

Homeowner's Manual

THUNDER VALLEY REGENERATIVE COMMUNITY

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Prepared for:

Thunder Valley Community Development Corporation

Prepared by:

Pyatt Studio on behalf of Minnesota Housing Partnership

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About This Manual

The aim of this document is to present the integrative design strategy of the Thunder Valley Tiospaye Zero Energy Model Home for the single family housing units in Phase I of the Thunder Valley Regenerative Community Development. It includes technical methodology for sustainable building, construction methods and maintenance, based on climate and context of the Pine Ridge Reservation.

In addition, this document will provide new homeowners with the tools and information that each will need in order to maintain a green and healthy home, community, and lifestyle.

This Manual:

- Provides integrated design background and details for the homes
- Provides guidance on maintaining and operating your home
- Offers tips and suggestions for creating and maintaining a healthy and green home
- Provides tips for how to maximize your home's energy-efficiency

Project Overview

Designing for a Resilient Community

Thunder Valley CDC is building a regenerative community on the Pine Ridge Indian Reservation in Porcupine, South Dakota. This community development includes 21 climate change resilient homes designed by Pyatt Studio through a community-led process that resulted in the "Thunder Valley Tiospaye Zero Energy Model Home," and the "Thunder Valley Tiospaye Model Pocket Neighborhood Plan."

MISSION STATEMENT

Empowering Lakota youth & families to improve the health, culture and environment of our communities, through the healing and strengthening of cultural identity.

The development is a response to the need for economic development, policy changes, housing, job creation, and community empowerment and capacity building. Thunder Valley CDC believes in the importance of choosing resilient housing designs and infrastructure while keeping affordability for the family in the forefront of the decision-making process. With a need for over 4,000 homes on the Pine Ridge Reservation and over 50% of the population under 18, this project seeks to address the urgent need for safe, healthy, affordable housing that is rooted in Lakota culture. There are currently no planned developments on the Pine Ridge Reservation, Thunder Valley CDC is creating a replicable model to meet that need. This community will be mixed-income with affordable market rate housing for families who are not eligible for subsidies. Low income and very low income families will be eligible for subsidies and sweat equity programs that ensure affordability

for homeownership. The Thunder Valley Regenerative community development will provide housing, jobs, workforce development, economic development, and community empowerment in one of the poorest places in North America.

DEVELOPMENT OBJECTIVES

- To provide safe, high quality, affordable homeownership opportunities to Lakota families
- To provide a model of sustainable mixed use development for North American tribes
- To encourage diversity of incomes in every phase of development
- To provide a safe environment focused on Lakota values, traditions and spirituality for Lakota youth
- To train a workforce in sustainable construction techniques and create new jobs on the Pine Ridge Indian Reservation
- To incubate and accelerate entrepreneurial endeavors on Pine Ridge Indian Reservation.

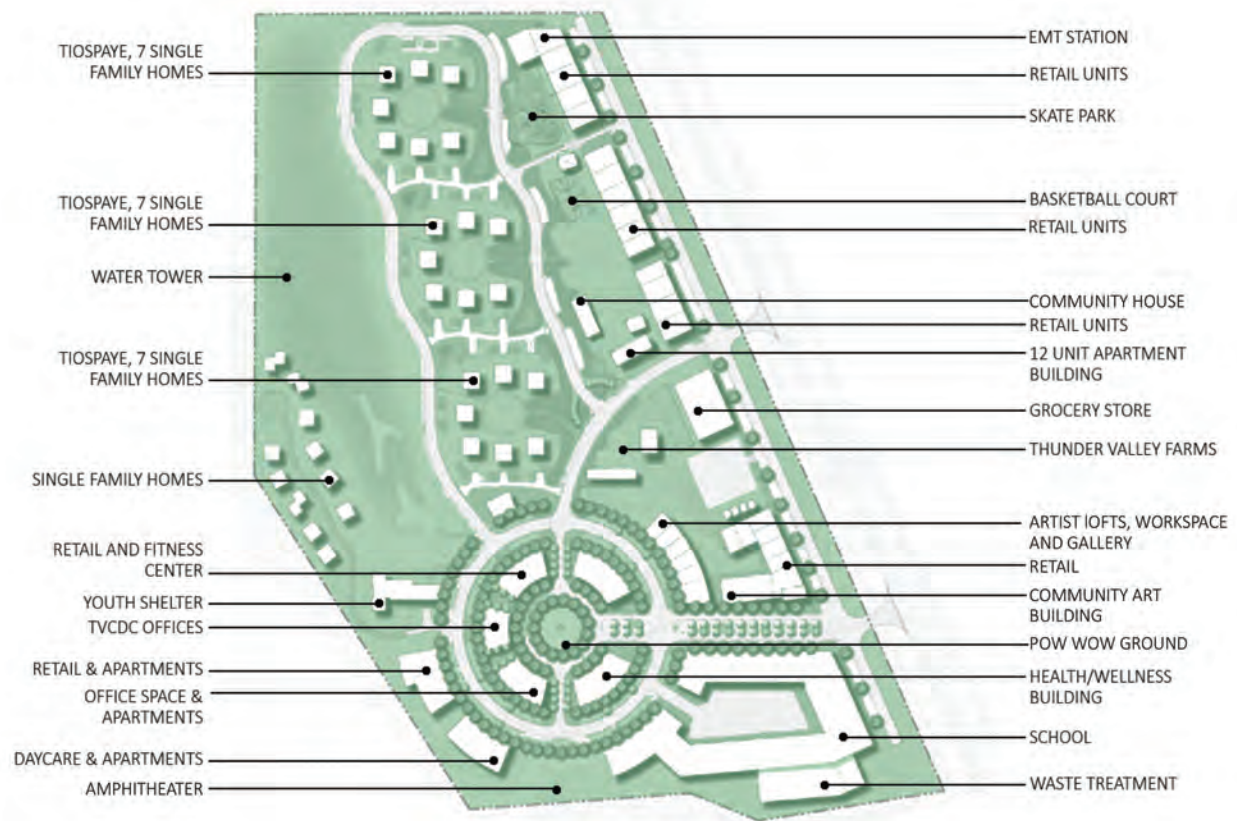


FIGURE 1 Site Plan Diagram by BNIM

Your New Home

Sustainability and Your Home

The 2005 World Summit on Social Development reaffirmed the idea that true sustainability is made up of three “pillars” that are interdependent (connected to each other) and mutually-reinforcing (support each other). The overall goal of the Thunder Valley Regenerative Community is to create a sustainable and interconnected community that provides better housing, places for businesses to thrive, and a

supportive environment for youth, elderly and families. Your home was designed through an integrative design process that balanced these community goals and is designed with the intent to improve human health, reduce environmental impacts and be firmly grounded in Lakota culture.

