Mastering Building Code Challenges

Today's leading manufacturers need to do more than produce products and market them; they are a builder's most integral partner. Here are the stories that show how the builder-manufacturer relationship creates cost-efficient, high-performance homes that exceed even the most challenging building codes.

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Photo courtesy of *Professional Builder Magazine* and Jeffrey A. Davis Photography Inc.

The 2016 New American Home was built by Elemental Design Build and is a nationally recognized showcase of residential building products and technologies.

YEARS AGO, BEFORE ANYONE BUT SCIENTISTS PAID ATTENTION TO BUILDING SCIENCE, MOST BUILDERS PUT UP HOMES THE WAY THEIR FATHERS DID. Or, if they worked in larger home building companies, they simply followed the protocols that had been in place for decades.

These were times when a builder was on his own when bringing to life a blueprint using the products and crews he knew best. While he put up house after house, issues like building codes, climate implications, product failures, buyer demands, callbacks, and a host of other concerns dogged his sleep.

Those days are long past for the most innovative builders, who now know that to be successful you need to work with manufacturers who are invested in getting home building right. The best manufacturers have evolved into the purveyors of crucial information that builders simply can't get on their own—information such as research and development of products and building practices, advanced knowledge of building codes and how to meet or exceed them, and reverence for the concept of the house as a system.

COVER PHOTO: **Palo Duro is one of the few builders in New Mexico delivering 100 percent LEED-certified homes.**

Get on the Same Page

Building science is the basis upon which a builder can grow a thriving company. "Builders tell us the worst thing that can happen to a builder is a callback—now I have moisture problems with wall paint that is peeling, musty smells, and air problems on my hands," says Achilles Karagiozis, Global Director of Building Science at Owens Corning. "All of these become a worst nightmare because of the costs and the builder's reputation. This is where builders need building science."

Karagiozis notes a push-pull effect in the building industry when it comes to manufacturers working directly with builders. It used to be that manufacturers had to push their information to the builders, hail them down at trade shows or rely on marketing to get product messages to them.

"It's come a long way," Karagiozis says. "Builders are now pursuing us. They love to interact with us and work with us 1:1, and all of them are eager to spend time with us. Usually it's hard to get a builder to find time to work with folks, but you tell them 'I'm with Owens Corning building science team. They want to bring us in and keep us in."

The primary reason for this pull from the builder side is the evolving world of building codes, which have gotten stricter (and some say more confusing) over the past few years. But there are other factors, too. Consumers have demonstrated an increased interest in owning comfortable High Performing homes that offer good indoor air quality. And then there is the ramped-up media attention on net zero energy homes, made popular because production home builders, such as KB Home, Shea Homes and Pulte are building them as "mainstream" housing in many U.S. states.

All these factors have helped create the pull toward high-performance building, and to stay competitive, builders are taking a hard look at the performance of their homes and beginning to view the house as a system.

"There has to be holistic thinking when you put together a high-performance building," Karagiozis emphasizes. "You can't rely on one technology. You can't use equipment to achieve high performance. In insulation, for example, you have to have the correct envelope with the right amount of insulation correctly placed in the right locations. We want a high-performance, durable home that will be around for a long, long, long time."

And so Owens Corning has embarked on a journey to bring its partner principle to forward-thinking builders of America—those builders who are leading the industry by building better performing homes and continuously evolving as methods and products change.

In the process of developing deep partnerships with builders, the company discovered the four characteristics, or actions, that make a manufacturer a quintessential partner for builders: helps builders overcome code challenges, is climatically attuned, provides comfort for home buyers, and boosts home sales.

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Building Ahead of Code

The 2018 ICC code changes loom on the horizon, and many builders feel that the 2012 and 2015 versions already delivered quite a few adjustments and accompanying headaches. In addition, builders must deal with other ratings, labels, and standards—both mandated and elective – that seem to burden the construction industry.

