



Building America Case Study Whole-House Solutions for New Homes

Shaw Construction

Burlingame Ranch Phase 1 | Aspen, CO

PROJECT INFORMATION

Construction: New home

Type: Single- and multi-family

Builder: Shaw Construction,
Grand Junction, CO, 970-242-9236
www.shawconstruction.net

Size: 1 or 2-story, avg. 1,325 ft²

Price Range: subsidized

Date Completed: 2011

Climate Zone: Cold, IECC 7B

Team: Building Science Corporation

PERFORMANCE DATA

HERS Index:
54-62 without PV

Projected annual energy cost savings:
\$775

Added first cost of efficiency measures:
\$6,8178

Annual mortgage increase:
\$498

Annual net cash flow to homeowner:
\$277

Billing data: Not available

In 2007, the City of Aspen worked with Shaw Construction to complete the first 84 multi-family units at Burlingame Ranch, a community of 248 energy-efficient condominiums, to provide affordable housing for working class citizens. The homes achieved HERS scores of 54 to 62 with assistance from the U.S. Department of Energy's Building America research partners Building Science Corporation and the National Renewable Energy Laboratory.

High-density spray foam in the wall cavities, cathedral ceiling cavities, and even sprayed directly onto the gravel under the floor slabs ensured a highly insulated and air-sealed enclosure for the multifamily buildings, which housed 2 to 8 units each. Each building has a central mechanical room containing two 93% AFUE condensing gas-fired boilers to provide hot water for the hydronic baseboard heating systems as well as domestic hot water. The domestic hot water is preheated from a solar hot-water system consisting of 192 ft² of solar panels mounted on the roof of each building with a 120-gallon storage tank located in the mechanical room. Ventilation is provided with continuous heat-recovery ventilators (HRVs) installed in each unit.

"This project was a great model for us and has helped promote energy-efficient construction to all of our employees and clients. Staying at the forefront of energy-efficient construction helps differentiate us from the competition."

*David Hall, project manager
for Shaw Construction*

KEY ENERGY-EFFICIENCY MEASURES

HVAC:

- Heating: Central 93% AFUE condensing gas-fired boilers provide hot water for baseboard heating systems and domestic hot water.
- Ventilation: HRV
- Cooling: none.

Envelope:

- Attic: Unvented, R-50 high-density foam at sloped roof, R-38 at flat roofs
- Walls: 2x6, 24-inch on-center advanced frame stud walls with 3.5 inches of high-density spray-foam in cavity
- Foundation: R-13 XPS rigid foam slab edge insulation. Basement walls: R-13 (2 inches) of polyisocyanurate rigid foam on interior. Basement floors: R-28 (4 inches) high-density, closed-cell foam sprayed directly onto 4-inch gravel bed under foundation slab.
- Windows: double-pane, fiberglass-framed, low-e, $U = 0.37$, $SHGC = 0.33$
- Tightly sealed house, 2.5 in.² leakage area per 100 ft² of envelope

Lighting, Appliances, and Water Heating:

- 90% CFL
- ENERGY STAR® dishwashers, refrigerators, clothes washers, ceiling fans
- Domestic hot water is preheated by central rooftop solar thermal systems with boiler backup.

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



Deep overhangs and deciduous trees provide shade from intense Colorado sun. Low-maintenance exterior materials like cement siding and composite decking provide durability in harsh conditions. Two layers of ice and water shield are used for ice dam protection. The thick, even blanket of snow on the roofs and the lack of icicles show that warm air is not leaking through the ceilings and warming the roof deck, a major cause of ice dam formation. (Photo Source: Shaw Construction)

High-efficiency windows and lighting and ENERGY STAR dishwashers, refrigerators, clothes washers, and ceiling fans increase the efficiency. A passive radon protection system is installed. Deep overhangs reduce summer solar heat gain and keep snow off porches and sidewalks.

Lessons Learned

- While the central boilers provide some equipment savings, the City planned to specify individual water- and space-heating in phase 2 to provide more incentive for individuals to conserve water and energy and reduce homeowner association maintenance of the complex central systems. The City was considering individual solar hot-water systems and gas furnaces or possibly electric baseboard heating due to the low heat load.
- Building Science Corporation identified several issues to be considered in future phases including design and commissioning issues with the ventilation, heating, hot water and solar PV; thermal bridging at the foundation; the need for lower cost triple-pane windows and solar water heating; the ability to do unit metering for multi-unit heating systems.

U.S. DEPARTMENT OF
ENERGY

Energy Efficiency &
Renewable Energy

For more information, visit:
www.buildingamerica.gov

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