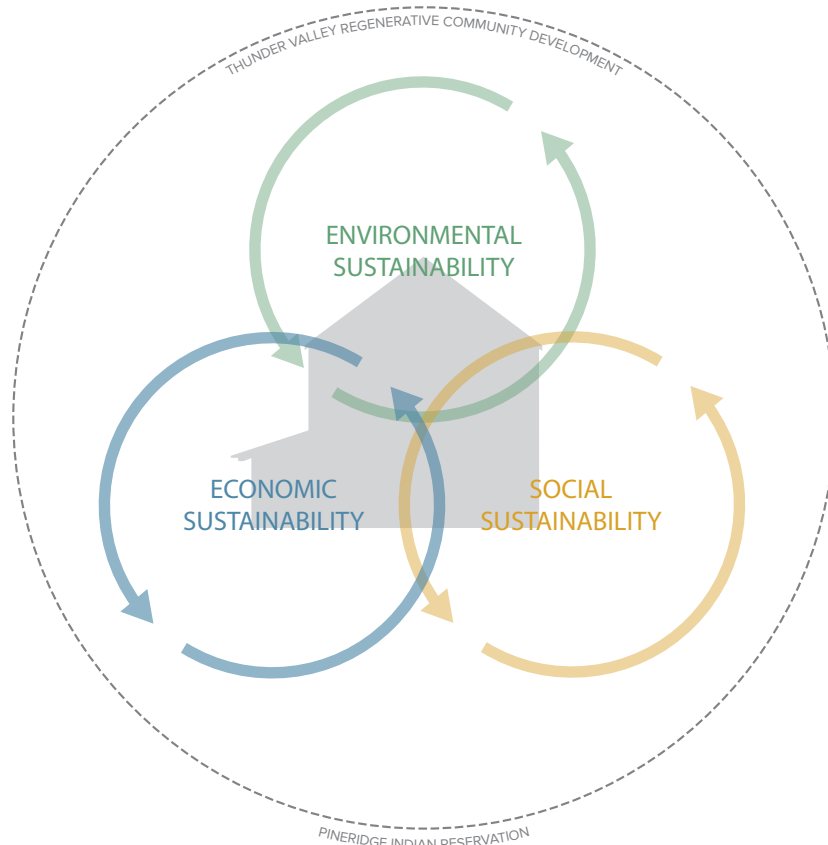


FIGURE 2 Sustainability Diagram by Pyatt Studio

ENVIRONMENTAL SUSTAINABILITY

- Protects nature, wildlife and its diversity
- Improves air quality and reduces toxins - using low or non-toxic materials, free of volatile organic compounds (VOCs) in all paints, coatings, sealants, adhesives, and flooring
- Conserves natural resources - energy efficiency through smart passive design strategies, plumbing fixtures that use less water, rainwater collection and reuse
- Homes are designed to maximize passive and active solar potential
- The community infrastructure includes integrated storm-water systems, natural landscaping

SOCIAL SUSTAINABILITY

- Improves your health and wellbeing
- Increases access to housing for families of all income levels- different programs are available for low and moderate income families
- Increases access to community resources - Each home connects to the common area through exterior porches, community gardens, playground spaces and allows for expansion through pre-planned wheelchair accessible bedroom additions
- Culturally supportive design - each of the three pocket neighborhoods include culturally-significant elements such as east-facing entries and access to community buildings for ceremonies and family gatherings

ECONOMIC SUSTAINABILITY

- Affordability - the homes were designed to be built through a sweat-equity and training model that will result in between 15- 30% cost savings for low income Native American families living in the development. The development will also provide market rate options that are affordable to moderate income families.
- Supports the economic growth of the community
- Creates a workforce
- Reduces the cost to operate the building
- Lowers utility bills - energy efficient lighting, heating equipment, and appliances
- Improves performance and durability of the homes to resist the future effects of climate change

THUNDER VALLEY REGENERATIVE COMMUNITY MASTER PLAN





Tiospaye Neighborhood Plan

Housing Design Process

“Integrative Design draws upon concepts of synergies and interconnectedness, and consists of two components: an integrated design approach and integrated team process.”

The “integrated” design approach asks all the members of the building stakeholder community, and the technical planning, design and construction team to look at the project objectives, and building materials, systems, and assemblies from many different perspectives. This approach is a different from the typical planning and design process which relies on the expertise of specialists who work in their respective professions somewhat isolated from each other. Integrative design in practice also requires a collaborative team process in which the design team and all affected stakeholders work together throughout the project phases and to evaluate the design for cost, quality-of-life, future flexibility, efficiency; overall environmental impact; productivity, creativity; and how the occupants will be enlivened. This process draws from the knowledge of all the stakeholders across the life-cycle of the project.

From defining the community need for housing through planning, design, construction, building occupancy, and future operations.

Housing design team goals:

- Facilitate community-led housing design charrettes and focus groups on the Pine Ridge Indian Reservation
- To gather community input from all stakeholders
- To balance the community goals in a model home and neighborhood design that reflects the needs and values of the Lakota people

-Whole Building Design Guide, a program of the National Institute of Building Sciences



FIGURE 3 Community Stakeholder Diagram by Pyatt Studio

Community Engagement

Pyatt Studio facilitated several housing design charrettes and focus groups where all stakeholders contributed to a series of “touchstone” exercise, used to identify and prioritize a series of eight goals and objectives that informed the housing design. Each design objective was significantly important to the project and held in proper balance during the design process; their interrelationships and

interdependencies with all building systems where explored, evaluated, applied, and coordinated concurrently from the planning and programming phase.



