

SG Green | Issue 8.0

MARCH 2019

# SG GREEN



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# HOME GREEN HOME

**INSIDE:  
HOME GREEN  
HOME**

Pg 4

**LIVING OFF THE  
(POWER) GRID**

Pg 36



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# SGG GREEN

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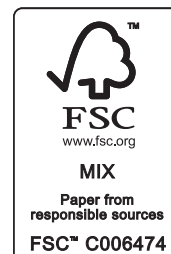
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# CONTENTS

Message from the Editorial Team

03



HOME GREEN HOME

Pg 4



THE HEARTBEAT OF BEDOK

Pg 18



BEAUTIFULLY CRAFTED COMFORT

Pg 28



LIVING OFF THE (POWER) GRID

Pg 36



BREATHE EASY

Pg 48



GREEN HOME RENOVATION:  
A STEP TOWARDS GREEN LIVING

Pg 56



## MESSAGE FROM THE EDITORIAL TEAM

It has been a hectic day at work and you have reached your main gate. With a turn of the key and a gentle push of the door, you are greeted with the familiar sight of your living room, done up in the popular Scandinavian renovation concept filled with warm tones and earthy hues. Taking a deep breath, you feel none of the nasal congestion experienced in the office, a by-effect of the workplace's ongoing mold problem. You remove your shoes and feel your soles on the smooth vinyl flooring, assured that no harmful substances will have a foothold on your bare skin. Satisfied, you settle down onto your sofa and begin to relax, the ceiling fan and smart television automatically switching themselves on with a tap on the mobile app, calibrated to your personal preferences.

At the most basic level, this is the very definition of a green home: a safe, healthy and positive sanctuary for its occupants. Considering the fact that we spend about a quarter or more of our day at home, ensuring that our residences are done up sustainably should be as important – if not more important – as creating an aesthetically striking feature wall in the living room.

After all, green is the colour of health.

Greening your home does not have to be an extensive, expensive endeavour, especially if you are not in the position to undertake full renovation works. Going

green can start small, such as changing your light bulbs to energy efficient LEDs, making a conscious effort to use fans instead of the air-conditioning system and also placing appropriate indoor air plants to improve views as well as indoor quality. For larger scale home improvement projects, make it a point to ask for certified products and materials (such as those certified by SGBC) as these have been tested for their environmental performance and impact on human health. Usage of certified materials minimises the risk of harmful substances invading your indoor environment, leading to unnecessary health issues.

In this issue of SG Green, a collection of insightful articles all focused on green homes will give you plenty of food for thought and ideas for greening your own homes. In particular, the World Green Building Council has come up with a fantastic guide outlining the three main factors of **Indoor Air Quality, Thermal & Acoustic Comfort** and **Lighting** as essential elements to green and healthy homes. By taking into consideration these three factors in any renovation project, you can make a healthy, positive impact and create a home green home.

Yours sincerely,  
**SG Green Editorial Team**





# HOME GREEN HOME

**CREATING A GREENER WORLD STARTS AT HOME AND IT DOES NOT HAVE TO COST THE EARTH.**

Human beings spend an inordinate amount of time in buildings: from the minute we awake, we leave our homes for our schools or workplaces, move on to recreational places for leisure and then return to our homes to call it a night. Although we spend the bulk of our waking hours at our schools and/or workplaces, the places we call home cannot be discounted. After all, our homes are our sanctuaries of refuge and solace, therefore it stands to reason that these places have to be safe, productive and healthy.

There is a growing body of research showing that green buildings – homes, schools, workplaces, etc. – are able to mitigate the effects of climate change by virtue of their onus on sustainable, energy efficient design. Buildings account for almost half of the world's energy consumption and over a third of global greenhouse gas emissions, therefore, they are in a prime position to address challenges brought about by climate change. Essentially, helping to create a greener world can start with our homes.



