



Affordable Housing

Participant information

Enercept Charlie Ewalt, Roberta Bartel 3100 9th Ave SE Watertown, SD 57201

Phone: 605-882-2222

Email Address: enercept@enercept.com

Website: <u>www.enercept.com</u>

Category

Affordable Housing

High Performance: No

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

Date Completed: July 2018

Total cost of project (exclusive of land): \$110,000

Dimensions of building (all floors of multi-story building): First and second floors: $26' \times 26'$ with attic bonus space for storage

Asking price/purchase price (Affordable Housing only): \$130,000

Total sq. ft. of conditioned space: 1,448 sq. ft. Built By (if different than applicant)

Thunder Valley CDC and homeowners Enercept 290 Empowerment Drive Porcupine, SD 57772 Panels Manufactured By

Company Name (members only): Enercept, Inc.







Affordable Housing

Designed By (if different than applicant - SIPA will only recognize members) Pyatt Studios Rob Pyatt 1445 Pearl St #209 Boulder, CO 80302

Thunder Valley House



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

Describe the end use of the building: 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.

How did SIP construction help you get this job? 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.

SIP wall thickness and core material: 6" walls with EPS solid insulating core SIP roof thickness and core material: 12" roof with EPS solid insulating core

Describe the benefits of using SIPs on this project. Did SIPs help save time, labor, construction costs, or energy? 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.

Please list any certifications the project received, such as ENERGY STAR, LEED, National Green Building Standard, WELL, Passive House, Green Globes or local green building programs. Only list certifications that are completed: None completed at this time

HERS Index (required only for High Performance Category and recommended for residential projects): Projected calculations indicate

Blower door test results (ACH50) (required only for High Performance Category and recommended for residential projects): The airtightness target of this

Energy use intensity in kBtu/ft2 (required only for High Performance Category and recommended for commercial projects): $14,500 \text{ kwh/year} \times 3.412 = 49,474$

Describe the HVAC system used on the project: 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.

Thunder Valley House



Describe any other energy-saving materials used in the building envelope other than SIPs. List U-values of windows used and the U or R-value of any insulation materials. (judged only for High Performance Category) 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

Please list any energy-efficient products or design features, such as lighting, hot water heating, appliances, passive solar (judged only for High Performance Category): LED lighting; Hydronic floor heat; Energy Star appliances; Low Flow Water Fixtures

Were any solar panels installed on the project? If so, indicate the size of the system (judged only for High Performance Category): Yes, 6KW PV system

Please list any sustainable materials or design features not listed above, such as recycled materials, low-VOC finishes, landscaping, etc. (judged only for High Performance Category): Low or no VOC finishes were used. The shared space and yards are seeded with native prairie grasses and shrubs.

Any additional comments on the project: This house is one of seven units supplied. The homes were designed to be built through 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.