PHOTO CREDIT 1 Photo by Pyatt Studio

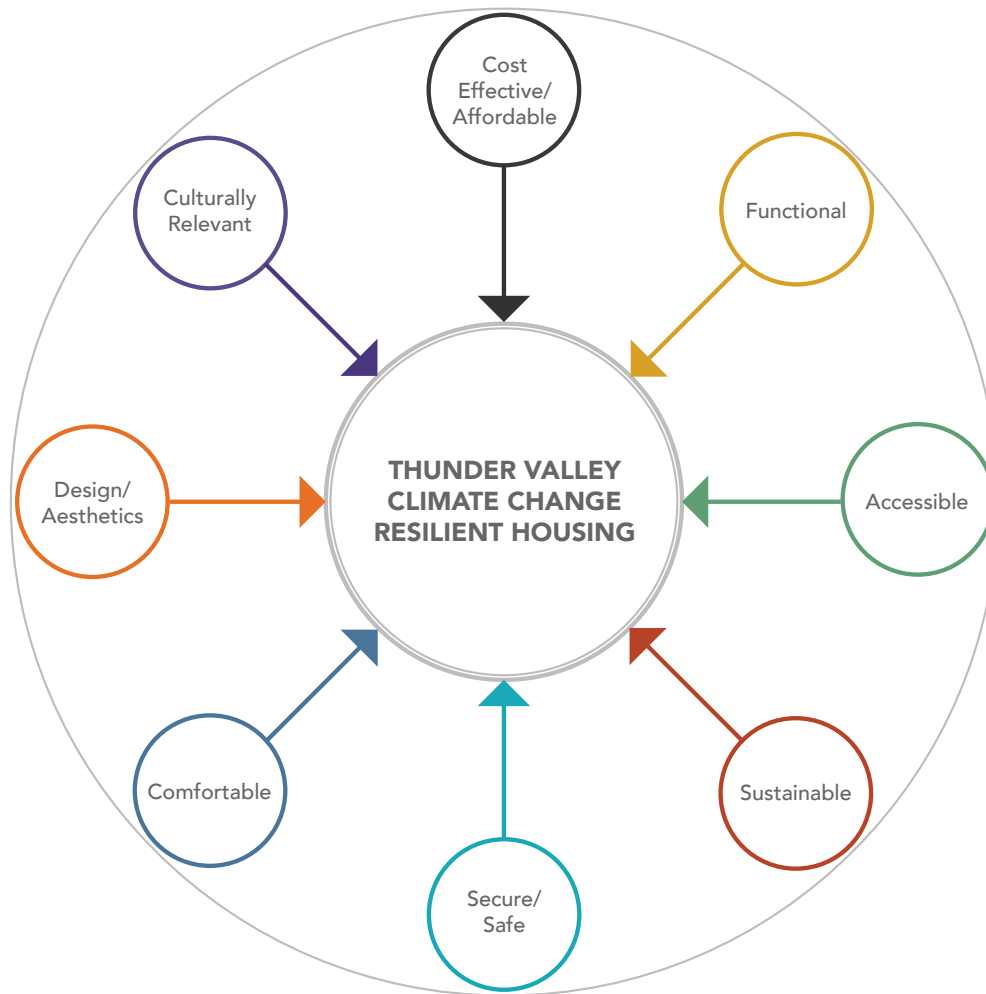


FIGURE 4 Design Objectives Diagram by Pyatt Studio

DESIGN OBJECTIVES

Cost Effective/Affordable

Selecting building elements on the basis of life-cycle costs (weighing options during concept and design development, and value engineering), as well as basic cost estimating and budget control.

Functional

Functional programming– spatial needs and requirements, system performance, as well as durability and efficient maintenance of building elements.

Accessible

Building elements, heights and clearances are implemented to address the specific needs of disabled people. Visitability and Universal Design.

Sustainable

Pertains to environmental performance of building elements and strategies including materials and systems.

Secure/Safe

Pertains to the physical protection of occupants and assets from man-made and natural hazards caused by climate change.

Comfortable

Pertains to occupants' well-being– physical and psychological health and comfort– including building elements such as air distribution, natural daylighting, and cross ventilation.

Design/Aesthetics

The physical appearance of the design, cultural aspects, natural materials and durability.

Culturally Relevant

Support the interrelationships between the Oglala Lakota culture and the physical environment, to improve knowledge of the impact of cultural and social factors on the health and wellbeing of families.

Culturally Supportive Design

The Thunder Valley Tiospaye Zero Energy Model Home and Tiospaye Neighborhood Plan are based on the Lakota geometry of a sacred circle. The small group of seven compact single-family homes are organized around a circle of shared space to foster and support a Lakota Tiospaye or extended family. Shared community spaces within the circle include community gardens,

playground space, access to a community building and an integrated solar and storm-water management system. The houses are all oriented to the south and have east entries and exterior porches which connect to the common areas, and are designed to allow for future expansion



FIGURE 5 Conceptual Tiospaye Plan by Pyatt Studio

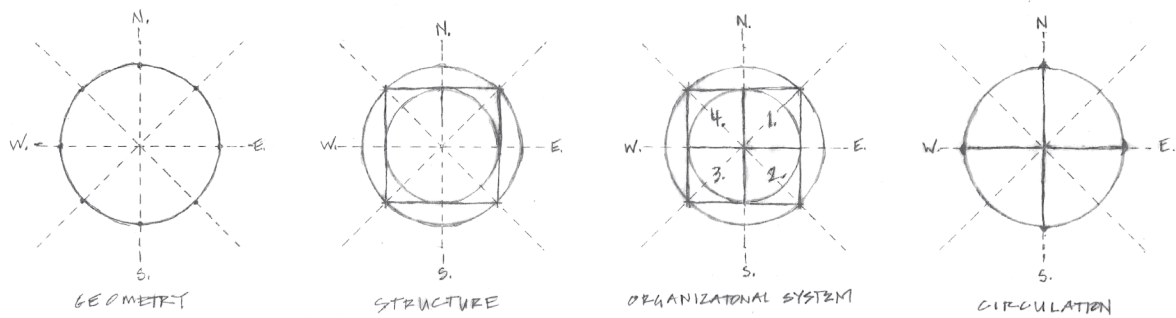


FIGURE 6 Four Directions Geometry Diagram by Pyatt Studio

The Four Directions Geometry serves as the foundation for design of the Tiospaye Project – for the individual homes as well as the larger pocket neighborhood. The eight prioritized objectives set by the community and Thunder Valley CDC, and the sacred Lakota circle, or Hocoka, in which all spiritual and commonplace life takes place were carefully considered in

tandem as the team developed the site plan and the home designs. It is of the upmost importance that the practical objectives of the project not only fit within, but also honor and solidify the larger spiritual and cultural context of the Lakota world view.

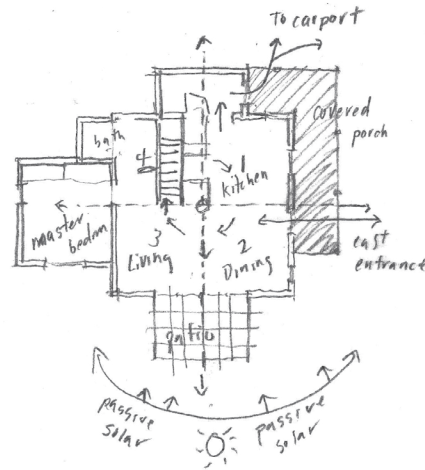
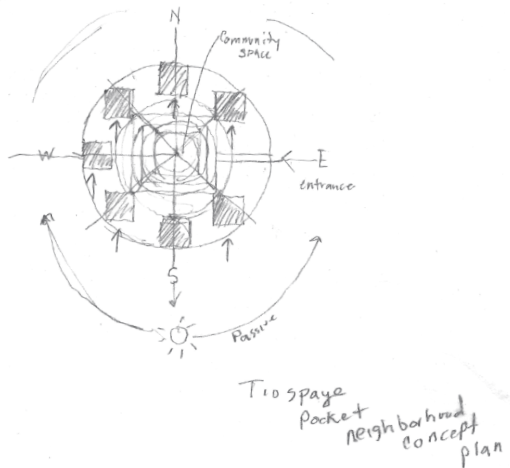


FIGURE 7 Passive Strategies Diagrams by Pyatt Studio

PASSIVE STRATEGIES

The Thunder Valley Pocket Neighborhood Plan is designed to maximize each home's passive & active solar access, connect to the common area through east entries and exterior porches, and allow for expansion through planned wheelchair accessible additions in support of elders.