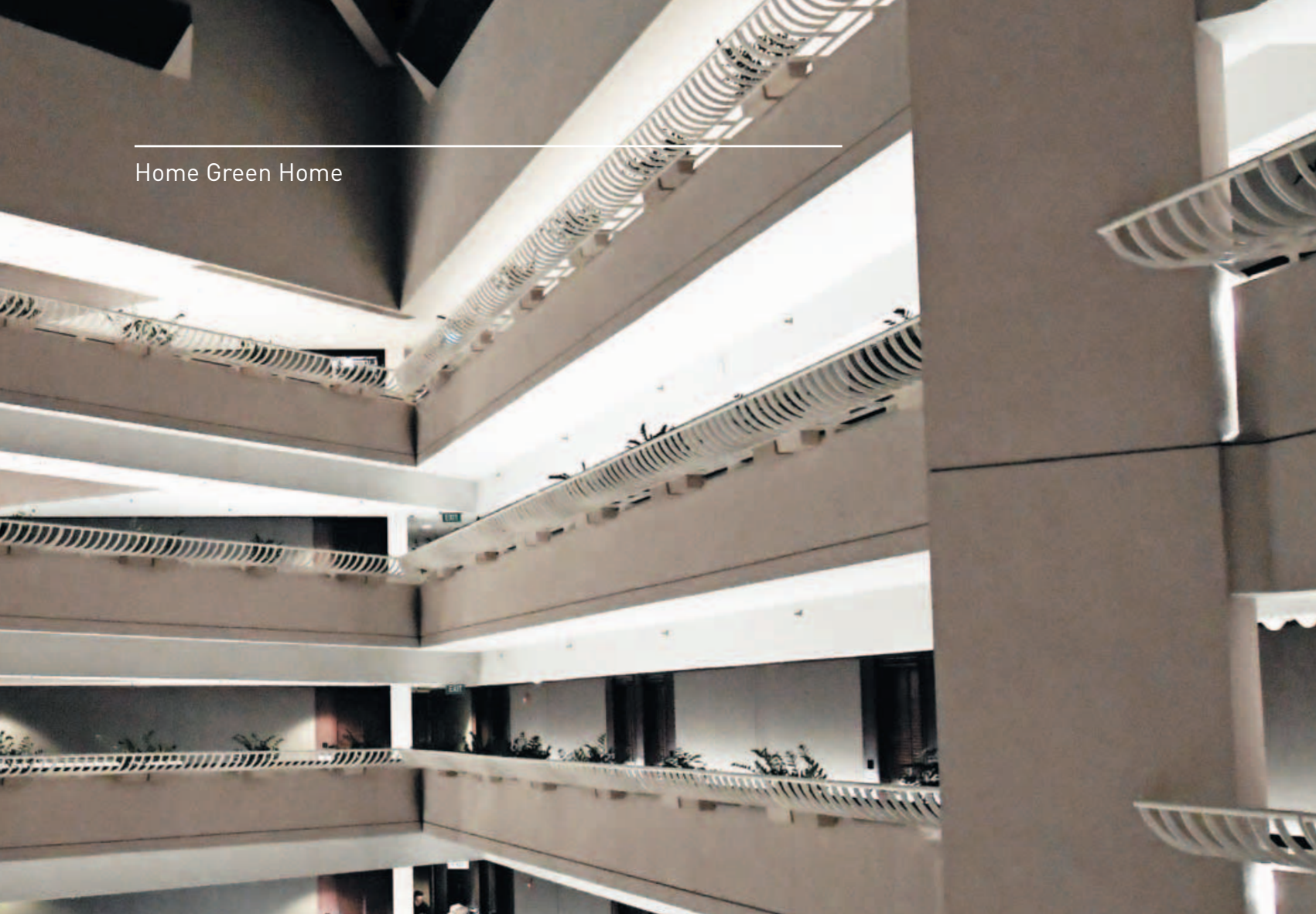
### GREEN IS THE HEALTHIEST COLOUR

The design of a green home and its material selection play vital roles in ensuring that the resulting space is healthy and productive. For example, usage of certified green building materials for high volume furnishings such as paints and carpets can tremendously improve indoor air quality. This is particularly important since we breathe around 11,000 litres of air a day and bad indoor air quality will have a profound and detrimental effect on occupant health and wellbeing.

Lighting is also key. Natural light helps to make spaces healthier and cuts down on energy use. It also reduces mould growth, improves sleep patterns and boosts access to vitamin D. Having access to natural light also brightens up the home and lifts our spirits.

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There are many ways to green your homes, including but not limited to:

- Using building materials such as paints, carpets, flooring finishes certified for their environmental performance (e.g. VOC emission levels)
- Having suitable house plants to purify the air and provide biophilic views
- Replacing conventional bulbs with energy-saving LED fixtures
- Using ceiling fans for ventilation and setting the air-conditioning temperature to 25 degrees Celsius, which is more than sufficient for keeping homes cool
- Utilising a smart control system to operate electrical devices and appliances

While homeowners in Singapore do not always have the option of going for renewable energy sources, the liberalisation of the energy market since late 2018 allows homeowners to select energy retailers that provide green or clean electricity. This is typically achieved through solar power or carbon credits used to offset greenhouse gas emissions to result in a net-zero environmental impact. Choosing green electricity not only saves money, it is also a clear demonstration of your onus on sustainability.

Occupant consumption habits also go towards creating and maintaining green homes. By making a conscious effort to reduce energy and water use, you are also doing your part for the environment.



## MAKING A GREEN MARK

The national green building rating tool administered by the Building and Construction Authority (BCA) in Singapore has a dedicated category for residential buildings. Into its fifth edition, the Green Mark for Residential Buildings 2016 (GM RB: 2016) assesses and recognises new residential buildings for their design, construction and operation towards energy efficiency and environmental performance.

The GM RB: 2016 criteria centre around four indicators mapped to internationally recognised sustainability outcomes:

- Climate: demonstrate emissions reductions and resilience to climate change
- Resources: efficient use of resources to reduce environmental footprint over building life cycle
- Wellbeing: liveable built environments vital for health and wellbeing
- Ecology: integration of nature and protection of natural systems

The criteria are further structured into several sections, each taking into account and recognising an aspect that constitutes a green home.

For more information on the Green Mark for Residential Buildings 2016, visit [www.bca.gov.sg](http://www.bca.gov.sg)

## BETTER PLACES FOR PEOPLE

The World Green Building Council (WorldGBC) created a guide to healthier homes as part of the **Better Places for People** project that was released during World Green Building Week 2018. The guide outlines the three main features of Indoor Air Quality, Thermal & Acoustic Comfort and Lighting that homeowners should take note of, as well as provides suggestions for green home improvements such as how your home is designed to the materials used to furnish it. A robust selection of such materials can be found in the Singapore Green Building Council's (SGBC) Directory of Certified Products, each of them rigorously assessed for their environmental performance which often includes VOC emission levels and energy efficiency. From vinyl flooring to carpet tiles and ceiling fans, there is definitely a certified product that suits your green home needs. Visit [www.sgbc.sg](http://www.sgbc.sg) to find out more. ✓

# A guide to healthier homes and a healthier planet



## Is your home making you sick?

Did you know that the construction of the building, its light source, how it is heated and cooled or even furnished could be harming both you and the planet? There are easy, affordable steps you can take to make your living space greener and healthier for you and your family, while also reducing your environmental footprint.

