

# RISE

UC BERKELEY / UNIVERSITY OF DENVER

University of California, Berkeley / University of Denver  
U.S. Department of Energy Solar Decathlon 2017  
Jury Narrative Submission  
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## STUDENT TEAM LEADERS

**President:** Sam Durkin  
**Head of Design:** Brenton Kreiger  
**Head of Construction:**  
Ruth McGee, Joan Gibbons  
**University of Denver Leads:**  
W. Christensen, D. Joffey, C. Landsinger,  
J. Ross, K. Tyson



# Communications Narrative

## The Team | A Partnership of Universities

The RISE project began as the brainchild of the UC Berkeley students who formed the designs of the home over the course of two years. Later, the dedication to creating innovative solutions to sustainable housing is what drew the University of Denver to get involved with the construction aspect of the competition.



Source – Team Photos

Even before this project reached the desks of DU students, there was a significant amount of momentum. Beginning with Design Innovation 190, a student-taught class at UC Berkeley to garner interest, students collaborated with industry lectures and participated in a collaborative, integrated design process during evening lab sections. This interdisciplinary space was where our design philosophy and RISE was born.

As the competition neared, DU and Berkeley shared regular contact, and with each conference call and email chain initial designs soon became dissected and cross-evaluated. Each element incorporated into

the project represents a concerted effort to build a cleaner future for the global construction industry, but more immediately healthier housing option for a community desperately in need of solutions. Berkeley pitched their ideas, designs and motives with a passion and understanding that quickly pulled the two teams together, while the construction management graduate students at DU brought a lense of

buildability, marketability, and feasibility.

To represent this effort on site at the competition, every innovative product and construction technique will be on display, with

interactive opportunities to see, touch and hear how the RISE is unique to its market. The idea



Source – Team Photos

behind this project transcends the final product, so we wish to show the entire process. Not only is RISE home applicable to industry

professionals looking to take advantage of emerging construction technology, RISE also aims to engage average citizens and show that urban sustainability is important and attainable. By educating builders on the specifications and techniques online and at industry events, and the consumer on the function and the importance of the

## The Resources II Getting it Done

At UC Berkeley, this interdisciplinary team found their home at the Jacobs Institute for Design Innovation. A collaborative space filled with everything from machining equipment to abstract thought seminars, the student-led class here allowed for the students to explore their ideas in a low-



*Source – Team Photos*

technology, the RISE message will be bringing together both sides of the industry, builder and buyer. With our goal of practicality in innovation, born from the collaboration between two schools with differing mindsets, we hope to reach mutual understanding between historically clashing parties (designer vs. builder) for an overall quality home.

pressure setting with the help of industry mentors.

Local firms such as KPFF Structural Engineers, Cahill Contractors, and many more became invested in the project, working to help out student teams.

Without a physical product to show, we relied on more abstract financial ventures. From here, the students won the largest sum

ever given by The Green Initiative Fund, a Berkeley sustainability grant, at over \$30,000, and proceeded to launch the second most successful Berkeley crowdfunding campaign ever. Combined with teaching a plug-in class at Richmond high school, meetings with the mayor's office, over 500 Facebook followers, and six presentations at local Richmond neighborhood councils, the RISE home was making a name for itself.

With the move to our construction site in Denver, everyone was rooting for the "home team" and the only one from Colorado. Adding the resources of a university excited to join in, partnering with the Daniels Business School fueled our success. DU marketing and communications took it upon themselves to document our process both in person and with a supplied jobsite camera, the competition directors themselves paid a visit, and news outlets took notice - writing articles and performing tv interviews. Taken under the wing of PCL construction next door, we were not only supplied valuable resources (water, power, etc..) but valuable advice. Sub-contractors were funneled through PCL jobs to help us with plumbing (Olson Plumbing), fire protection (Extreme Fire), and electrical (Weifield Group), as our knowledge and confidence grew. With a home team advantage stretched to the fullest, we were able to let local material suppliers visit the site. Humble and eager to learn, contractors and artisans visited most days to help install their product, rejuvenated by the

excitement from the student end.

