

# PRC 建设

Pacific Rim Construction

## THE WORLD'S FINEST HAND CRAFTED TIMBERS

by Schotten and Hansen

世界上最好的手工制作木材

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## B HOUSE

### 划时代负排碳住宅

这幢创先河的平房，不单只能有负排碳作用，更可产生多出其需求的电力。借鉴新加坡殖民时期标志性的白底间黑洋房造型，配合众多被动式设计手法，造价却与区内同类物业相若。

B House 荣获新加坡环境友好型建筑的最高殊荣，建筑建设管理局 (BCA) 绿色建筑标志铂金奖。

新加坡荣获殊荣的可持续建筑设计事务所 Pomeroy Studio，最近宣布其首幢的负排碳平房在当地正式竣工。这幢在用水、耗源及废物处理方面具超卓效益的平房，不但以太阳能抵消住户的能源消耗，达至运作上碳中和，并提供将来可以回馈到电网的剩餘能量。B House 采用新加坡殖民时期常见平房的众多被动式设计技术，与现代科技结合，成为与周边住宅价钱相若，但却能实践环保的独立平房。

「B House 的业主希望在其武吉知马区的双幢平房项目中，挑战可持续发展的界限。设计目标是确保用户永不会收到电费账单，并可大幅降低水费。难题是怎样以同类物业的成本兴建零碳排放的平房？一开始我们以零碳排放作目标，最终却成为新加坡第一间能居住的负排碳平房。」公司创办人 Jason Pomeroy 教授介绍道。

B House 相当程度上以亚洲第一间零碳排放原型住宅，在马来西亚的 Sime Darby Idea House (2010年) 作参考，它同样是由 Jason Pomeroy 教授设计的。这边厢 Idea House 诠释马来甘榜屋所包含的建筑技术，B House 则从新加坡传统白底黑间平房中蜕变出来。这类建筑的特色是屋檐特阔、外廊特大以供室外活动及娱乐，及可调活动百叶窗，既可遮挡阳光，亦可让空气保持流通。汲取了这类平房的被动式设计技术及空间规划的原则后，重新阐释21世纪的热带平房。

B House 与其原祖白底黑间平房一样，以「外形配合气候」手法应对新加坡气候以减少能源和食水消耗。同样采用座向及外形减少从东到西的猛烈太阳，减少吸收太阳热量及营造交叉对流通风，窗户位置深思熟虑，并以高楼层加强通风效果。南北外檐由高中低窗户及百叶窗组成，与其原祖一样，成为一系列闸门以调节日照。这些百叶窗在最热最潮湿的季节，能作不同组合程度开关，调节通风、提供遮阳作用。日光渗透入低浅楼层板后进一步优化室内环境，令所有居住空间获得百分百天然光。

庭院和外廊素来是殖民时期和亚洲民房的标志，是社交场所亦能冷却楼宇本身，当微风吹进平房时，周围的绿叶能发挥降温作用，B House 可谓两者兼俱；位处平房两侧的凉台，引导凉风进入室内，中央庭院设在较隆重的接待区及私人地方之间；这确保天然光及新鲜空气渗入屋内，同时发挥户外社交功能。

亚洲传统民居的被动式设计技术，为 Pomeroy Studio 所引入的最新环保技术和做法提供节能基础，乃 B House 成功获得负排碳效益的凭据。由于项目采用模块化设计，预制组件能在别处制造，如此可提升品质及减少建材浪费，整个预制套装亦令施工效率与速度比起同类项目能提高五成。此外，整个项目采用低生态毒性及高含量可回收材料，而附有雨水收集设备的节水系统每年可节省465立方米用水。一个典型五口家庭的能源消费量估计为每年12,500千瓦时，而在 B House 估计每年仅消耗约8,000千瓦时。屋顶上的100平方米多晶硅光伏太阳能面板预计每年产生16,720千瓦时。这意味着 B House 可充当发电站，把剩餘能源供应给电网产生收入。

通过观察过去以塑造未来，B House 凸显文化与传统在解决新加坡和亚洲所面临的环境挑战的重要性。「可持续发展的未来不只是科技突破，但如 B House 般，借鉴了文化和传统的精髓，以创建零碳及真实反映民风的建筑环境。我们有幸得此机会设计这幢新加坡负排碳住宅。项目巩固我们事务所在零碳发展及其应用商业化项目的持续研究，我们对于能以与普通成本相约但突破可持续发展的界限，同时保留地方文化特色的设计而感到自豪。」

### About 有关 Pomeroy Studio

Pomeroy Studio is an award-winning international team of designers and thought leaders of sustainable built environments. The studio comprises of master planners, landscape architects, architects, interior and graphic designers, as well as sustainability consultants and academics.