This guide will focus on three key features of your home



Air quality



Thermal and acoustic comfort



Light

For each feature we present the **latest research** on the health and environmental impacts of the homes that we live, work, learn and play in. We also outline **suggestions for green home improvements**, from how your home is designed to the materials you use to furnish it, that help **improve your health and your environment**, and could even benefit your pocket.

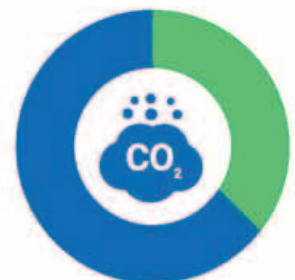
## Why green buildings?

On average we spend 90% of our time indoors<sup>1</sup>. Because the world's buildings have a direct impact on our environment and our wellbeing, we need to look at ways to make our buildings good for human health as well as beneficial to natural, urban and suburban environments.

### Currently buildings and construction account for



36%  
of global energy use<sup>2</sup>



39%  
of global energy-related carbon emissions<sup>3</sup>

Positive personal action, like saving energy, and energy-efficient renovation, will not only unlock unexpected health and financial benefits in your home, but will also help address what the *World Health Organisation* calls the **biggest global health threat of the 21st century<sup>4</sup> – climate change.**

## Air quality

More than half of the air you'll breathe in your lifetime is inhaled inside your home<sup>6</sup>. However, for 92% of us, the air outside our homes is not safe to breathe<sup>7</sup>. This polluted outdoor air harms our health and our planet, and infiltrates into our homes. Air pollution can also be caused by pollutants within the home.

**60 x**

Around **12,000 litres of air<sup>5</sup>** is inhaled and exhaled **daily** – the volume of about **60 bathtubs**.

## Health impacts

There are three ways that air pollution can be harmful to human health in and around our homes and communities.



**Outdoor air pollution experienced when we're outside** is responsible for an estimated 1/3 of lung disease deaths, 1/4 deaths from respiratory infection and 1/6 deaths from heart disease and stroke<sup>8</sup>.



**Outdoor air pollution experienced when we're inside.** This polluted air infiltrates into our homes, so a significant portion of our exposure to these outdoor air pollutants occurs when we're indoors<sup>9</sup>.



**Indoor air pollution produced inside** can be just as harmful as outdoor pollutants<sup>10</sup>. These include pollution created from cooking and heating with traditional biomass coal stoves, as well as toxic chemicals, such as Volatile Organic Compounds (VOCs), emitted from cleaning products, furnishings, and paints in your home.

## Environmental impacts

Many pollutants generated in our homes also damage our natural environment. Short Lived Climate Pollutants (such as methane, or black carbon/soot) are dangerous air pollutants that come from fossil fuel combustion, vehicles and agriculture. Such pollutants are powerful climate forcers in warming our planet.



**Approximately 45% of global warming** can be attributed to Short-Lived Climate Pollutants<sup>13</sup>.



Dramatically reducing Short-Lived Climate Pollutants in the years ahead would slow global warming **by as much as 0.5° C by 2050<sup>13</sup>**.

## Economic impacts

An estimated 5.5 million lives were lost in 2013 to diseases associated with outdoor and household air pollution. These deaths cost the global economy about US\$225 billion in lost workforce productivity and over US\$5 trillion in welfare losses<sup>15</sup>. China has lost substantial chunks of national GDP due to lower productivity from pollution – 6.5% in 2016<sup>16</sup>. The annual cost of asthma and pulmonary disease is E82 billion across Europe<sup>17</sup> and CAN\$8 billion in Canada<sup>18</sup>, which we know is being worsened by air pollution.

# Air quality improvements for a green and healthy home

Simple, low-cost strategies can offer you, your family and the planet huge benefits.

Use green energy to improve outdoor air pollution by installing solar panels on your roof or switching to a renewable electricity supplier.

Add outdoor air-purifying vegetation to your home, like a green roof or wall, that also offers weather protection.

Ventilate your home to clear away the hidden indoor toxins. Increase air flow and freshness simply by opening windows or, if outdoor air is polluted, use efficient mechanical ventilation or hybrid strategies, powered by renewable energy sources.

**Did you know?** 52% of poor indoor air quality can be attributed to inadequate ventilation<sup>19</sup>. Natural ventilation has been seen to reduce lung-related illnesses by up to 20%<sup>20</sup>, so open those windows!

Choose non-toxic (low-VOC) paints and furnishings to reduce indoor pollutants. VOCs can build up to 1,000 times outdoor levels within homes, and can cause Sick Building Syndrome, cancer, and damage to our liver, kidney, nervous system and mental performance<sup>12</sup>.

Use clean energy sources for heating and cooking.

In developing nations, 2 million people die each year from the pollution created from cooking and heating with traditional biomass and coal stoves<sup>11</sup>, which is estimated to be the main energy source for 1/3 of global population by 2030<sup>21</sup>.

**Did you know?** Babies and young children are at highest risk of health hazards from indoor chemicals<sup>22</sup>. Crawling babies and young children, due to exposure to carpets and flooring materials, can be at risk of damage equivalent to the child smoking three cigarettes per day.

## Don't let your home become a sick building

Sick Building Syndrome is characterised by a number of symptoms, from mild headache, fatigue and dry eyes, to more severe allergies and asthma attacks, that occur when you are in a building with poor air quality. It has been associated with poor ventilation and build-up of pollutants like VOCs, mould and bacteria and carbon monoxide<sup>14</sup>.



## Thermal and acoustic comfort

An uncomfortable home that is too hot, too cold or excessively noisy can cause severe health issues for its occupants. It can also waste energy and money. In this section we will look at thermal comfort and acoustics, and showcase a range of positive measures to optimise them for your health, your pocket and the environment.



