Affordable Residential
Thunder Valley House

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SIP wall thickness 6" walls with EPS solid insulating core.

SIP roof thickness 12" roof with EPS solid insulating core.

Enercept, Charlie Ewalt
Thunder Valley House (Regenerative Community)
Porcupine, SD.
Affordable Residential
Thunder Valley House

Enercept
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Watertown, SD 57201

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Project information:
Thunder Valley CDC (Regenerative Community) House
290 Empowerment Drive
Porcupine, SD 57772

Date Completed: July 2018

Dimensions of building: First and second floors: 26' x 26' with attic bonus space for storage

Total sq. ft. of conditioned space: 1,448 sq. ft.

Built By:
Thunder Valley CDC and homeowners
290 Empowerment Drive
Porcupine, SD 57772

Panels Manufactured By: Enercept, Inc.

Designed By:
Pyatt Studios
Rob Pyatt
1445 Pearl St #209
Boulder, CO 80302

The home is part of the Thunder Valley Regenerative Community located on the Pine Ridge Indian Reservation. Each unit is a single family home for low to moderate income Native American families.

The developers are creating climate change resilient homes. SIP construction fit well because of the improved energy efficiency they offer. Thunder Valley CDC has limited construction crews and wanted a building system that would go up quickly and that the homeowners could participate in. Rural utilities are generally more expensive, by building energy efficient housing ownership becomes more affordable.
Using SIPs allowed a very inexperienced crew and homeowners the ability to frame up the house and create an air-tight exterior shell.

Describe any innovative design elements or structural engineering involved:
The home was designed to maximize passive and active solar potential. The roof pitch has been adjusted for ideal solar gain and equipped with solar panels. The covered porch proves passive cooling.

Energy use intensity in kBtu/ft2:
14,500 kwh/year x 3.412 = 49,474

High performance integrated space and water heating system with inverter heat pump for cooling/ dehumidification, energy recovery ventilator, and high-efficiency filter - all delivered through a small duct distribution system.

Windows: 0.27 U-Value 0.20 SHGC.
Slab and Foundation Insulation = R-12; 6 KW PV System.
Covered Porch for Passive Cooling & Sun Protection.
High SRI standing-seam metal roof for reduced heat gain.

LED lighting, Hydronic floor heat, Energy Star appliances, Low Flow Water Fixtures, and a 6KW PV system solar panel system were installed for long term energy savings.

Low or no VOC finishes were used.
The shared space and yards are seeded with native prairie grasses and shrubs.

This house is one of seven units built. The homes were designed to take advantage of a sweat-equity and training model that resulted in between 15- 30% cost savings for low income Native American families living in the development.

Each home comes with a 'Homeowner's Guide' that include instructions on keeping the home safe, healthy, and green.
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[Image of a map or diagram related to Thunder Valley House, with logos for SIPA and the 17th ANNUAL BUILDING EXCELLENCE AWARDS]
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Energy Efficiency & Your Home

The Thunder Valley Regenerative Community was designed with the goal of being a "Net-Zero" Energy Community.

Net-Zero Energy Building Design
A Zero Energy Building (ZEB) produces enough renewable energy to meet its own annual energy consumption requirements. This reduces the need for non-renewable energy sources (for example, fossil fuels such as coal, petroleum, and natural gas). Your new home is a zero energy building!

The Home Energy Rating System (HERS®) is the industry standard by which a home’s energy efficiency is measured. It’s also the nationally recognized system for inspecting, testing and calculating a home’s energy performance.

A ZEB has many long-term advantages, including lower environmental impacts, lower operating and maintenance costs, better resiliency to power outages and natural disasters, and improved energy security (which means uninterrupted availability of energy sources at an affordable price). A ZEB is designed to use all cost-effective measures possible to reduce energy usage. Each Thunder Valley home has been constructed to comply with the Department of Energy’s Zero Energy Ready Home (DOE ZERH) National Program Requirements. Thunder Valley Homes are also "Energy Star Qualified Homes."

More About Energy:
Reducing your energy consumption provides the greatest opportunity to positively affect the environment. This is because the energy produced by power plants to fuel the building results in major greenhouse gas emissions — impacting air quality, wildlife, and climate. Also saving energy saves money!

Lighting and Daylight
• Efficient light fixtures have been installed throughout your home
• Your home was designed to have ample daylight to cut down on the need for electric lighting.

Added Comfort
• The walls, floors and roof all have increased insulation and improved air sealing to prevent drafts, leaks and cold surfaces.
• The windows are double-pane in order to keep the air inside and the air outside, out.
• These measures are intended to reduce the need for climate control (heating/cooling systems) to keep in indoor temperature within a comfortable range.

Energy Star Appliances
• Washing machines, dishwashers, and refrigerators that are Energy Star rated to minimize energy and water use. (See Appendix for usage tips that will help you maximize the energy efficiency of these appliances).

Cleaner Air: Your New Home is Indoor airPlus Certified!
Your new home is certified under the US Environmental Protection Agency’s Indoor airPLUS Program. In order for a home to become airPLUS certified, a builder must first design a home to earn the ENERGY START Certified Home label - the government-backed symbol for energy efficiency. The result is a home that is significantly more energy efficient than a home built to minimum code. This both reduces your energy bills and helps to reduce greenhouse gas emissions, which is better for the environment.

The builder is then required to include additional home design/construction features to help improve the indoor air quality of the home. These include:
• Moisture control systems to prevent mold
• Integrated pest management
• Heating, ventilation and air-conditioning systems
• Combustion-venting systems
• Radon resistant construction
• Low-emitting building materials

The National Institute for Building Sciences, 2015
US Environmental Protection Agency
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Housing Design Development

Pyatt Studio utilized energy modeling and analysis to develop the wall assemblies, materials and building systems for the homes to ensure that all project goals were met.

DESIGN STRATEGY AND KEY POINTS

- Enclosure: Durable and robust building systems using Structural Insulated Panels (SIPs), conditioned attic, high performance windows, exterior foundation insulation, and airtight construction.
- HVAC: High-performance integrated space and water heating system with inverter heat pump for cooling/dehumidification, energy recovery ventilator, and high-efficiency filter – all delivered through a compact, small duct distribution system.
- IAQ: Design strategy focused on pollution avoidance, source-point exhaust, continuous ventilation, and consistent distribution of fresh and filtered air to habitable rooms.

TECHNICAL SPECIFICATIONS

- Slab Insulation = R-12; Foundation Insulation = R-12
- Wall Insulation = R-32; Roof Insulation = R-50
- Airtightness Target = 1.0 ACH@50Pa
- Windows = 0.27 U-Value; 0.20 SHGC
- Heating/Cooling/DHW Specifications = 95%
- CAE; 17 SEER
- Energy Recovery Ventilation = 60 to 120 cfm w/70% SRE

PROJECT DATA

- Location: Pine Ridge Indian Reservation, Porcupine, South Dakota
- 2009 IECC Climate Zone: 6
- Square Feet: 1448
- Number of Stories: 2
- Number of Bedrooms: 4
- Number of Bathrooms: 2
- HERS Score: 40, with 6 KW PV System: 0
- Estimated Monthly Energy Costs: $98; $20 with PV