

1964 RANCH HOME RENOVATED TO BE NEAR NET ZERO

Written by Andrea Michael, Love| Schack Architecture



Project Highlights

- Major improvements to the building envelope
- 40% reduction in heat load
- All electric home
- Air to water heat pump with storage tank & electric coil backup, for space heating & domestic hot water
- 5.4kWh Solar PV array

Contractors

- Jed Wolfram, Bozeman Sustainabuild
- Liquid Solar Systems
- Warm Floor System's Inc
- Love | Schack Architecture
- OnSite Energy



"I wanted to go all electric because I was confident we could cover most of our needs with a solar array and feel strongly that we needed to stop using combustion fuels on site due to their greenhouse gas emissions."

- Andrea, Homeowner

GETTING TO NET ZERO

Andrea Michael, a local architect at Love | Schack, retrofitted her family's home to be near Net Zero through a 3-year phased project.

This mid-century ranch style home was not a top performer for energy efficiency or comfort. When the siding and windows started to reach the end of their lifespan, it was the right time to make energy efficiency improvements.

Now, over two years and three major phases the house is ready to be Net Zero (or near that). Air sealing, ventilation, insulation, and mechanical systems were all upgraded.



before photo

PHASE 1: THE ATTIC

Starting at the top, the first phase included improvements to the attic. A new roof and ridge vent, baffles in the rafter bays, and blown-in insulation tightened the thermal retention.

Prior to this process ice dams were an issue, installing a continuous ridge vent paired with the added insulation solved the problem.

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PHASE 2: THE HOUSE OVERHAUL

The thermal envelope of the walls came next. Two layers of siding, all of the windows, and the exterior doors came off; baring the home to a clean surface. After repairing some rotten sheathing, the house was wrapped in Solitex Mento 1000. With all of the seams fully taped and the bottom edge brought below the rim joist and adhered to the concrete foundation with sealant, this WRB (weather-resistant barrier) product doubled as an air barrier.


New flange-style windows were set into the existing rough openings and new egress windows were added to the basement bedrooms. 3" mineral wool was tacked to the sheathing and run below the rim joist (this junction in older houses is notorious for lots of thermal loss) and furring strips above that formed a rain screen and a surface to attach the new siding. Pre-finished wood siding completed the exterior renovation, creating a much tighter overall envelope that required new mechanical ventilation.

Andrea chose a Lunos through wall HRV. These units are great for renovations because they don't require ductwork. A bonus of completing all of the insulating upgrades from the exterior meant minimal disruption to the interior, allowing the family to live at home throughout the renovation.



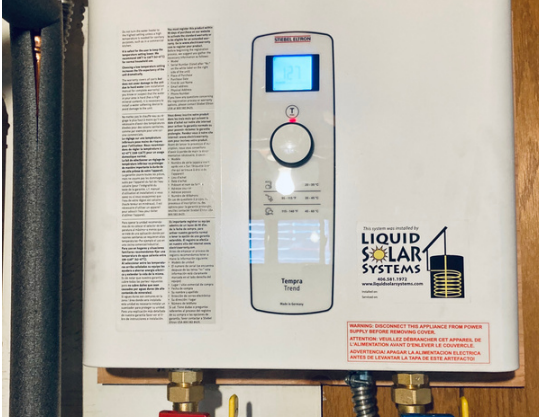
PHASE 2.1 A SIMILAR TREATMENT FOR THE GARAGE

Two notable additions for improving the garage's performance were finding the best garage door to fit the budget and the opening, which was a 3" thick insulated steel door; and air sealing the common wall between the garage and house. Andrea noticed an immediate improvement in the indoor air quality of the house after this step was taken.

 **40%**
DECREASE IN HEATING LOAD

With a higher performance envelope in place, Andrea pushed pause to gather energy modeling information over the course of a year. Overall they found the exterior improvements gained them a 40% reduction in heating load.

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PHASE 3: THE MECHANICAL OVERHAUL

Andrea wanted to continue to use the existing hot water baseboards as the primary heating source but also wanted a more efficient option for heating the water. Andrea worked with Liquid Solar Systems and Warm Floor System's Inc. to select and install an air-to-water heat pump for space heating and domestic hot water.

Finally, Andrea worked with OnSite Energy to install a solar PV array.



For the 2,400 square-foot home supporting a family of four, the final system includes:

- 5.4kWh Solar PV array
- Air-to-water heat pump with storage tank & electric coil backup, for space heating & domestic hot water
- On-demand electric water heater to boost the domestic hot water temps if needed
- New fan coil heating unit in the garage (her husband's favorite part of the whole system!)



"The house temp stays far more consistent instead of fluctuating up and down all the time. And it is much cooler in the summers. It used to get so hot upstairs that it was uncomfortable to sleep up there but the last two summers it has stayed comfortable throughout the house.

It is also way quieter inside!"

- Andrea, Homeowner



Learn more about energy upgrades at www.bozeman.net/sustainability