### Health impacts

In most EU countries, only 10% of buildings can report good levels of energy performance<sup>23</sup>. Poor insulation and construction of buildings is often the cause of this low energy efficiency, and can severely compromise the occupant's comfort and health.



65% of Europeans who live in major urban areas are exposed to dangerously **high levels of noise pollution**<sup>24</sup>, which lead to health issues like **stress, high blood pressure, hypertension and strokes**<sup>25</sup>. Chronic exposure to noise can also **adversely affect children's cognitive development**<sup>26</sup>.



**Respiratory illnesses, asthma, and poor mental health** have been associated with **living in damp, cold housing**, which is a breeding ground for mould. Up to one-third of Canadian buildings show signs of dampness or mould<sup>27</sup>, and today 2.2 million Europeans have asthma, partly as a result of their living conditions<sup>28</sup>.



**Our changing climate is expected to lead to a rise in heat waves across the world.** Colombia is expected to suffer 2,000% more heat-related deaths during the period 2031 to 2080 compared with 1971 to 2010<sup>29</sup>, so future-proofing homes to protect occupant health is of growing importance.



### Environmental impacts

Energy efficient homes with good thermal comfort from high quality building fabric enjoy lower heating and cooling requirements, reducing a home's climate-changing carbon emissions.



**Air conditioning uses around 6% of all electricity in the USA**<sup>30</sup>, and many older systems still use highly polluting CFC and HFCs refrigerants, which are a huge contributor to climate change.



**Insulation retrofits** across 46 million US homes are predicted to result in 100,000 fewer tons of nitrous oxide emitted, corresponding to 6,500 fewer asthma attacks, 240 fewer deaths and \$5.9 billion per year in financial savings<sup>31</sup>.



### Economic impacts

Energy efficient properties can help save on energy bills. An Australian study on home energy efficiency retrofits suggests average energy bill savings of \$108 per year<sup>32</sup>; and American Consumer Reports have suggested that sealing leaks within homes can reduce energy costs by approximately 15%<sup>33</sup>. In New Zealand, building 100,000 homes to certified Homestar standards could provide benefits of \$680 million in energy and water savings<sup>34</sup>.

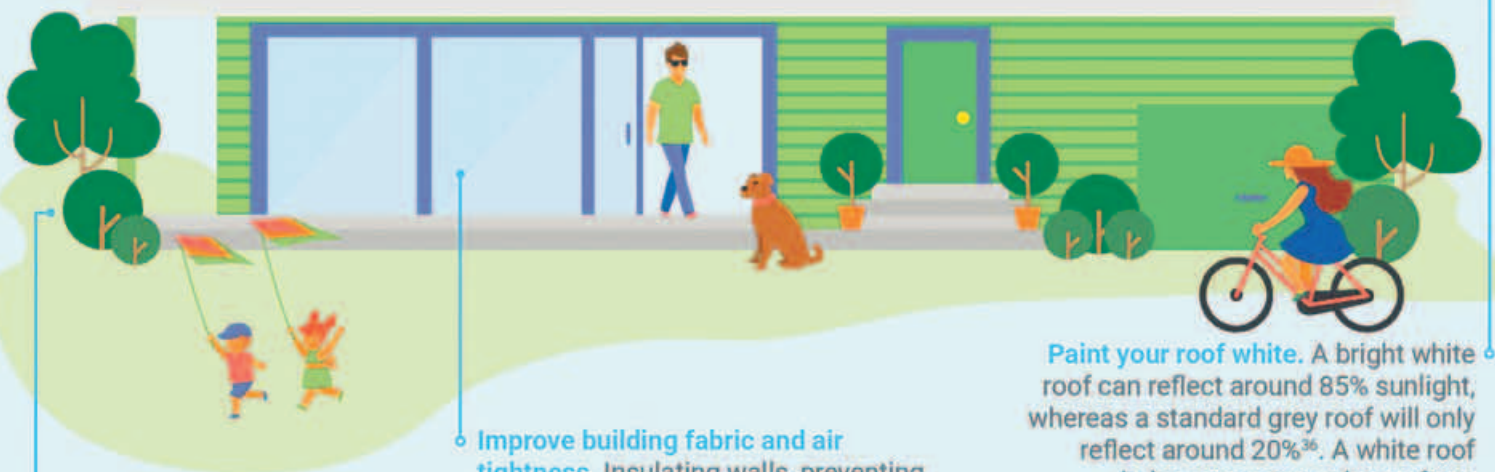
# Thermal and acoustic improvements for a green and healthy home

There are lots of affordable things you can do to make your home more comfortable, healthier, and better for the environment.

**Increase ventilation and air flow for natural summer cooling.** Passive ventilation, ideally with two open areas across a space, can yield up to 25-50% in energy savings from reduced air conditioning use<sup>20</sup>. Ceiling fans can also provide a low energy alternative to air conditioning.

Sometimes technology is needed to provide comfortable conditions, like cooling in hot climates. Minimize your energy need and utility bills with a well insulated building, and power conditioning devices by renewable energy<sup>39</sup>. **Solar panels are known to provide a good payback on investment** across the world, with experts citing between 1-4 years to reimburse investment in solar panels for a typical US home, while providing 30 years of clean energy.

**Block unwanted sunlight with external or internal blinds and shades.** High quality solar control glazing can prevent incoming heat from sunlight, and awnings and roller shutters have been shown to reduce the effect of overheating by 73% and 90% respectively<sup>37</sup>.