Exterior front view





Exterior street view





Kitchen view





Construction view





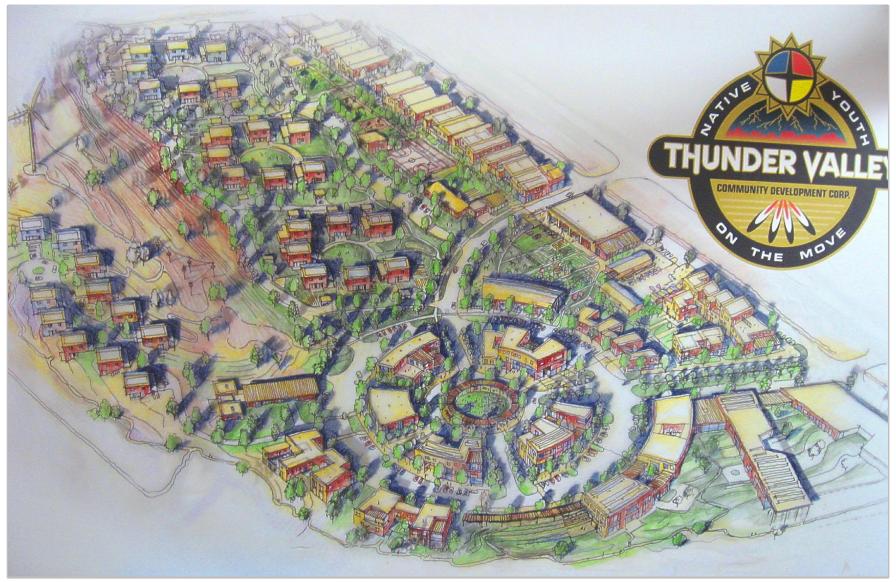
Neighborhood view





Site view

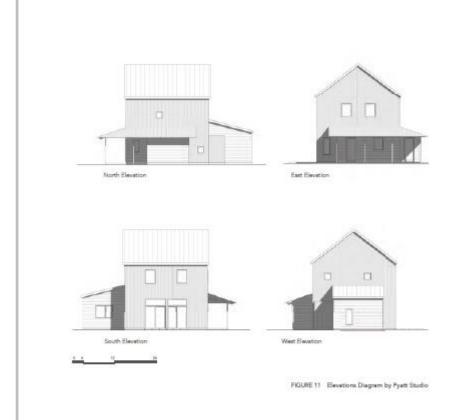




Elevations and floor plans

Thunder Valley House





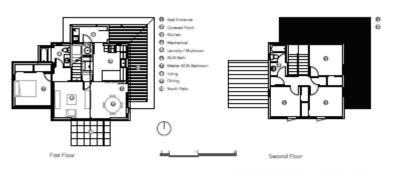


FIGURE 8 Floor Plan Diagram by Pyatt Studio

FLOOR PLANS

- East Facing Entrance
- Passive Solar
- Wheelchair Accessible + Bedroom & Bath on Ground Level
- Bedrooms, Full Bath, and Flex-space on Second Floor for Maximum Sleeping/ Working Capacity
- Covered Porch for Passive Cooling and Sun Protection
- Storm Shelter Option
- · Public (Communal) & Private Orientation
- · Ease of Access to and from Carport

Energy Efficiency

Thunder Valley House



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!

A ZEB has many long-term advantages,

operating and maintenance costs, better

resiliency to power outages and natural

including lower environmental impacts, lower

disasters, and improved energy security (which

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.

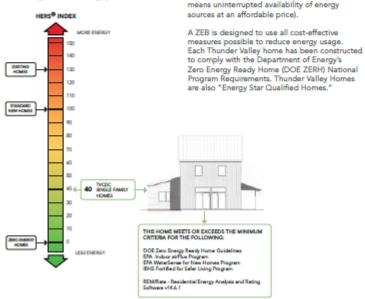


FIGURE 9 HERS Index Diagram by Pyatt Studio

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 in 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

HERS® MODELING ASSUMPTIONS

	Component	Modeled Value
Errestope	Foundation walls	NO.
	Foundation floor	Ro under slab AND Ro permeter from 24" below grade to top of slab)
	Frame floor over arritment.	N/A
	Rn/band jost	RX blown cellulose with RX exterior rigid
	Above grade walls	Ro blown cellulose with Rib extentor rigid
	Windows	U-027, SHGC-0.30 at all windows, sinder doors, and fulfille doors
	Roof/orling	Ro attic, for at vaulted
	Air leakage	616 NACH (natural air changes per hour)
Hedust of	Heating system	ASHP, HSPF ID.1
	Cooling system	ASHP, SEER 20
	Domestic hot water	HPWH, EF 24
	Location of ducts	NA
	Programmable thermostat?	Yes
	Mechanical ventilation	Balanced HRV, 66% sensible recovery efficiency
Appliance and Research as	Refrigerator	450 lashtyr
	Delwaster	26Gml/yr
	Clothe washer	Frengy Star
	High efficiency lighting	100%
	Photosoltatos	none
	Salar Bernal	THE RESERVE OF THE PERSON OF T

HERS score as modeled*	40			
Required HERS score per code	N/A			
Nation A temperated "audition" under the required score is highly encommended, as there are oftentimes unforespen and/or changes during construction that affect this score.				

FIGURE 10 Building Energy Modeling by Pyatt Studio

Design Strategy

Thunder Valley House



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 (SIP's), 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.

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

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

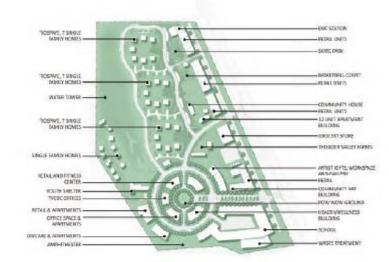




FIGURE 1 Site Plan Diagram by BNIM