

## COMPREHENSIVE ENERGY RETROFIT

### Case Study:

# Yakama Nation Housing Authority Wapato, WA



In 2005, the Yakama Nation Housing Authority teamed with the U.S. Department of Energy's Building America Program to rehabilitate 25 single-family homes in its Adams View development on the Yakama Indian Reservation. Not only have these homes achieved a total energy savings of 47% (over the pre-retrofit homes) but the "system retrofit package" designed during this collaboration has been applied to more homes on the reservation and has the potential to be replicated across more than 4,300 homes built on reservations in the Northwest under the U.S. Department of Housing and Urban Development (HUD) 1937 Housing Act.

"The project was very successful," said Clarence Moy, construction manager for the Yakama Nation Housing Authority. "Steven Winter was a valuable resource." Steven Winter Associates leads the Consortium for Advanced Residential Building (CARB), one of five Building America research teams.



Example of a pre-rehab home on the Yakama Indian Reservation.

The 25 retrofitted homes are among 700 homes built on the Yakama Reservation by HUD since 1970. The 1,573-square-mile reservation is located in the Yakima Valley of south-central Washington State, a region known for hot, dry summers, cold winters, and strong winds.

### Energy Efficient Features

The original homes were built to minimal energy code standards using 2x4 wood framing with R-11 batt wall insulation, R-19 batt attic insulation, and little insulation under the floor above the concrete vented crawlspace. The Yakama Housing Authority did a complete rehab, stripping out sheetrock, insulation, roofing, windows, plumbing, appliances, and heating equipment.

With input from CARB, the Housing Authority purchased a machine for blowing in cellulose and trained staff in its use. "Now we insulate everything with blown-in cellulose," said Moy. "Rodents don't like it, and we can completely fill the voids in the wall cavities."

Building America's CARB team worked with the Yakama Nation Housing Authority to rehabilitate 25 homes on the Yakama Indian Reservation in eastern Washington. Lessons learned are being applied to many homes across the reservation.

### BUILDER PROFILE

Yakama Nation Housing Authority  
Wapato, Washington

Established: 1981

Number of Staff: 110

Featured Project:  
Adams View,  
Yakama Indian Reservation

Size: 25 homes

Square Footage:  
3- and 4-bedroom homes

"A number of things we learned from this project we are applying to projects today."

*Clarence Moy, Construction Manager,  
Yakama Nation Housing Authority*

## Key Energy-Saving Features

Walls – R-13 cellulose insulation plus ½-inch R-3 rigid insulation, house wrap, and integral foam insulated vinyl siding

Floor Assembly – R-30 batt insulation

Roof – Standing seam metal roofing, site fabricated by owner

Attic – R-38 cellulose insulation

Windows – Vinyl frame, double-pane low-e, 0.31 U value, and 0.32 SHGC

Heating – Exterior Heat Pump  
6.8 HSPF

Cooling – Exterior SEER-10  
Heat Pump

Water Heater – Interior 40-gallon electric EF 0.90

Piping – PEX with copper valves

Lighting – 22% fluorescents  
(60 W/40 W)

Rigid foam insulation was added on all exterior walls to minimize thermal bridging and increase overall R-value. House wrap was placed over the insulated sheathing and under the vinyl siding to provide a continuous air barrier. R-30 fiberglass batt insulation was added between the floor joists. Old copper waterlines with lead solder were replaced with polyethylene (PEX) piping and copper stops and valves.

In the attic, flex ducts were buried in 12 inches of cellulose blown over R-19 batt for an equivalent of R-38 insulation. Attic and crawlspace hatches were weather-stripped and all ductwork was sealed with mastic. In the dry climate of eastern Washington, burying the ducts in blown-in attic insulation is a viable measure. In humid climates, burying ducts in attic insulation can raise concerns about condensation forming on the outside of the ducts.

All aluminum double-pane windows were replaced with double-pane low-emissivity windows with vinyl frames, which reduce heat loss, solar gain, and water condensation.

Within the sealed house, mechanical ventilation occurs through a local exhaust fan (in the bathroom or laundry room) rated at 80 cfm with a timer set for a 75% runtime. As a result of improved air tightness, the overall system sizing for each SEER-10 heat pump was reduced by a ton for cooling (from 2.5 to 1.5 ton) and cut in half for heating.

## Innovations

Moy's team replaced the asphalt shingle roofs with standing-seam metal roofing that is better able to withstand the region's high summer temperatures and stiff winds.

The old roof is stripped down to the roof sheathing. Thirty-pound felt is applied and dried in. On top of this, 1x4 furring strips are nailed to the roof at each truss. Along the roof's peak, an aluminum screen is installed over the ridge gap for continuous ventilation. The metal panels are snapped in place over the trusses.

“By having the metal off the roof on the 1x4 furring, the temperature differential is less [less heat is transferred through the metal roofing to the roof deck]. If it is hot, [the assembly] will carry this heat up toward the roof ridge. If it is cold, it will keep it from penetrating the house,” said Moy.

## Dollars and Sense

The total source energy savings over the pre-rehab home is 47% or 136.9 million Btu/year. Annual utility costs were cut nearly in half for each rehabbed home. If replicated across the 4,300 HUD 1937 Housing Act homes in the Northwest, this whole-house strategy could save an estimated 588,670 million Btu/year.

## The Bottom Line

Don Clem, the CARB architect from Steven Winter Associates, appreciates the collaboration and the building skill inherent in the Yakama Nation Housing Authority. He reflects on the value of this project as an example of “bringing us back to the concepts of sustainability, which is where Native Americans started.”

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