## The Tour II Engaging the Market

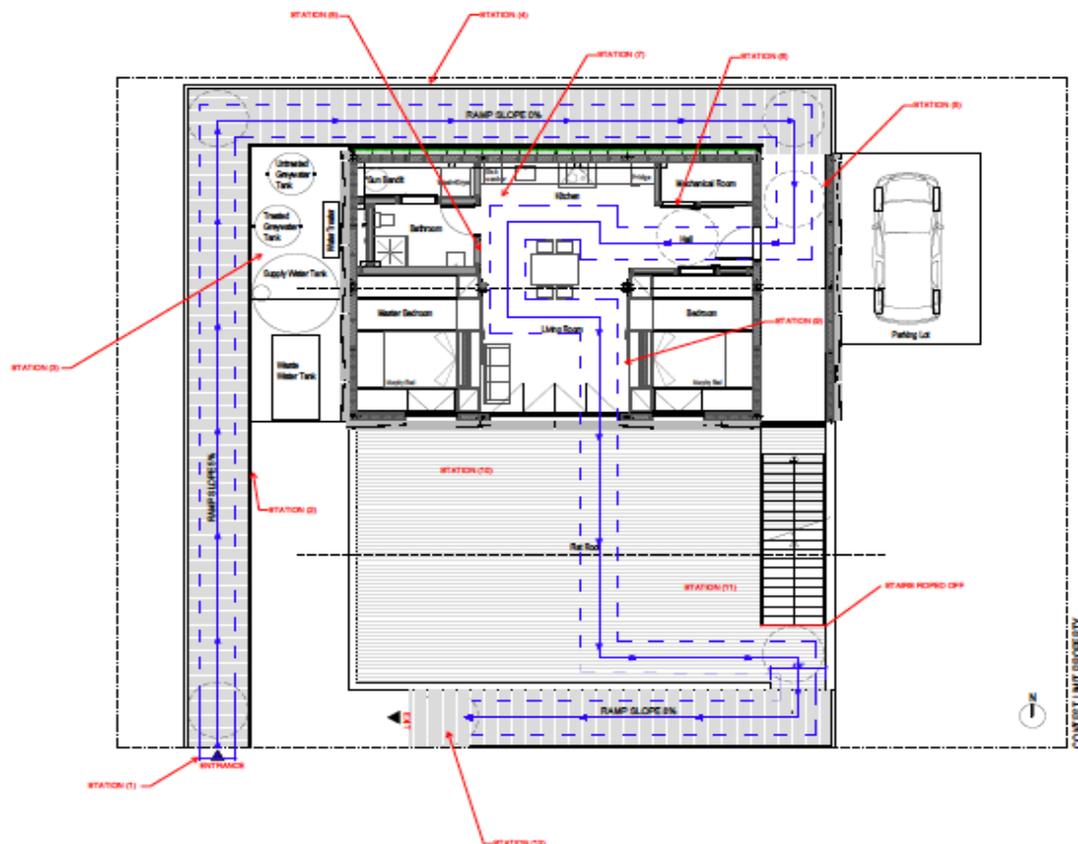
When entering the home, the tour is designed not to drill information into the visitors, but rather to use experience and sensation to bring complex design concepts into a practical light for the average homeowner. While there will be technical specification and design data for industry professionals and anyone interested, the majority of the information presented at each station will be more focused on the over-arching concepts behind the technology and the implications that they have on daily home life.

Starting at our first station, the very first piece of information that the visitor will receive is our house guide pamphlet that displays the tour route designed in the style of the local Richmond public transit system. Emphasizing our philosophy of practicality, we aim to use seed paper for this pamphlet that has a tangible end use that is not the trash. These two features of the pamphlet, the compostability and the focus of public transit focus, demonstrates the multifunctionality that the RISE home incorporates into the broader design of the home. In addition, this station will address our concept of stackability.

Given that it was the governing concept for many design decisions, it is important that each visitor understands this idea. As the visitors move along the tour, they will come along the second station designed to relay the importance of complying with the local Richmond market. Integrating the RISE home into Richmond is one of the most important pillars of the house's design. At this second station, visitors will be prompted to download the specially designed app for our tour through scanning a QR code. This will give visitors information about all of our innovative products and sponsors along the way. The poster and student here will give visitors a concrete idea as to why the RISE

home fits perfectly into Richmond's future plans for the city with regards to the Richmond Livable Corridors Code. This second station will also highlight the community efforts that the RISE team has undertaken with local Richmond High Schools and the donation of the home.

The third station will then bring visitors from the big picture ideas that the RISE team has for the Richmond area, down into the technology that makes this home so special. The water systems section of the tour will highlight the very pressing water conservation issues that all of California faces. This station will emphasize all efforts focused on conserving water in a simple,



Source – Team Drawings

easy way. The fourth station passes the north facade delves into a particularly innovative piece on the home; the green wall. Here, visitors will learn how plants sequester carbon, naturally purify surrounding air, mitigate energy needed for cooling the home and the durability of moss. At this fourth stage of the tour, a guide will explain the production of a moss wall, how the moss is specially designed for a range of climates and will work well in both Denver and Richmond.

