

TEAM LAS VEGAS

PRESENTS

Sinatra
LIVING

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UNIVERSITY OF NEVADA LAS VEGAS

U.S. Department of Energy Solar Decathlon 2017
Jury Deliverables

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FOREWARD

Life begins when you start living passionately.

We designed a home that helps you live passionately by embracing every moment, simplifying your life, and giving you freedom. Sinatra Living is an energy-efficient and health-conscious home for active aging citizens of Las Vegas and beyond.

U.S. Department of Energy Solar Decathlon 2017 — Team Las Vegas

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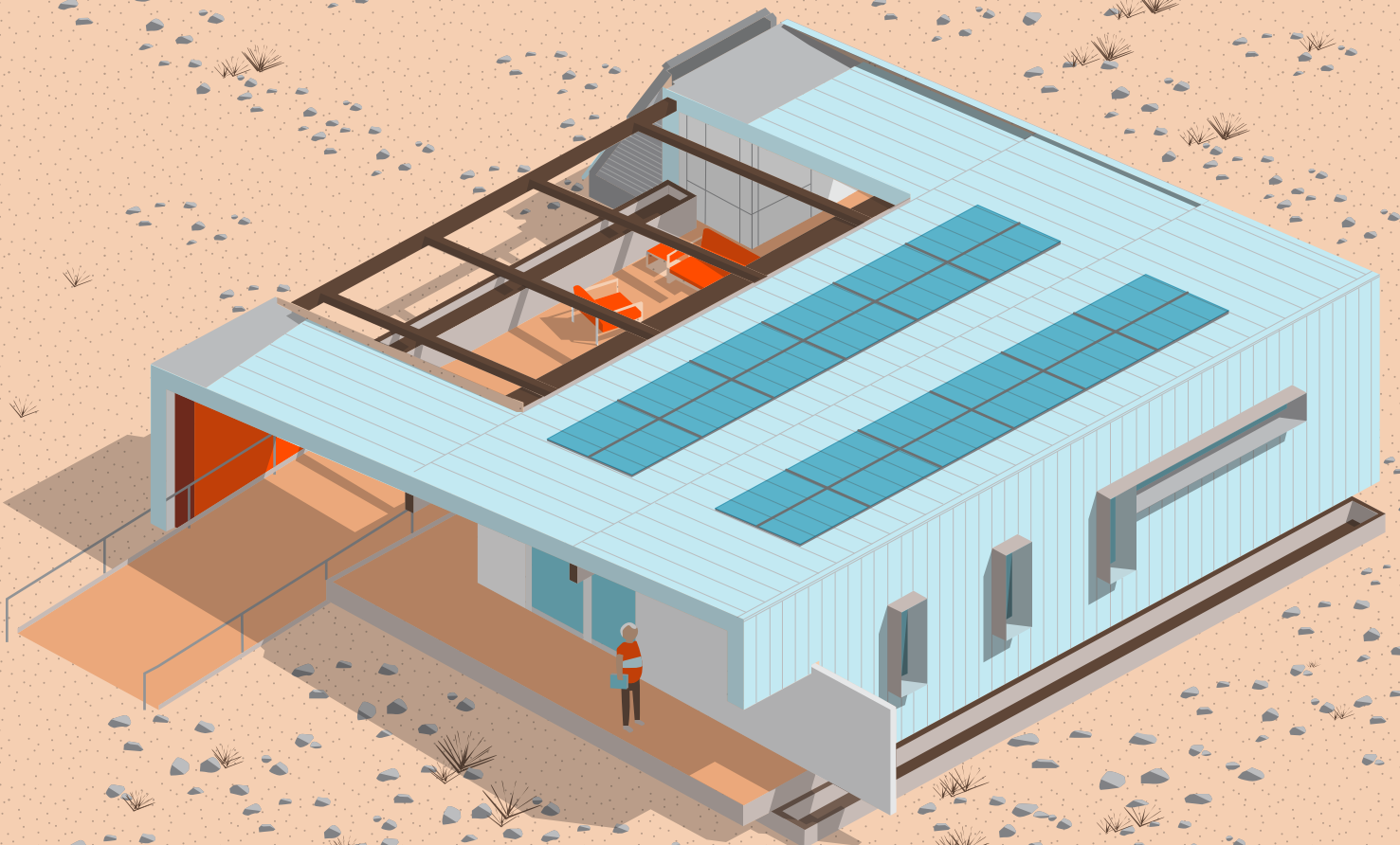
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ARCHITECTURE

From core to shell, form and function marry to introduce desert living as well as healthy living, creating an accessible full living solution for active aging.

