

Revive Properties/ Philgreen Construction

Green Leaf Street
Fort Collins, CO



BUILDER PROFILE

Revive Properties/Philgreen Construction
Fort Collins, CO

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FEATURED HOME/DEVELOPMENT:

Project Data:

- Name: Green Leaf Street
- Location: Fort Collins, CO
- Layout: 2 bdrm, 4 bath, 3 fl, 1,533 ft²
- Climate: IECC 5B, cold
- Completed: November 2017
- Category: multifamily

Modeled Performance Data:

- HERS Index: without PV 42; with PV -8
- Projected Annual Energy Costs: without PV \$800; with PV \$50
- Projected Annual Energy Cost Savings: (vs typical new homes) without PV \$1,050; with PV \$1,850
- Projected Annual Energy Savings: without PV 10,600 kWh; with PV 20,000 kWh
- Added Construction Cost: without PV \$0, with PV \$10,900
- Savings in the First 30 Years: \$80,900

Homes built to the U.S. Department of Energy's Zero Energy Ready Home criteria can save energy and cut costs for home owners. They've been known to provide a more comfortable, quieter living experience. And, in Fort Collins, Colorado, they may just be helping to spark a neighborhood revival.

"A former Assistant City Manager was just out at our development and commented that our Zero Energy community has revitalized North College Avenue," said Susan McFaddin of Revive Properties, LLC, which partnered with Philgreen Construction on the REVIVE Fort Collins project to construct 37 townhouses and 18 single-family homes with attached apartments on the 10-acre site on the north side of Fort Collins.

The property is located in an urban renewal district just north of a trailer park. "The property was in an undesirable location and the development had been unsuccessful under a previous developer," said McFaddin.

Now there is a large grocery store and shopping area within a quarter mile. "A new movie theatre and restaurant were recently built within a half mile and other businesses and cultural centers are coming to this urban renewal district and revitalizing this part of town. Revive is known as a catalyst for the revitalization," said McFaddin.

"What differentiates us from all other developers is that we only sell zero energy homes," said McFaddin. "All our homes have [Home Energy Rating System] HERS ratings of 2 or less this year and our lowest was negative 11. Solar is not optional. We sell our solar to buyers at cost, which is about half of what most builders charge. Other builders make PV an option and many home buyers choose to avoid the extra cost. Rather than incentivizing lots, finishes, etc., as some builders do, we incentivize the PV, which we believe to be the most beneficial to both the buyer and society."



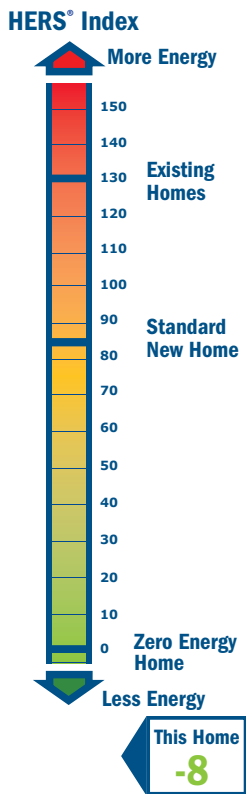
The U.S. Department of Energy invites home builders across the country to meet the extraordinary levels of excellence and quality specified in DOE's Zero Energy Ready Home program. Every DOE Zero Energy Ready Home starts with ENERGY STAR Certified Homes Version 3.0/3.1 for an energy-efficient home built on a solid foundation of building science research. Advanced technologies are designed in to give you superior construction, durability, and comfort; healthy indoor air; high-performance HVAC, lighting, and appliances; and solar-ready components for low or no utility bills in a quality home that will last for generations to come.

Revive Properties and Philgreen Construction built this 1,533-ft² multifamily project in Fort Collins, Colorado, to the high performance criteria of the U.S. Department of Energy Zero Energy Ready Home (ZERH) program. The mostly mono-planned roof design provides more space for the 6.4 kW of solar panels on each unit.



What makes a home a DOE ZERO ENERGY READY HOME?

- 1 BASELINE**
ENERGY STAR Certified Homes Version 3.0/3.1
- 2 ENVELOPE**
meets or exceeds 2012 IECC levels
- 3 DUCT SYSTEM**
located within the home's thermal boundary
- 4 WATER EFFICIENCY**
meets or exceeds the EPA WaterSense Section 3.3 specs
- 5 LIGHTING AND APPLIANCES**
ENERGY STAR qualified
- 6 INDOOR AIR QUALITY**
meets or exceeds the EPA Indoor airPLUS Verification Checklist
- 7 RENEWABLE READY**
meets EPA Renewable Energy-Ready Home.



