

PROJECT SUMMARY



PROJECT GOALS

- To create a community that keeps the sustainability culture of the Hopi alive while incorporating modern and efficient building techniques.
- Design exterior spaces that allocate room for traditional activities and provide a sense of connection to the land.
- Plan a multi-family housing project, in a remote location, that is communally connected while maintaining occupant privacy.
- Plan a community that is self-sustaining, grows the local economy, has a Net-Positive energy footprint, and meets PHIUS Zero standards.

DESIGN STRATEGIES

The design strategy for Tawa'Ovi multifamily housing is to reinvigorate the site's existing landscape by creating an engaging space that accommodates Hopi students and faculty, implementing culturally appropriate building materials, and maintaining net-positive standards. Within Hopi nation, the Tawa'Ovi development is at least a 45 minute drive away from major amenities such as grocery stores, gas stations, and health services. The current location is not conducive to walking, as most places are at least a six hour walk away. With about 40% of the Hopi population having a family and around 30% having a college education, it is important to provide housing for students to continue their educational journey with amenities close in proximity. The dwelling spaces have been divided into four bedroom units and two bedroom units connected by communal kitchens to foster unity among students.

PROJECT DATA

CATEGORY: Multi-Family Housing
 LOCATION: Tawa'Ovi, Hopi
 Reservation, AZ, USA
 CLIMATE ZONE: 5B
 ELEVATION: 6,000'

NORTHEAST BUILDING UNITS

LEVEL 2:		LEVEL 3:	
2BED1BATH	650 ft ²	2BED2BATH	630 ft ²
4BED2BATH	1130 ft ²		
		COMMON ROOM	400 ft ²
COMMON ROOM	700 ft ²		

SOUTHEAST BUILDING UNITS

LEVEL 2:		LEVEL 3:	
4BED2BATH	1170 ft ²	2BED2BATH	571 ft ²
COMMON ROOM	530 ft ²	COMMON ROOM	560 ft ²

SOUTHWEST BUILDING UNITS

LEVEL 2:		LEVEL 3:	
3BED2BATH	970 ft ²	2BED2BATH	520 ft ²
COMMON ROOM	620 ft ²	COMMON ROOM	490 ft ²

NORTHWEST BUILDING UNITS

LEVEL 2:		LEVEL 3:	
2BED1BATH	640 ft ²	2BED2BATH	560 ft ²
4BED2BATH	1150 ft ²		
		COMMON ROOM	470 ft ²
COMMON ROOM	680 ft ²		

EUI: -88
 HERS: -8
 CARBON EMISSIONS: 11.1 Mill kgCO₂e
 CONSTRUCTION COST: \$16,701,349.90

TECHNICAL SPECIFICATIONS

ENCLOSURE SYSTEMS:
 EXTERIOR WALLS: R 51
 ROOF: R 70
 WINDOWS: U 0.13

MEP SYSTEMS:

HEATING/COOLING:
 Warmboard panel system connected to
 Chiltrix heat pump
 VENTILATION:
 16 Zehnder Energy Recovery Ventilators
 APPLIANCES: LG Energy Star

ENERGY PRODUCTION & STORAGE:

Solar Roofing & Block Energy System
 Solar Production: 1,050,123 kWh/Yr

10 CONTESTS

Architecture

The design will heavily incorporate the clients goals by respecting their cultural wishes such as, having accessible roofing, space in both the front and back of the dwelling for drying cultivated goods, cooking, and gardening. Ceiling heights will be kept to a minimum to reduce wasted space, and windows will have a small surface area to prevent damage during harsh weather while still providing adequate natural lighting.

Engineering

This multifamily housing will utilize efficient and effective engineering systems. Heating and cooling will be done through radiant flooring in order to create comfortable spaces. Plumbing strategies will include wastewater systems and allow for water conservation. Structure will be composed of a mass timber column and beam system that will optimize the use of materials.

Envelope

Utilizing Timber Age systems, the project will have self-insulated pre-fabricated CLT wall panels, rated to R-50. Thermal air, moisture, and vapor barriers are seamless and provide adequate response to climate conditions.

Efficiency

The structure will have a well-insulated, airtight envelope. Window surface area will be kept to a minimum to optimize response heating and cooling loads. The local climate allows for night-flushing of individual units to increase efficiency of cooling throughout the summer. Operable shading systems on the south side of all units provides solar heat gain during the winter and mitigates excess energy use in the summer.

Grid Interactivity

The multi-family residential structure in Tawa'Ovi will rely on solar energy and the storage of excess power from solar grids in the development. Block Energy battery systems will be utilized to ensure resillience in critical load conditions.

Life Cycle

Case studies will be used in order to predict the life cycle of the buildings. In order to ensure the most accurate predictions, case studies will consist of buildings with similar structural systems, materiality, as well as user groups. Carbon emissions will be tracked through the use of softwares such as Tally.

Health

To ensure the well-being of occupants sustainable materials that are bio-based and low in VOCs will be incorporated into the design. Spot ventilation will be utilized in bathrooms, laundry rooms on each floor, and community kitchens to ensure proper air quality. Materials such as tectum ceiling panels and acoustic felt will be installed in common areas and individual units respectively to improve acoustic performance.

Market

This multifamily housing is part of the Tawa'Ovi Continuing Technical Education (CTE) Development that provides dwelling units and commercial activities for students and faculty members, some of whom currently live on the Hopi reservation. Individual dwelling units will be rented to students and faculty. Facilities such as the wellness center, cafe, and bookstore will create community engagement and interaction amongst residents, while generating funds to ensure maintenance upkeep.

Community

The intent of Tawa'Ovi is to provide a space for Hopi people to grow as a community and encourage a revival of youth engagement on Hopi land. Designing multifamily housing that is close in proximity while providing each resident with privacy will unify the community.