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.

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

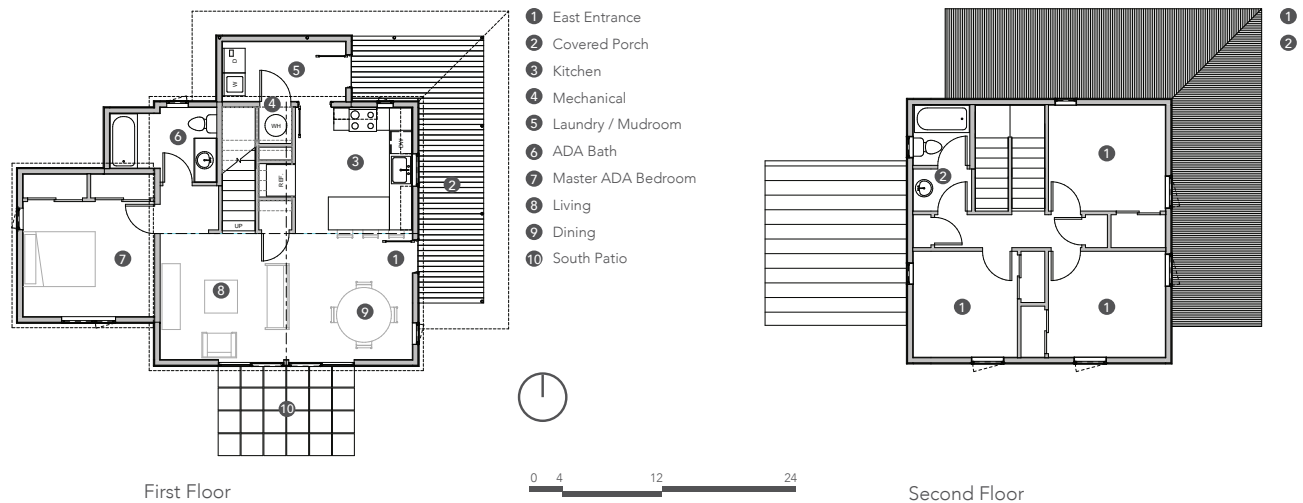


FIGURE 8 Floor Plan Diagram by Pyatt Studio

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 & 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."

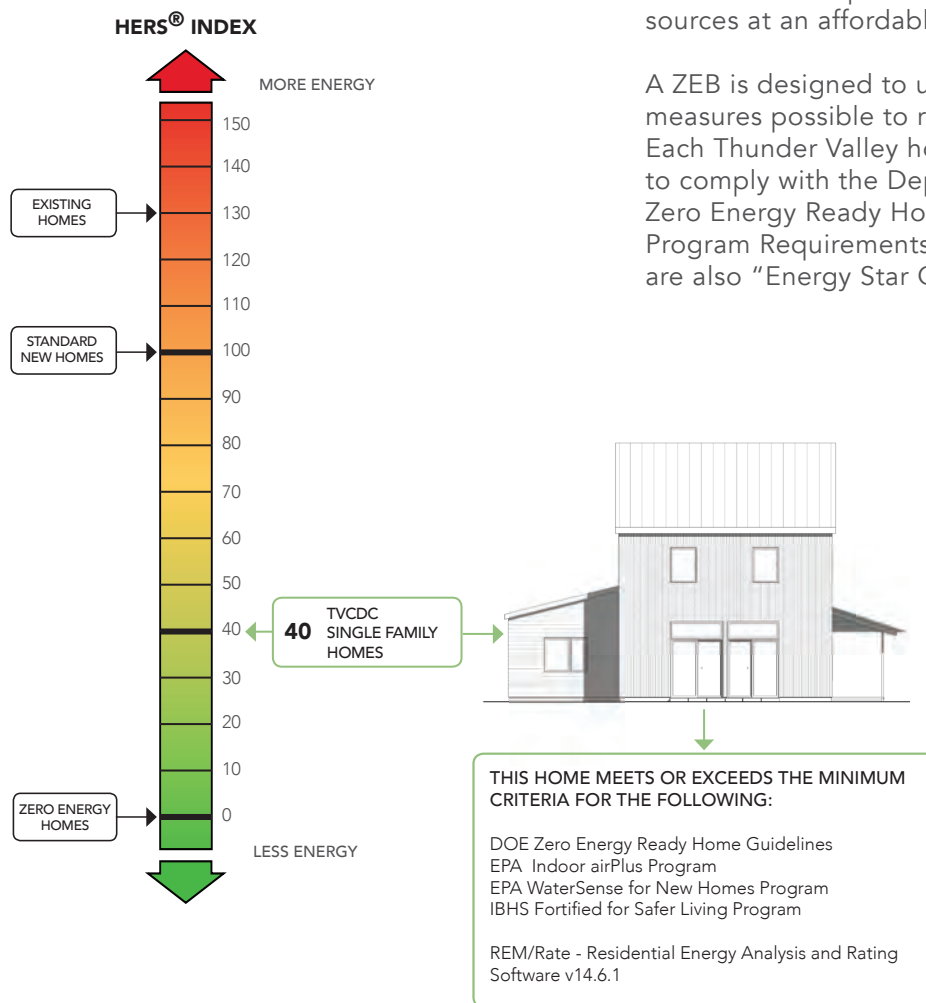


FIGURE 9 HERS Index Diagram by Pyatt Studio

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 STAR 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
Envelope	Foundation walls	N/A
	Foundation floor	R10 under slab AND R10 perimeter (from 24" below grade to top of slab)
	Frame floor over ambient	N/A
	Rim/band joist	R20 blown cellulose with R10 exterior rigid
	Above grade walls	R20 blown cellulose with R10 exterior rigid
	Windows	U-0.27, SHGC-0.30 at all windows, slider doors, and full-lite doors
	Roof/ceiling	R60 attic, R49 at vaulted
	Air leakage	0.10 NACH (natural air changes per hour)
Mechanicals	Heating system	ASHP, HSPF 10.3
	Cooling system	ASHP, SEER 20
	Domestic hot water	HPWH, EF 2.4
	Location of ducts	N/A
	Programmable thermostat?	Yes
	Mechanical ventilation	Balanced HRV, 66% sensible recovery efficiency
Appliances and Renewables	Refrigerator	450 kwh/yr
	Dishwasher	260kwh/yr
	Cloths washer	Energy Star
	High efficiency lighting	100%
	Photovoltaics	none
	Solar thermal	none

HERS score as modeled*	48
Required HERS score per code	N/A
Note: A two point 'cushion' under the required score is highly recommended, as there are oftentimes unforeseen and/or changes during construction that affect this score.	

