Ohio's Pioneering Smart Builders

by StjepanVlahovich

Ohio's history is the history of pioneers. From its first settlers though the towering inventors of the Industrial Age, Ohio has been a place where our urge to make things better has blossomed. Today there are still pioneers at work in Ohio. Among them are innovators who are designing, demonstrating, and popularizing ways to improve our homes – making them more efficient, comfortable, safe, and durable.

There are many motivations and inspirations for this burst of innovation in Ohio's housing. Some are motivated by the thought of saving money on their utility bills, some by the idea of using fewer natural resources. For some, health issues require a home that minimizes their contact with toxic products, for others the idea of a home that's easy to maintain is important.

Support, research, and funding for these efforts come from a myriad of sources. The most important of these sources is the home buyers and owners themselves. Other important support comes from government (the US Department of Energy, the Ohio Department of Development), industry (the National Association of Homebuilders), and non-profit organizations (the US Green Building Council, the Energy & Environmental Building Association). There are specific programs and projects at work such as the US Department of Energy's Building America, Zero-Energy Home, and Energy Star ® programs, and the American Lung Association's Health House ®.

There are so many motivations and approaches that it's difficult to find one word to encompass all of the innovation going on in housing construction in Ohio, and throughout the nation. One of the terms often used to describe this movement is green building. That term certainly describes the impact and motivation for much of what is being done. Another term often used is smart building. This term hints at how this re-examination of the way we build homes is using the knowledge and products we now have available to ensure that what we build meets our current needs, both to serve the way we live and to preserve the environment.

The smart home building going on in Ohio mirrors that in the rest of the nation in terms of the variety of motivations and approaches. These Ohio pioneers are building everything from homes of less conventional design that incorporate and proudly display all of the varieties of renewable energy available, to homes that fit perfectly into established neighborhoods, modestly hiding their innovative design and advanced construction materials and techniques. The remainder of this article will examine in more detail **some** of the work being done by Ohio's pioneers in smart residential building.

An Effective Approach to Smart Building

John Robbins of Robbins Alternate Energies (http://home.insightbb.com/~johnfrobbins/) has been one of Ohio's smart building pioneers for more than twenty years. His thoughtful approach to home design and building in the Cincinnati area focuses on the concept and importance of passive

performance by the building. As he says, "the best energy management approach to homes and buildings is the one that results in the least energy consumption and the lowest numbers of special energy conversion equipment."

Mr. Robbins insists that his clients determine quantifiable goals, such as how much they want to reduce their energy costs or how much they want to lower their impact on the environment. Once the goals have been established, he recommends ways to achieve them that minimize energy consumption. For example, his designs typically control the sizes, shapes, and performance characteristics of exterior surfaces and also use super-insulation. Mr. Robbins doesn't favor one technology, type of material, or building system over another, but uses whatever solutions allow his design to achieve the client's the goals most easily and cost-effectively. As he notes, special equipment is often not the complete solution. "Occupant education and training" can be an important part of the process as well.

Mr. Robbins has used his approach to design a number of very efficient homes in the Cincinnati area, some of which incorporate alternate energy sources. In Loveland he designed a home for a client who needed exceptional indoor air quality. Careful selection of interior materials and paints coupled with electronic air cleaning and central exhaust ventilation with heat recovery helped make an especially healthy home. The use of structural insulated panels for the walls, a passive sunspace, and active solar water heating were among the many features making it energy efficient. In 2001 this 2,200 square foot home, which is all electric, had an average monthly utility bill of $89.

John Robbins-desinged home in Loveland

Innovative Technology Showcases

While Mr. Robbins has been fostering innovative building in southwestern Ohio, projects demonstrating some of the most advanced building technology have been nearing completion in the northern part of the state. Curtice, east of Toledo, is the home of Solterra, while Sandusky has the equally ambitious House on Third Street. The similarities and differences between these projects are very interesting.

Solterra (http://www.solterra.info/pages/1/index.htm) is the culmination of more than twenty years of research, planning, and, now, building by Ralph Semrock and his wife Leah. Solterra is an earth sheltered passive solar home with five alternate energy sources. This amazing home's basic construction uses insulated concrete forms for its walls and floors. The north and west sides of the home are earth-bermed to protect them from winds and to take advantage of the earth's more moderate and consistent temperature.

Active solar collectors on the roof will provide thermal heat for domestic hot water and for the radiant heating system in the floors. The home's passive solar design includes an interior thick masonry Trombe wall to absorb heat from the sun during the day and radiate it to the home in the evening. Back-up heat and air-conditioning will be provided by a geothermal furnace. Also providing power for the home's heating and cooling and other electric needs will be an array of photovoltaic cells capable of producing 2.8 KW of power and a wind turbine on a 64 foot tilt tower capable of producing 1.5 KW of power. The goal of all of these features is for the Semrocks to have a home that is energy independent. Since this project is demonstrating so much new alternate energy technology, it received a grant from the Ohio Department of Development towards its completion.