The next station of the tour will re-visit the stackable concept of the RISE design. At this station, a guide will display the importance of dense housing in the Richmond area, and the benefits that local communities will see by living in housing designed for communication and social interaction. Also at this stage, there will be an exposed section of wall that will show framing techniques designed to support large loads, the different layers of waterproofing and the organic wool insulation, which visitors will be able to touch and smell. The corridor of the home will display the practical uses of the egress and the vertical movement that it would bring if there were three stacked units. The following will be much more technical, with an explanation of the mechanical systems that make the RISE home so efficient. At this point, there is room to leave the line and pass based on varying interests in specific mechanical systems. We will have iPad screens to demonstrate the function of our systems in real-time and how this technology will help

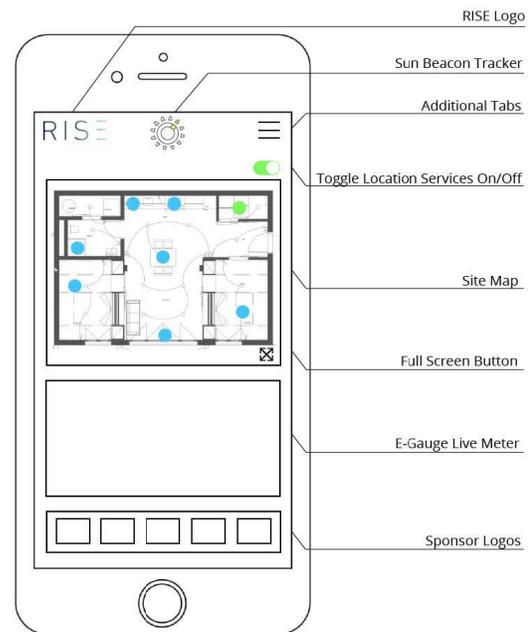
make net-zero a popular trend in the very near future. There will also be an opportunity to see how the app integrates with the mechanical system to help homeowners know exactly what is going on in their home.

As the visitors move from the kitchen to the bathroom, they will get a chance to see the water mitigation strategies in the RISE home at work. The low-flow faucets and the greywater system will create a link to the importance of water in California, while the 97% recycled tiles and light wall will show the invitations that make the RISE house a home. In the bathroom, the light wall will be fully lit, adding to the natural lighting of this otherwise darker corner. This point will emphasize the modular split between “wet” and “dry” modules, offering time for a quick plug about the transportation process. As the tour moves from the bathroom to the living room, another innovation will be emphasized. The movable wall is not just about space efficiency, it redefines what a home actually means by highlighting the important shift that Richmond wants to make from sprawling residential areas to dense, functional living spaces that can flex to the needs of the user. As U.S. suburbs transition from greedy space design remnant from post-WWII housing to the efficient dense housing, innovative design features will allow for homeowners to have big living rooms and multiple bedrooms



## RISE Mobile App

- Designed for use @ Expo
- "Tour guide," helps attendee to recall info
- Allows attendees to learn more from sponsors
- Gamification: gifts for people who complete tour
  - M: Attendees must visit all checkpoints
  - D: Easily navigable, simple instructions
  - A: Hot spots change color, sun beacon tracker fills



Source – Team Photos

without sacrificing a dense footprint.

Finally, as the tour comes to an end, the visitors will be ushered out to the deck, where two of the most social aspects of the design become a reality. The deck and planters are the main arteries for the human connection that the house hopes to promote. The large deck provides a stage for BBQs, parties and general relaxation while the planters provide clean and sustainable food sources that can be shared with neighbors or used for a community meal. As the tour moves to the stairs, the energy system of the PV array will be explained. The guide will give a demonstration of how light is transformed into consumable energy orchestrated

through the cell-phone application.

### The Message II Educational Outreach

Throughout this process, our team has learned that a successful project takes engaging the community, exciting the sponsors, and asking for help. Through this



Source – Team Photos



undertaking we have had the opportunity to meet amazing people and spread our knowledge and excitement into the blossoming industry of sustainable design. The main outreach techniques from the RISE team include news publications, social media, and Richmond community interaction.

Within the Richmond community, what began as a city council meeting has ended in our home being donated to the Richmond Community Foundation, a non-profit organization that uses social impact bonds to help families living at and/or below the poverty line afford their first home. In this time span, Berkeley students spent a semester teaching a plug-in for a class with the Richmond High School's Engineering Academy. Through this process, we were able to not only educate the students about the Solar Decathlon and teach them through our own experiences, but we were able to learn as well. The students throughout the class indicated design decisions they would like to see implemented in their community and represented challenges that needed to be solved via their own sentiments. In addition, the RISE executive board was privileged to present our concept and design at multiple Richmond Neighborhood Council meetings in which we both received input from the residents as well as educated and spread the word about our project.

Although the interaction with the Richmond community and high schools was the most important and rewarding outreach for our team, in line with our communications goals

we interacted with many other members of the public along the way. Outside the direct Berkeley community, the team presented at a over 30 engineering, architecture, design, construction, and other offices in the Bay Area. Each presentation educated more members of the community about the challenges the Bay Area was facing in regards to housing and how our team was approaching them. They also continued to fuel the fire that the Berkeley team had created with this founding of their first Solar Decathlon team. At Berkeley, tabling, flyering, and presenting at sustainability-related events has also been of paramount importance. Recruiting fresh students adds a ripple of excitement throughout the project, motivating our leadership team to keep improving. Through this hard work, there have been multiple publications and news coverage articles describing the challenge we have taken on, some of which are listed on the next page.

