



**UNIVERSITY OF DENVER**  
*Solar Decathlon*



# FINZON

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# 100 WORD DESCRIPTION

The University of Denver (DU) project was based on the desire to share the collected knowledge of energy efficient building practices with the surrounding community. The DU team will set an example with a net-zero renovation of a single-family residence. Located in the floodplain, DU will develop a cost-effective plan following Federal Emergency Management Agency (FEMA) guidelines in transforming a 1950s home into the modern age. Floodplain homeowners can discover budget-conscious options available in updating their existing infrastructure and enjoy the comforts of their home for years to come.



# DESIGN PHILOSOPHY



## HOUSE DESIGN

We intend to incorporate renewable products into our house including:

- ☑ Recycled wood and other products to give the home an earthy feel and sustainable aspect.
- ☑ Recycled barn wood from nearby homeowners and the recycled dead tree that must come down on the property will both add to the taste through an ascent wall and landscaping mulch.
- ☑ Recycled cabinets that have been touched up and modernized will also add to the overall aesthetic of the home.

The interior design will be all pulled together with the Aquaponics System that our engineering team is building. This complete eco-system will embody our renovated home as the center piece of the kitchen and living room.



## GOALS

Through this project, we will set the example for the community around us for how they can remodel their homes in the floodplain into a net-zero Home. With both the given and unforeseen risks involved in our retrofit, we will be able to build a step-by-step plan to then learn from and reconfigure to best develop the surrounding neighborhood.

Our goal is to achieve net-zero housing in spite of the many challenges including asbestos, the flood plain, and a retrofit. We strive to achieve an architecturally satisfying Renovation all while under a reasonable budget.

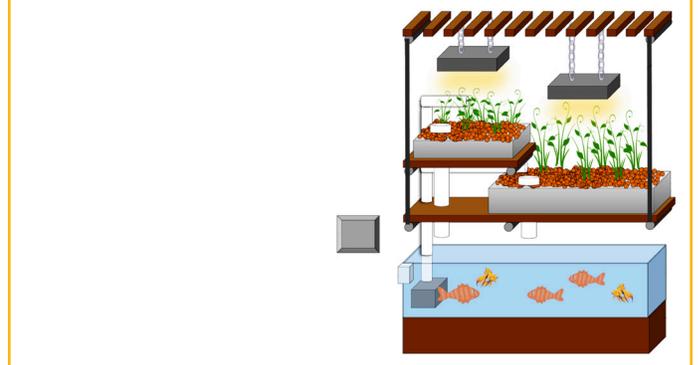


# UNIQUE FEATURES



## 1955 RANCH HOUSE RENOVATION

Transforming an existing house into a home that is energy efficient and comfortable for its occupants.



## AQUAPONICS SYSTEM

A goal is to mimic a natural ecosystem by using the waste outputs of one system as inputs to the other.



## RETRO FOAM INSULATION

RetroFoam has a higher R-value, eliminates drafts and air leaks, and does not break down over time.



## AIR BARRIER TECHNOLOGY

A solution that is sprayed into the building area that conjugates and seals hole with no harmful chemicals.

