

PROJECT SUMMARY

As a team from Monash University in Australia, Surreal Estate proposes a net-zero energy, bushfire-resistant, suburban single-family home of the future. We have focused on sustainable design and innovation to bring forward a competitive house that does not compromise on comfort.



Figure 1: Rendering of Single Suburban Family home design

Our aim was to optimize design in order to create a home that would be fire-resistant and affordable, as well as reaching a net-zero energy target. This design is a result of surveying the devastation caused by the bushfires in Australia over the past year. Record-breaking temperatures and severe drought led to the deaths of at least 24 people and 1 billion animals, leaving 12 million acres of land scorched¹ (an area the size of the U.S. states of Vermont and New Hampshire combined). Climate change and resource scarcity require shifts to renewable energy sources and reductions in energy consumption in every sector of the economy to ensure resilience in the face of extreme weather events. Monash University stands by the motto ‘Ancora Imparo’, meaning ‘I am still learning’. Our team believes it is imperative to learn from past misfortune and take action where possible to learn from past devastation. The purpose of the suburban single-family home presented by Surreal Estate is twofold: 1) to protect the environment by standing operating at net-zero energy, and 2) to protect families by introducing fire-resistant housing.

Our industry partners for this design competition included Aquarevo and Jacobs, who have been invaluable in providing production considerations and experience. We have also benefited from the knowledge and advice provided by our lecturers at Monash University, including Brandon Winfrey and Victor Bunster, both of which are based in the Department of Civil Engineering.

RELEVANCE OF PROJECT TO COMPETITION GOALS

The Solar Decathlon challenges teams to design and build the most efficient, affordable and innovative homes. In order to have an impact on the housing industry, our design must be attractive to families in suburban Australia.

Surreal Estate desires to provide families in Australia with a home that can combat the annually occurring wildfires while improving the environment. This challenge requires innovation and forward-thinking from our engineers and architects and has a positive impact on the world we are living in.

DESIGN STRATEGY AND KEY POINTS

Our team decided on a triad of key points for our design strategy. These priorities included creating fire-resistant suburban homes which are net-zero energy and affordable for the average Australian family purchasing their first home.

On the basis of this, our initial focus was finding an appropriate location, where a typical Australian home would be impacted by bushfires. As a team, we chose to design a home in the Melbourne suburb of Tarneit.

This is a growing suburban area in Melbourne, Australia, with a climate zone of 3, similar to that of San Francisco, California. This area allowed us to focus on the realistic struggles a new family would face when moving to the suburbs.

Our goal was to ensure that we could incorporate all the innovation needed for fire resistance, while still catering to the environmental and financial interests of our home buyers.

To reach necessary conclusions about our target demographic, our team had to survey young families looking to buy their first home in the suburbs. Our team analyzed market data and researched potential buyers in order to adjust our design accordingly.



Figure 2 Triad of Key points

PROJECT DATA AND TECHNICAL SPECIFICATIONS

Table 1: Project Data and Technical Specifications

<p>Location: Tarneit, Victoria, Australia</p> <p>Climate Zone: 3 (Melbourne has a climate similar to San Francisco, CA)</p> <p>Lot size: 6,039 ft²</p> <p>Building size: 2,174 ft², 1 story</p> <p>Annual Utility Cost Estimate: \$1,228 USD</p> <p>Construction Cost Estimate: \$190,611 USD</p>	<p>Envelope: R-30 wall, R-31 foundation, R-53 roof</p> <p>Windows U-values: 0.24</p> <p>HVAC SEER Rating: 20.0</p> <p>HVAC type: Central air source heat pump</p> <p>Ventilation: Ceiling mounted ducting system</p> <p>Energy: 6 kW PV array with a 10kWh battery</p>
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