Ralph & Leah Semrock's Solterra

The House on Third Street is being built in an established Sandusky neighborhood by Mark Norman and Sue Daugherty. Although it does not incorporate alternate energy, it is as ambitious as Solterra in demonstrating the potential and benefits of new building technologies.

The initial motivation for Mr. Norman and Ms. Daugherty was a home which minimized energy expenses. While researching ways to do that, they also became interested in demonstrating how homes can be made more healthy and safe.

Like Solterra, the House on Third Street has insulated concrete form walls and a foam-insulated concrete floor along with a radiant heating system. In contrast, though, the water for the radiant heating systems will be warmed by tankless water heaters. Also in contrast with Solterra, the Sandusky home has steel roof trusses and joists and a metal roof. These add to the durability of the structure. In fact, both homes are earthquake and wind proof and much more fire resistant than conventionally built homes.

Sandusky's House on Third Street

In addition to providing structural durability, the House on Third Street's use of steel eliminates wood framing, which can be a place for mold and bacteria to grow. Other features of the home which make it a healthier environment are the use of ceramic tiles, composite floors, and mold-resistant wallboard. It also has a whole house filter to keep the interior air as clean as possible.

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In addition to the whole house filter, the home has an air exchange system which will remove eighty percent of the humidity. This eliminates the need for air conditioning. Triple pane windows and faucet sensors will add to the home's energy efficiency. Based on current prices, it is estimated that this 1,600 square foot home will need less than $200 per year to heat.

Fitting into the Neighborhood, Cleveland-Style

The House on Third Street is designed to fit into an established neighborhood and appear from the outside to be like all of its neighbors. Much of the smart home building in Cleveland has been designed for a similar purpose under the auspices of the US Department of Energy's Building America program by the Building Science Consortium (BSC).

Eco-Village "green" town homes

Several designs by Betsy Pettit, an Ohio-born architect, have been built in the Eco-Village on Cleveland's west side. One of the largest Eco-Village projects was construction of twenty "green" town homes, which were dedicated in June of 2004. Among the green features of the homes are super energy efficiency, controlled ventilation, and the use non-toxic materials. Several of the units also have photovoltaic panels on the roofs of their garages. To give an example of how energy efficient these units are, one of the owners of a 2,400 square foot unit is paying a budget heating bill of only $35 per month.

Near the Eco-Village town homes are two single family homes also designed by Ms. Pettit. Both have received ENERGY STAR ® and Healthy Homes ratings. They incorporate the same energy efficiency and green design features as the town homes and are also proving to have low heating costs. One of the homes has not had a monthly heating bill of more than $100, which is excellent in this area for a detached home of almost 2,000 square feet. There are several other sites in the Cleveland area where Ms. Pettit's single family design has been used for in-fill housing. Most recently, several homes were built using her basic design in the eastside suburb of Shaker Heights.


Betsy Pettit-designed home in Cleveland

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Ohio-Grown Innovative Building Systems

Another source of innovative housing in the Cleveland area is Energy Wise Systems (http://www.highperformancepanels.com/) a company that builds homes using its own system of tubular steel and expanded polystyrene for walls and roof sub-systems. Energy Wise ™ homes have much higher levels of insulation than conventionally built homes and are resistant to moisture and pests such as termites. They can be built more quickly than homes made with traditional wood framing and, because the walls carry the structure's load, provide a great deal of flexibility in designing the home's interior.

Matt Frost and his wife purchased an Energy Wise ™ home constructed in 2004 in Cleveland's revitalizing east side. This home, which qualified for ENERGY STAR ® designation, has a combination heating system. Combination heating systems are effective in very well-insulated homes. They use the domestic water heater as the source for both water and space heating. Incorporated into the system is a heat recovery ventilator. This ventilator ensures a continuous supply of fresh air to the home while minimizing the heat lost through the exchange of air. The

L to R: Energy Wise Home water heater, heat recovery ventilator, and exterior

average heating bill for the Frost's was $125 per month, a very reasonable amount for a 2,550 square foot home in Cleveland.

Energy Wise Systems is not the only Ohio company that is a pioneer in the design and manufacturing of smart building systems. Nathan Pingel's PDG Domus (http://pdg-domus.com/frames/fr_about.html) of Columbus is integrating modern technology with conventional design to provide lower cost, low-maintenance component built homes. Like Energy Wise Systems, PDG Domus homes do not use organic materials and are built using manufactured components that are assembled on-site. PDG Domus homes use steel framing. The components are joined by welding or with aircraft epoxy.

PDG Domus Prototype

conventionally built homes of similar size. Their walls and roofs are cast from a laminate material that can be molded into any shape, allowing for design flexibility. One of their minimum maintenance features is that the exterior never needs to be painted.

The prototype PDG Domus home was built in the Victorian Village neighborhood of Columbus more than five years ago. When it was evaluated by the Ohio Department of Development's Office of Energy Efficiency, it rated as one of the most energy efficient homes the staff had encountered.