# CHALLENGES OVERCOME

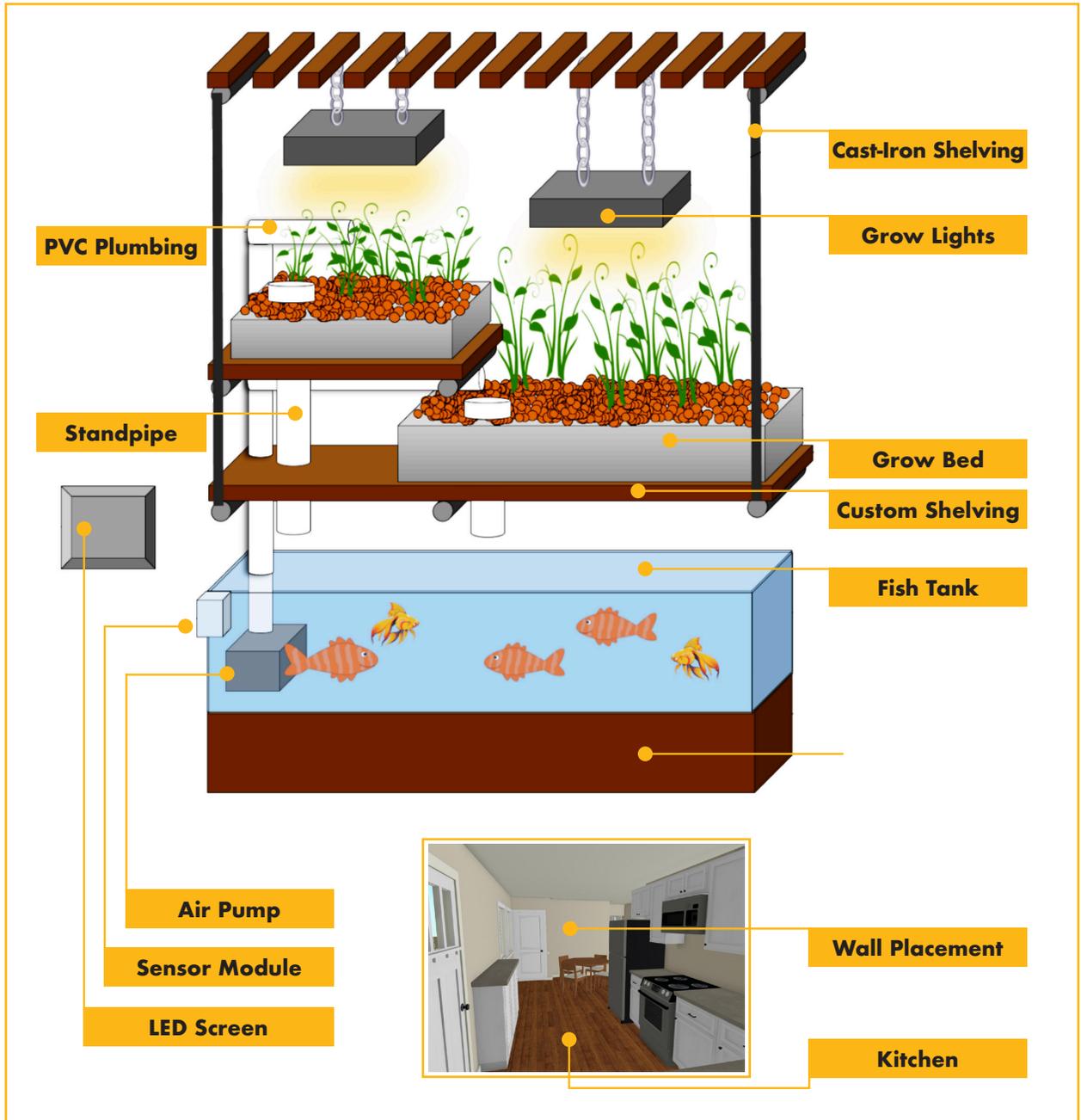
## LOCATED IN A FEMA DESIGNATED FLOOD ZONE

The existing structure is located in a FEMA 100-year floodplain. We have been challenged to avoid updating the entire structure to current FEMA floodplain standards as it would require us to demolish the entire building and start from scratch. We have since chosen to make improvements to the structure while at the time staying below 40 percent of the structures estimated value without having to bring the building to FEMA standards. If we had gone over budget, we would have triggered significant improvement (SI) standards, which would have required major updates not feasible to the owner of the house.

## ASBESTOS

The presence of trace elements (greater than zero, but less than 1 percent) of asbestos in found the house. Proper procedure included a 16-hour training for asbestos abatement and the use of appropriate protective equipment.





## AQUAPONICS

The primary goal of aquaponics is to mimic a natural ecosystem by using the waste outputs of one system as inputs to the other. The fish excrete waste into the water. This water is then pumped into the grow beds where the waste is broken down into nutrients for the plants to grow. The plants in turn purify the water and reoxygenate it to be sent back to the fish, completing the cycle. The aquaponics team has been tasked with constructing a low energy aquaponics system to provide the future occupants of the Solar Decathlon house with an organic, sustainable food source to supplement their diets.

A large emphasis has been placed on sustainability and user-friendliness. All components have been selected to minimize power consumption, resulting in a power draw roughly equivalent to a standard size refrigerator. These components were also selected to produce the least amount of noise to avoid disrupting the occupants of the home. The piping has been reinforced to prevent leaks and avoid potential flood-risks. The shelving unit is constructed from salvaged barnwood and cast-iron piping. The structure supporting the fish tank was converted from an old furniture piece.

This system features three primary subsystems:

☑ **The Grow Subsystem**

☑ **The Aquatic Subsystem**

☑ **The User Interface**

Two grow beds have been selected to maximize growth capacity and to increase crop variety. Potential crops include strawberries, spinach, and kale. A 75-gallon fish tank was selected, capable of housing 12-16 Tilapia fish. This large tank will allow for a more stable system that is less affected by fluctuations in the system changes, such as temperature. To continuously monitor system variables, such as temperature and pH, the BlueLab Guardian Monitor Connect was selected to record data. This data can then be analyzed to determine trends in the overall health of the system.

### **RETRO FOAM INSULATION**

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RetroFoam is a solution to eliminate energy loss through walls. Traditional wall insulations, like fiberglass and cellulose, can break down while also trapping dust and moisture. Over time, walls settle and air creeps in, causing the HVAC system to work overtime, increasing the occupant's energy bills. RetroFoam is a much better solution than standard wall insulation because it has a higher R-value, maintains that R-value at any temperature, and eliminates drafts and air leaks. Reducing drafts not only increases the occupant's comfort, but it also increases their savings with more cost-effective heating and cooling bills. As an added bonus, RetroFoam does not break down over time.