Lastly, through social media outlets we have been able to share our progress and represent our sponsors. Our website is regularly updated with the newest information and publications on our team while linking our visitors to our continuously updated Facebook, Instagram, and twitter accounts. On these three platforms, the team would post pictures, interesting articles, and updates on the team. These posts aimed to engage a wider audience while still keeping our followers educated. Don't forget to like us on Facebook and Instagram

ASCE Article:

<http://www.asce.org/magazine/20170411-uc-berkeley-engineering-team-readies-competition-house/>

HGTV coverage:

<http://www.hgtv.com/design/decorating/design-101/the-future-of-solar-powered-architecture>

Public Jobsite Camera:

<https://www.senserasytems.com/public/project/RISEHome>

Berkeley Sustainability:

<http://sustainability.berkeley.edu/engage/solar-decathlon>

SERC Student Organization:

<https://serc.berkeley.edu/student-organizations/>

DU Newsroom:

<http://news.du.edu/du-partners-with-uc-berkeley-for-international-competition/>

NBC9 Denver News:

<http://www.9news.com/news/education/du-and-uc-berkeley-create-solar-energy-house-454182245>

The Denver Post:

<http://www.denverpost.com/2017/07/03/university-of-denver-university-of-california-berkeley-students-team-solar-home/>

Denver Business Journal:

<https://www.bizjournals.com/denver/news/2017/06/29/university-of-denver-students-compete-in-solar.html?surround=etf&u=XYalABjl1c0%2ByML7%2FO8E1w040d055d&t=1499196594&j=78472951>

Facebook:

<https://www.facebook.com/RISE2017SolarDecathlon/>

Twitter:

<https://twitter.com/solardatucb>

Instagram:

<https://www.instagram.com/risesolardecathlon/?hl=en>

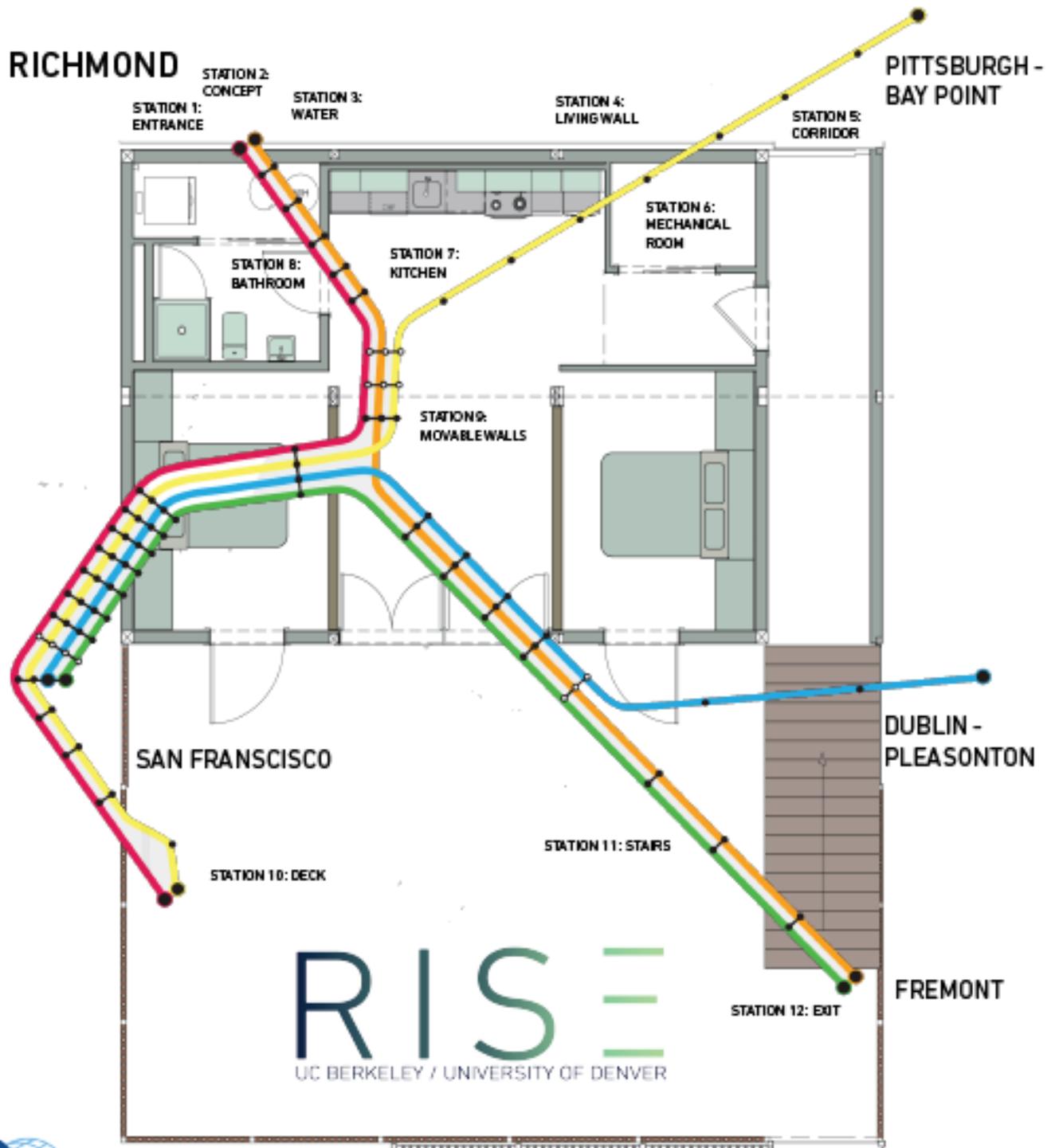
Website:

<https://solardecathlon.berkeley.edu/>



# Public Exhibit Materials

# welcome to the bay area



U.S. DEPARTMENT OF ENERGY  
**SOLAR DECATHLON**

U.S. DEPARTMENT OF  
**ENERGY**

**ENERGETICS**  
A Division of PG&E

# A New Normal for Bay Area Suburbs

# Our Richmond Concept

# RISE

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The San Francisco Bay Area added nearly **500,000 new jobs** over the past decade. This has caused a population boom that sent ripples throughout the community, and especially in the housing industry.

**Richmond, CA** is one of the many suburbs of San Francisco that has felt the effect of this housing crisis. The city's population continues to expand while housing prices soar.

The City of Richmond is home to large industrial operations such as a shipyard and oil refinery, 34 miles of bay shore, and two BART (train) stops. These aspects make it attractive to newcomers, but it is also littered with **deteriorating, long and skinny infill lots** deemed "Zombie Properties".

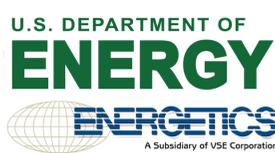
In conjunction with the Mayor's Office, community councils, and the Richmond Community Foundation, our team will **RISE to the occasion** to provide an example for a housing solution for the community. RISE home will ultimately be placed on an infill lot within the City of Richmond through a Housing Renovation Program!



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# Pioneering Conservation Urban Drought Strategy

## RIS

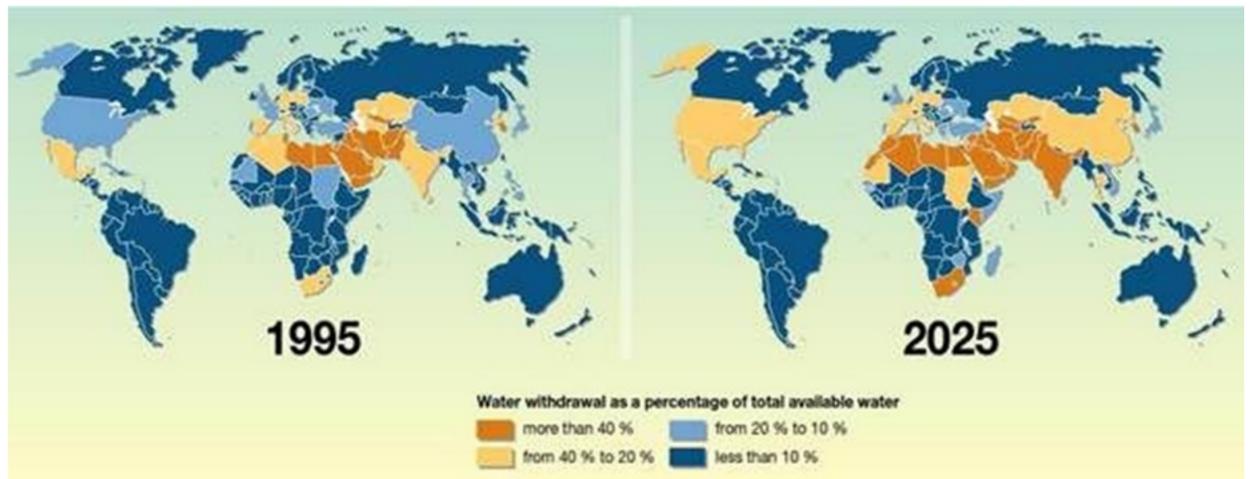
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**Northern California** is one of the many regions in the United States that has experienced rampant droughts over the past decade. Thus, it is more important than ever to come up with new innovative ways to conserve and reuse water!

