

# Tree House Condominium **HOME WITH A GREEN HEART**

Text by Ann Teo and Stephanie Gautama  
Images as credited








## PROJECT CREDITS

**Location:** 60 Chestnut Ave, Singapore **Client:** City Developments Limited **Completion Date:** July 2013 **Lead Architect:** ADDP Architects LLP **Lead Landscape Architect:** COEN Design International Pte Ltd **Interior Designer:** Axis Architects Planners Pte Ltd **Civil & Structural Engineer:** DE Consultants (S) Pte Ltd **Mechanical & Electrical Engineer:** United Project Consultants Pte Ltd **Quantity Surveyor:** Langdon and Seah Singapore Pte Ltd **ESD Consultant:** Arup Singapore Pte Ltd **Main Contractor:** Tiong Seng Contractors (Pte) Ltd **Landscape Contractor:** Scenic Landscape Pte Ltd **Water Feature Contractor:** Men's Pool (Pte) Ltd **Site Area:** 22,700 m<sup>2</sup> **GFA:** 52,437 m<sup>2</sup>

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 On a dewy morning after a downpour, mist was rising from the forested valleys of Bukit Timah Nature Reserve. We stood on the Tree House condominium's 19th-storey sky terrace that is perched in between the two sections of what is now the world's largest vertical garden in the Guinness World Records. The resident condominium manager, Mr. Phua, took us along his maintenance supervision rounds to the backstage of this green edifice. Our view from the sky terrace opened out to survey the leafy canopies of large rainforest trees. It is a rare luxury to be able to enjoy this sight daily in highly urbanised Singapore.

As we walked, a bee drifted by and nuzzled into a *Thunbergia* blooming on the green wall. "I didn't know bees can fly so high," Mr. Phua commented. "It is quite amazing how they can fly up so high." The bee had floated up its natural range to reach the sweet nectars of the flowers blooming on the green wall. While some residents may have qualms about seeing bees, in truth, bees do not bother people unless they are disturbed. Bees are also critical to civilisation's continuity as they are the sole agents of pollination for key crops. Furthermore, they are a positive sign that the residence is becoming integrated with the ecological network of this habitat.

### The Site

The location where Tree House is built was originally a wooded grassland corridor adjacent to the Zhenghua Park that is connected to the larger Bukit Timah Nature Reserve. The condominium was the first high-rise development to be introduced to this quiet estate when it was first bought by City Developments Limited in 2009. The developer had made a conscious decision from the outset to build a sustainable development and minimise disruption to the local ecology. A Biodiversity Impact Assessment (BIA) was formally commissioned and carried out by wildlife ecologist, Subaraj Rajathurai, to survey the diversity of the site's flora and

fauna. The BIA found 99 species of animals inhabiting the original site, including 5 mammals, 53 birds, 3 reptiles, 6 amphibians, 24 butterflies, and 8 dragonflies. Of these, 12 species are considered threatened, including the melodious songbird, Straw-headed Bulbul (*Pycnonotus zeylanicus*), and the rare Common Birdwing Butterfly (*Troides helena*).

### The Idea

The initial idea of "bio-shielding" was first conceived by ADDP Architects as a means to mitigate the urban heat gain from the building gable-end facing the most sun exposure on the westerly side. Inspired by the powers of leaf photosynthesis that harnesses the power of the sun for growth, the design team dreamt up an extensive green wall that could cover the entire wall. This green wall is intended to mitigate the urban heat gain and utilise the strong sun exposure to create lush vegetation cover, hence the term "bio-shield". Research has suggested that shading the building façade with lush vegetation can lower the building surface temperature and indoor ambient air temperature considerably, thereby reducing the electrical consumption of the residence as a whole.

Visually, the green wall was conceptualised as a natural extension of the surrounding parks that would form a continuous tapestry of greenery that climbs up the architectural façade. The connectivity between the ground and green wall was achieved by creating a seamless trellis connection that tapers up from the ground level. The xylem-inspired white aluminium laces up the green wall and adds a finishing that identifies with the design language of the rest of the development.

### Green for the Long Run

The developer was excited at the idea from the very beginning, although also cautious of this design investment, as a green wall









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1. The green wall façade at Tree House extends the lush landscape of Zhenghua Park around it (Photo: Cheng Pheng Lim).