Exceeding building codes today is a smart move that many builders embrace because it will keep them from having to make sudden adjustments to stay compliant in the future. This was the opinion of Ron Davis, owner of Dallas-based Ron Davis Custom Homes. He builds one-of-a-kind luxury homes that offer high efficiency and comfort. The company builds to the 2015 IECC Code Davis was determined to not just meet building codes, but to also futureproof his homes.

"This is a builder who loves building homes. It's literally his life in addition to his income," says Neil Freidberg, Building Science Leader and Field Application Engineer for Owens Corning. "We came in to help him understand why his buildings do what they do and how they can perform even better."

The builder was already putting up homes that exceeded code by 15 percent, but Freidberg knew they could do better. "Owens Corning has a ComfortBuilt™ Homes program that provides prescriptive approach, enabling you to build at a HERS 50," he says.

Owens Corning put Freidberg in the field to help the builder achieve his performance goals. In the process they looked to both the framers and the insulators to help fortify the house against air infiltration and moisture intrusion.

Ron Davis Custom Homes builds one-of-a-kind luxury homes that offer high efficiency and comfort.

"On this project we applied an air sealing method where we had the framers install a proprietary air-sealing gasket material in the wall. They would air seal areas that the insulation installers couldn't access," Freidberg says. This took some training for the framers to make sure they could achieve a tight house.

Then, Freidberg had to make sure the insulators were touching all the areas that the framers didn't touch. "This house was 5,000 square feet which meant a lot of framing. We provided onsite training to help installers correctly add the air-sealing gasket to help seal the frame," Freidberg says.

When the insulation was complete, the team conducted a smoke test and was impressed with the results. "We had 2,000 square feet of wall and had only two leakage points. That was it. At the test, we had the builder, framer, insulator, and owner of the home there... everyone was ecstatic," Freidberg says. "We surpassed what we thought possible."

Freidberg points out that while it took effort to train the crews, a builder who enforces the practice and puts it in the scope of work will be successful: "The hardest person to sell was the framer, but after the smoke test we said, 'The reason it is not leaking is because you did a good job.' People think [new practices] are not always an easy sell, but show them a house like this, what is involved, and how good a home you can create and you can see pride in their eyes."

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Ron Davis, Ron Davis Custom Homes

Palo Duro is building the most energy-efficient homes in New Mexico and their ComfortBuilt™ homes offer a 33 HERS rating.

Owens Corning faced additional code challenges with builder Palo Duro Homes in Santa Fe. Palo Duro is one of the few builders in New Mexico delivering 100 percent LEED-certified homes.

"The first gauntlet builder Tom Wade threw down on this project was, 'This house is designed for spray foam; we can't do this house without spray foam,'" recalls Craig Marden, Field Application for Owens Corning. Marden was convinced that Owens Corning's ComfortBuilt™ system could work in place of the spray foam--and perform better.

The second issue was a code-mandated height restriction. "We were limited structurally. I've never seen a design with so many footers, and the second floor was smaller than the first floor but none of the second floor walls had bearing walls below it," Marden describes.

"It's the most comfortable home we've ever built!"

Tom Wade, Palo Duro Homes

What is a ComfortBuilt™ Home?

Today's home buyers expect more than ever before. They want to build their home the smartest way possible to achieve comfort and durability, energy efficiency, and affordability. Owens Corning's ComfortBuilt™ Homes can help you build energy-efficient homes that boast both comfort and enduring value. Based in proven building science and scalable building techniques, they're unlike any other in the marketplace. ComfortBuilt™ Homes are:

- Comfortable. Gone are drafts and uneven temperatures from room to room.
- Energy-efficient. With open floor plans and lots of energy-efficient windows, you'll welcome the view and lower heating and cooling bills.
- Durable. Crafted from exceptional products and materials, these homes are built to last.

Collaborate with Owens Corning today and get help:

- Optimizing costs based on HERS scores in your area.
- Identifying the best return on investment.
- Exceeding today's building codes and standards through maximized performance.
- Differentiating yourself as the high performance home builder in your market.