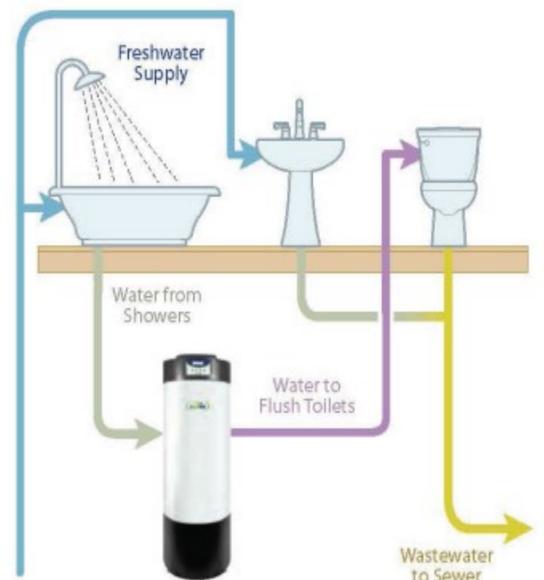
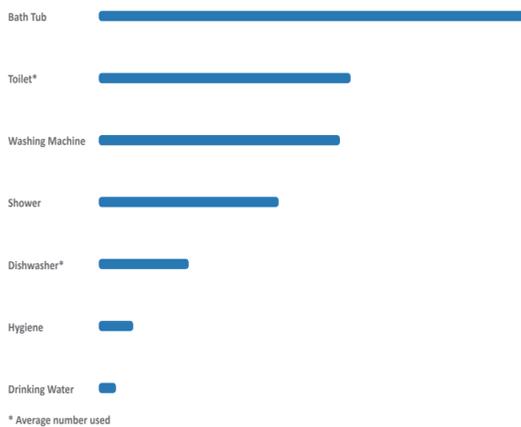
The **RECOVER SYSTEM** from Bio-Microbics is an innovative, easy-to-use, residential appliance that recycles water from our shower to fill and flush our toilet. It's minimal footprint is also ideal for our space constrained, urban design.

Not only is water conservation important, **hot water consumption** accounts for over 30% of a home's water usage. The energy required to heat that hot water typically accounts for about 20% of a home's utility bill.

To **save both energy and money**, our home utilizes the extremely efficient **SUN BANDIT WATER HEATER**. This simple and small water heater is not only saving the homeowner energy, but also runs with zero-emissions and zero-sound making the home even more livable!



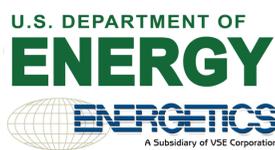
Consumption Data on Various Household Appliances in Gallons



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# Stackable Design Solving Urban Density