The DOE Zero Energy Ready Home construction has attracted positive attention for the builder. “We participated in the Northern Colorado HBA (Home Builders Association) Parade of Homes in 2017 and won the Greenest Home award,” said McFaddin. A new reporter at the local paper wrote some positive articles about the community. “These helped create a very favorable public perception,” said McFaddin. “The day after one such article, there was a stream of Priuses going down our back alley.”

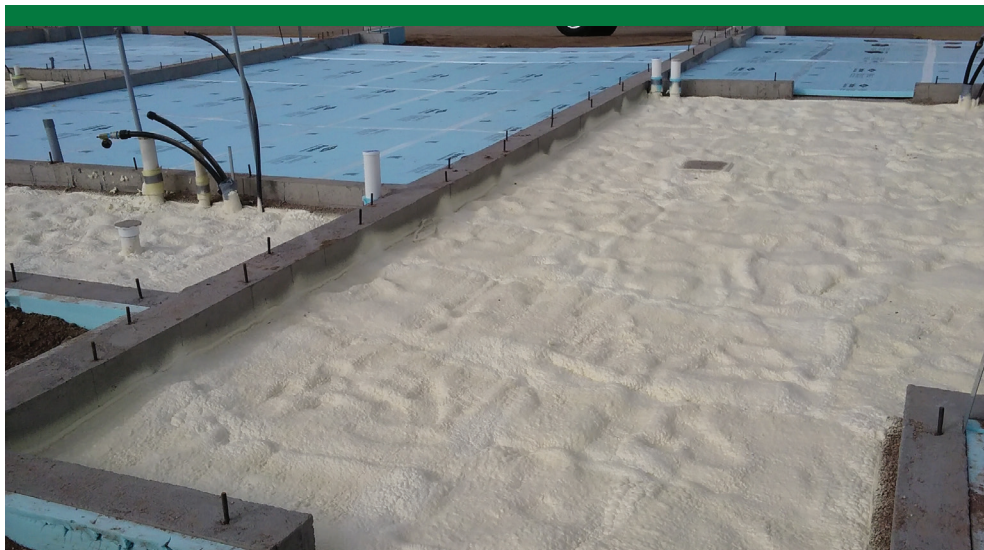
“Our development is used as a research project for several of the City departments including the Utilities Design Assistance Program and the Green Building Program,” said McFaddin. “Elected officials, including a former mayor, a city councilman, and a member of the Colorado House of Representatives, have all inquired about living in our community,” said McFaddin.

“Two new zero energy home projects are planned in our city and both refer to our development as the catalyst for their developments going zero energy. If imitation is the best form of flattery then I guess we should be proud,” said Chad Adams, owner and developer of Revive.

“Our development is seen as highly desirable, not only for the homes’ efficiency, but also for their beauty and comfort. Our duplexes and entry-level townhomes are now all sold. We recently released 12 townhomes and four went immediately under contract with only dirt. Many of our home buyers regard these homes as the future of home building. They’ve told us the energy-efficient construction is an expression of their core beliefs. Our buyers are mainly environmentally conscious early adopters,” said McFaddin.

“We also attract many buyers who want control over their future energy bills and who care about the quality of construction,” said McFaddin. “Our energy bill data has, in fact, been the major selling point. Most people have never seen negative energy bills—a benefit a number of our residents enjoy because of net metering,” said McFaddin. Energy bills are expected to average about \$4 per month for owners of the 1,500-ft² two-bedroom, four-bath, three-story townhomes.

To achieve those low energy bills, all of the townhomes are being built to the criteria of the DOE Zero Energy Ready Home program. The program requires homes to meet all of the requirements of ENERGY STAR Certified Homes Version 3.0 or 3.1 and the U.S. Environmental Protection Agency’s Indoor airPLUS, as well as the hot water distribution requirements of the U.S. Environmental Protection Agency’s WaterSense



Spray foam and rigid foam were used under the slab while R-10 of rigid foam wraps the exterior of the foundation walls. Spray foam was also used to insulate the rim joists and to cover the underside of the roof deck, providing vaulted upper-level ceilings to every home.

program and the insulation requirements of the 2012 (or 2015) International Energy Conservation Code. In addition, homes are required to have solar electric panels installed or have the conduit and electrical panel space in place for it. All of the REVIVE Fort Collins townhomes include the installation of solar photovoltaic panels. The unit described here, which won a DOE Housing Innovation Award in 2018, had a 6.4-kW PV system installed on the roof.

The townhouse units are 1,533 ft² and have two bedrooms, and two full and two half baths. All of the units are three stories with patios, balconies, and vaulted ceilings on the third floors to maximize daylighting.

The home's concrete foundation slabs are left exposed and polished to serve as the flooring for the first floors. The slabs are insulated with R-10 of closed-cell spray foam under the slabs and R-10 of rigid polystyrene wrapping the slab edges.

