S U N B L O C

Mixed Use Multifamily | The Loop

Solar Decathlon

U.S. Department of Energy
Solar Decathlon 2020 Design Challenge

University of Arizona
INTRO | Our Home

SONORAN DESERT

CULTURE

ART
Tucson provides ideal conditions for a zero energy built environment.

- Existing buildings are easy to retrofit to sustainable building standards
- Gridded roads are a microgrid opportunity
- High waste heat production from cooling loads in large buildings
- AZ has highest total daily solar resource out of the entire United States
- High solar radiation and minimal cloud cover means efficient pv panels

A single kW of PV panels can produce 1,760 kWh/year, 25% more than the same panel in New York City.
INTRO | Grid Stress
INTRO | Sunblock
Median rent

- Myers: $644
- National average: $1,470

Household income

- Myers: $27,000
- National average: $63,100

Home value

- Myers: $85,560
- National average: $184,700
The team selected a site that best reflects the problems that Tucson faces and the symptoms of suburban sprawl, a vacant strip mall.
The Loop’s two most important goals are to empower the community and encourage sustainable living, but many of the project’s features achieve both.
The Loop is made up of a retrofit building that contains units and public resources, as well as a new building with units and retail space. Public spaces feature open floorplans for a flexible program.

**RESIDENTIAL**  Area: 127,162 sf

**PUBLIC RESOURCES**  Area: 23,150 sf

**RETAIL**  Area: 2,730 sf

**URBAN FARM**  Area: 6893 sf

New Build: 57 units
28 Studio: 415 sf
12 1 BD: 450 sf
7 2 BD: 550 sf
20 3 BD: 800 sf
AREA: 93,240 sf

Retrofit: 32 units
32 2 BD: 1060 sf
AREA: 33,920 sf

Resources
Library: 11,300 sf
Office space: 5,450 sf
Daycare: 6,400 sf
AREA: 23,150 sf
The Retrofit residential units turn existing storefront spaces into 1000 square foot, two-bedroom units with patios and a skylight.
A daycare is an important resource for low-income and single-parent families, as well as an employment opportunity for residents.
A commercial maker-space provides rentable offices and an open center for large groups or flexible desk space.
A public library provides for The Loop with tech and literary resources, an open floorplan, and an outdoor amphitheater for events.
The New Building shows off its passive cooling methods with metal-clad solar chimneys against a stucco façade.
To the west, the visual language of the solar chimneys continue on the New Building as shady, screened-off patio spaces with vines.
Thanks to our rent pricing, The Loop can focus on three often overlooked demographics that make up Tucson and the Myers community.

**TUCSON**

Tucson is my home, I have a job but I can no longer afford the rising price of rent. I wish I could be more involved in my community.

**MYERS**

I am retired and living off of social security. I would like to live somewhere with community values and friendly neighbors.

I am a single parent working full time. I am looking to live somewhere that is safe and close to a good school.
The Loop responds to needs within its community by adding important resources to a car-dependent, isolated site.

Easement adaptation
The landscape and buildings work together to create natural ventilation throughout the site.
Two different kinds of solar chimney ventilate each residential unit, keeping The Loop comfortable indoors for up to 30% of the year.
Within each unit natural building materials, ventilation, daylight, air quality, and acoustics all go into a comfortable environment.
The Loop’s wall assembly is successful thanks to three special building materials.
Properly placed insulation ensures that there are no thermal bridges in the retrofit building from an exposed slab.
With a 454,750 kWh/year pv array, The Loop generates enough energy to cool the entire Myers neighborhood.
A predominantly CLT panel structure ensures a simplified construction process and small carbon footprint. Exterior walkways are a steel superstructure to avoid thermal bridging.
Balanced ventilation is an important part of unit design and duct planning.
Balanced ventilation is achieved in commercial and public spaces through creative strategies.
Heat Pumps are placed in exterior circulation corridors to take advantage of the cool air produced as a byproduct.
Gray water reduces SunBlocks potable water usage.
Our “In The Loop” app empowers residents by keeping them connected and informed.
Even lighting in The Loop adapts to its environment. Lumination sensors turn off indoor lights when the sun is out, and outdoor lights only activate by motion.
The Loop is a limited equity co-op owned by its shareholders, which gives renters a unique opportunity to own private property and have a voice in their community.
Rent is a sliding scale based on Tucson’s average median income (AMI), with a rent reduction program for low-income residents. Thanks to Sunblock, the price of utilities has been reduced.