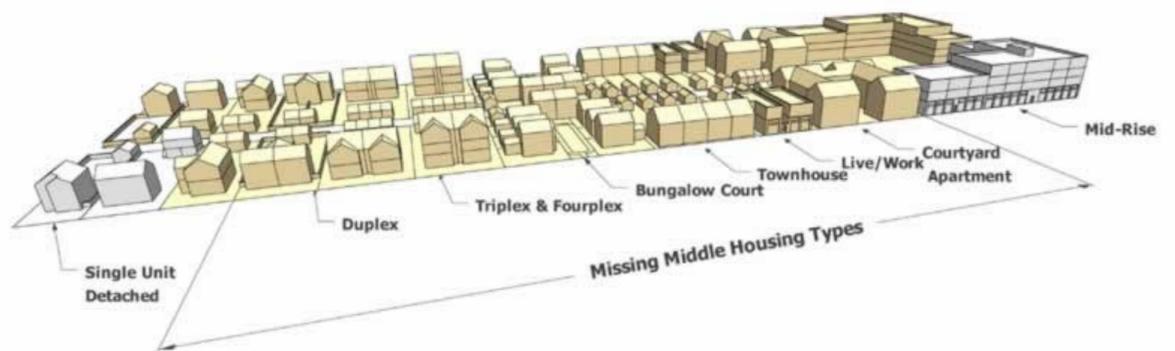
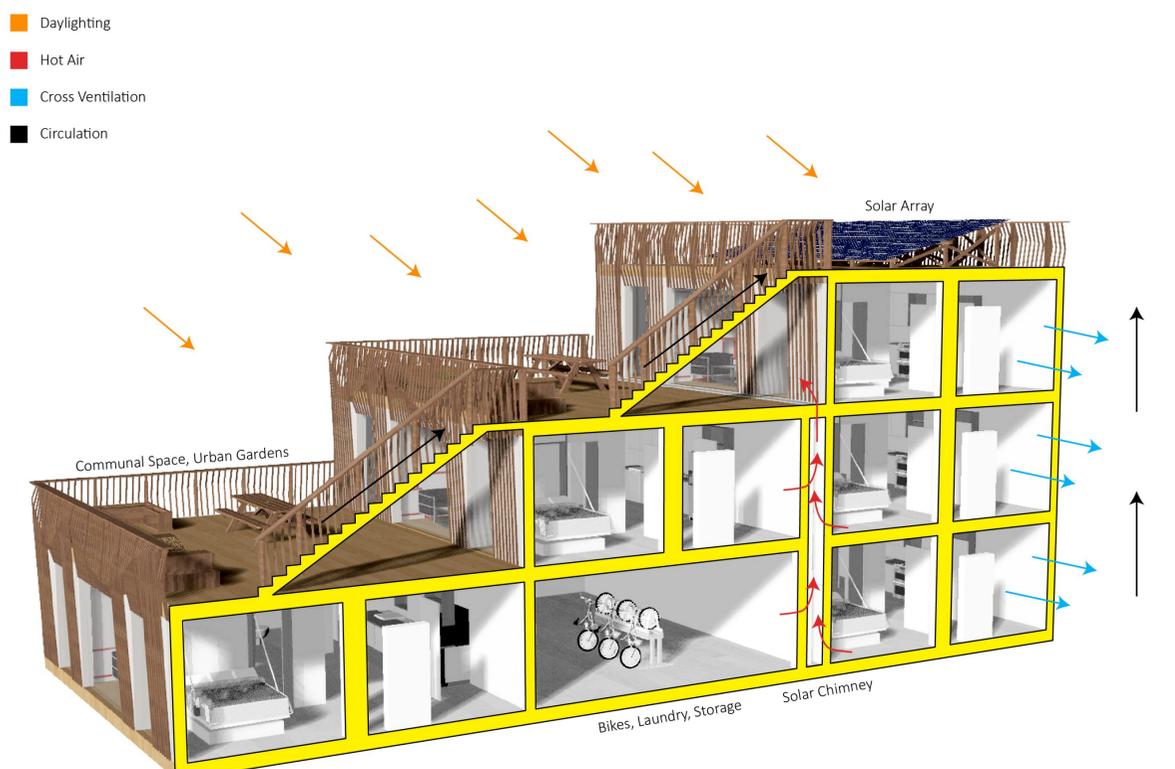
## RISE UC BERKELEY / UNIVERSITY OF DENVER

As **population density** continues to increase in the Bay Area, land availability is limited. Thus when designers need more space they must build upward. But how does one elegantly use height in a transitioning suburb?

RISE home is a single module with a structure designed to be **stacked three stories high**. This simple post-and-beam design with only exterior shear walls provides flexibility in implementation and ultimately flexibility in the interior design.

The stackable concept was developed to strategically blend into the City of Richmond, particularly on long and skinny infill lots. The tiered design allows for each unit's roof to double as deck space for the unit above. These decks, along with shared vertical communication, aim to increase **communal interaction**.

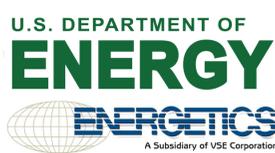
As housing density increases, it is extremely important to consider the residents one is building for and the community a new building is going in. RISE home aims to do both for the City of Richmond and its residents!



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# A Sheep's Coat

## The Natural Solution to Insulation

# RISE

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One of the easiest way to save money and energy in a residential setting is by creating an extremely efficient home. For RISE home this started with the thermal envelope and using innovative insulation!

**HAVELOCK wool insulation** was used in the RISE home because the R-Value is second only to spray foam insulation. The inherent **SUSTAINABLE** properties of wool insulation creates a higher indoor air quality, and no hazmat suits are needed for installation!

**HAVELOCK** is **naturally collected from sheep** in New Zealand. It is soft to the touch and hypoallergenic while also having excellent moisture control properties and a very high resistance to fire. Wool insulation is long lasting and helps improve **ACOUSTIC** insulation in the RISE home.

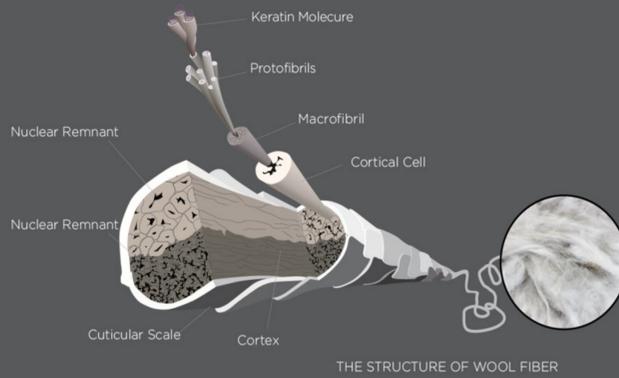
At the end of the life cycle of a home, you can discard the wool in the **COMPOST**. The material is not regularly used in construction, but will soon become a standard building material in Net Zero homes because of its **environmental friendliness, sustainable properties, and low embodied energy.**

