SIHI PLAZA
Solar Decathlon
Multifamily Housing
University of Arizona
Tawa’Ovi Community for the People of the Hopi Nation
OUR TEAM

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Currently, the Hopi are dealing with a significant loss of youth, as it is difficult for young adults to acquire education and subsequent jobs on the Reservation.
**HOPI CULTURE**

**BACKGROUND**
- Hopi have been settled in Northern AZ since 1100AD
- Lack of economic opportunity has lead to decline of population
- Tawa’Ovi is a community plan to address the issues facing Hopi

**VALUES**
- Water Conservation
- Community
- Stewardship of the Land
- Resilience
- Independence

**CULTURE**
- Dry Farming
- Communal Cooking
- Celebrations for Agriculture

**DESIGN RESPONSES**
- Open plan communal spaces
- Emphasis on large kitchens
- Terraced roofs
- Minimize waste
- High solar production
- Radiant Flooring systems

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THE MISSION
Create a PHIUS Zero multifamily housing complex, within a new solar powered micro-grid village.

The project will respect Hopi cultural traditions and beliefs, while promoting student engagement through community amenities and dwelling units that appropriately respond to climatic conditions.
PROJECT GOALS

A CULTURE OF SUSTAINABILITY
To create a community that keeps the culture of the Hopi alive while incorporating modern and efficient building techniques.

RESPECT FOR THE LAND
Exterior spaces that allocate room for traditional activities and provide a sense of connection to the land.

COMMUNAL GROWTH
Plan a multi-family housing project that is communally connected while maintaining occupant privacy.

ENERGY INDEPENDENCE
Plan a community that is self-sustaining, grows the local economy, has a Net-Positive energy footprint, and meets PHIUS standards.
ENGAGING THE SITE

ARCHITECTURE  ENGINEERING  ENVELOPE  EFFICIENCY  GRID  LIFE-CYCLE  HEALTH  MARKET  COMMUNITY
STIMULATING THE ECONOMY

1. POST OFFICE
2. COMMUNITY KITCHEN
3. FITNESS CENTER
4. WELLNESS CENTER
5. MARKET
6. CAFE
7. BOOKSTORE
8. LAUNDROMAT
BOOKSTORE
CONNECTION TO NATURE
HEALTHY MATERIALS

- **Glulam Southern Pine**
  - Locally sourced

- **Limewash Plaster**
  - no VOCs
  - hypoallergenic
  - mold resistant

- **Butcher Block Countertop**
  - made from salvaged wood

- **Marmoleum Flooring**
  - allergy-free
  - lasts for 30 years
  - 97% natural materials
10’x10’ grid to facilitate ease of construction
CLIMATE RESPONSE

ASHRAE CLIMATE 5B

PHIUS PRESCRIPTIVE VALUES
Max U-Value: 0.23
Minimum SRE for E/HRVs: 0.75
Minimum Wall R-Value: 31
Minimum Roof R-Value: 61

ACTUAL BUILDING VALUES
U-Value of Windows: 0.13
SRE for E/HRVs: 0.83
Wall R-Value: 51
Roof R-Value: 70
ENVELOPE

- 3” CLT Panel
- 11-3/4” BCI Joist
- Cellulose Insulation R-51
- Bolt connection for panel system
- 3/4” OSB Sheathing
- Continuous Air Barrier
- Water Barrier
- 1/2” Exterior Gypsum Board
- Metal Lathe
- Stucco Finish
- Drainage Plane
- 3” EPS Insulation
- Continuous Class 1 Vapor Retarder
- Continuous Liquid Moisture Barrier
- Metal Lathe
- Lime-based Stucco
- 3” Cross Laminate Timber (CLT) from Ponderosa Pine
- Bolt system mounting Modular panel
- 1’x1’ Glulam structural column
- BCI Joists at 2’ on center
- Horizontal Connect wall panels together
- Dense Pack Blown in cellulose at R-51
- 3/4” OSB Sheathing (Air Barrier)
- Bolt connection for panel system
- Ash-crete foundation to Engineer’s specs
- 12” Glulam Column
- Continuous Air Barrier
- Water Barrier
- 1/2” Exterior Gypsum Board
- Metal Lathe
- Stucco Finish
- Drainage Plane
- 3” EPS Insulation
ALPEN TYROL TILT-TURN WINDOWS

