



## PROJECT SUMMARY

The Hopi Tribe, nestled in Northern Arizona, confronts the dual challenge of safeguarding its vibrant heritage while embracing modern innovations. Many young members are venturing beyond the reservation for higher education, yet few Hopi return post-graduation. Within the Hopi nation, numerous households lack modern amenities like running water and electricity. To tackle these issues, the proposal introduces Tawa'Ovi, a contemporary Hopi Village situated on the outskirts of their land, aimed to encourage the younger population to remain. The Harvest Mesa initiative includes the construction of twenty-four eco-friendly row houses tailored for young families, fostering a blend of communal and private living. By offering affordable, efficient housing, this initiative aims to cultivate a fresh, flourishing community for years to come.

## PROJECT DATA

<b>LOCATION:</b>	Tawa' Ovi, Hopi, Arizona
<b>CLIMATE ZONE:</b>	5B , Elev. 6,000
<b>BUILDING SIZE:</b>	6,067 sf. , 4 units (14 OCC.)
<b>HOUSING UNITS:</b>	1,474 gross sf.
<b>AVG. UNIT SIZES:</b>	1,200 sf.
<b>AVG. UNIT UTILITY COST:</b>	Without PV: \$3,335 With PV: \$40
<b>ANNUAL CARBON EMISSIONS:</b>	6.9 CO <sub>2</sub> e/ft <sup>2</sup> /yr
<b>CONSTRUCTION:</b>	\$1,480,595
<b>HERS:</b>	Without PV: <b>49</b> With PV: <b>-8</b>

## DESIGN STRATEGY

Harvest Mesa's design prioritizes community, honors Hopi culture, provides energy-efficient living, and improves residents' well-being to foster a close-knit, sustainable community. Through shared outdoor spaces and traditional elements like accessible roofs, residents can easily connect and build relationships. Designing for the environment, measures like berms and wind barriers ensure a cleaner, more comfortable living environment. The open-concept, modular design, including traditional passive design strategies minimizes the need for heating and cooling reducing energy consumption. Lastly, scrupulous attention to construction assemblies and the implementation of high-efficiency systems paves the way for a net-zero Hopi society. The building is designed to meet Phius Zero criteria.

## TECHNICAL SPECS

### ENCLOSURE SYSTEMS

**SLAB ON GRADE:** R-9    **WINDOWS:** U-.16

**INTERIOR FLOORS:** R-19    **ROOF:** R-68

**WALLS:** R-54

**MEP SYSTEMS:** RADIANT IN-FLOOR HEATING AND COOLING, ERV, AIR TO WATER HEAT PUMP

**SLAB:** MATT SLAB

**FOUNDATION:** SLAB ON GRADE

**INTERIOR FLOORS:** WARM BOARD RADIANT HEAT SYSTEM ON SLAB, CERAMIC TILE FINISH

### PHOTOVOLTAICS

**ROOFTOP:** 82.19 kW/day per unit

## PROJECT HIGHLIGHTS

### ARCHITECTURE

To honor the rich culture of the Native American Hopi Tribe, Harvest Mesa is providing much-needed housing that connects to the tribe's ancient values of community in a modern way. An open-concept floor plan with accessible rooftops links back to Hopi values of utilizing space efficiently. Working alongside the tribal members on the reservation, this housing complex directly meets their needs and desires for attached housing in their new community.

### ENGINEERING

By employing a modular approach through prefabricated structural panels, the design creates clusters that function seamlessly as a unified structure, facilitating straightforward construction methods for efficient assembly in a remote location, supplying tribal members with the agency to potentially build their dwellings, and save labor and production costs.

### ENVELOPE

The building's envelope was thoughtfully designed to minimize the need for active heating and cooling systems, through the use of passive strategies. A passive wall takes advantage of the southern sunlight, by including a Hopi sandstone Trombe wall and a solar chimney for passive heating and cooling. The well-insulated exterior walls respond to the heating-dominated climate by retaining the heat during the winter months, window placement, an appropriate window-to-wall ratio, and innovative shading help to control the solar heat gain during the summer.

### EFFICIENCY

In line with Hopi principles centered on harmony with the natural world, Harvest Mesa integrates traditional passive techniques like solar orientation, natural ventilation, and passive heating, in addition to radiant heating and cooling with energy-efficient air and water heat pumps. Prioritizing well-insulated and thermally efficient spaces, the building is designed to meet Phius Zero criteria, fostering sustainability within the constructed landscape.

### GRID-INTERACTIVITY

This remote site does not have access to an electrical grid. The project draws from a solar microgrid facilitated by Block Energy systems. This unique grid concept relies on energy-independent buildings that generate their own energy through photovoltaics which allows for energy to be shared within a neighborhood. Sizing the PV system for the worst-case scenario, the PV panels can be placed partly on the roof, and the rest will be placed in an onsite solar farm to ensure enough energy is generated annually.

### LIFE CYCLE

The selected prefabricated Timber Age CLT Panels are crafted from Ponderosa Pine sourced from overcrowded forests at risk of wildfires, these forests require the removal of over one million board feet of wood to return the forests to their natural density. Incorporating this wood not only promotes forest health but also mitigates the carbon footprint of the constructed environment when compared to the use of traditional building systems.

### HEALTH

Harvest Mesa prioritizes the well-being of its residents by implementing berms and wind barriers to block dust, creating a cleaner and more comfortable living environment. Additionally, the use of an ERV ensures optimal indoor air quality and energy efficiency, enhancing residents' health and comfort. Natural lighting and native vegetation further contribute to a sense of tranquility and connection to nature, promoting the mental health of its residents.

### MARKET

Partnership with Timber Age Systems in Durango, Colorado supplies the project with prefabricated panels that use responsibly sourced timber to create easily constructible homes, fostering community engagement in trades and skill development, to create a scalable building solution. The incorporation of photovoltaics will power cost-effective and low-maintenance systems, including air-to-water heat pumps for heating and cooling, heat pump water heaters, and ERVs. Implementing traditional sandstone masonry, brings back Hopi jobs to this new village and the reservation.

### COMMUNITY

Harvest Mesa fosters a sense of community by providing residents with opportunities for spontaneous interactions and social gatherings in a large plaza space as well as community kitchens. These shared outdoor spaces serve as natural meeting points where neighbors can connect, build relationships, and create a vibrant communal atmosphere, enhancing the overall sense of belonging and solidarity within the neighborhood.