



Building America Efficient Solutions for New Homes

Case Study: Pine Mountain Builders

Pine Mountain | Georgia

PROJECT INFORMATION

Construction: New home

Type: Single-family

Builder:

Pine Mountain Builders

Pine Mountain, GA, (706) 663-8443

www.callawaygardensliving.com/pine-mountain-builders.html

Size: 1,192 to 3,124 ft²

Price Range: \$300,000 to \$450,000

Date Completed: 2011

Climate Zone: Mixed-humid, IECC Zone 4

PERFORMANCE DATA

HERS Index: 59-85

**Projected annual energy
cost savings:** \$1,180

**Added first cost of energy-
efficiency measures:** \$2,564

Annual mortgage increase: \$917

Annual net cash flow to homeowner: \$263

Billing data:

utility bills as low as \$50 a month

Pine Mountain Builders began working with Building America research partners IBACOS and Southface Energy Institute in 2005 to design energy-efficient homes for a green community of 140 homes in western Georgia. Their designs have yielded homes with HERS scores as low as 59, electric bills as low as \$50 a month (or half the state average), and 30% energy savings compared to homes built to the Georgia construction code.

The thermal envelopes of Pine Mountain's homes are built to be airtight. Blower-door tests show 1.0 to 1.8 air changes per hour at 50 Pascals of air pressure. The walls are 2x4 16-inch on-center, and the cavities are filled with R-13 low-density spray foam. Above grade, 75% of the exterior walls are covered with a ½-inch R-3 extruded polystyrene (XPS) rigid foam insulation, which provides an insulating, moisture-resistant replacement for oriented strand board structural sheathing. The unvented attic is insulated along the underside of the roof deck with R-30 low-density spray foam, providing a semi-conditioned space for the 14 SEER/HSPF 8.0 heat pump and mastic-sealed ducts. A fresh air intake is ducted to the return side of the air handler, which is controlled by an air cyclor to periodically circulate the air, even when not heating or cooling, to provide ASHRAE 62.2-compliant whole house ventilation.

To help reduce cooling load, the builders chose low-emissivity, wood-framed, double-glazed windows filled with argon that exceed ENERGY STAR requirements (U=0.38 and SHGC=0.35). Solar gain is also mitigated through the use of architectural shading, such as low overhangs, and the preservation of mature trees to provide shade.

(Photo top left) Pine Mountain Builders worked with IBACOS, a DOE Building America research partner, to come up with designs that use off-the-shelf parts to build homes that look conventional but are both environmentally sustainable and energy efficient.

KEY ENERGY-EFFICIENCY MEASURES

HVAC:

- 14 SEER/HSPF 8.0 heat pump, ACCA Manual J-sized (some homes have ground-source heat pumps)
- Ventilation: Air-cycler fresh-air supply at 20 cfm
- Duct system: ACCA Manual D sized, located in semi-conditioned attic space, mastic sealed at joints

Envelope:

- **Foundation:** Slab on grade, perimeter slab-edge insulation
- **Walls:** R-13 grade-1 batt insulation in 2x4 frame wall, wood shake cladding over R-3 XPS structural insulated foam sheathing
- **Attic:** Cathedralized, sealed, R-30 low-density spray foam insulation
- **Windows:** Double-pane, low-e, wood-framed, $U = 0.38$, $SHGC = 0.35$
- **Tightly sealed house:** 1.0 to 1.8 ACH50

Lighting, Appliances, and Water Heating:

- 75% compact fluorescent lighting
- ENERGY STAR® appliances
- 0.93 EF 40-gal electric water heater

For more information, please visit:
www.buildingamerica.gov



The 2x4 framed wall cavities are filled with R-13 low-density spray foam insulation and then sheathed with moisture-resistant R-3 XPS foam sheathing that is taped to provide a drainage plane and air barrier.

The builders have calculated that their efficiency measures add \$917 per year (based on a 30-year mortgage at 7% interest), compared to a home built to Georgia code. IBACOS calculated the energy improvements can save homeowners up to \$1,180 per year on their utility bills for a net gain to the homeowners of \$263 per year.

Lessons Learned

- The builder employs several moisture-resistant measures: slab-on-grade foundations are raised with 4-foot stem walls, sheathing is rigid XPS instead of OSB, and the spray-foam envelope seals off cracks that would let in humid air.
- Solar gain is mitigated through the use of low-emissivity double-glazed windows, thoughtful orientation on lots, architectural shading such as low overhangs and covered porches, a spray-foam insulated roof deck to keep heat out of attics, and preservation of mature trees to provide shade.
- The heat pump and ducts are located in conditioned space in the insulated attic.

“We think that our greatest success is our overall customer satisfaction. Our consumers are enjoying greater overall indoor air comfort and lower utility costs.”

*Mike Guinan, co-owner
Pine Mountain Builders*