### Wool vs Synthetics A COMPARISON

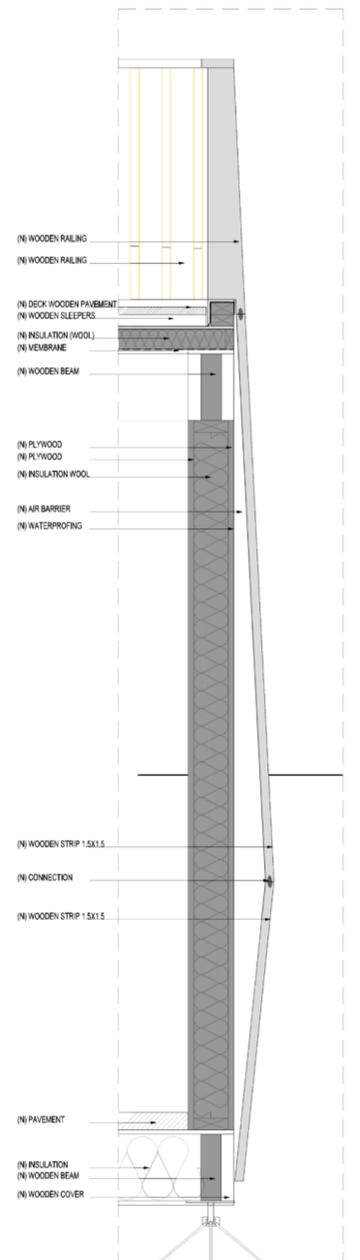
Insulation Type	Retains R Value -50 years	Self Extinguishing	Manages Moisture	Protective Clothing Required for Installation
Wool	Yes	Yes	Yes	No
Fiberglass	No	No	No	Yes
Cellulose	No	No	No	Yes
Foam	No	No	No	Yes

### The Science of Wool Fibre

UNDER THE MICROSCOPE



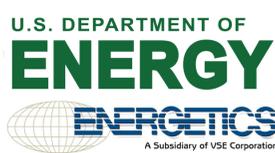
SHREK THE SHEEP..



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# Simple is Sleek Kitchen & Bathroom

# RISE

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The **North Module** of RISE home features all the major mechanical, electrical, and plumbing aspects of the home. This allows for simplicity in design which can also be seen in our minimalist kitchen and bath spaces.



Our kitchen features a traditional **Pullman Design** that is used both to save space and minimize piping runs. The simplistic style is complemented by the highly efficient appliances that both conserve water and energy.

As a resident enters into the bathroom they immediately see the elegant Porcelanosa fixtures and tiling that bring comfort to the space. The tiles are made of 97% recycled material and the fixtures are all low-flow to conserve water.



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# Complementing Design Solar Brings the Power

## RISE

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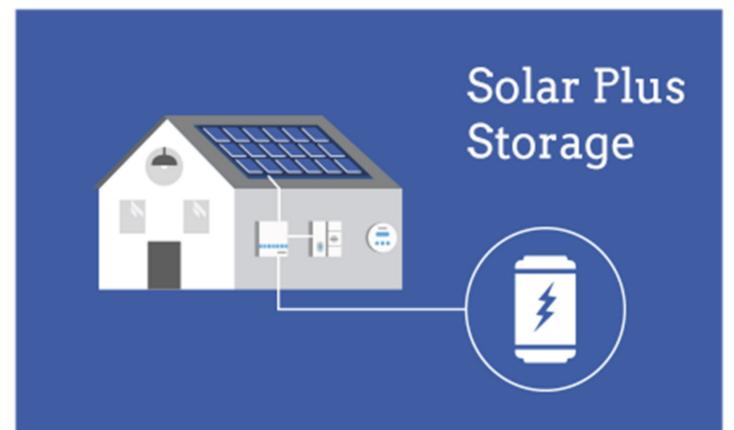
**RISE** home was developed to be energy efficient and incorporate elements that **TAKE THE HOME OFF THE GRID.**

Energy efficiency is achieved by recycling greywater and recovering waste heat energy.

**PANASONIC PV SOLAR PANELS** capture rays of the sun on the panel cells and convert this solar energy into a usable source of electricity that can be stored for later use.

**PANASONIC PV SOLAR PANELS** convert sunrays into **DIRECT CURRENT** energy. DC energy travels to the electrical device called an **INVERTER** to convert this current into **ALTERNATING CURRENTS**. The AC energy is the same energy supplied to homes and businesses by utility companies all over the world.

The PV PANELS create usable energy that can be stored in the **TESLA POWERWALL BATTERY** installed on the exterior of the home. This allows the RISE home to be completely **OFF THE GRID** during the day and night, **RAIN** or **SHINE**. RISE sets the standard for **NET ZERO** homes.



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