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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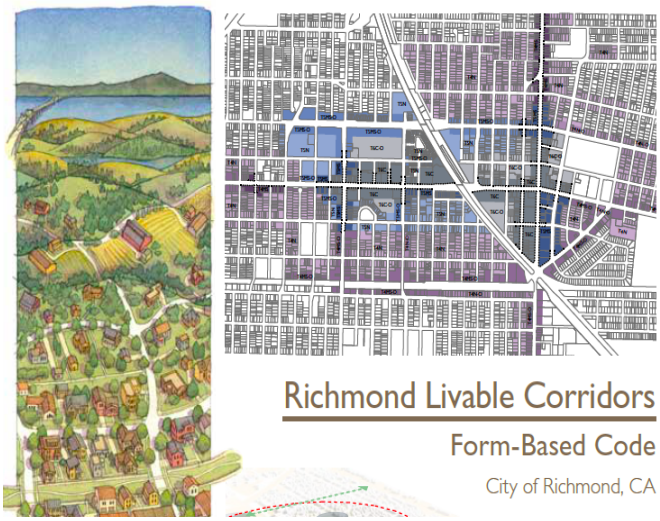
Architecture Narrative

Design Philosophy || Representing Practicality

The design process for the Solar Decathlon has been a balancing act. Balancing building codes from different states, transportation trade-offs, and competition performance versus its final resting place, the only way to remain decisive and consistent was to develop a strong philosophy. Our team concluded that practicality is key, calling on the very purpose of the competition - to supplement our education with a real-life experience - and we have gone to all lengths to ensure that our home will end up with a family in Richmond. We have based every decision on what would get us closer to providing a family a home. Juggling the practical needs of a Richmond resident, the drive to innovate at the competition, and the need to impress the public, we came up with RISE home. Ultimately, we are determined to create Residential, Innovative, Stackable, and Efficient housing that provides a solution for urban infill lots and specifically focuses on families struggling with the ever-increasing housing prices in the San Francisco Bay Area. Addressing the lack of horizontal space, clean air, and financial accessibility of our market, the aim is to create affordable, sustainable homes.



Source – Livable Corridors Code

Both technically and aesthetically we targeted the cutting edge, yet have taken care not to implement the wildest technology of the far future. Overall, we have achieved a design that blends-in within the City of Richmond, while still pushing the limits and tugging the city toward a more sustainable future. Described further below, our external facade structure is a source of equated beauty that represents the possibilities of new technology. It draws attention to the home as being something different, and needed. An affordable, net-zero structure that is a blueprint for a goal for the city to move towards.

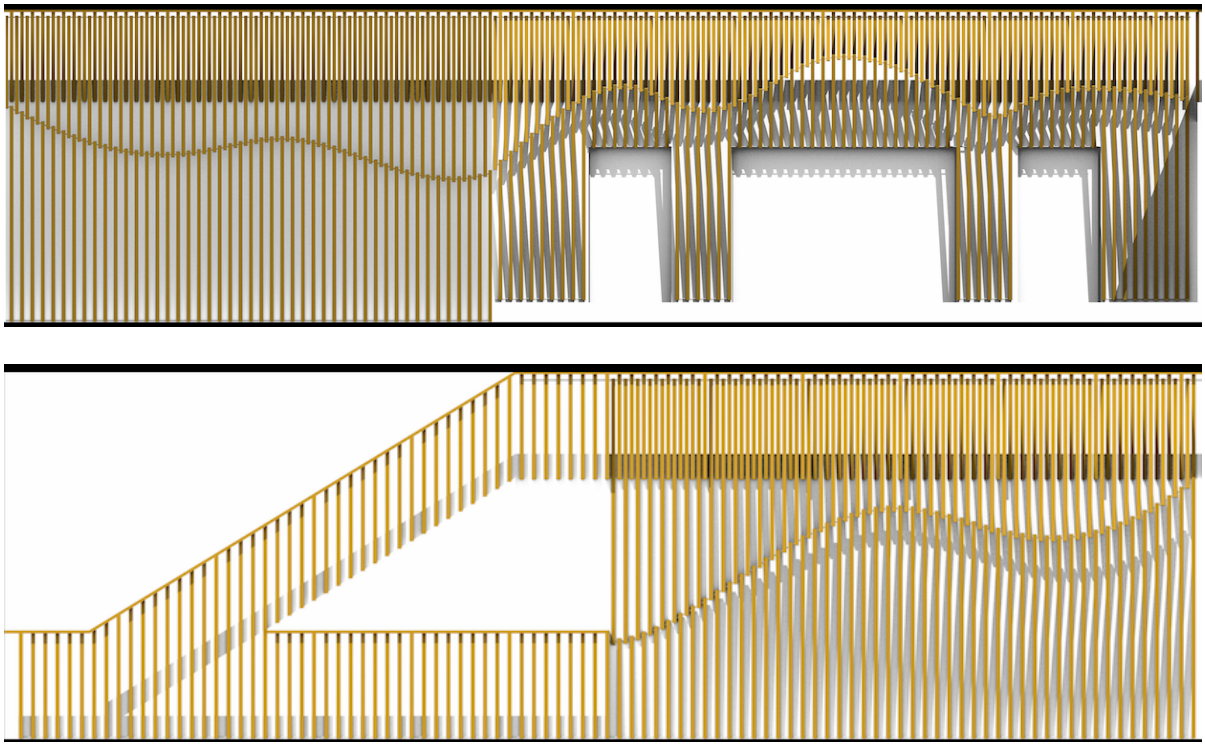
In order to further emphasize the progressive path of this transitioning municipality, we designed our home to meet the technical and implied specifications of the Livable Corridors Code, a new form-based code that became partially adopted in 2016. This code promotes the availability of green spaces within a five-minute walk, reduces parking space requirements, reduces unit square footage, and increases height limitations. With this code, city council guidance, and input from the neighborhood councils, we