**Plant trees, shrubs and a green roof to cool your home** without relying on power-thirsty and expensive air conditioning. Shade from trees can help lessen peak summer temperatures by 2°C to 9°C<sup>35</sup>.

**Improve building fabric and air tightness.** Insulating walls, preventing leakage and investing in good quality windows are strategies that have been shown to directly improve health. A 15% reduction in days off school has been measured among children in homes that received energy efficiency upgrades through improved respiratory health<sup>38</sup>.

**Paint your roof white.** A bright white roof can reflect around 85% sunlight, whereas a standard grey roof will only reflect around 20%<sup>36</sup>. A white roof helps prevent your home from overheating in hot, sunny weather.

## Comfort tip

Insulation should work three ways – keeping heat inside buildings in cold climates, trapping heat outside in hot climates, and maintaining comfortable acoustics by blocking traffic or neighbour noise. A good building fabric is key, wherever you are in the world.



## Light

Good quality light is essential for a healthy life. In green and healthy homes, maximising the use of daylight and being efficient in your lighting use will cut energy bills, lower your carbon emissions, and unlock health benefits for you and your family.



### Health impacts

Living in a dark home has been shown to undermine the occupant's health and wellbeing.



One study looking at **living in a dark home** found **health worsened by 50%**, with headaches, insomnia, depression, Seasonally-Affected Disorder (SAD) and even breast cancer and suicide among the reported effects<sup>28</sup>.



**Natural light** regulates our body's circadian rhythms, often disrupted by technology and light pollution, **improving sleep quality** and therefore health overall. Studies have shown that **exposure to natural light during the working day leads to 46 minutes more sleep each night**<sup>40</sup>, demonstrating the importance of bringing healthy light into our homes.



Allowing **daylight** into your home controls damp, mould and bacteria growth, **lowering the risk of asthma** and other respiratory diseases<sup>41</sup>.



### Environmental impacts

Making more use of daylight in our homes through windows and skylights cuts down on artificial lighting, saving energy. Combining that with the most energy efficient lighting technology can substantially reduce your home's carbon footprint. Lighting is one of the biggest contributors to greenhouse gas emissions from dwellings across the world. The amount of electricity consumed by lighting is almost the same as that produced from all gas fired generation<sup>42</sup>.



In developed countries, lighting in homes accounts for around **14% of electricity consumption**, with this share understood to be higher in less developed nations<sup>43</sup>.



Research has shown that **increased daylight can reduce the need for artificial lighting by 16-20%**<sup>44</sup>.



### Economic impacts

Lighting in many homes accounts for roughly 20% of the electricity bill<sup>45</sup>. Studies suggest that just switching ten bulbs to efficient equivalents can pay back four times the initial cost in just one year<sup>46</sup>.



# Light improvements for a green and healthy home

There are easy changes you can make to your lifestyle and home to ensure access to natural light.

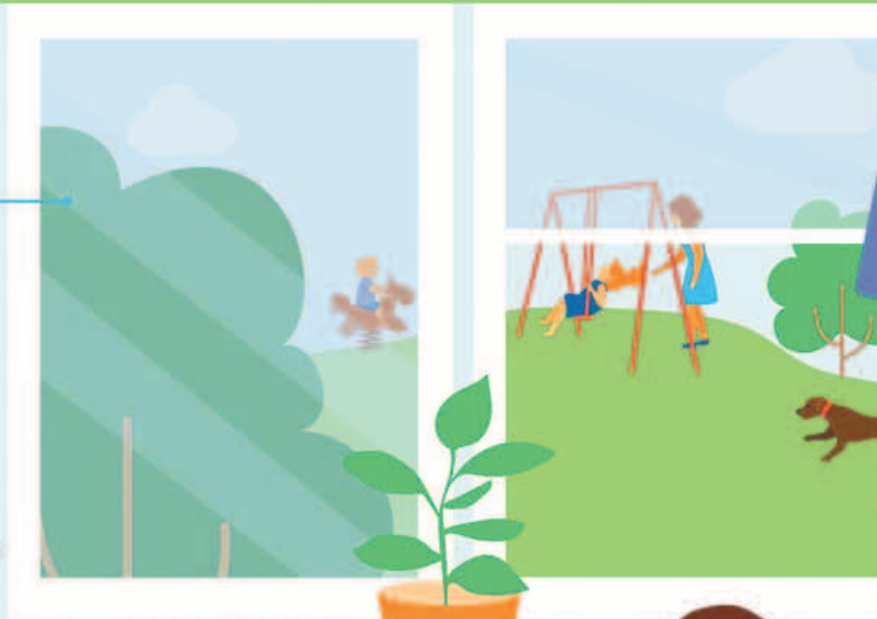
Renovating or buying a new home? Install roof windows and skylights to deliver twice the amount of daylight as similar-sized façade windows and three times as much as dormer windows<sup>47</sup>.



Use timers and dimming sensors to reduce energy waste.



Consider solar controlled glazing in warm climates to allow access to light, while controlling the risk of overheating. Awnings, blinds and solar films can be applied as a retrofit to your existing windows allowing you to control temperatures without compromising on access to light.



Choose more efficient LED light bulbs. LED light bulbs can last twenty times as long as regular incandescent light bulbs and can cut energy use by up to 80%<sup>48</sup>.



Natural light can increase human productivity by up to 15%<sup>49</sup>. Work near windows where possible and seek out a view of nature.



## Don't let your home make you SAD

Seasonal Affective Disorder is a depressive illness linked to the availability and change of outdoor light in the winter<sup>42</sup>. Experts estimate that **up to 30% of the world's population suffer from different degrees of Seasonal Affective Disorder**<sup>49</sup>.