The above-grade walls are constructed with 2x4s staggered on 2x6 top and bottom plates allowing the R-23 of blown-in fiberglass insulation to wrap around the sides of the studs to minimize thermal bridging (or heat transfer) through the walls. The party walls between units are insulated with blown-in cellulose for an R-value of 13. The rim joists are insulated with R-2 of open-cell spray foam.

The vaulted ceilings are filled with R-50 of open-cell spray foam. The roof decking of 7/16-inch OSB is covered with ice-and-water shield. Drip-edge flashing is installed along the eaves and the roof is topped with Class 4 asphalt shingles.

All of the windows are double-paned and vinyl framed with low-emissivity coatings to block heat transfer and an insulating argon gas fill between the panes. The windows have an insulation U-factor of 0.29 and a solar heat gain coefficient of 0.22.

All homes in the DOE Zero Energy Ready Home program are third-party tested. This home was blower door tested and showed an airtightness of 2 air changes per hour at 50 Pascals pressure difference (ACH 50).

All units are heated and cooled with a ground-source heat pump with a heating coefficient of performance of 3.6 COP and a cooling energy efficiency ratio of 18 EER.

HOME CERTIFICATIONS

DOE Zero Energy Ready Home Program
- 100% Commitment

ENERGY STAR Certified Homes
Version 3.1

EPA Indoor airPlus

EPA WaterSense



Every DOE Zero Energy Ready Home combines a building science baseline specified by ENERGY STAR Certified Homes with advanced technologies and practices from DOE's Building America research program.



The walls were constructed of 2x4 studs staggered on 2x6 plates, providing space to weave R-23 of blown fiberglass insulation in between the studs and forming a continuous thermal break through the wall.

All of the townhomes are sold with photovoltaic panels installed and the garages are pre-wired for electric car charging stations.

The lots and streets had been plotted by a previous developer before REVIVE Fort Collins took over the site so the builder didn't have complete control over building orientation on the lots but ultimately they were still able to achieve considerable energy savings. "The greatest lesson we learned in this is that you don't need the optimum solar orientation to achieve net zero—just a combination of good windows, insulation, air sealing and solar," said McFaddin.

The winning home achieved a HERS index of 42 without PV, which is far better than the typical HERS score of 80 to 100 for new homes built to code across the country. When the solar energy production is included in the calculation, the townhome's HERS score drops to a negative 8. The winning unit had a calculated annual energy bill of \$50 and estimated annual energy savings of \$1,850, when compared to a home built to the state energy code equivalent, the 2012 IECC.

But energy savings aren't the only benefit to home owners. "Home owners I talk to are very impressed with the comfort," said McFaddin. "They're very quiet houses. They work really well and I think it goes without saying that meeting EPA's Indoor airPLUS and WaterSense makes them healthy, too. Those things go hand in hand with energy efficiency."

Photos provided by Revive Properties.

The refrigerators and dishwashers are ENERGY STAR rated and ENERGY STAR ceiling fans are included in many of the rooms. All of the lighting is supplied by LEDs and strategically placed windows provide daylighting even in closets, bathrooms, and garages. Significant energy modeling was done to maximize daylighting while reducing both heat loss and uncontrolled solar gain.

A heat pump water heater supplies the home's hot water with an efficiency of 3.42 EF. Water conservation features, such as dual-flush toilets and EPA WaterSense-compliant hot water distribution, including a recirculation pump to the top-floor bathrooms, reduce water use inside the home, while landscaping incorporates low-water-use plants outside.

KEY FEATURES

- **DOE Zero Energy Ready Home Path:** Performance.
- **Walls:** 2x6 advanced framed, R-23 blown-in fiberglass in exterior walls; R-13 blown-in cellulose in party walls. R-20 open-cell spray foam in rim joists.
- **Roof:** 7/16" OSB sheathing, ice-and-water shield, drip edge, asphalt shingles.
- **Attic:** R-50, open-cell spray foam on underside of roof deck, unvented.
- **Foundation:** R-10 EPS at slab edge, R-10 EPS under slab.
- **Windows:** Double-pane, vinyl-framed, low-e, argon-filled, U=0.29, SHGC=0.22.
- **Air Sealing:** 2 ACH 50.
- **Ventilation:** Exhaust fans, 92 cfm, 15 Watts.
- **HVAC:** Ground-source heat pump, 3.6 COP, 18.1 EER.
- **Hot Water:** Air-source heat pump 50-gal water heater, 3.42 EF.
- **Lighting:** 100% LED, 2 ENERGY STAR ceiling fans.
- **Appliances:** ENERGY STAR refrigerator, dishwasher, clothes washer, and clothes dryer.
- **Solar:** 6.4-kW PV system.
- **Water Conservation:** Dual-flush toilets, recirculation pump.
- **Energy Management System:** Smart thermostat.
- **Other:** Prewired for electric car charging stations. Low-VOC paint. Daylighting.