Pomeroy Studio 由可持续建筑设计的获奖国际团队而组成，包括策划、景观设计师、建筑师和室内设计师，以及可持续发展顾问和学者。





## PIONEERING CARBON-NEGATIVE HOME THE B HOUSE UNVEILED IN SINGAPORE



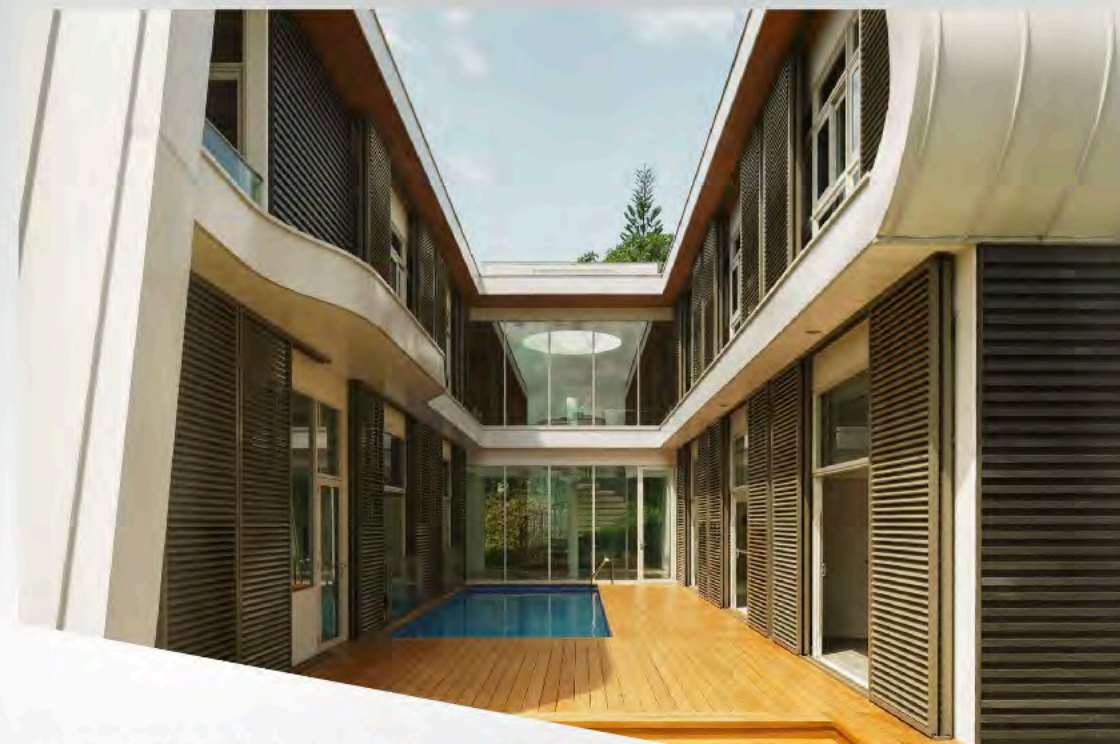
The B House has been awarded the Building Construction Authority's (BCA) Green Mark Platinum Award, the highest award for environment-friendly buildings in Singapore.

Pioneering operational carbon-negative home generates more green power than it consumes, costs the same as similar properties in the area, and draws on many of the passive design techniques used in Singapore's iconic Black and White colonial bungalows.

Pomeroy Studio has announced the completion of their pioneering operational carbon-negative home: the B House, in Singapore. The home, which is highly water, energy and waste efficient, offsets the energy requirements of its occupants (i.e. operational carbon zero) through the use of solar energy, and provides surplus energy that could in the future be fed back into the grid. The B House employs many of the passive design techniques used in Singapore's colonial Black and White bungalows; and when coupled with modern technology, results in one of the most sustainable detached modern homes in the region at the same price point as the neighbouring residential developments.