The design approach was guided by the team's target client selection. The team recognized retirees as a growing demographic.



SINATRA LIVING

History

Las Vegas has a rich history rooted in passionate living. In the 1950's and 60's, Las Vegas was a place unlike any other: it was daring and bold. Architects like Dan Palmer and Bill Krisel designed some of the most iconic homes during the Modern period. These homes are still in high demand, and recognized by historic preservation societies.

In the late 70s and 80s Las Vegas quickly expanded and resulted in a housing boom. Homes took minimal consideration of the desert environment or promoting healthy living for its users. A rapid population growth through the 80's and 90's resulted in an even quicker growth of these home types. These homes make up the majority of housing in Las Vegas today. **The Sinatra Living design team wanted to bring back the mid-century modern style that characterized the homes of classic Las Vegas.**

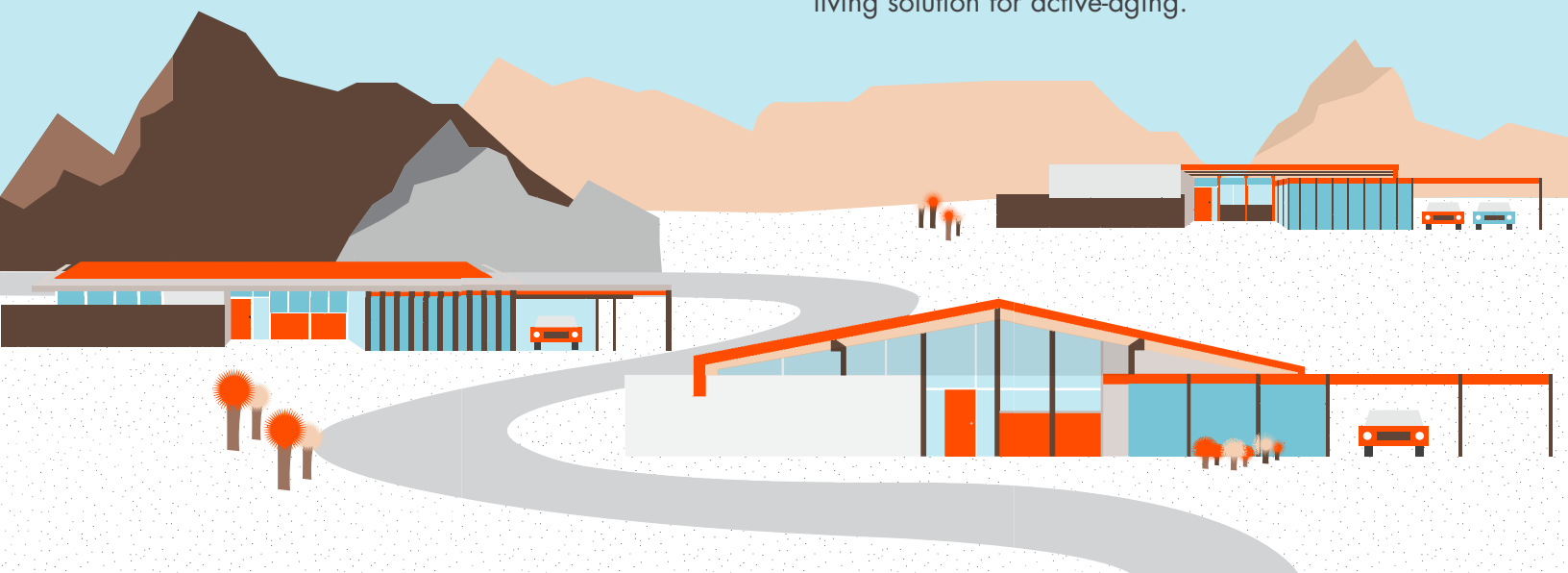
Design Approach

The design approach was guided by the team's target client selection. The team recognized retirees as a growing demographic.

Las Vegas is known for its expansive retiree population and communities. However, not every design supports active-aging and healthy living. This is an issue that the team aims to solve with their prototype home.

