

# At Home with Innovation:

## Energy and Material Efficient Strategies

Passive Cooling/Heating

Ventilation

Advanced Materials and Products

Prefabrication

Fossil Fuel Free

Efficient Use of Space





# Passive Cooling and Heating

## Thermal Masses

Thermal masses, like concrete floors, stucco walls, and concrete block walls, help regulate the temperature over the course of the day — absorbing heat during the day and releasing it at night.



Concrete Floors



Stucco Walls

## Eave Depth

Calculated via solar studies, the depth of the eaves is sized to keep sun off the windows during the hot months, while allowing the warming sun to penetrate the home during the colder months.

These images show the angle of the sun at noon on both the summer and winter solstices.



June 21, 12pm



December 21, 12pm



# Passive Cooling and Heating

## Window Placement

The location, orientation, and size of the windows have been designed carefully to ensure that each space has sufficient light throughout the day, without the need for artificial lights. Locating windows on more than one side of each room provides balancing light, limiting glare.

The use of clerestory windows throughout the home allows for light, privacy, and minimal solar heat gain.



Plenty of Natural and Balancing Light



Balancing Light and Privacy

## Reflective Cladding and Roofing

White surfaces are particularly effective at reflecting the hot sun and help keep the building cool. South- and west-facing walls and roofs are the surfaces most susceptible to overheating.



Reflective Cladding



Reflective Roofing



# Passive Cooling and Heating

## Shading Structures

Shading structures prevent sun from shining on surfaces, while providing the space for cooling air to circulate beneath them.

The pergola on the lanai has been designed using solar modeling to determine the precise angle and spacing of each aluminum fin, to achieve complete coverage throughout the day.

The solar panels nearly shade the entire conditioned space under the upper roof. With a 5-inch space between the panels and the roof, cooling air can move freely between the two.



Pergola



Solar Panels

## Plantings

Vegetation next to the building, particularly to the south, absorbs heat that would otherwise be reflected back into the building, while providing evaporative cooling.

Trees and hedges to the west help shade the building from the harsh afternoon sun.



Plantings to the South and West



Plantings to the South



# Ventilation

## Natural Ventilation

Natural ventilation is achieved through operable windows and walls. When open, they promote cross ventilation of spaces, cooling them naturally through air movement.



Operable Walls - Closed



Operable Walls - Open

## Mechanical Ventilation

Equipping every living space with a fan supports the operable windows and walls in promoting air movement, thereby cooling the spaces and extending the season during which air conditioning is unnecessary.



Great Room Fan



Children's Room Fan



# Advanced Materials and Products

## Engineered Wood Products

Engineered wood products comprise the framing of this home. Their use reduces the number, age, and size of trees used to create the structural material.

Engineered wood products are also more stable, more durable, and stronger than conventional framing lumber, reducing the required size of the structural members.



Laminated Strand Lumber and Oriented Strand Board



Laminated Douglas Fir Beams, with Structural Old Growth Veneer

## Thermally Modified Timber

Thermally treated woods have been baked at very high temperatures, changing the chemical composition of the wood, rendering it more durable, stable, resistant to decay, and resin-free.

The modified wood is naturally darker due to this treatment. The ash and birch here have only been coated with a UV sealant.



Thermally Treated Ash



Thermally Treated Birch



# Advanced Materials and Products

## High Efficiency Windows and Doors

Marvin carries a full suite of wood-framed, aluminum-clad, thermally broken windows and doors with low E3 coating, and argon gas-filled insulating glass.

Marvin's lift-and-slide door carriage system lifts the panels off their track for smooth operation and lowers them again to create a tight seal for protection from the elements.



Lift-and-Slide Doors



Awning and Fixed Windows

## Low Voltage LED Lighting

LED lighting has a longer lifespan than traditional light sources. It is also much smaller and has significantly lower energy consumption, reduced maintenance costs, and a higher safety rating.



Posable Track Lighting



Concealed Strip Lighting



# Fossil-Fuel Free

## Photovoltaic Solar System

This is an 11.77 KW system composed of 36 SunPower solar panels with integrated microinverters, covering 632 square feet. This system produces approximately 24 kWh per year, which represents 200 pounds of avoided CO<sub>2</sub> emissions.



Stanchions for Solar Panels



36 Installed Solar Panels

## Electric Appliances and Systems

All appliances and systems, including the clothes dryer, the on-demand hot water heaters, and the heat pumps for the pool and spa have been chosen for their efficiency and are powered by electricity.



Induction Cooktop



Heat Pumps, On-Demand Hot Water Heater, Etc.



# Prefabrication

## Material Efficiency

When wall panels and other components are fabricated in the factory, very little building material is wasted.

## Fewer Site Trips

Fewer site trips are necessary when less material is brought to the site.