SOLAR HEAT GAIN COEFFICIENT
SOUTH FACING WINDOWS: 0.5
WEST FACING WINDOWS: 0.3

WINDOWS

Continuous Air Barrier
liquid applied: AIR-SHIELD TMP

Scale 3”=1’ DETAIL 1 HEAD JAMB
Custom ALPEN Tyrol Tilt Turn Window

Scale 3”=1’ DETAIL 2 SILL
Custom ALPEN Tyrol Tilt Turn Window

Distance exaggerated for clarity
Flashings

ALIGNED FLUSH WITH BOTTOM EDGE OF GLULAM BEAM

TOTAL R VALUE FOR ROOF= R56
7-1/2” HEMPWOOL @ R28 EACH

DROP CEILING W/ TWO LAYERS OF RAISED TILE SYSTEM ON ROOF ALLOWS FOR DRAINAGE TO PLANTINGS
1” AIR GAP
WATER/VAPOR BARRIER
PASSIVE PURPLE LIQUID APPLIED W/ 7-1/2” HEMPWOOL INFILL R28

2X6 CEILING FRAMING
3/4” GYPSUM BOARD
1” OSB SHEATHING & EXTERIOR

Continuous Air Barrier
liquid applied: AIR-SHIELD TMP

Metal Lathe
Lime Based Stucco

Continuous Air Barrier

Rigid Insulation

Backer Rod

Recycled steel sill with flashing

11-3/4”x1-1/4” Wood Infill for Sill stability

Wood Trim

Wood Trim

Drainage Plane
RADIANT SYSTEM

Roughly 40% more efficient than conventional HVAC

Buffer Tank

Summer Cooling
55.5°F
95°F
Winter Heating

Radiant Manifold

Zoned Radiant Flooring

Domestic Hot Water

Heat Pump

Chiltrix

Usable Water

Usable Water

120°F

Usable Water

Zoned Radiant Flooring

12.83 CFM

200-600 CFM

13.81 CFM

24 CFM

USABLE WATER
Energy Recovery Ventilator (ERV) / Heat Recovery Ventilator (HRV)
RAINWATER COLLECTION

ANNUAL PRECIPITATION ESTIMATE 5”
TOTAL ROOF SIZE: 25,084.64 FT²
ANNUAL COLLECTION:
5”x0.62GALx 25,084.64 FT² = 77,762.384 GAL
BUDGET

Site Work $9,278.39
Foundation $81,248.57
Framing $1,906,830.32
Windows $214,464.40
Roofing $1,881,348.00
Interior Wall Insulation/Doors $43,846.00
Specialties $227,235.95
Electrical $109,701.18
Mechanical $1,036,328.32
Overhead $401,734.81
Furniture $52,751.89

TOTAL

Estimated Total Building Cost $5,964,767.82
*Estimated Building Cost Post-Covid $11,929,535.64
*Estimated Labor Cost $4,771,814.26

Total Building Cost with Estimated Labor Post Covid $16,701,349.90
$408.96 per sq.ft
SIHI PLAZA
PV PRODUCTION
1,050,123 kWh

CTE PV PRODUCTION
253,200 kWh

ATTACHED PV PRODUCTION
180,000 kWh

TOTAL PV PRODUCTION
1,483,323 kWh

MICRO-GRID

BLOCKCENTRAL™
CONTROL

TOTAL PV PRODUCTION
1,483,323 kWh

DIRECTION OF POWER
DIRECT CURRENT

BLOCKENERGY SYSTEM

ALTERNATING CURRENT

ATTACHED PV PRODUCTION
180,000 kWh

CTE PV PRODUCTION
253,200 kWh
MICRO-GRID

BLOCKHOME™
+ROOFTOP SOLAR

BLOCKBOX™

BLOCKLOOP™

EV CHARGER

BLOCKENERGY SYSTEM
DIRECTION OF POWER
DIRECT CURRENT
ALTERNATING CURRENT
ENERGY USE INTENSITY

SIHI PLAZA
PV PRODUCTION
1,050,123 kWh

ANNUAL USAGE
137,230 kWh

TOTAL
-912,893 kWh

PV PRODUCTION NET GAIN
-912,893 kWh

kBTUs
-3,119,146

TOTAL SQ FT
35,145 FT²

EUI
-88 kBTUs/FT²

HERS
-8
LOOKING TO THE FUTURE
ACKNOWLEDGMENTS

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Engineering Consultant

Chiltrix

TIMBER AGE SYSTEMS

BLOCK ENERGY

ALPEN
HIGH PERFORMANCE PRODUCTS
Thank You!