Click here for more information and for a PDF of ComfortBuilt™ Home Performance Specifications for all the U.S. climate zones.

When he got onsite, the house was already framed and sheathed. The builder had sent Marden the truss plan in advance, so he worked with the truss manufacturer to seal and put gasket material on the trusses in the factory. However, four of the trusses for the floating second floor ran from conditioned to unconditioned space. They created leakage paths because the trusses, girders, and other structural pieces didn't bolt together tightly. To solve this, Marden and team used additional 1 part can foam and sealant and Owens Corning's EnergyComplete® Sealant on the house.

The result? A house that achieved 2 ACH 50 (air changes per hour). "We did R-24, 2 x 4 walls, 24 inches on center, which took the place of open cell spray foam, and we achieved a better R value [than we would have achieved with spray foam]."

Today, Palo Duro's ComfortBuilt™ Homes offer a 33 HERS rating. Palo Duro is building the most energy-efficient homes in New Mexico.

Take Into Account Climate Zones

Climate considerations are up there with codes when it comes to product choices and ensuring adherence to solid building practices. "You will not build the same building in Miami as you would in Seattle," Karagiozis explains. "You might have the same square footage, but different wall structures and different control elements in it that mitigate vapor and liquid flows. They will require climatically tuned solutions, something Owens Corning is very unique in providing. We provide these solutions that can't be found anywhere else because of the state-of-the-art building science we offer our customers."

Through the system Owens Corning set up for Quail Homes, the company is able to deliver homes with a HERS Index of 49.

When the Owens Corning building science team partnered with Quail Homes in the Pacific Northwest, rain was on the mind. They modeled the project so there would be specific analysis informing the choice of products to address moisture. Specifically, they ran the project through WUFI, a computer program that calculates heat and moisture transport through building components. "We looked at the high moisture content and high wind in the Northwest area to determine what would help maintain a comfortable and durable home," Karagiozis says.

Ultimately, the Owens Corning team used the results of WUFI testing to help Quail Homes reassess their internal air sealing process and replace it with sealing the outside of their homes with rigid foamboard to better protect from conditions in the region.

"When you build an airtight wall assembly in high humidity, you need a rainscreen." The builder had spec'd James Hardie's Hardiboard. Freidberg recommended the builder install a rainscreen over the exterior rigid foamboard, then ran furring strips under the fiber cement siding. "They taped the seams of the foam, creating a tight air and moisture barrier. By adding the furring strips on top of that, it allows the air to ventilate on top of the airtight surface, which keeps moisture from building up causing delamination of products."

Freidberg trained the framers to follow this best practice and pay attention to other details that might be affected. "When you make a wall stiffer by adding foam, you also have to look at the windows—inset, outset, casings," he notes. "You need to go through a lot, but in Portland, where moisture is the problem, you will get better performing walls and a longer life on the siding."

"Owens Corning has studied how we build; they've studied our climate zone and said, 'Here's your recipe.' Then we work with the building scientists, modify it so that it's workable, and now we've got a recipe that's repeatable. The building scientists... they're your coach."
Jon Girod, Quail Homes

"Owens Corning has studied how we build; they've studied our climate zone and said, 'Here's your recipe,'" explains Quail Homes owner Jon Girod. "Then we worked with the building scientists, modified it so that it's workable, and now we've got a recipe that's repeatable. The building scientists... they're your coach."

Through the system Owens Corning set up for Quail Homes, the company is able to deliver homes with a HERS Index of 49, improving comfort and reducing heating and cooling bills* over the lifetime of the homes.

*Savings vary. Higher R-values mean greater insulating power. **Click here to find out why in the seller's fact sheet on R-values.**

Make Good Design Happen

What happens when you mix high design aesthetic with wall-to-wall windows in a desert climate? Josh Anderson of Element Design Build in Las Vegas found out. The builder of the 2016 New American Home, a nationally recognized showcase of residential building products and technologies, his 5,200-square-foot NAHB show home presented quite a challenge to the Owens Corning building scientists.