developed our design philosophy stated above. Under these guidelines, bringing a single-family home to the competition didn't make sense. We are working with an urban environment where sustainability means utilizing vertical space. Richmond is moving onward and upward, with more people and less space - therefore a single-family home is neither helpful nor sustainable for this transition. At this point, our "stackable" structure was born. Able to be implemented in 1-3 stories residentially, it may also be utilized in the space above commercial concrete buildings. We aimed for a higher density and a more practical solution, and we know RISE will deliver. The competition model for RISE was developed as the top unit in the stacked structure, packing in all of the structural and architectural concepts that represent the entire multi-family building. With modular, pre-fabricated units, the home is easy to duplicate and easy to transport, making the iterative stacking process less of a logistical challenge.

Innovation II Thinking Outside of just the Box

With a simple, symmetrical form to ensure ease of transportation, better thermal performance, and a more affordable, stackable structure, we had to find complexity in our detailing. The first obvious architectural element is the facade superstructure.

The façade design is a beautiful architectural feature that complements the rectilinear



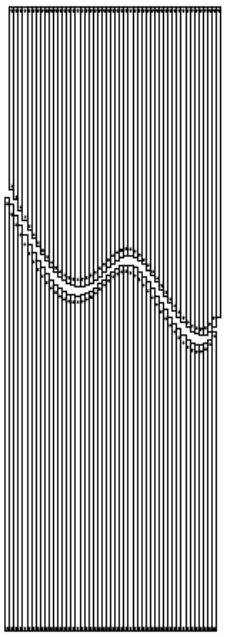
Source – Team Renderings

form of the base building and reinforces the Solar Decathlon design goals of the University of California, Berkeley / University of Denver. A parametrically designed wave of deliberately spaced wooden elements creates a dynamic interplay between light and shadow and tectonics and form and brings light and three-dimensional interest to the base structure. The eye follows the wave as it originates from the railing of the lower deck, circumscribing the building as it winds towards the upper deck, ultimately terminating at the upper level. Viewers following the façade are given a tour of the building through the wave, from the lower recreational deck and circulation area through to the living wall and finally to the solar array above.

This vision was achieved through a system of planar wood elements emerging from the base structure. Alone, elements imply a triangular shape. Combined, the varying triangles superimpose a wave onto the façade.

Source – Team Renderings

Integration of the façade into the existing railing was key to providing a complementary system. Railing balusters are spaced at 4" on center, and this spacing is carried over to the wave system. However, instead of having a continuous wooden element form the triangle, the element is split at the apex of the triangle, and then offset 3" to create a regular rhythm and double thickness space at the crest of the wave, further accentuating the wave's movement and simplifying connections as explored below.



Source – Team Drawings

Economy of material and construction time were carefully considered in design of the façade. Although the use of a CNC router was not available due to cost, a packing script was developed for efficient placement of elements on boards for CNC cutting, and element thickness was optimized to minimize material loss while maintaining durability. Connections were also greatly simplified to save construction time. Holes are drilled through each end of the façade element, and a rod and cable system is added to quickly thread façade elements

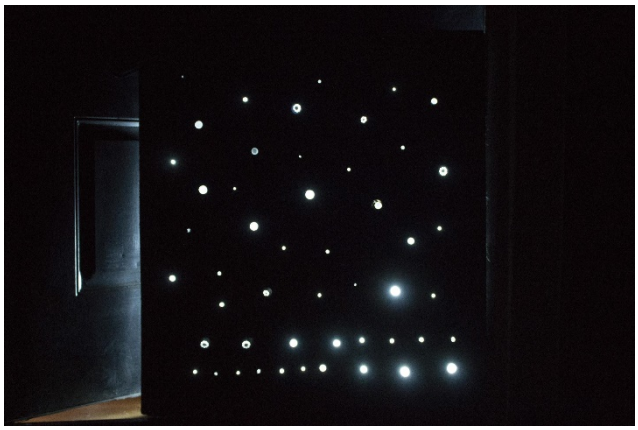
into place. The rods and cable create flexibility allowing elements to adjust as the structure is erected.