2. Aerial view of the lush Tree House landscaping from the higher floors of the residence (Photo: Cheng Pheng Lim).

3. Brilliantly coloured koi fishes at the Misty Creek Cascade (Photo: Cheng Pheng Lim).

4. A lush cascade of *Vernonia elliptica* plants drapes over the opening at the basement car park for natural ventilation (Photo: Cheng Pheng Lim).

5. A close-up of the *Thunbergia grandiflora* climber blooming on the Tree House green wall (Photo: Cheng Pheng Lim).

6. Ornamental *Musa laterita* banana (Photo: Cheng Pheng Lim).



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design of this scale had never been implemented in a residence before. The big question that loomed on everyone's mind was: how is this 2,289-square-metre green wall going to be maintained in the long run, and how much would it cost?

All the commercially available green wall systems were considered at that time. For example, the panel system on swinging doors, cable climbers, and even the soilless hydroponics system were explored for feasibility. At the end of the day, however, these proprietary systems were deemed too costly to construct and maintain, and our team of architects and landscape designers went back to our drawing boards to devise our very own system that would be cost-effective, safe, and easy for the residents to maintain in the long run.

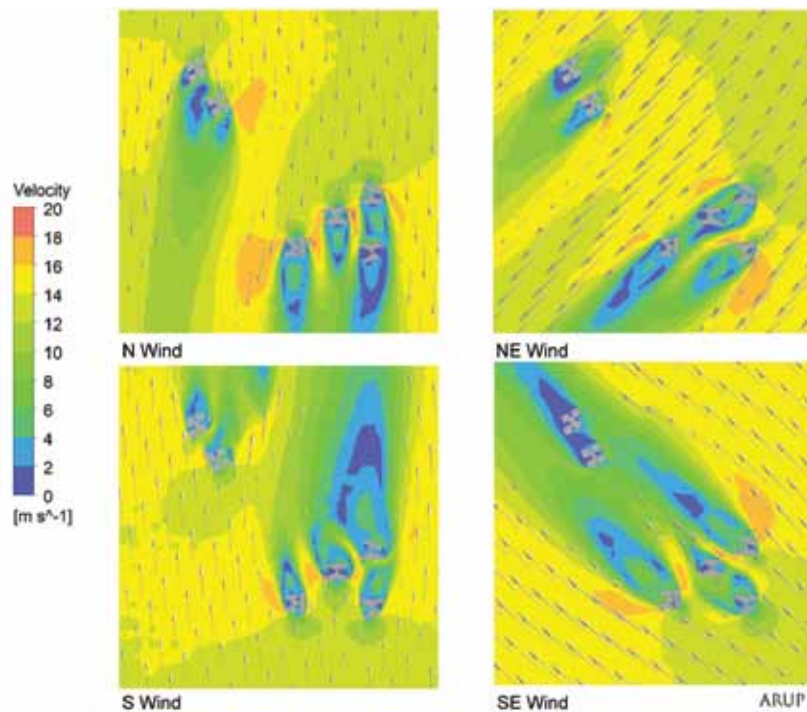
The result was a green wall system design based on the conventional planter and climber system. The planter was designed to be at least 600 millimetres in soil depth to create a robust substrate for the plants to put down their roots and retain sufficient moisture. These planters are located every two storeys, each with its own aluminium maintenance catwalk access, which is placed above the soil level of the planters to save space. Access balconettes with a small maintenance window are interspersed along the planters to create access points for pruning and cleaning dead leaves and other debris.



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Macro-scale computational fluid dynamics modelling to understand how the seasonal wind velocity affects the condominium was carried out to optimise the building orientation and apartment layouts (Image: Arup Singapore Pte Ltd).

The green wall also strives for sustainability in its electricity and water consumption. The roof of the tower collects rain and stores it in a rainwater harvesting tank for irrigating the green wall. By placing the rainwater harvesting tank at the rooftop, the automatic irrigation system does not need pumps to bring the water to the top of the green wall. Instead, gravity aids the flow of water down to the automatic drip irrigation and fertiliser system that runs parallel to the maintenance path.