FIGURE 10 Building Energy Modeling by Pyatt Studio





North Elevation



East Elevation



South Elevation



West Elevation



FIGURE 11 Elevations Diagram by Pyatt Studio

A Healthy Home

Living in a Healthy Home

What is a Healthy Home?

Historically, a home's main purpose was to provide people with such basics as walls to keep out animals, and a roof to keep out rain. As health knowledge increased, people realized that a safe, affordable, healthy and accessible home not only supports the basic need for shelter, but also protects them from illness and injury.

A healthy home is one that:

- Is a solid structure that provides shelter from wind, sun, weather, moisture, noise, pollution and pests
- Has clean indoor air
- Is either designed to, or has systems to keep the indoor temperature within a safe and comfortable range
- Has clean water
- Is free from lead, high levels of radon, and excess chemicals
- Is designed to keep its occupants safe from injury
- Is culturally supportive
- Is designed to be accessible
- Protects its occupants from the future effects of climate change



FIGURE 12 Architectural Rendering of the Thunder Valley Tiospaye Neighborhood by Pyatt Studio

The Connection Between Your Health and the “Health” of Your Home

Most People spend at least half of every day inside their homes. Seniors and young children are most vulnerable to home health threats, since they tend to spend more time inside, and their immune systems are more vulnerable than most older children and adults. In fact, studies

show that, on average, young children spend as much as 70% of their day inside their home. In addition, environmental toxins impact children’s developing brains and bodies differently than they impact adults.

SOME LEADING HOUSING-RELATED CAUSES OF INJURY AND ILLNESS:

Lead- based paint exposure (peeling paint/ improper prep work when repainting in homes built before 1978)	Lead poisoning - causes lower IQ and other learning and behavior problems in children
Smoking, secondhand smoke	Asthma, respiratory problems, sudden infant death syndrome (SIDS), lung cancer and deaths from fire
Carbon Monoxide (from poorly maintained furnace or un-vented gas heater)	Headaches, dizziness, confusion and death. Known as the “silent killer” - Colorado is responsible for 500 deaths and more than 15,000 doctor visits per year.
Dust mites	Asthma
Radon (naturally occurring gas caused by the breakdown of uranium and radium in the ground)	Responsible for more than 20,000 deaths annually. Leading cause of lung cancer in non-smokers and people who have never smoked
Lack of a working smoke alarm	Fire injuries and deaths
Moisture and mold	Asthma, nose and throat irritation, congestion, coughing, wheezing and pneumonia
Pesticide exposure	Acute poisoning and possible chronic conditions such as cancer, low birth weight and prematurity
Exposure to toxins	Eye, nose and throat irritation, headaches, loss of coordination and nausea; damage to the liver, kidney and central nervous system; cancer

Your Home at a Glance

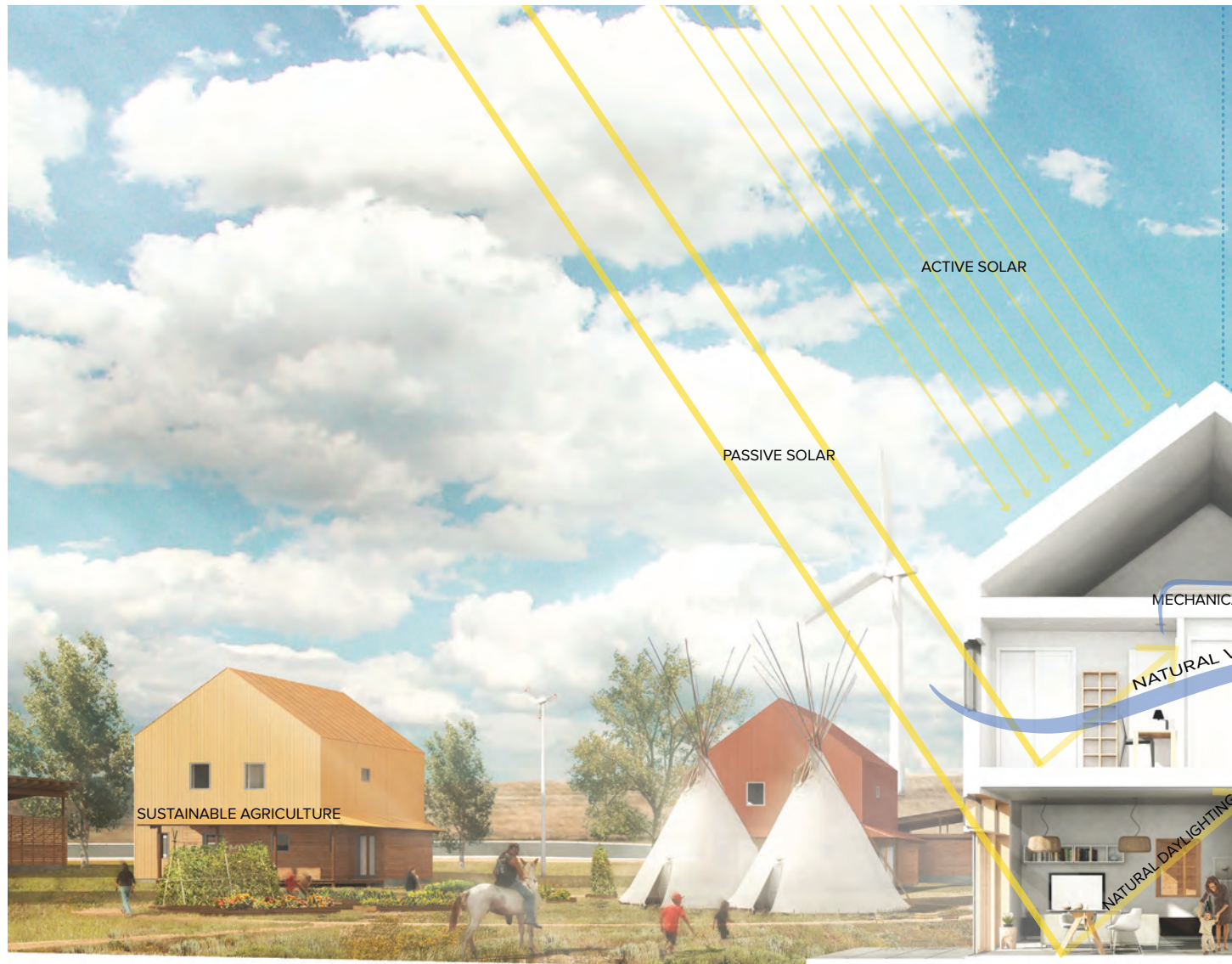




FIGURE 13 Building Section Diagram by Pyatt Studio

Integrated Features of Your Home



1. Rainscreen System
2. High Performance Building Envelope
3. Frost-protected shallow slab foundation
4. Solar PV & Solar Thermal Panels
5. Heat Pump/Water Heater
6. Energy recovery ventilation system
7. Low flow water fixtures
8. LED/ ENERGY STAR Interior lighting
9. Low E Windows that provide natural daylighting and ventilation
10. ENERGY STAR Appliances
11. Natural, Low or No VOC Finishes and Furniture
12. Structural Insulated Panels
13. High SRI standing-seam metal roof for reduced heat gain



FIGURE 14 Integrated Features Diagram by Pyatt Studio

Features of Your Home

1. RAINSCREEN SYSTEM

A rainscreen is an exterior cladding detail that allows the exterior cladding to stand off from the WRB (Weather Resistant Barrier), creating an air cavity directly behind the cladding that helps to protect the buildings wall system by promoting airflow. This allows any moisture that may pass by the cladding to easily drain away from the building, and accelerates evaporation of any residual moisture from the wall assembly.