In addition, the acetylated natural wood material, Accoya, was deliberately chosen for its durability and lifespan of up to 50 years. Importantly, no maintenance of the Accoya is expected, greatly reducing lifecycle cost despite the complexity of the structure. The facade wave imparts an upward motion on the viewer in line with the stacked multi family home concept of the RISE team. The three-story complex would flow with façade waves, with the waves rising from the ground plane, exploring the space, and culminating at the top deck. To this end, the rod system is installed throughout the sample house to imply the presence of more waves and a greater context beyond the scope of the built project.

The other attractions on the exterior of the home include the stairs and moss wall. Cladding the North Facade, this self-sustaining moss padding grows within a polyurethane plate that attaches to the structure. Sequestering carbon, improving air quality, and boosting insulation values, this low maintenance solution has all the benefits of a living wall with no huge weight additions or maintenance required. The stairs are a centerpiece element of vertical circulation that ties into the facade via the railing and acts as the main source of communication between levels. While the homes themselves are less perforated and have the option for high safety and privacy, the stairway is designed to induce community interaction and highlight the multi-family aspect of the project.

To complement these exterior detailing elements, the interior has a collection of practical innovations. Murphy furniture in the bedrooms allow for versatility. Accompanied by moveable bedroom walls, the living room space can expand to almost 3 times the original square footage and the bedrooms are easily convertible to office spaces. For a community transitioning to a more urban setting, this element is extremely important to accommodate a diverse clientele.

From here, a few measures were taken to add natural lighting as well as accentuate the natural lighting we already receive. Physically, a light-wall transom in the west wall plumbing cavity allows for optical fibers to transport natural lighting outside of the



Source – Team Photos

house through a sealed cavity and spread across the bathroom west wall. Additionally, the east wall of the bathroom is peppered

with a light wall that transmits ambient light. It is small enough to ensure complete privacy, yet large enough, in number of fibers, to add a significant amount of light to the bathroom. This measure will save money on the energy bill as well as create a better, passively lit environment. Lastly, to make our natural lighting go further, the entire interior is finished in white. With this, lighting will be accentuated and reflected on white finishes to seem brighter.

Source – Team Renderings

The Project ll Synthesizing Systems

With a simple form and complex detailing, the final step was to ensure consistency for our target market and tie everything together. We poured over data-based information such as the average household income ($54,012) and the average number of people per household (2.8), then compared that to qualitative information we gathered from the city and neighborhood councils. Using visuals to garner feedback, we made sure that the complex facade superstructure would add depth and texture that is appreciated by the Richmond community. Working with the numbers with an engineering analysis, space was delegated accordingly to accommodate thick walls and reduce unnecessary space. Lastly, an important part of our design philosophy and our conscience required us to avoid sacrificing quality for affordability. The method being to find high-caliber, sustainable materials with a comparable life cycle cost to more inexpensive alternatives. Using wool over fiberglass, recycled tiles, recycled wood, and completely wooden structures was the result. In addition, providing a large deck space through efficient roof utilization and massive south fenestration gives a seamless, beautiful transition to the outdoors. Qualitatively, our story was compatible with our design decisions and material choices. The next step was to tie together our technical products and integrate systems to work

Source - https://www.pinterest.com/pin/419468

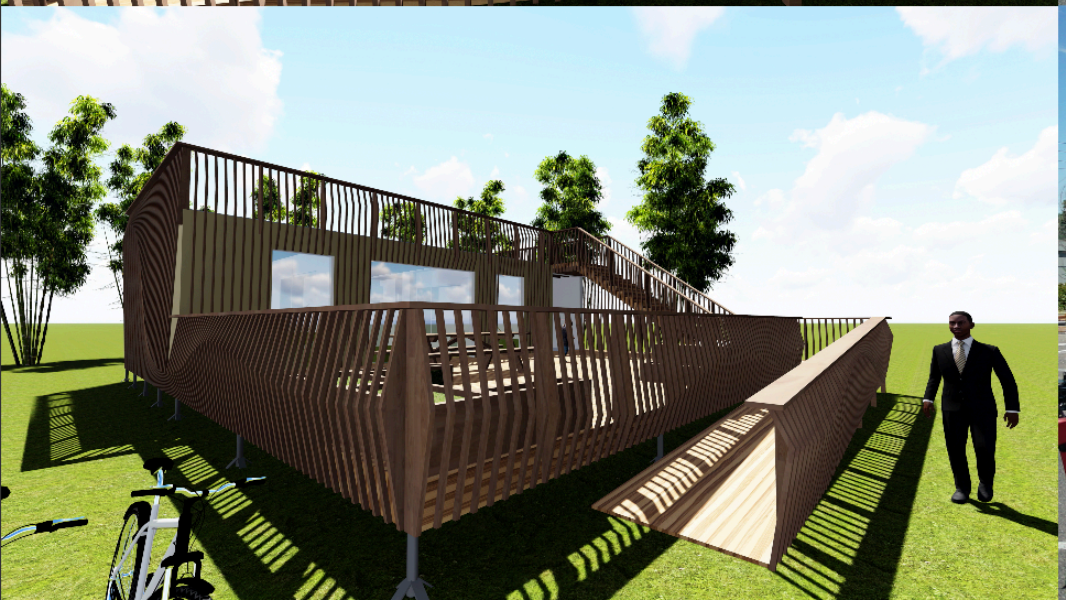
together efficiently.