The two species of plants dominating this green wall are *Thunbergia grandiflora* and *Bauhinia kockiana*. The fast-growing *Thunbergia grandiflora* is a popular vertical greening plant that creates an instant green impression. The slower-growing *Bauhinia kockiana* plant is interspersed in the planting to “catch up” with the *Thunbergia* and establish another layer of greenery. A third species of climber plants, *Quisqualis indica*, was interspersed randomly to enrich the potential of the green wall to become a butterfly habitat. This plant also adds texture as it habitually grows outwards instead of adhering to the green wall structure.

### More than Meets the Eye

While Tree House’s outstanding green wall has certainly garnered a high level of media attention recently, there are many more invisible green technologies embedded in the condominium’s

design. While planning the building layout, the design team, which includes the mechanical engineers at Arup Singapore, observed the seasonal wind pattern and the site’s locale so as to devise an optimal building orientation using computational fluid dynamics (CFD). The CFD modelling helped to generate a building footprint and unit layout that is most conducive to natural cross ventilation. With more passive cooling by the winds, there are opportunities for savings in the energy bills of residents as they will not require as much air-conditioning to enjoy their desired levels of thermal comfort.

The importance of having fresh airflow was also realised at the basement level where, instead of the extensive use of conventional mechanical ventilations, strategic openings were introduced to bring in fresh air from the ground level. These voids also bring in sunlight and create a view corridor to the gardens above it. Leafy creepers such as *Vernonia elliptica* drape over the opening and soften the hardscape of the car park. On the landscape deck, the openings to these voids are secured with railings, shrewdly hidden within planter beds and screened with lush layers of plantings so as not to disrupt the natural experience.

A bio-retention basin is implemented on the topographically lower southern perimeter of the site. Rainwater is directed to this under-











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99 species of animals inhabiting the original site,  
including 5 mammals, 53 birds, 3 reptiles,  
6 amphibians, 24 butterflies, and 8 dragonflies.

8. Measuring 2,289 square metres, the green wall was recognised by Guinness World Records in April 2014 as the world's largest vertical garden (Photo: Cheng Pheng Lim).

9. The chestnut-themed tree houses are tiered, with some elevated to a higher level for varied vantage views (Photo: Cheng Pheng Lim).

10. Spectacular view from the sky terrace perched in between the two sections of the green wall (Photo: ADDP Architects LLP).


11. The chestnut-themed tree houses provide a tranquil space for residents to hang out (Photo: Cheng Pheng Lim).

ground bio-retention basin, which captures stormwater runoff and slows it down via a series of filters. This mechanism results in a more evenly distributed stormwater discharge load and a considerable improvement in the water quality released.

The aboveground landscape water features, including the Secret Spring Pavilion, Misty Creek Cascade, and Discovery Pond, also demonstrate environmental friendliness. Instead of using chlorine to keep the water clean, the water in the Discovery Pond and Misty Creek Cascade is treated with bio-filters, while natural sea corals at the base of the pools keep the water at a stable water hardness level. Aquatic plants such as *Pandanus amaryfolius* and *Thalia dealbata* gracing the pond provide habitat opportunities for the native fauna such as frogs and dragonflies. Graceful koi fishes enhance the tranquil ambience and control possible pest larvae. The presence of a living ecosystem in the bio-pond enables residents, especially children, to discover and increase their appreciation of nature's life cycles and its ecology.

Perched at the end of these meandering waters are one-of-a-kind bulbous pavilions, whose forms were inspired by the condominium's address at Chestnut Avenue. These chestnut-shaped pavilions, or "tree houses", offer cosy cocoon-like spaces in the garden where residents can lounge and enjoy the sights and sounds of nature. Residents can also walk up to the Tree-Top Walk to reach the pavilions and enjoy a strategic view of the verdant Zhenghua Park and beyond.

### Raising the Green Bar

For its innovative green technology, Tree House has achieved the Building and Construction Authority Green Mark Platinum status and won many awards. They include the Singapore Institute of Architects Green Design Award 2014, Singapore Institute of Landscape Architects Awards 2013, and National Parks Board's (NParks) Skyrise Greenery Award, just to name a few. It was also one of the three projects certified as Outstanding in NParks' Landscape Excellence Assessment Framework (LEAF) 2014. Tree House Condominium is a distinctive landmark among high-rise residences that raises the bar for green living in Singapore in the years to come. 





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