**Did you know?** Studies have shown that people are 150% more likely to report ill health when they live in a dark home<sup>28</sup>. Protect your health and open those blinds!

# Global features Local practice

Up to **one-third** of Canadian buildings present signs of dampness or mould<sup>64</sup>.

CANADA

The health burden to the US caused by particulate pollution from fossil fueled power plants correlates to **over 5 million lost workdays** in the US each year<sup>65</sup>.

USA

The **potential for savings from energy efficiency is estimated at 21% of projected total energy supply in MENA countries by 2025**, with residential buildings being one of the largest areas with scope for savings<sup>66</sup>.

WHO estimates that approximately **58,000 deaths each year are attributable to ambient air pollution**, and 80,000 to household air pollution in Latin America and the Caribbean<sup>60</sup>.

CENTRAL  
AND SOUTH  
AMERICA

**87% of deaths from outdoor air pollution occur in low- and middle-income countries<sup>61</sup>**. In these countries, household air pollution is responsible for almost 10% of the mortality rate<sup>62</sup>.

The World Bank Group estimates that **by 2030, three billion people, or 40% of the world's population will need new housing units<sup>52</sup>**.

**Half of all childhood pneumonia deaths (2004) were due to indoor smoke from biomass and coal cookstoves<sup>66</sup>**.

EUROPE



**Three out of four** detached or semi-detached European homes are not energy efficient<sup>50</sup>.

In the UK, a study estimated that **54% of the population** was exposed to noise pollution above recommended levels of 55 decibels<sup>51</sup>.

About **4.3 million** people die from household air pollution and **3.7 million** from ambient air pollution, most of whom (3.3 and 2.6 million, respectively) live in Asia<sup>52</sup>.

The World Bank estimates the **total health cost associated with outdoor air pollution** in urban areas of China in 2003 was between **1.2-3.3% of China's GDP**<sup>55</sup>.

CHINA

**Over half** of the planet's new buildings are constructed in Asia annually and the construction sector constitutes an estimated **25% of overall energy consumption**<sup>53</sup>.

INDIA

A project in India demonstrates that by **retrofitting windows** within homes to increase daylight families can make savings of between **30-50% on their energy bills** and enjoy healthier homes<sup>58</sup>.

**Air-conditioning** is estimated to take up as much as **60% of the overall electricity load in South-Asian countries**<sup>54</sup>.

SOUTH AFRICA

In South Africa, **environmental factors**, such as air and water quality, are associated with the deaths of **124 in 100,000 children under five**<sup>59</sup>. Many of these could be preventable with healthier homes and communities.

AUSTRALIA

In Australia, **air pollution** is estimated to kill more people every year than road traffic accidents. The shift to clean energy and transport could save the Australian economy up to **\$6 billion annually** in avoidable health costs<sup>57</sup>.





# THE HEARTBEAT OF BEDOK

**As a purpose-built, mixed-use facility designed with cohesion in mind, Heartbeat @ Bedok serves as a green and healthy hub for the community**

Nestled in the heart of Bedok town centre, Heartbeat @ Bedok is a seven-storey, multi-use, Green Mark Platinum certified community-centric building that houses a variety of ancillary services and facilities, including a community club, sports and recreation centre, public library, polyclinic, and a senior care centre. The building is the result of the dramatic transformation of a public adventure park in the heart of the vibrant East Coast neighbourhood as part of the Housing and Development Board's (HDB) "Remaking Our Heartland" initiative.

Envisioned as a key civic and community space for the residents of Bedok town, particularly senior citizens, it offers a host of integrated services that brings residents of different backgrounds together, helping to improve social ties and cultivate community spirit.





## FUNCTIONAL DESIGN

An architecturally distinctive and visually impressive community building, Heartbeat @ Bedok is defined by the highest standards in modern sustainability. Featuring an inverted podium-and-blocks design strategy, spaces within the new building are predicated on functionality. The elevated podium allows for optimised natural ventilation, with a group of microclimates created around internal public spaces. A covered area extends 145 meters diagonally

across the site, creating a three-storey atrium that enhances porosity between floors, while also working to improve overall connectivity and visual integration of the internal spaces.

Heartbeat @ Bedok is cohesively planned, boasting a unique scheme that is an innovative response to the call for modern community-centric buildings. Featuring lush greenery and landscaping throughout the site, it contains an impressive array

of passive environmental controls. From rainwater and grey water systems, to tapered façade glazing and brise soleil architectural elements that mitigate solar heat gain and radiation within the building by deflecting sunlight, these features work together to create an environmentally progressive building, centred on reduced energy consumption, and lowered building operation and maintenance costs.

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## The Heartbeat of Bedok



### A SUSTAINABLE ACTIVE DESIGN

While more than half of the building (55 percent) is air-conditioned, the development is designed to reduce its total annual building energy consumption by about 31 percent through a complementary suite of green building features.

An energy efficient chilled water plant design with a system efficiency of 0.60 kW/RT, working together with an efficient air distribution system, helps to maximise energy savings for ventilation and cooling of the air-conditioned spaces. Optimised usage of LED fittings also helps to decrease energy consumption for artificial lighting by 42 percent.

As a result of these energy efficient features, the energy usage index (EUI) of the building is expected to be 176k Wh/m<sup>2</sup> per year. This is 32 percent lower than a typical Green Mark Platinum retail building of 259 kWh/m<sup>2</sup> per year.



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ENERGY USAGE  
INDEX (EUI) IS

**32%**  
**lower**

than a typical Green Mark  
Platinum retail mall.

