requires constant heating of the tooling that creates the seal therefore consuming large amounts of energy. Impulse heat sealing, on the other hand, is more energy-efficient—requiring heat only for the duration of the heat-sealing cycle. Additionally, impulse heat sealing can handle practically all types of plastic films, giving manufacturers more flexibility in their packaging materials.

When it comes to critical applications such as EV batteries, the importance of a strong, hermetic seal cannot be overstated. In EV batteries, multiple cells are often stacked together, and if the anodes and cathodes come into contact with one another, it could lead to short circuits. This poses significant safety risks. Impulse heat sealing creates a secure seal around each cell, ensuring that there is no contact between the individual components, further enhancing the safety and reliability of the battery.

Unlike constant heat, which can lead to film waste and inconsistent results as the tooling overheats, impulse heat sealing

controls the temperature cycle precisely, cooling the material immediately after heating. This process leads to a stronger and more consistent seal, reducing the risk of defects or waste. As manufacturers look to reduce their carbon footprint and energy consumption, impulse heat sealing provides a clear advantage.

THE TOSS DIFFERENCE

Today, TOSS impulse heat sealing technology is being used by a variety of customers to package lithium batteries, from EVs to smaller devices like pacemakers. Whether the battery is powering a lawnmower or an EV, TOSS technology ensures that each cell is individually sealed with no risk of contact between the cells.

TOSS' PIREG technology is at the core of its heat sealing systems. By measuring the temperature of the heat seal band 60 times per second, PIREG ensures consistency across its seals. This high level of control is essential in applications where safety is paramount, such as in EVs.

Furthermore, these systems can scale to accommodate parts large and small, in any shape. This versatility ensures that no matter the application, a consistent, reliable seal is delivered every time. This is a significant advantage, especially as EV manufacturers seek more compact, efficient battery designs that still provide maximum performance.

Another key differentiator for impulse heat sealing is its ability to be validated. This is especially critical in industries where precision is paramount. TOSS systems feature a feedback loop that allows users to monitor temperature with a high resolution, ensuring that the sealing process is always functioning as intended.

As the world continues to shift towards EVs and battery-powered devices, the demand for advanced battery packaging solutions will only grow. Offering precision, reliability, and sustainability, TOSS is helping manufacturers deliver safer, more efficient products to consumers around the globe. **GB**

Trevor Stout is applications engineer for [TOSS Machine Components](#), a distributor of precision heat sealing equipment.

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THE CASE FOR GRACE



Ron Jones
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Many years ago, a close relative of mine, who was struggling to find his way, confided that although he was willing to carry a heavy load, he truly wished that the journey wasn't always uphill too. This sentiment was, and still is, easy to agree with. I don't know anyone who chose sustainability as their mission in life because they thought it would be easy. At times, the road can be fairly straight and level, but as we all know, there are plenty of hurdles and potholes lying in wait.

Recent developments in our governmental leadership staggered the green building sector and raised frightening concerns that all the hard-earned progress that we have recently enjoyed is very much at risk. In a nutshell, special interests in the building industry and beyond are licking their chops at the tantalizing prospects of diluted regulations, performance rollbacks and a hearty buffet of loopholes.

The initial reaction for many of us was a blend of anger and bewilderment. The loss of control and any reasonable predictability created widespread angst throughout the sustainability community. But almost immediately another almost universal response emerged. A wide variety of sustainability advocates issued the call to double down on our individual and collective efforts to advance the built environment to higher levels. Some simply declared that we just need to get back to work.

A close friend wrote, "I've decided that the best revenge is to not give up, not acquiesce, don't compromise, and maintain our values with tenacity and faith. The future will be a watershed of change. I am going with doubling down on my values and goodwill when it is warranted."

I was immediately reminded of a brilliant opinion piece by the great William Safire that appeared in the New York Times on Feb. 11, 1985. In it, he posed the question of why

A close friend wrote, "I've decided that the best revenge is to not give up, not acquiesce, don't compromise, and maintain our values with tenacity and faith. The future will be a watershed of change. I am going with doubling down on my values and goodwill when it is warranted."

we celebrate Lincoln's birthday.

He asserted that the reason is not necessarily because Lincoln was known for freeing the slaves and for preserving the union, but rather because he forced the country, through the horror of the Civil War, to forge an unbreakable commitment to the backbone of the democratic process, or as Safire put it, Lincoln enshrined majority rule. He described how in our system the transfer of power happens "majestically, as though there were no other way."

We have witnessed the alternative and none of us ever want to experience something like that again. We are absolutely entitled to feel disappointment, even betrayal, and to express our frustrations over the outcomes of events like important elections that don't go our way.

But such experiences provide us with opportunities as well. In a case such as this, we can choose to embrace the pain with grace, to allow ourselves to be bigger than the moment and to seize upon the challenges with renewed determination and courage. **GB**

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