A rich history met with an aging demographic prompted the team to select a unique and suitable name for the home. The team decided on Sinatra Living. The marketing and design team were inspired by Frank Sinatra's music. As a famous Las Vegas icon, his music symbolizes living passionately and living life to the fullest.

Sinatra Living has 3 goals: to help the homeowner to live passionately by simplifying their life, embracing every moment, and giving them freedom. Passionate living encompasses sustainability, healthy living, and smart automation technology. The history of the past combined with technology of the future creates a full living solution for active-aging.



Here is Team Las Vegas' vision of an energy-efficient and health-conscious home for active aging citizens of our local community and beyond.

Our home helps
you live passionately by

**embracing every moment,
simplifying your life, and
giving you freedom.**

In everything we do, we are —

1 Simple

Adaptable Design

Provide an open, naturally illuminated interior design that adapts to the needs of persons who age in place, and may develop limited mobility and cognition.

2 Personal

Maximum Comfort

Attain an energy efficient performance that also maximizes occupant comfort, through radiant heating, energy recovery ventilation and ductless air conditioning.

3 Reliable

Responsive Health

Provide networking capabilities to facilitate communications among occupants, family and professionals that improve healthcare outcomes.

DESIGNED FOR THE DESERT

Implementation

The Mojave Desert is an exciting and challenging environment for desert architecture. Sinatra Living is designed for the desert, and aims to demonstrate desert living at its finest.

Sinatra Living's architectural form is based on a core and shell. The core is composed of private and social spaces. The shell is a protective outer layer from the harsh desert climate. The design team carried and refined this design from concept to construction. Through many iterations, the design became a practical building solution for our target clients.

Architectural Composition

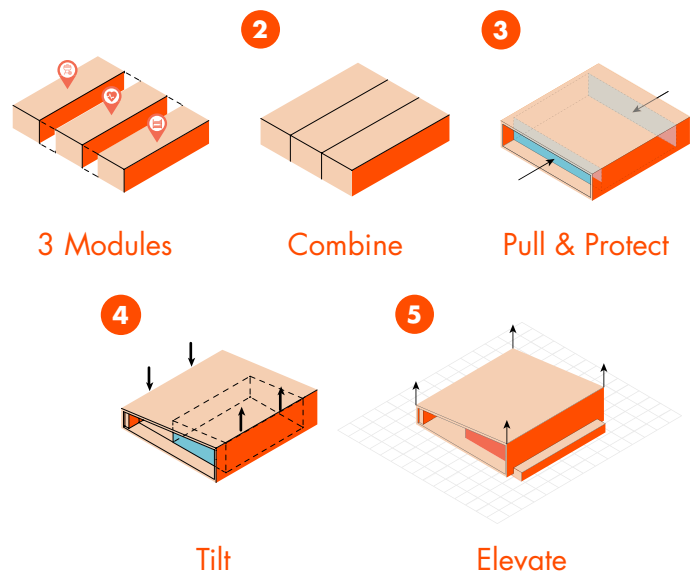
At 965 square feet, the home is spacious and fully accessible. Transportation constraints and accessibility determined the home's ideal orientation and modularity. Massing studies determined that a rectangular form oriented south offered superior energy performance. Last, configuring a space plan that is comfortable and wheelchair accessible determined the final square footage.

The home is split in two modules that will be transported to the competition site on custom mobile home chassis. A third module, although not on a chassis, extends the living space to the southern deck. The arrangement of the modules lends itself to the daily activities from private, to social, to nature, and back.

Deep overhangs on the east and west sides of the modules reduce direct heat gains through the envelope of the home. The roof is tilted to optimize energy production and creates Sinatra Living's iconic roofline. The roof line unifies the two modules and extends to the car charging station and integrated mechanical pod.

An generous outdoor deck adds an extra 1700 SF of outdoor living. The deck provides space for meditation, outdoor exercise, gardening and dining. Ample shading and large sliding doors create an indoor-outdoor transition from deck to living space.

The deck, mechanical pod, car charging station, and their connecting roofs are modular. These parts can disassemble from the main house structure for transportation. The two main house modules attach to high-capacity axles for transport via semi-truck. This system allows for quick re-assembly on-site.