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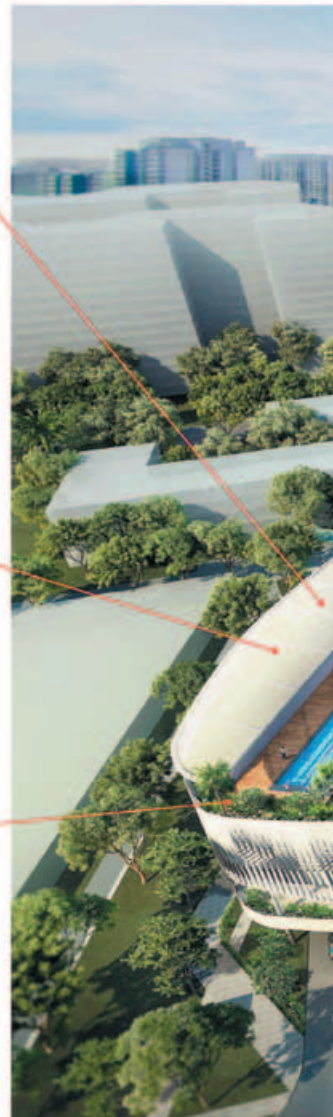
OVERALL WATER  
CONSUMPTION

**38%**  
**lesser**

than similar buildings.

---

- Vegetated Roof
- Wastewater Management
- Enhanced Microclimate
- Greywater Filtration
- Solar Shading
- Public Transport Facilities
- Vegetation & Landscape
- Greywater Filtration
- Bike Lane



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OPTIMISED LEDS  
lower energy consumption  
for artificial lighting by

**42%**

---





- Vegetated Roof 
- High Albedo Roof 
- Water Efficient Landscape 
- Enhanced Microclimate 
- Walkable Street 
- Pedestrian 

CHILLED WATER PLANTS  
WITH SYSTEM EFFICIENCY OF

**0.60W/RT**



## CLIMATIC RESPONSIVENESS

Embodying holistic and integrated sustainable design intent and features, HeartBeat @ Bedok's unique scheme overlays the designers' onus on creating an environmentally progressive building with reduced energy consumption, resulting in lowered overall building operation and maintenance costs. To reduce the building's reliance on mechanical systems for comfort, a number of measures were taken to create an internal environment suitable to the tropical climate.

Firstly, the early adoption of passive design concepts and intention to channel wind led to the building mass being configured to promote wind flow through the Level 1 atrium space via the venturi effect (essentially wind created by air channel through a narrow space), leading to a conducive and comfortable naturally-ventilated social space. Computational fluid dynamics (CFD) simulations on the use of natural ventilation helped to refine the building design and achieve acceptable wind flow rates in the areas that are not covered by air-conditioning.

Secondly, internal spaces were designed with high ceilings for enhanced overall porosity, allowing for effective cross-ventilation and air circulation. This helped create microclimates at both the pedestrian thoroughfare and sports complex area for enhanced end-user comfort.

Thirdly, a self-shading façade was conceptualised with the intent to reduce heat gain. Tapered fenestrations, wrap-around tensile fabric and vertical fins help reduce solar heat gain and the incidental cooling load by 30 percent by allowing wind to permeate into naturally ventilated corridors on upper levels. This also helped to trim construction cost by eliminating use of expensive double-glazed units without compromising envelope thermal transfer value (ETTV) performance. The peripheral planter boxes serve as natural screens to the internal space, reducing heat gain, and also having an aesthetic and therapeutic impact.

Lastly, rainwater-recycling systems, greywater filtration systems, and wastewater management were integrated into the building's extensive landscaping, resulting in an overall design that is highly water efficient.



### URBAN HARMONY

Heartbeat @ Bedok sits on the site of a community park that has been central to neighbourhood planning since the 1960s. Its design takes advantage of the park's great accessibility and connectivity to the surrounding areas. To preserve aspects of the original green space, lush greenery is integrated into the design to achieve a green plot ratio of 4.5, compensating the green spaces that were previously part of the park and creating a modern urban and biophilic space.

Careful consideration was taken when selecting plants to create medicinal and sensory garden concepts to complement the building's usage and sociological impact (polyclinic, senior care centre and childcare centre). The use of communal sky garden and terraces also provides places of respite and improves the micro-climate around them. The extensive landscaped area will be irrigated using harvested rainwater and is served by rainwater sensors to reduce potable water use.

### HEALTH & WELLBEING

As a community building, Heartbeat @ Bedok aspires to provide a lively social spot for the residents of all ages. It is designed to integrate with the surrounding developments to create seamless connectivity. Sky gardens and terraces on the third storey are accessible to the public.

These spaces are planted with therapeutic garden plants and herbs to provide refreshing and healthy relief areas for respite and relaxation. In recognition of its user-centric design, the development was awarded the BCA Universal Design Mark, Gold<sup>Plus</sup> in 2017.



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## The Heartbeat of Bedok

### RESOURCE EFFICIENCY

Building materials and products for the development were carefully selected for both their aesthetic appeal and environmental impact and long-term ease of building maintenance.

A wide variety of certified green building materials and products were used in the development, including:

- Waterproofing
- Ceiling tiles
- Carpets (SGBP ✓✓✓✓)
- Ceramic tiles & adhesives
- Landscape drainage cells (SGBP ✓✓✓✓)
- Non structural pre cast kerbs, drains
- Car park wheel stopper
- Vinyl flooring (SGBP ✓✓✓)
- Precast concrete wall panels (SGBP ✓✓✓✓)

To minimise the building's embodied energy, green concrete with recycled content was used for the structural beams and slabs. Innovative solutions such as hollow core slabs were used in the building, reducing the overall quantity of concrete required as well as reducing the development's carbon footprint.