A well-designed rainscreen cladding system needs:

- A high permeance fully adhered water-resistive barrier (WRB);
- An air gap between the WRB and the back of the siding;
- Flashings around all windows and doors, penetrations and vulnerable areas
- Airflow and insect screens at the top and bottom of the wall.

2. HIGH PERFORMANCE BUILDING ENVELOPE

A high-performance building envelope is responsive to changing exterior and interior conditions. The role of high-performance building envelope is to protect the building from the elements, provide the occupants with fresh-air through cross ventilation with operable windows, collect solar energy through passive and active solar technologies, harvest rainwater for storage and reuse, and provide natural daylighting and views.

Passive strategies include site orientation to contribute to the buildings performance

3. FROST-PROTECTED SHALLOW FOUNDATION

Frost-protected shallow foundation (FPSF) design provides cold weather durability without excavation below the frost line and reduces both the amount of concrete and excavation required. The FPSF system utilizes a rigid foam polystyrene (EPS or XPS) insulation board placed around the outside of a foundation perimeter, which directs heat loss from the building toward the foundation and is based on the principal that heat loss through a building's foundation keeps the ground beneath from freezing and heaving by raising the frost depth at the foundation's perimeter.

The FPSF is an integral part of the affordability and workforce development strategy for the homes. FPSF are designated a U.S. Department of Housing and Urban Development's (HUD's) Partnership for Advancing Technology in Housing (PATH) Top Ten Technology for 2004, the FPSF design concept has gained acceptance due to its insulation benefits, energy efficiency, and cost effectiveness.

4. SOLAR PHOTOVOLTAIC TECHNOLOGY

Solar PV provides renewable energy to the homes from the sun.

Solar cells, also called photovoltaic (PV) cells, convert sunlight directly into electricity. PV gets its name from the process of converting light (photons) to electricity (voltage), which is called the PV effect. The PV effect was discovered in 1954, when scientists at Bell Telephone discovered that silicon (an element found in sand) created an electric charge when exposed to sunlight.

5. HEAT PUMP WATER HEATERS

Heat pump water heaters use electricity to move heat from one place to another instead of generating heat directly. Therefore, they can be up to three times more energy efficient than conventional electric resistance water heaters. To move the heat, heat pumps work like a refrigerator in reverse. <https://energy.gov/energysaver/heat-pump-water-heaters>

6. ENERGY RECOVERY VENTILATION (ERV)

Energy recovery ventilation (ERV) is the process of exchanging the energy contained in normal homes exhaust air and using it to treat (precondition) the incoming outdoor fresh air. During the warmer seasons, the system pre-cools and dehumidifies while humidifying and pre-heating in the cooler seasons. ERV is the preferred mechanical ventilation system for a high performance home. Proper and balanced ventilation improves indoor air quality and improves the health of the home and occupants.

7. LOW FLOW WATER FIXTURES

EPA WaterSense Program:

Water is a finite resource – even though about 70 percent of the Earth’s surface is covered by water, less than 1 percent is available for human use. Despite the water supply and infrastructure challenges faced by many communities across the US, each American uses an average of 88 gallons of water each day at home. Conservation is the first step and every drop counts:

- Bathrooms are the largest use of water in the home, using more than 50 percent of all indoor water.
- Approximately 5 to 10 percent of US homes have easy-to-fix leaks that drip away 90 gallons a day or more.
- Residential outdoor water use across the US accounts for nearly 9 billion gallons of water each day, mainly for landscape irrigation.
- Heating water is typically the second largest use of energy in a home (after space heating and cooling).

8. LED/ ENERGY STAR LIGHTING

LEDs, or light-emitting diodes, are semiconductor devices that produce visible light when an electrical current passed through them. LEDs are a type of Solid State Lighting (SSL), as are organic light-emitting diodes (OLEDs) and light-emitting polymers (LEPs). LED lighting technology has improved dramatically over the past 10 years. Improvements in technology have enabled LEDs to achieve among the highest efficiencies of available white-light sources. Improvements in manufacturing have enabled LED products to achieve a low enough cost that there has been measurable LED adoption in all general illumination applications. Despite this progress, further improvements are both possible and desirable. The technology can be improved in efficiency and in other features, such as color quality, light distribution, form factor, and building integration. The manufacturing technology for LED lighting can also be improved to reduce cost and increase market penetration, resulting in the greatest possible energy savings for the nation.

<https://www.energy.gov/eere/ssl/led-basics>
https://www.energystar.gov/products/lighting_fans/light_bulbs/learn_about_led_bulbs

9. LOW E WINDOWS

Marvin Energy-efficient fiberglass windows can help reduce your utility bills and make your home more comfortable. Not to mention the peace of mind that comes with knowing you’re helping the planet by minimizing environmental impact. Marvin offers a variety of window and door options that help you achieve long-term performance and energy cost savings, in any climate.

10. ENERGY STAR APPLIANCES

<https://www.energystar.gov/products/appliances>

Every appliance comes with two price tags: the purchase price and the cost of operating the product. ENERGY STAR certified appliances help consumers save money on operating costs by reducing energy use without sacrificing performance.

Features of Your Home, cont...

11. NATURAL, LOW OR NO VOC FINISHES & FURNITURE

Volatile Organic Compounds (VOC) are emitted by different gases and solids such as paints and lacquers, paint strippers, cleaning supplies, pesticides, building materials and furnishings, and craft materials including adhesives and permanent markers.

According to the EPA, levels of select organic pollutants were found to be 2 to 5 times higher inside a home than outside it. That's why it's important to choose low and zero VOC products. It's especially important when selecting paint as it remains in the home for several years.

reject solar heat. Standard black (reflectance 0.05, emittance 0.90) is 0 and a standard white (reflectance 0.80, emittance 0.90) is 100.

