VOS Home

University of Alaska Fairbanks: Bristol Bay Campus

New Housing | November 30, 2021

Project Summary

Figure 1. Placeholder image of REMOTE wall house.
Image Credit:Timber Frame HQ

The Village of Solomon (VOS) is a tribal community located within the Nome Census Area along the northwestern coast of Alaska. In keeping with the Paris Climate Accord, the VOS traditional council is addressing the housing needs for tribal members and their families through a framework of rural development for climate resiliency. Currently the tribe lacks sufficient residential units to mitigate safety concerns in regards to the COVID-19 Pandemic. Housing challenges include overcrowding and lack of units needed to isolate and enjoy daily comforts such as access to hygiene and laundering facilities, as well as private rooms for studying and working remotely. In response the VOS traditional council has begun implementation of their first Strategic Affordable Housing Plan in compliance with Tribal Resolution 2019-02. The UAF Team is providing housing design plans for the tribe to utilize prior to construction, village site planning, and contractor bidding, but also local and statewide partnership development moving forward. The final design will need to utilize sustainable energy practices in order to maintain the Paris Climate Accord. Successful completion of the design project is key in order to begin construction on affordable residential housing for tribal families with future generations in mind.

The UAF Bristol Bay Team is committed to providing research and feasibility for clean energy, thermal design, insulation, energy efficiency and renewable energy systems to assist the tribal community known as the Village of Solomon (VOS) in designing effective residential housing in a rapidly changing sub-Arctic environment. Located at a newly planned site in Nome, Alaska, this project will seek to address needs for energy efficiency, as well as combat longer-term and current issues of housing shortage, homelessness and overcrowding. The key building design will serve as a single family home, available as a lease-to-own option for tribal members. This will be an innovative, high tech, energy efficient new housing opportunity in the Nome Census Borough. This will serve as a building design template for all new residential housing construction on this project.

Design Strategy

As a template for high-performance housing in rural northwest Alaska, the VOS house will optimize structure efficiency versus construction cost through building envelope improvements and natural resource utilization. Novel design techniques will be employed to create a highly insulated, air-tight, and streamlined home environment that consumes energy sparingly and retains as much heat as possible throughout long dark winter months in Nome. Design details include: building orientation for passive solar integration, strategic thermal mass placement, insulated exterior walls to meet sub-Arctic standards, heat recovery ventilation, high-performance windows and doors, efficient appliances and LED lighting, air-source heat pumps, rooftop solar photovoltaic panels, and consideration for integrating an additional geothermal power system given the exploration of nearby Pilgrim Hot Springs by the town of Nome as a future energy resource. Careful implementation of these strategies and technologies will assist in combating high heating and power costs in rural Alaska and provide an example of a durable, comfortable, healthy home suitable for year-round use in a remote northern climate.

Project Highlights

Architecture: Possibly diagonal facing placement on the lot with integrated systems in place to develop a high-performing, durable, comfortable residential home. HRV, heat pump to decrease fuel consumption, solar panel siding all to consider indoor air quality and sustainability for a clean home. In such a remote location, furniture is not readily available or easily transported. Architectural design with mindful storage and multifunctioning space optimization will be of the utmost importance for the VOS house.

Engineering: A strong knowledge base of the land including aspects such as ground permafrost at the site will assist throughout our design process for engineering. All design aspects must aim to reduce carbon emissions, both embodied and operational, incorporating grid-interactive technologies as well as smart appliances that will produce energy from natural resources and integrate all high-performing thermal building envelopes for optimal efficiency.

Market Analysis: Not only will the first home constructed provide a single family with comfortability, sustainable energy and heating, it will also serve as a pilot housing design for surrounding rural cold climate housing programs as they begin their own construction. Once constructed, the home will be a prime example of efficiency, renewable and high tech integrated comfort performance in rural Alaska.

Durability and Resilience: Utilizing resource experts and an interdisciplinary approach we will explore all renewable and clean energy options as well as build materials to withstand the changing climate over time. Materials sourcing and energy systems must consider supply and demand in remote Alaska, as well as sustainable resource management and repairability of the house and its systems. A main focus will be on adaptability of systems with other natural energy systems being implemented in the area.

Embodied Environmental Impact
Integrated Performance: Installing radiant heating flooring throughout, supplied by renewable energy where possible to operate the heated floors, the electricity, exploring a heat pump, and the highest rated energy star appliances with an achievable insulated r-value of 26

Occupant Experience: This new home design will be the framework for upcoming affordable housing programs in rural Alaska, while ensuring affordability for the occupants. This design will also pave the way forward in managing high energy efficiency performance utilizing and maintaining alternative energy sources whereas rural Alaska heavily relies on fuel for heating and existing structures built decades ago, with minimal thermal building envelopes which causes higher cost in fuel expenses for heat in cold climates.

Comfort and Environmental Quality: Programmable smart thermostats, energy production gauges, all controls to monitor the high performing home will be throughout the residence, the building envelope will be such an efficient design, the demand for heating will not be as high as the other homes surrounding.

Energy Performance: The pEUI target is 25 kBtu/ft² for a high intensive high energy performance home design utilizing each researched and analyzed feasible alternative heating and energy source to provide the utmost comfortability and sustainability for such a home. This includes triple pane windows, on-site solar pv panels, programmable thermostats, heating recovery ventilation, appropriate facing home layout and the highest energy efficiency construction possible.