



Building America Case Study Whole-House Solutions for New Homes

Devoted Builders, LLC

Mediterranean Villas | Pasco, WA

PROJECT INFORMATION

Construction: New home

Type: duplex and triplex

Builder:

Devoted Builders, LLC
Kennewick, WA, (509) 947-5670
www.mvtownhomes.com

Size: 1,140 to 2,100 ft²

Price Range: \$145,000 to \$300,000

Date Completed: 2011

Climate Zone: Cold, IECC Zone 5

Team: Building Industry Research
Alliance (BIRA)

PERFORMANCE DATA

HERS Index: 54-68

**Projected annual energy
cost savings:** \$1,333

**Added first cost of energy-
efficiency measures:** \$10,132

Annual mortgage increase: \$809

Annual net cash flow to homeowner: \$524

Billing data: \$50/month electric bills

Devoted Builders worked with Building America (through its Building Industry Research Alliance team's local research partner the Washington State University Extension Energy Program) to achieve HERS scores of 54 to 68 on 230 duplex and triplex town homes in eastern Washington state. The homes qualified for the federal tax credit and DOE's Builders Challenge. The homes also qualified for Northwest ENERGY STAR and Washington State's BuiltGreen 3-star and 4-star levels.

A unique feature of the homes is the insulated concrete form (ICF) wall construction, something Devoted's owner, Fred Giacci, has used since 2002. Giacci chose an ICF product consisting of a 4- or 6-inch layer of concrete sandwiched between two 2 5/8-inch layers of rigid expanded polystyrene (EPS) foam. The foam comes as hollow blocks that are stacked to create wall forms for the concrete, which is poured in place. The blocks are reinforced with steel rebar and heavy plastic studs set vertically in the foam every 6 inches. The location of these studs is marked on the outside of the foam blocks making it easy to locate them for screwing in drywall on the interior or siding on the exterior side of the finished wall. The foam blocks provide a continuous air and thermal boundary from the footer (30 inches below grade) to the roof line.

Devoted Builders has continued to work with Building America to refine its construction practice. The first homes had forced gas furnaces; more recent models have had central heat pumps, and some have high-performance ductless heat pumps. All of the homes have energy recovery ventilators (ERVs) for providing conditioned and controlled fresh air. Most of the homes have ducts inside conditioned space. In homes where ducts are located in the vented attics, the ducts are mastic sealed and encased in spray foam. Spray foam also spans the entire attic floor and is covered with a foot of blown cellulose attic insulation.

KEY ENERGY-EFFICIENCY MEASURES

HVAC:

- 8.5-HSPF, 14-SEER heat pump with backup 93% AFUE gas furnace
- Ducts in conditioned space or covered with spray foam in attics
- Duct leakage less than 6 cfm at 50 Pa to exterior
- Energy recovery ventilator (ERV)

Envelope:

- **Walls:**
R-25 insulated concrete form (ICF) exterior walls
- **Attic:**
Spray foamed attic floor plus 12 inches blown cellulose (R-49)
- **Foundation:**
Slab on grade with ICFs providing R-25 perimeter insulation
- **Double-pane, low-e, vinyl windows:**
U = 0.29, SHGC = 0.26
- **Whole house air leakage:**
≤2.0 ACH@50 Pa

Lighting, Appliances, and Water Heating:

- 70% hardwired CFL lighting
- ENERGY STAR® refrigerator, dishwasher, and clothes washer

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



Spray foam is used to insulate and air seal the attic floor and any ducts located in the attic. The spray foam is covered with more than 12 inches of blown cellulose for the equivalent of R-49 of attic insulation.

Devoted's homes are very airtight. Giacci's goal is 2.0 ACH@50 or less, but he has achieved blower door scores as low as 0.8 ACH@50.

Lessons Learned

- ICF walls provide a continuous air barrier with no thermal bridging from the foot of the foundation to the roof line; the thick solid walls also insulate well (R-25) and protect against solar heat gain and pressure fluctuations from eastern Washington's strong sun and heavy winds.
- The ERV provides fresh and conditioned air to the very tightly constructed homes.
- Homebuyer education is essential to help potential buyers understand and value the differences between a high-performance home and a code-built home. Giacci commented that in the Seattle and Denver areas, green homes sell for more and realtors are more aware of the differences because the multiple listing sheets list the home's green and energy-efficient features, but that is not the case in eastern Washington.
- Building America research partner WSU Extension Energy Office calculated that the Devoted Builders' home would save homeowners \$1,333 in energy costs each year compared to a home built to the 2006 Washington State Energy Code.

"Our goal is to achieve 2.0 air changes per hour or less on every home we build."

*Fred Giacci, Owner
Devoted Builders*