**Market Rate**
I live alone and make $56,000 a year, over 100% AMI. I am happy to do my part for the community. With the membership fee, my rent is $1,000 a month.

**Affordable Housing**
I live with my wife and son and make $23,000 a year, or 40% of Tucson’s AMI. Thanks to my community, my rent for a two bedroom unit is $800 a month.

**Tucson**
- $125 Electricity
- $75 Gas
- $200 Monthly

**The Loop**
- $100 Electricity
- $0 Gas
- $100 Monthly

**SunBlock at The Loop Subscription model:**
AC, Heat, Hot Water & Twice-annual systems services
Low cost of construction helps make income-based rent pricing possible. Construction is 65% cheaper in Tucson than San Francisco.
Thanks to xeriscaping with native plants, no extra water is required and rainwater runoff that caused dangerous flooding is now 80% soil infiltration.
The site is designed to direct rainwater through all landscaping as well as the agrivoltaic community garden with the help of bioswales.
Bioswales take advantage of the natural relationship between plants to create a comfortable, self-sustaining environment.
Agrivoltaics create a relationship between a shady community garden and a pv array that is cooled by evaporation.
By simulating a climate affected by global warming projections, WUFI proves that The Loop will meet Passive House 2018 + requirements even in the year 2080.

### PASSIVEHOUSE REQUIREMENTS

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<th>PHIUS+ 2018</th>
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https://fitzlab.shinyapps.io/cityapp/
In the event of a power outage, The Loop will remain survivable for almost three days, while the original building lasted less than one day.
The Loop is an interconnected community that can respond efficiently to a global virus pandemic.

1. Each unit has its own ERV and airtight layer
2. All circulation is outside, no shared corridors
3. Bike routes safely connect residents to grocery stores
4. Public resources on site
5. Community garden in case of limited food supply
Empower the community
Encourage sustainable living
Both
**TUCSON**

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Cooling Exterior Circulation through Heat Pump DWH
DYNAMIC RESULTS

<table>
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<tr>
<th>Component group</th>
<th>Zone 1 (Residential)</th>
<th>Zone 2 (Commercial)</th>
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</thead>
<tbody>
<tr>
<td>Internal loads</td>
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<td>Total</td>
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<tr>
<td>Total demand</td>
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ZONE 1: Residential

ZONE 2: Commercial

The Myers neighborhood 100% Cooled by Sun-Block’s The Loop
Resilience

ADAPTABILITY

Financial
Feasibility
& Affordability

Operations

Mesquite are nursery trees

Desert lavender is often found alongside mesquite

Plant roots reduce erosion

Clay particlals in soils ab: pollutants

Plants, moss and microbes use pollutants to grow

POWER OUTAGE DISASTER EVENT

TEMPERATURE (F)

TEMPERATURE OF EXTERIOR AIR

EXISTING BUILDING

RETROFIT AND NEW BUILDING

Livable temperature limit

BUILDING WITH CONSTANT SUPPLY

SUPPLY OUTAGE POINT

TIME AFTER OUTAGE IN TUCSON SUMMER

DATE: JULY (1-7)
IN THE LOOP
5 min
Look’s like your carbon dioxide levels are high, consider opening your windows to improve circulation.

IN THE LOOP
5 min
Your plug loads are making up 18% of your monthly energy use. Remember to unplug electronics when not in use.

IN THE LOOP
5 min
Hello Claudia, welcome to your new home at The Loop.

Your energy breakdown
- AC
- Electronics
- Hot water
- Heating

How do you compare?
- 149 kWh
- 98 kWh
- 850 kWh
Resilience

ADAPTABILITY

Financial Feasibility & Affordability

ONE TIME

STOCK BUY-IN

MEMBERSHIP FEE

MAINTENANCE

MONTHLY

Tucson

$125 Electricity
$75 Gas

$200 Monthly

The Loop

$100 Electricity
$0 Gas

$100 Monthly

MARKET RATE

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AFFORDABLE HOUSING

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SunBlock at The Loop
Subscription model:
AC, Heat, Hot Water
& Twice-annual systems services
SUNBLOCK | Thank You