In our envelope, OSB sealed with Pro Clima's Tescon Vana tape is topped with ½" Drywall for an air tight conditioned space. As a barrier to the exterior, high performing Havelock Wool insulation works well with the breathable Pro Clima Solitex Mento waterproof membrane and OSB on the exterior. This airtight, watertight, and structurally sound element of the facade is an excellent base for panel siding and the facade superstructure that add a finished, complex look to our project. With a ¾" gap for air and moisture to travel under the panel siding and superstructure, these products will last longer and remain appealing for many years.

The next integrated system involves our MEP. Starting at the front entrance, a lower dropped ceiling (eight feet in height) and hallway creates the first impression. Moving into the kitchen and out into the living room, the ceiling raises and becomes recessed into the joists, both exposing the structure and increasing the ceiling height to almost ten feet as you move through the large french doors into the spacious deck. With this effect and our wet/dry modular design, ductwork and electrical work are hidden within the dropped ceiling with electrical spreading into the walls as it enters the dry module. Plumbing moves to a chase in the west wall for a stacked system, and systems are only exposed in the mechanical rooms for ease of access and demonstration.

The final major theme of our simple, low energy home involves integrating low energy systems and lighting with our concept. Only one facade contains openings to emphasize the application in infill lots, however, combined window doors provide 140 square feet of transparent space allowing light to penetrate deep into the smaller home. Where light cannot reach, this natural lighting aesthetic is complemented by low-energy LED lights. In addition, optical fibers installed as a test-piece in the west wall will transport natural light into the bathroom when available. With minimal stress on the solar array and battery, these high efficiency window doors (R10) and LED lights work hand-in-hand to cultivate a sustainable experience.

Architectural Photographs

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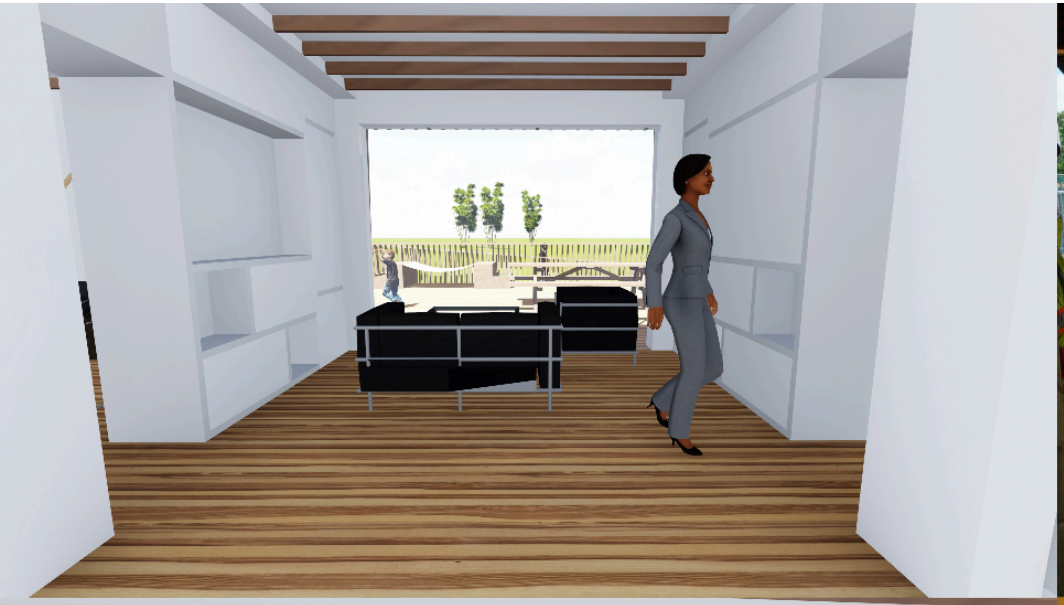


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