The high reflectivity, emissivity and solar reflectance index (SRI) of Berridge metal roofing helps mitigate the heat island effect. Berridge's Kynar 500® & Hylar 5000™ cool metal roof colors are optimal for reducing energy consumption

A standing-seam metal roof makes it easy to mount solar panels.

12. STRUCTURAL INSULATED PANELS (SIP's)

Structural insulated panels (SIPs) are a high performance building system for residential and light commercial construction. The panels consist of an insulating foam core sandwiched between two structural facings, typically oriented strand board (OSB). SIPs are manufactured under factory controlled conditions and can be fabricated to fit nearly any building design. The result is a building system that is extremely strong, energy efficient and cost effective. Building with SIPs will save you time, money and labor.

<http://www.sips.org/about/what-are-sips>

13. HIGH SRI STANDING-SEAM METAL ROOF

Solar Reflectance Index (SRI): Incorporates both solar reflectance and thermal emissivity **in a** single value. SRI measures the roof's ability to

Seven Principles of a Healthy Home

1. KEEP IT DRY

Damp houses provide a nurturing environment for mites, pests, rodents, and molds. - All of which are associated with asthma. Moisture also contributes to the growth of mold and mildew.

There are three ways your home can get wet:

1. From outside elements - leaks from roof, rainwater run-off, etc.
2. From the inside - leaks from showers, sinks, or toilets. Or moisture that is not properly vented.
3. Condensation - when warm air comes into contact with a cold surface and droplets of water form and collect.

While your home was being built, the construction crew was required to follow specific guidelines to ensure that no moisture was trapped within the finished work (in walls or under floors, etc.) In addition, a properly designed "building envelope" (the physical separator between the interior and the exterior of a building) provides air circulation and helps to prevent the build-up of condensation inside the home.

2. KEEP IT CLEAN

Keeping a clean home is not just about looks. Bugs are attracted to an environment that provides a steady source of food (provided by food crumbs, dirty dishes, empty food containers, and other trash).

A clean home also minimizes the risk of exposure to contaminants like dust, mites, mold and mildew, and chemicals and toxins that have been tracked in on people's shoes.

3. KEEP IT PEST-FREE

Recent studies show a relationship between exposure to mice and cockroaches (and their droppings) and asthma episodes in children. Yet inappropriate treatment for pest infestations **can make health problems worse, since pesticide** residues in homes pose risks for neurological damage and concern. "Integrated Pest Management (IPM) is an approach to pest control that uses multiple approaches that work together (for example, cleaning up food spills, sealing up holes underneath cupboards, using baits) to prevent pest exposure in a way that is safe for the building's occupants.

4. KEEP IT SAFE

The majority of injuries among children occur in the home. Falls are the most frequent cause of residential injuries to children, followed by injuries from objects in the home, burns, and poisonings. A safe home has smooth floor surfaces, stair handrails, adequate lighting, and safely devices.

5. KEEP IT CONTAMINANT-FREE

Some contaminants enter the home from outside - getting tracked inside on our shoes, or entering through open windows and doors - but some contaminants come from the house itself or from products that we use to keep our home maintained.

Chemical exposures include lead, radon, pesticides, and volatile organic compounds. Exposures to asbestos particles, radon gas, carbon monoxide, and secondhand tobacco smoke are far higher indoors than outside. Volatile organic compounds (also known as

VOC's) are dangerous gasses that are emitted by certain solids or liquids. Adverse health effects caused by exposure to VOC's include: eye, nose and throat irritation, headaches, loss of coordination and nausea; damage to the liver, kidney and central nervous system. Some organic compounds are suspected or known to cause cancer in humans. Unfortunately, VOC's are often ingredients in many common household products such as paints and varnishes; many cleaning, disinfecting, cosmetic, degreasing and hobby products; and fuels. All of these products can release VOC's

6. KEEP IT VENTILATED

"Ventilation" is the process of cycling stale air out of and fresh air into, your house. Certain portions of a home (such as the kitchen, bathroom, clothes dryer, and wood stove) require "exhaust ventilation" in order for this air exchange to occur. Proper ventilation is also dependent upon a properly designed building envelope. Lack of ventilation keeps toxins/poisons in and allows moisture to build up. Studies show that increasing the fresh air supply in a home improves respiratory health.

7. KEEP IT MAINTAINED

Poorly maintained homes are at risk for moisture and pest problems. In order to maintain the structural integrity and the energy-efficiency of your new home, it is important to perform certain routine maintenance tasks.

-U.S. Department of Housing and Urban Development. Centers for Disease Control and Prevention, U.S. Environmental Protection Agency, and National Center for Healthy Housing

Operating & Maintaining Your Home

Seasonal Maintenance

Reference guide for common maintenance tasks. Checking and mitigating any potential issues will keep your home operating at peak efficiency for health and cost savings.

Maintenance Task	Season				Every Few Years
	Winter	Spring	Summer	Fall	
INDOOR POLLUTANTS					
1. Check/replace batteries in fire/carbon monoxide alarms		●		●	
2. Clean/ replace door mats		●			
3. Vacuum all carpets weekly. Steam-clean every 6 - 12 months	●	●	●	●	
4. Check/clean fireplace and chimney (if applicable)				●	
EXTERIOR STRUCTURE					
1. Clean debris from gutters and downspouts		●		●	
2. Remove excess snow from roof to prevent ice dams	●				
3. Inspect foundation for pooling water		●			
4. Check/repair roofing and flashing for signs of wear or damage		●		●	
5. Check/repair all cracked or missing exterior caulking			●		
6. Check/replace weather-stripping					●
7. Check/repair damaged roofing			●		
INTERIOR FINISHES					
1. Check/repair caulking & grout in and around showers & baths			●		
2. Touch-up or repaint needed areas with low, or no-VOC latex paints					●
LIGHTING AND APPLIANCES					
1. Replace lighting with ENERGY STAR labeled lighting					●
2. Use power strip or reduce phantom loads from chargers, TV's etc.		●		●	●
3. Clean lint screen and dryer vent					
4. If replacing appliances, use only ENERGY STAR labeled items	●	●	●	●	