PDG Domus homes meet the earthquake and hurricane codes for both the west and east coasts. Their on-site assembly makes them quicker to build, reducing their overall cost compared with

Conventional, but Innovative

Much of the smart building is being done using non-traditional materials and systems. There are a number of builders who are taking the lessons learned by other building pioneers and incorporating them into more conventionally built homes. Two of these are Decker Homes from the Toledo area and Benton Homes from Cincinnati.

Since it was founded in 1981, the philosophy at Decker Homes (http://www.deckerhomes.com/) has been that "high quality and energy efficiency go hand in hand." All Decker Homes receive an ENERGY STAR ® label, which demonstrates that they are at least thirty percent more efficient than comparable homes built to meet only the Model Energy Code. Decker Homes have extra insulation, including insulated basements, high efficiency furnaces, insulated ductwork, and energy efficient windows.

Deer Valley Decker Home

Homeowners began moving into the first Decker Homes subdivision in Ohio, Monclova Township's Deer Valley, in 2003. Many of them are in bigger homes but experiencing utility bills that are as much as two-thirds less than they had in their previous homes. One resident of a 1,700 square foot home reported average monthly natural gas bills of $59 and average monthly electric bills of $47. This is remarkable given the fact that this area has the highest utility rates in Ohio.

Under the leadership of its founder Bill Decker, the commitment of Decker Homes to smart building took another step forward last year when it began offering photovoltaic systems as an option for its buyers. One resident of Deer Valley purchased the

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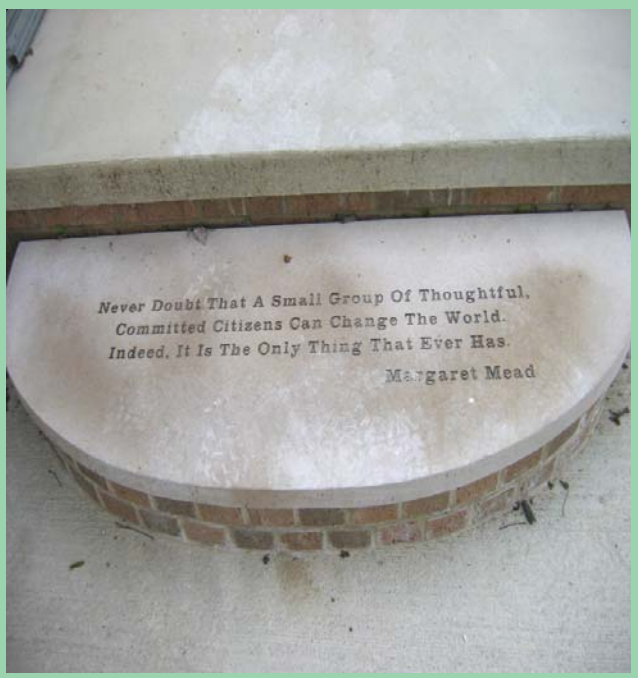
subdivision's model which has photovoltaic roof shingles and another home currently under construction will also include solar energy.

Benton Homes in Cincinnati was founded by French Speece in 2002 and became Cincinnati's first ENERGY STAR ® builder partner. Benton Homes achieves its ENERGY STAR ® designation by including extra insulation, very efficient windows, and 96%+ super efficient furnaces. Because their houses are built so tightly, Benton Homes uses an Energy Recovery Ventilator to provide a continuous supply of fresh air while minimizing the energy loss associated with that air exchange.

A Loveland home built by Benton last year received a Five Star rating from ENERGY STAR , which means it should be at least fifty percent more efficient than a comparable home built in traditional ways. The rating estimated that the monthly energy bills for the home would be $84. The mortgage lender for the buyers of this home used that information to give them an additional $23,000 on their mortgage. Last winter the highest monthly heating bill for this 3,550 square foot home was $195.

Decker Homes and Benton Homes are not the only ENERGY STAR ® home builders in Ohio. M/I Homes, the largest builder in Central Ohio, has pledged to build all of its homes to meet ENERGY STAR ® criteria. Other Columbus area builders making that commitment are Beazer Homes, Homestead Communities, Joshua Homes, Manor Homes, and Medallion Homes. Benchmark Homes of Brookeville, James E. Moline Builders of Toledo, SDC Homes of Akron, and Testa Builders of Akron/Cleveland have also pledged to build 100 percent of their homes to the ENERGY STAR ® standard.

Exciting things are happening in Ohio. New innovators are following Ohio's pioneer tradition and showing us smart ways to build our homes. As a reminder of what an impact they will have, carved into the front steps of Sandusky's House on Third Street is a famous quotation by anthropologist Margaret Mead. It says: Never doubt that a small group of thoughtful, committed citizens can change the world. Indeed, it is the only thing that ever has."



Quote from Mead, at the House on Third Street

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