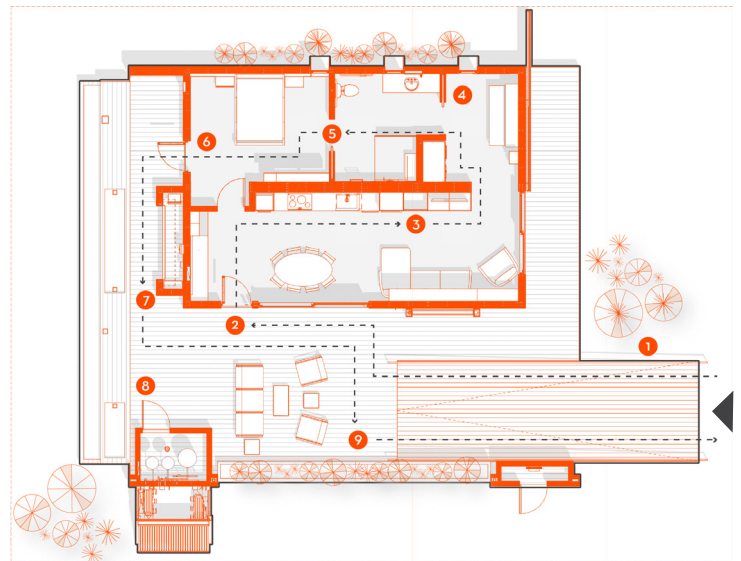
Lighting Design

Balancing daylight with summer heat gains was a primary concern during the design progress. Combined studies of daylighting, energy modeling, and passive ventilation determined glazing placement and material selection. The goal was to create an accessible, energy-efficient and beautiful experience with strategic lighting design. Daylighting calculations of each room determined the amount of glazing used. The team selected exterior doors and double-pane windows from Glo Windows. These windows meet the energy efficiency, aesthetic, and accessibility goals of Sinatra Living.

The artificial lighting design also supports the target clients for everyday tasks (see Engineering Appendix). Daylight sensors throughout the home to supplement with artificial lighting in overcast conditions. Artificial lighting meets the competition requirements of 300 lux.

Exhibition Tour

Sinatra Living's bold and unique roof-line creates a memorable image in the minds of visitors. The team's tour route (fig. x) allows for competition visitors to get a full tour of the home. A 10'-10" wide ramp allows for a comfortable queuing experience. Visitors are able to take photos and share them on social media. Integrated display boards throughout the home describe its key features. Additional information is provided through the home's Amazon Alexa home automation system.



- 1 Introduction** — Architectural Concept, Aging In Place
- 2 Southern Deck** — Green Wall, Glazing, Wall Assembly, Shading
- 3 Social Module** — Home Automation and Interior Design

- 4 Flex Space** — Acoustics, Lighting, Heat Pumps
- 5 Bathroom** — Fall Detection, Accessibility and Plenum
- 6 Bedroom** — Radiant Floor Heating, Critical Loads, Lighting, Monitoring Bed

- 7 Electrical Room** — PV System, Battery + Inverter
- 8 Mech Pod** — Solar Thermal Tanks, Evacuated Tubes
- 9 Garden** — Greywater Reuse, Filtration, Rainwater Collection, Charging Wall/Car Port

MATERIALS

Finishes

Aging well in the desert, the home's materials aid in energy performance and fit our aesthetic. Architectural finishes are simple, personal, and reliable.

The entire outer layer of the home's shell is clad with a combination of standing seam metal and metal panels. Light grey materials used on the roofing area increases solar reflectance. Dark grey materials used on the home's fascia emphasizes the iconic roof silhouette. Although metal collects heat during the day, it is able to cool down much quicker than other roofing materials. This prevents radiating heat into the building throughout the night.

Heat-treated pine, used on the inside of the home's outer shell, provides warmth and comfort. The same material covers the deck and transitions into the interior as a ceiling finish.

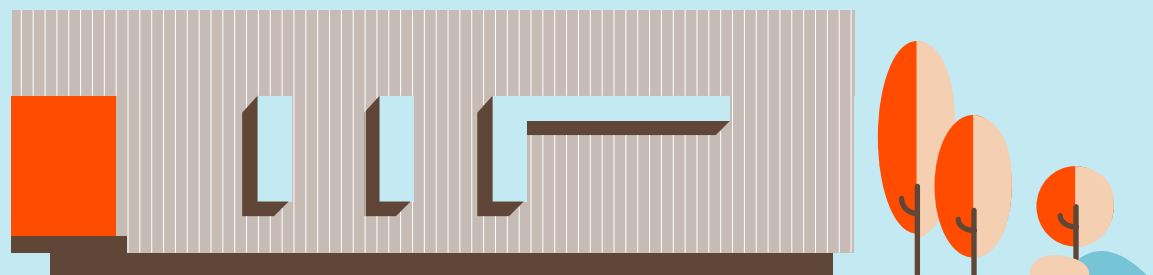
White fiber-cement panels, used on the facade of the home, reduce heat absorption. Reduction in weight is important for reducing risk of damage during transportation. This material also acts as a great ventilated rainscreen. This helps reduce heat transfers through the wall envelope. To save money, homeowners can replace the panels with an Exterior Insulated Finish System (EIFS) as well.

