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 state energy 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 cycler 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.
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