Wall Panels Built in a Factory



Delivery of Prefab Package

## Minimized Construction Waste

Assembly of a prefab package generates little on-site waste.

## Airtight Building

The precision in the construction of a building with factory-made components leads to a level, plumb, square, and true building. This simplifies the application of finishes, and leads to a more airtight building.



Assembled Structure of Prefab Package



Level, Plumb, Square, and True



# Efficient Use of Space

## Integrated Cabinetry and Casework

Shallow built-in storage throughout the house provides easy-to-access spaces for everyday items. Integrating storage into the architecture ensures that the space dedicated to storing things can be kept to a minimum.

Using the periphery of the living spaces for the built-ins not only allows for easy access from zones of movement, but also provides a privacy buffer between rooms.



Bookcase, Low Cabinets, and Drawers



Full Height Cupboard and Integrated Sideboard



Kitchen Cabinetry



Bedroom Ensuite Cabinet with Drawers



# Efficient Use of Space

## Transformable Furniture

A home that accommodates various stages of life eliminates the need for moving to a new home, building an addition, or purchasing different furniture—all of which are expensive and inefficient undertakings.

In its 2100 square feet, this home can transform to satisfy numerous scenarios:

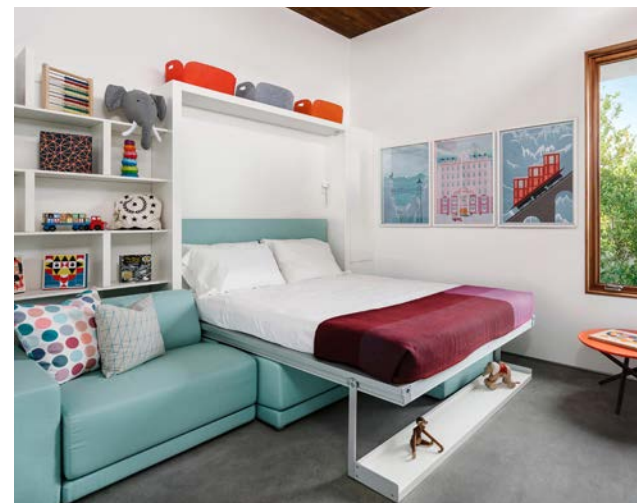
- three ensuite bedrooms, sleeping a total of 8, all with private pool access
- a master suite, with a junior master suite and a hobby room
- a master suite, with a children's room and den
- and other configurations



Children's Room



Hobby Room/Bedroom with Desk



Secondary Bedroom



Hobby Room



Den



Junior Master Bedroom



# Efficient Use of Space

## Multi-Use Spaces

Spaces can take on multiple functions — increasing the usability of both the house and its site, and removing the need for additional dedicated spaces:

A living room daybed can become poolside lounging by sweeping away a wall of glass.

A home office or den can also double as a storage hub for the home or as a passage to spaces beyond.

Zones of movement, when integrated into the function of the room, can remove the need for dedicated circulation, thereby reducing the size of the building.



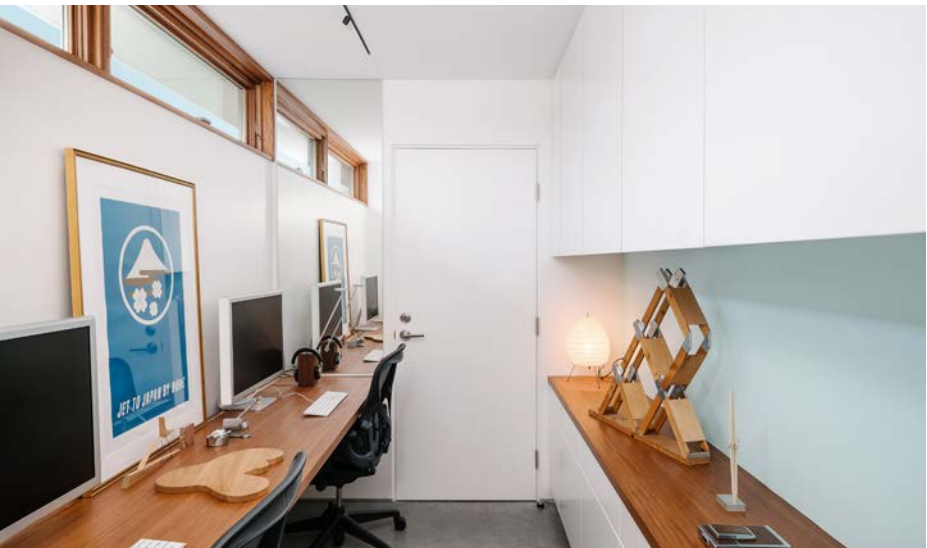
Living Platform - Outdoor Seating



Living Platform - Indoor Seating



Den/Storage Hub



Office/Storage Hub