Construction

Builders in Las Vegas today can adopt the methods Sinatra Living used to increase energy performance. The construction team utilized laminated veneer lumber (LVL) for strength and superior interior finish level. Using LVL allowed us to frame at 24 inches on center, versus the traditional 16 inches. Fenestrations used in advance framing remove the need for trimmer studs and allow for more insulation to increase envelope performance.

To prevent air leaks caused by framing, we spray one inch of closed cell spray foam against the sheathing. This also adds an extra layer of rigidity to the walls. The rest of the cavity is filled with open cell spray foam to save cost. The team also calculated return values, to determine optimal wall thickness and r-value. (See Appendix #). This entire process has higher costs, but the long-term energy savings are worth it.

An R6.5 Zip Sheathing System breaks thermal transfer from sheathing to studs. This system also helps us save time and labor during the waterproofing stage. Thermal bridging between the steel chassis and subfloor is mitigated with a continuous neoprene gasket. Air leaks are minimized by sealing the door and window frames to studs with an expanding foam gasket.

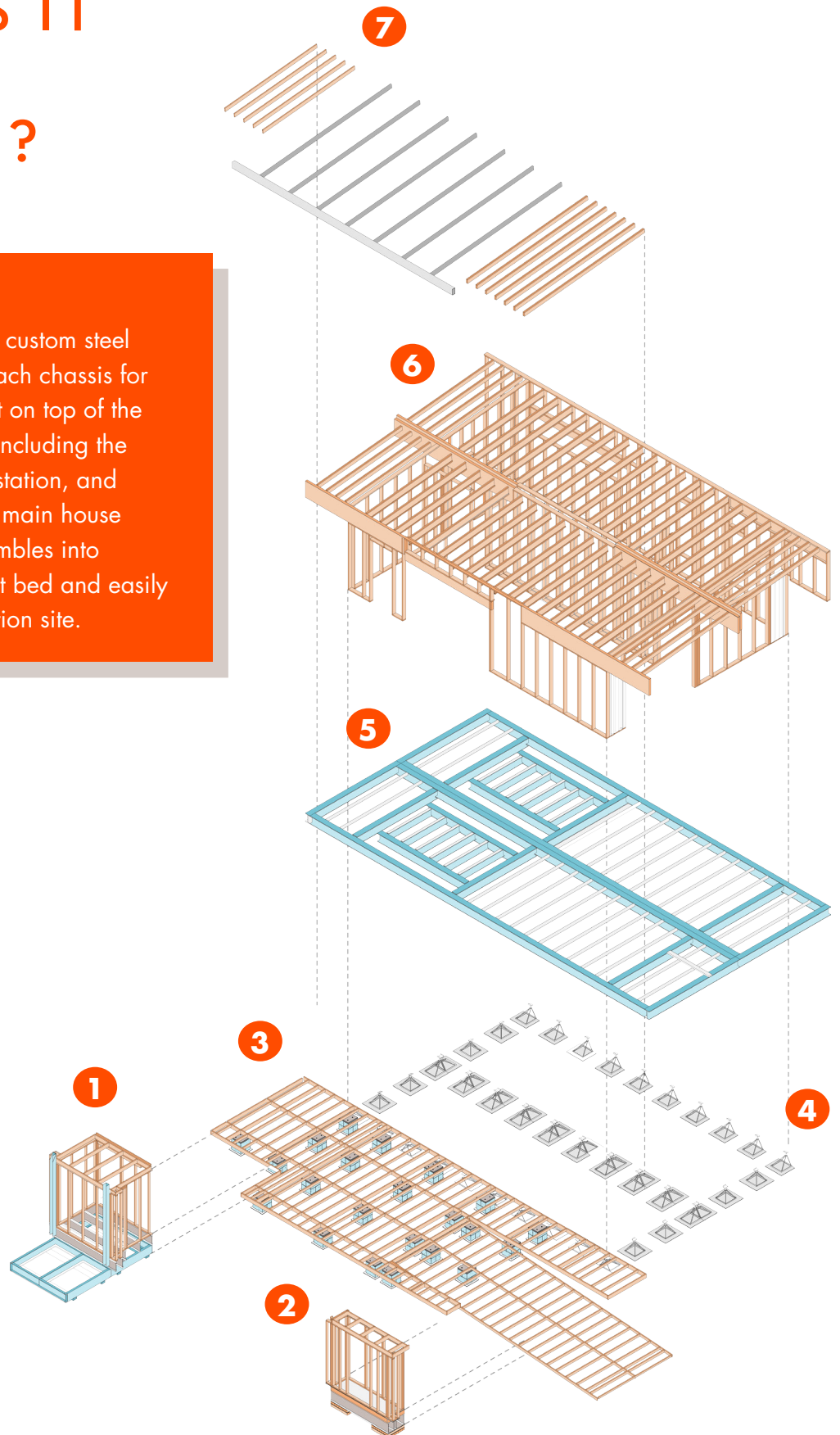


HOW DOES IT COME TOGETHER?

Assembly

The home is constructed on two custom steel chassis. Three axles attach to each chassis for transport. A wood frame is built on top of the chassis. Modular components, including the mechanical pod, car charging station, and trellis structure, detach from the main house for transport. The deck dis-assembles into components that can fit on a flat bed and easily be re-assembled at the competition site.

- 1 Mechanical Pod
- 2 Car Charging Station
- 3 Outdoor Deck
- 4 Foundation Footings
- 5 Steel Chassis
- 6 Advanced Framing
- 7 Trellis



PROCESS & DOCUMENTATION

Integrated Project Delivery

Team Las Vegas (Sinatra?) was provided the opportunity to work with an independent project management and leadership consultant, Anne Smith, PE, of Smith Culp Consulting. She coached the team monthly on project team development, overall project planning and scheduling, communications, and conflict resolution tools and techniques in alignment with Integrated Project Delivery (IPD).