"The owner of the B House was keen to push the boundaries of sustainable design for a private commission of two family bungalows in Bukit Timah, Singapore," said Founding Principal Prof. Jason Pomeroy, continuing "the home sought to ensure that the occupants would never have energy bills again, and greatly reduced water bills. The challenge therefore was to create a zero carbon house at the same cost of a bungalow comparable in scale. What started as a carbon zero project would eventually become a pioneering operational carbon negative house in Singapore"

The B House drew on many of the lessons learnt from Asia's first carbon-zero prototype home, the Sime Darby Idea House (2010) in Malaysia, which was also designed by Prof. Pomeroy, an expert in sustainable design and zero-carbon development. Whilst the Idea House reinterpreted the techniques embedded in the Malay Kampong House, B House provided an opportunity for Pomeroy Studio to study the traditional Black and White bungalow of Singapore. Such buildings featured generous roof overhangs, large Verandahs for outdoor living and entertaining, and variable shutters that could keep the sun out but allow the air to percolate in. Learning from its passive design techniques and space planning principles allowed for their subsequent reinterpretation for the 21st century tropical house.



Like the Black and White bungalows before it, the B House takes a 'form-matching-climate' approach that embraces the climatic conditions of Singapore in order to reduce energy and water use. The house is orientated and shaped to minimise heat from the East and West sun – reducing solar heat gain and maximising cross ventilation through the prevailing wind. Airflow is further facilitated through strategically placed window openings and high ceilings. North and South façades comprise of low, medium and high-level windows and shutters that act like a series of valves in a similar fashion to its historical predecessor. These can be opened and closed in multiple configurations to regulate airflow, prevent rain, and provide shade whilst filtering light during the hottest or wettest seasons. Daylight penetration is further optimised through shallow floor plates that permit all habitable rooms to receive 100% natural light.

Colonial and Asian dwellings were marked by the presence of Courtyards and Verandahs, serving as places of social interaction while also cooling the buildings themselves, as the breeze entering into the home through such spaces would be cooled by the surrounding foliage. The B House features both. Verandahs line both wings of the house, channelling cooler air into the interiors, and the central Courtyard is strategically placed between the more public formal reception area and private areas. This ensures that natural light and ventilation percolate into the interior spaces, and also acts as an outdoor social space.

The passive design techniques drawn from the traditional Asian dwellings provided a low energy base from which Pomeroy Studio were able to incorporate the latest green technologies and practices, giving the house its carbon-negative credential. The design of the house is modular, allowing pre-fabricated modules to be manufactured off-site, improving quality and reducing wasteful off-cuts. This pre-fabricated 'kit-of-parts' also increased the speed and efficiency of construction by 50% as compared to a similar sized residential building. Furthermore, materials with low eco-toxicity and high recyclable content were used throughout, and water-harvesting equipment with a water saving system forecasted to save up to 465m<sup>3</sup> of water per year.

The household energy consumption for a typical family of five in a 'normal' home is estimated at 12,500 kWh per year, while a family of five in the passively designed B House is estimated to consume approximately 8,000 kWh per year. The 100m<sup>2</sup> of polycrystalline photovoltaic solar panels on the roof are expected to generate 16,720 kWh per year, meaning that the B House effectively acts as power station that provides surplus energy that could be supplied back into the grid for income generation.



By looking to the past to shape the future, the B House highlights the importance culture and tradition plays in addressing many of the environmental challenges facing Singapore and Asia. "The future of sustainability is not just about technology, but, like the B House, draws on the essence of culture and tradition to create built environments that are carbon-free and truly reflect their inhabitants' way of life" said Pomeroy, adding "We are delighted to have been given the opportunity to design this carbon negative home in Singapore. This project complements our Studio's continued research into the field of zero-carbon development and its application to commercially orientated projects. We are proud to have been able to push the boundaries of sustainable design at the same price point as the 'business as usual', whilst retaining a commitment to the culture of place".

### DESIGN TEAM

Prof. Jason Pomeroy (Principal and Director-in-Charge), Yoshi Shimada (Associate Principal), Deepshi Bhogal (Senior Sustainability Consultant), Mayank Kaushal (Senior Sustainability Consultant), Elizabeth Garcia (Architectural Designer).