### **AIR BARRIER TECHNOLOGY**

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AeroBarrier is GREENGUARD certified - it contains no harmful or toxic chemicals. The AeroBarrier application includes a solution that is sprayed into the building area, it then conjugates and seals holes as small as a hair follicle. The sealing process is controlled by computer, and shows the sealing results in real-time. Benefits include:

☑ Improved building health

☑ Labor cost reduction

☑ Improved comfort

☑ Easier to achieve the stringent envelope sealing requirements of Passive House or the latest energy code

### **AIR BARRIER TECHNOLOGY**

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A solution that is sprayed into the building area that conjugates and seals hole with no harmful chemicals. As AeroBarrier is applied, the results are displayed in real time. By incorporating a blower door, the AeroBarrier system is able to target and hit your desired Air Changes per Hour (ACH). The system gets leakage readings in real-time allowing to stop the process once the target is hit.

# TARGET MARKET



*"I'm looking into ways that add value to my home. Making my space feel great for having company over and having a good time."*



## OVERVIEW

The market we are focusing is not looking to move into a brand-new home, but live in one with character and charm that just needs a little of that **TLC magic**. The target client for the DU house is a homeowner seeking to renovate their home with net-zero and energy efficiency in mind - within a reasonable budget of course! They are curious in knowing what the latest technologies and methods are in transforming their little corner of the world.

## JANE SMITH

Location	Denver, Colorado
Age	50
Status	Married
Household Income	\$76,900
Children	1
Education	Bachelor's
Rent/Own	Own
Time Lived in Area	15 years

## FAVORITES

Some of Jane's favorite things about her neighborhood:

- ✓ Walkability
- ✓ Parks
- ✓ Location
- ✓ Great sense of community
- ✓ University Campus

## HOME

Some of Jane's favorite things about her home:

- ✓ Memories of family and friends
- ✓ Character and charm
- ✓ Backyard
- ✓ Extension - added space

## JANE'S NEEDS & GOALS

Jane lives her husband and they have the house to themselves now that her daughter is in college. She is looking to improve her home by adding to the spaces where she can entertain and gather with friends and family.

- ✓ Entertaining
- ✓ Building lasting friendships
- ✓ Enjoy the great outdoors (front and backyard)

## JANE'S FRUSTRATIONS

- ✓ Affordable options
- ✓ Easy understandable comparison of alternatives
- ✓ Knowing what energy efficient methods to use

## TECH COMFORT

INTERNET

SOCIAL MEDIA

SEARCH ENGINES

DEVICE CHOICE: LAPTOP

# COMMUNITY ENGAGEMENT

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## **CORONA VIRUS - COLORADO STATUS**

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All people in Colorado must follow the letter and the spirit of these two orders currently in place:

- ✓ Public Health Order 20-24 (Stay-At-Home)
- ✓ Public Health Order 20-22 (Closing Certain Businesses)

Stay-at-Home (20-24) started March 26, 2020 and lasts through April 26, 2020. Closing Certain Businesses (20-22) went into effect March 16, 2020 and ends April 30, 2020. These orders may be extended, changed, ended or replaced.



## **COMMUNITY EXHIBITION**

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The *tentative*\* dates for community exhibitions are:

- Location:** 2468 S Race St, Denver, CO 80210
- Dates:** Saturday, May 30, 2020  
Saturday, June 6, 2020
- Times:** To be determined
- Parking:** Street parking

\* *Group gatherings subject to change due to COVID-19 orders.*

# PLANS FOR THE HOUSE

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## LOCATION

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2468 South Race Street, Denver, CO. 80210

## DU IMPACT 2025

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The University of Denver is on a mission to create impact model of higher education for the 21<sup>st</sup> century. With a long history of educating and encouraging individuals who are imaginative, bold, resilient and ready to help their neighborhood and community - the house will be used as a more attainable housing option. In an effort to support more affordable housing near campus for undergraduate and graduate students, faculty and staff, the DU Solar Decathlon house will help take one step towards accomplishing such aims. Not only will DU and its students, faculty, and staff be able to benefit from the house, the hopefully the collected knowledge for the local community to serve as a resource as they venture into energy efficient practices that they can implement themselves in their own homes.

# THE DU TEAM

## DU TEAM LEADS



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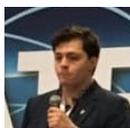
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## AWESOME MEMBERS

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**BEKO APPLIANCES**

**COPPER CANYON ELECTRIC INC.**

**ROCKY MOUNTAIN RETRO FOAM**

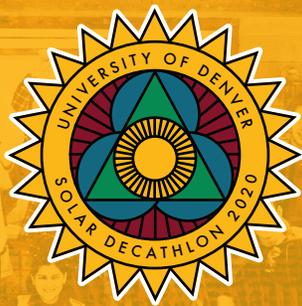
**MITSUBISHI WITH HVAC**

**DENVER AIR BARRIER**

**SKYYGUARD CONSTRUCTION**

**UNITED PLUMBING SERVICES**

**WAC LIGHTING**



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