The initial coaching workshop brought together the Project Manager (PM) and team leaders to start the leadership team formation and building trust process by creating a Partnering Agreement (attached?). This included developing mutually agreeable goals related to how the team would communicate, resolve issues and treat each other to get the project done collaboratively. The team leaders also learned in depth about their own individual working preferences through the Myers Briggs Type Indicator (MBTI). They also discussed as a team how to work effectively using the personality preferences knowledge and skills with other team leaders and team members so all could fully contribute to a successful project. The PM, team leaders and all team members committed to and signed the Partnering Agreement at the first full team celebration BBQ following the workshop.

Design and construction project management meetings with the coach have focused not only on detailed planning for the nextech competition deliverable, but also on proactively looking ahead at the critical path elements (e.g. such as getting the chassis delivered on time) and planning for potential issues out of the team's control (e.g. manufacturing time). The team has brainstormed "What If" scenarios to develop

strategies to either prevent issues that would affect schedule, budget or quality, or handle the issues if they weren't preventable. These strategies, action plans and other decision-making steps by the PM and team leaders have been documented and shared with all team leaders and affected team members after the meetings. This meeting process has relieved bottle-necking in communication, has served as a platform for proactive decision making and kept the project activities focused and on track.

As conflicts or communication issues have arisen during the project, the team leaders have worked together collaboratively in alignment with their partnering goals to make tough decisions for the overall benefit of the project, and have learned and implemented conflict resolution techniques. When individual team leaders experienced conflicts that affected the internal team functioning, they resolved the conflicts through a Mediation model of **Individual Listening, Perception Checking, Exploring Options, Finding a Mutual Solution, Acknowledgement of Each Other's Contribution.**

The PM and team leaders have used the project management meetings with the coach to judge project progress and have also conducted reviews using outside experts to assess the quality of the design and construction. These assessments have led the team to quantify the changes and revise the plan on a regular basis during the monthly project meetings to ensure meeting continued attainment of the competition schedule.

VISUALIZATION

BIM

The team also utilized a detailed BIM model during the design and construction phase. This model helped to resolve field issues, and represent certain scenarios to contractors. The team also used Modelo to view detailed 3D models of the home on mobile devices.