"When we looked at his building plans, we said, 'Oh my goodness, how will they get it to be energy efficient?' It is 65 percent window and 45 percent wall," Freidberg says.

The design team knew this would be a challenge, so they addressed things like bump-outs to protect the windows from the sun. Owens Corning ran WUFI testing on every aspect of the house, modeling long and big overhangs and looking at the highest R-values they could achieve with insulation. "Because of the design, we knew we had to make up for the windows," Freidberg says. "We insulated the house bottom to top with 2 inches of XPS foam around the whole house. We used 2 inches of slab insulation making it R-10. We made a fully encapsulated building—walls at R-33 and R-58 in the roof. We did all this to make up for the windows."

"I took what we modeled and put it in practice," Freidberg says. "I trained framers and plumbers and talked to everyone, so they understood the goal for what to achieve. I got everybody on board." When built, the house tested at 2.5 ACH 50 with a HERS rating before solar of 47 and after solar of -17.

The project was so successful for Anderson, he now builds to the ComfortBuilt™ Home performance platform in Boise, Idaho. "The builder no longer uses spray polyurethane foam in his homes," Freidberg says.

Exceed Codes, Ensure Comfort

While home buyers are interested in energy efficiency and the resultant money savings, comfort is also a big hook.

The New American Home was designed on the basic principles of heat, moisture, and relative humidity control. In designing for maximum comfort, human metabolic rates for sitting, sleeping and being active—while wearing long sleeves and short sleeves—were closely examined.

Owens Corning has helped Quail Homes improve comfort and reduce heating and cooling bills in the homes they build.

The 2016 New American Home has a fully encapsulated building—walls at R-33 and R-58 in the roof.
Photo courtesy of *Professional Builder Magazine* and Jeffrey A. Davis Photography Inc.

"For us, designing on the basis of comfort was a big philosophical change," says Karagiozis. "But gigajoules don't make people happy. Comfort, sustainability, and lasting construction do, however, not to mention the lower utility bills that come with an envelope as tight as this one."

Owens Corning took the same approach when working with Quail Homes. "We took a base line for comfort. The base went from 3 percent to 25 percent," notes Freidberg.

Offering something better means properly insulating and air sealing a home–"There is an energy savings in doing these things right because you don't have to condition more volume of air. We use hygrothermal modeling that allows you to pinpoint on a chart where you will land comfort-wise. The modeling is like having an invisible person in the room, and the analysis will show the "thermal sensation" a person would experience at different points in the room based on temperature and humidity. This helps builders understand the importance of properly air sealing and insulating their homes."

Differentiate to Sell More Homes

At the end of the day, builders have to build their reputation and earn respect and referrals to grow. They have to differentiate themselves in order to sell homes. Owens Corning offers them the systems and results that they can use to explain why they are the trusted professional a home buyer should use to build their dream home.

Davis, who already was building a good house before partnering with Owens Corning, now has an even better tale to share. "We would never have the opportunity to do this kind of marketing if it wasn't for Owens Corning," he says. "It tells who we are and helps separate us from other builders."

Quail Homes also uses the modeling Owens Corning performed as a selling tool as well. "You can use the modeling to show the home buyers incremental cost [or insulation upgrades] and they won't be interested," Jon Girod, owner asserts. "But once you can show them the data on return on investment year over year, well, the builder had some remarkable, sweeping statements about how successful that was for him."

When home buyers are looking at their budgets and making choices, they will spend $20,000 on an upsell because it offers them a continuous return on investment, Girod says. "These buyers know that the builder is building better homes based on the modeling. It takes the guesswork out and it is a tool he can use in his sales arsenal to close the deal and increase profit margins."

Case Studies and Resources

Want to learn more details about how builders are working with Owens Corning to leverage their building expertise to create energy-efficient, sustainable homes?

Click here to check out the case studies on www.highperformancebuildingexchange.com