Maintenance Task	Season				Every Few Years
	Winter	Spring	Summer	Fall	
HEATING, COOLING AND VENTILATION SYSTEMS					
1. Adjust thermostat for seasonal changes	●	●	●	●	
2. Have yearly servicing for Mini Split HVAC system	●	●	●	●	
3. Remove leaves, debris around outdoor HVAC Unit	●	●	●	●	
4. Clean in and around grills and registers	●	●	●	●	
5. Clean in and around backup radiators	●	●	●	●	
6. Check/adjust humidity levels; mitigate any damp areas	●	●	●	●	
7. Check/ clean mechanical ERV ventilation system	●	●	●	●	
8. Check that exhaust fans are unobstructed and working	●	●	●	●	
9. Check/clean air intakes and exhausts for debris	●	●	●	●	
PLUMBING					
1. Fix leaks immediately in pipes, appliances, etc.	●	●	●	●	
2. Prevent pipe freezes: Turn off outdoor faucets	●				
3. Keep water heater temperature at 120° F	●		●		
4. Check hot water heater for mineral buildup, drain & refill		●		●	
CARPORT/SAFE ROOM					
1. Check/ensure air vent is clear of debris. Keep safe room clear and available for use.	●	●	●	●	
2. Remove unneeded chemicals stored in carport. Dispose of any solvents, paints and other hazardous materials at an appropriate facility	●	●	●	●	
LANDSCAPING/YARD					
1. Check foundation drain to ensure proper flow	●	●	●	●	
2. Maintain proper grades for drainage on all property	●	●	●	●	
3. Winterize irrigation system; turn off water, drain hoses	●				
4. Keep all plants at least 24" away from home		●			
5. Avoid toxic chemicals for pest control and chemical fertilizers	●	●	●	●	
6. Regularly turn and maintain compost area	●	●	●	●	
7. Rinse and sanitize all trash & recycling receptacles	●	●	●	●	

-U.S. Department of Housing and Urban Development. Centers for Disease Control and Prevention, U.S. Environmental Protection Agency, and National Center for Healthy Housing

Operation & Maintenance

Your home is built and furnished with materials, fixtures and appliances that comply with the highest current standards for both energy efficiency, as well as human and environmental health. Using and maintaining your home, and contents through regular cleaning, maintenance and safety checks will ensure a longevity, cost savings, and a home environment that provides health, beauty and functionality. The descriptions below show the main features of your home and the general operation and maintenance guidelines. All the components of your home benefit from the following list of tasks:

- ✓ **INSPECT**
- ✓ **CLEAN**
- ✓ **LUBRICATE**
- ✓ **REPLACE**
- ✓ **REPAIR**
- ✓ **ORGANIZE**

Mini-Split Heat Pump: (TBD)

Whole House Ventilation System(ERV): (TBD)

Flashing: (TBD)

Sealant Joints: (TBD)

Low E Windows and Doors: (TBD)

Rain Screen Systems: (TBD)

High SRI Standing-Seam Metal Roof: (TBD)

Frost-Protected Shallow Slab Foundation: (TBD)

ENERGY STAR Low-Flow Water Fixtures: (TBD)

Toilets: (TBD)

Shower/Bath: (TBD)

Bathroom and Kitchen Faucets: (TBD)

ENERGY STAR High Efficiency Appliances: (TBD)

Cloths Washer: (TBD)

Cloths Dryer: (TBD)

Refridgerator: (TBD)

Dish Washer: (TBD)

Structural Insulated Panels (SIPs): (TBD)

Low and/or No-VOC finishes: (TBD)

Appendices

Appendix A: Green Cleaning

Keeping your house, garage or carport, and yard/landscaping clean is important for the health, efficiency and longevity of both the home and its occupants. However, many commercial cleaning products contain toxic chemicals and VOC's (volatile organic compounds) that can be damaging to the environment as well as the immediate and long-term health of people and animals living in the home. Below is a general cleaning guide with recipes for non-toxic and effective cleaning agents & solutions.

AVOID/ DO NOT USE:	NON-TOXIC ALTERNATIVE
Chlorine (explosive when in contact with ammonia, skin, vision, and lung irritant)	White Vinegar & Baking Soda (See recipe below)
"Anti-bacterial" or "Anti-microbial" products (these cause germs to become resistant to antibiotics)	Tea Tree oil, Witch hazel, Lavender essential oil (See recipe below)
Aerosol products (flammable & toxic to inhale)	See cleaning recipes below
Air fresheners (these often contain Para-dichlorobenzene which is a carcinogen)	Rubbing alcohol, baking soda and essential oils of your choice (see recipe below)
Mothballs (these contain either naphthalene or Dichlorobenzene which are carcinogens)	Red cedar shavings, herbs, neem oil, castille soap (see recipe below)
Pesticides, herbicides and chemical fertilizers for pest & weed control (chemicals used in these commercial products are responsible for both environmental damage, and human and animal health concerns)	Distilled white vinegar, salt, dish soap and citrus oil

Non-toxic Recipes for the Home and Yard:

Surface spray disinfectant cleaner:

1/2 cup Borax
1 gallon hot water

Abrasive cleaner:

In a small bowl or container mix 1/2 cup Borax with the juice of 1/2 lemon to make a paste

Windows and mirrors:

Mix the following into a spray bottle-
2 cups water or club soda
Juice from one lemon (fresh)
1 teaspoon cornstarch

Oven cleaner:

Mix equal parts of castille soap, borax & water. Let sit for 20 minutes. Combine first mixture with 1/4 cup baking soda and 1 tablespoon salt. Use as a scrub and rinse with water and dry with cloth.

Drain Cleaner/opener

1/4 cup white distilled vinegar
1/4 cup baking soda
Mix ingredients together then pour down drain and wait 20 minutes. Flush with boiling water.

Tile/Grout stains:

Make a paste with hydrogen peroxide and cream of tartar (available in spice or baking section of grocery store). Use as a scrub, leave to sit on stubborn stains and rinse.

Soap film, mildew, lime deposits:

Spray or pour full-strength white distilled vinegar onto surface, let sit then rinse or flush

Spot removal:

Pour or soak stains (as soon as possible after the stain has occurred) with club soda. Blot and rinse with clean water.

Water Spot Treatment:

Make a paste with equal parts toothpaste and baking soda. Apply to surface with damp cloth then use a clean, damp cloth to wipe clean. Buff with clean dry cloth. Pecan oil is useful to restore color and shine.

Biodegradable Insecticide/Pesticide:

2 tsp. Neem oil
1 tsp. mild soap (castille soap)
1 qt. water
Combine in a spray bottle and spray on plants or chosen area.

Appendix B: Helpful Resources

U.S. Fire Administration	www.usfa.dhs.gov/citizens
Home Safety Council	www.homesafetycouncil.org/index.asp
Environmental Protection Agency, Indoor Environments Division	www.epa.gov/iaq.co.html
Environmental Protection Agency, ENERGY STAR program:	www.energystar.gov
Net-Zero Energy Ready Homes	www.energy.gov
US Green Building Council	www.usgbc.org

Appendix C: Emergency & Safety

Know where the following are in your home and how to disable in an emergency:

- Water Supply (main valve control)
-
- Electrical supply
-
- Heating and fuel supply (eg. gas, oil & propane)

Have the following telephone numbers easily referenced in case of an emergency:

- Local poison center
- Nearest hospital or urgent care center:
- Local or nearest law enforcement for info on disaster protocol/relief

Regularly check/replace fire extinguishers in household and garage. Have each household member learn how to properly use the extinguisher in case of fire.

Check/replace batteries in smoke and carbon monoxide alarms.

Appendix D: Works Cited

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