VR/AR

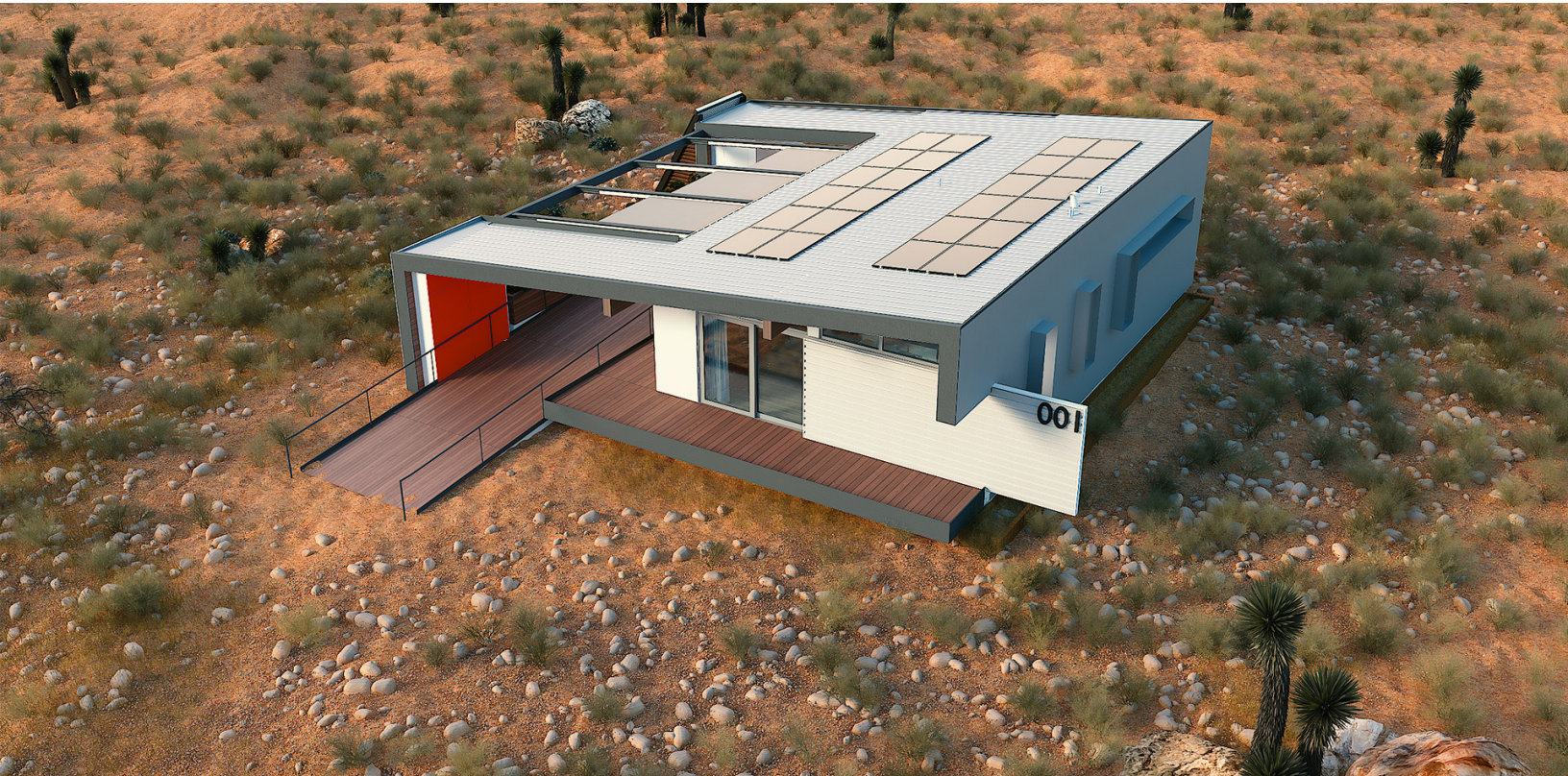
Using virtual reality, the team was able to present their competition prototype. Individuals were able to experience the home before its construction. This helped represent the project to donor groups, focus groups, and the general public. Augmented reality was used for design communication between student works on site. High-quality renderings were also used to represent the project on social media and the Sinatra Living website.

Sinatra
LIVING

ARCHITECTURE APPENDIX

APPENDIX - ARCHITECTURE

Renderings & Photography



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