



The University of Arizona

Attached Housing (AH) | April 05

Teachers' Row

Project Summary

Arizona's teacher shortage is acute in rural and Title-1 schools such as EC Nash Elementary in the Miracle Manor neighborhood of Tucson, Arizona. The school is in the Amphitheater School District and serves a total of 367 children, 235 of which are Hispanic. Other schools around the area include Amphitheater Middle & High School as well as Keeling Elementary School. SunBlock in collaboration with the Amphitheater School District and the University of Arizona will use architecture and net-zero resources as tools for promoting Pathways to Teaching, an innovative College of Education Teacher Preparation Program that seeks to "grow our own" teachers by supporting participants in earning a degree in elementary education with an ESL endorsement. The Teacher's Row attached housing project will be the next step in ensuring our schools are appropriately staffed and our students are cared for.

Design Strategy

Working with the Amphitheater School District as well as the University of Arizona, the Teacher's Row will develop a community by creating an attached housing project and retrofitting an existing motel along the urban street front of Oracle Rd, one of the busiest roads in Tucson. Furthermore, the building provides facilities for prospective teaching professionals in the local community. The support provided by the University of Arizona covers the cost of all tuition fees, the collaboration with the Amphitheater School District provides a partner with which to perform hands-on teacher experience in classrooms. The Teacher's Row attached housing project incorporates sustainable building strategies such as photovoltaic, thermal energy storage, and water collection. In addition to these energy solutions, Teacher's Row utilizes a modular building skin and footprint through the use of the prefabricated wall, roof, and floor panels. Taking inspiration from Tucson's daily energy demand (Duck Curve) the PV system optimizes energy production in the mid to late afternoon when energy usage is at its peak.



Project Data

- Location: Tucson, AZ, USA
- Climate Zone: AHSRAE 2B
- Lot Size: 1.18 acres
- Building Size: 9510 ft²; 1-2 stories
- Occupancy: 7 dwelling units / 14 beds / 21 people
- HERS Score Inside Units:
 - Without PV: 35
 - With PV: -139
- HERS Score Outside Units
 - Without PV: 47
 - With PV: -122
- Estimated Annual Utility Cost (Outside Units, No PV): \$1,528/yr
- Estimated Annual Utility Cost (Inside Units, No PV): \$2773/yr

Technical Specifications

- Exterior Wall Thermal Performance: R-35
- Roof Thermal Performance: R-59
- Stem Wall Thermal Performance: R-35
- Slab on Grade Thermal Performance: R-4
- Window U-Value: .20
- SHGC: 27%
- Annual Photovoltaic Energy Production: 146,102 kW



Project Highlights

Contest Goals



1. Architecture

To realize Teachers' Row, the architectural strategy is to produce an affordable, attached housing prototype for prospective professional educators that can be recreated in different locations. To make this process more feasible the construction utilizes pre-fabricated floors, walls, and roofs that can be erected faster than on-site construction.

2. Engineering

The building utilizes an Air to Water Heat Pump to provide both hot or cold air and water. Additionally, there is a photo-voltaic system large enough to provide all the energy the homes need and even sell some to the city or give to the surrounding structures. The building skin comprises of a pre-fabricated wall, roof, and floor panels with code compliant R-values.

3. Market Analysis

Some teaching professionals will have dependents such as a child or elderly parent/loved one, thus, the Teacher's Village will provide a facility for child/elderly daycare to aid the prospective teaching professionals who are either attending class or working at the nearby school. The added financial and emotional support will further serve as incentives for prospective students to participate in the University of Arizona Pathways to Teaching Program and create generational teaching professionals.

4. Durability & Resilience

Building resilience against current and future weather patterns is considered with improved envelope thermal performance and HVAC system upgrades. Heat retention, heat rejection, and heat avoidance are all considered in maintaining comfort levels within the building. An aluminum panel facade aids in the longevity and low maintenance of Teachers' Row.

5. Embodied Environmental Impact

Use local and semi-local materials and labor so as to cut down on carbon emissions and transportation. Use low carbon and high-quality wall assembly materials that improve airtightness and insulation. Dense-pack cellulose is used for insulation, minimizing the embodied carbon the building will create. A concrete free slab reduces the overall carbon footprint.

6. Integrated Performance

The building makes major design aspects play multiple roles, all with the goal of creating a structure that can be comfortable, appealing, and efficient.

7. Occupant Experience

Teacher's Row creates a community of educators where new and experienced professionals can live and learn from each other but most importantly it provides them with an opportunity to have financial stability while establishing the educators in the community they serve.

8. Comfort & Environmental Quality

The building orientation allows major spaces that will see ample usage throughout to receive both proper lighting and ventilation. This is accomplished by using operable windows and louvers, a solar chimney, and high performance windows.

9. Energy Performance

Through the use of photovoltaic, solar chimneys, operable windows and louvers, and Air to Water Heat Pumps, the building achieves an average HERS score of 41. Additionally, purposely orienting the solar panels to the West allows the system to maximize the energy production to the hours where the energy demand in Tucson reaches its peak.