Planters were rendered in a textured paint, reminiscent of sandstone rock formations, which inspired the stacked building form. Exterior walls were finished in plaster and textured paint for ease of maintenance. All paints used had been certified to have low volatile organic compound (VOC) emission levels, which translates to low impact on the environment as well as human health.

The distinctive tensile fabric fins decorating the façade of the development are rated as Class O, which is the most stringent classification for facade cladding in terms of fire safety. Spacing between tensile fabrics is set at 1800mm, to improve the porosity of the façade and incidentally increase airflow in the naturally ventilated corridors (2nd, 3rd, 4th & 5th stories) and swimming pools on 5th storey, which will also improve thermal comfort.

Using water efficient fittings, the overall water consumption in the development is 38 percent lesser than that of a similar standard building. The project



targets minimising carbon footprint throughout its life cycle. To this end, the builders have implemented extensive environmentally friendly practices during construction. This includes on-site water recycling and treatment plant for water reuse. Further, the use of Building Information Modelling (BIM) throughout the project enabled designers and contractors to implement clash detection before building works were carried out on site.

Perpetuating the direction of an integrated, community-centric facility similar to the likes of Kampung Admiralty and Our Tampines Hub, Heartbeat @ Bedok provides the community with a social focal point in a green, sustainable package. With the range of services and facilities under one roof, this development is indeed the *Heartbeat* of the community. ✓

**Developer/ Owner: People's Association**

**Architect: ONG&ONG Pte Ltd**

**Landscaping: ONG&ONG Pte Ltd**

**Lighting: ONG&ONG Pte Ltd**

**M & E Engineering: Rankine & Hill (S) Pte Ltd\**

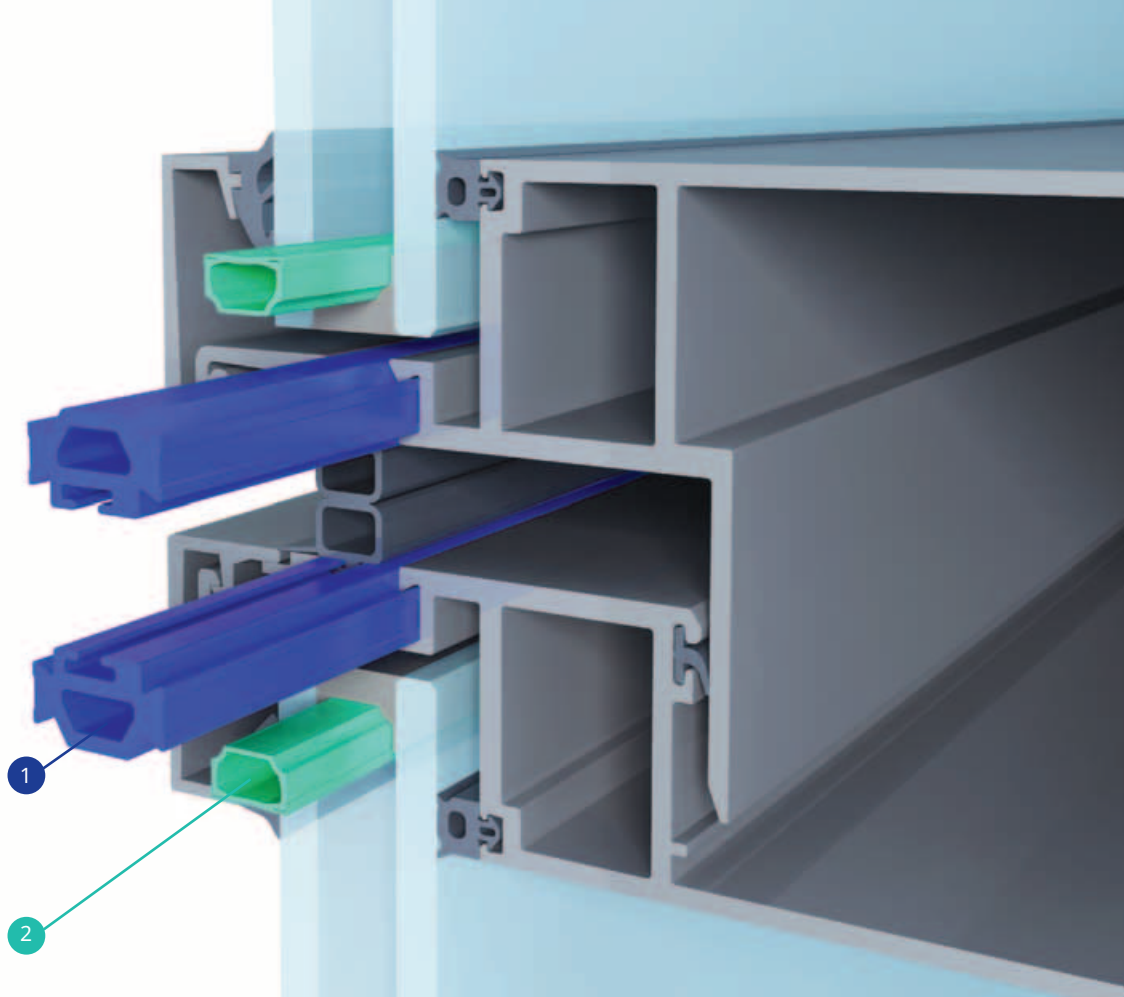
**Main Contractor: Kim Seng Heng Engineering Construction Pte Ltd**

*Text and images courtesy of ONG&ONG Pte Ltd.*

# Engineered for building performance.

Energy efficient curtain wall system engineered with

- 1 **Technoform Thermal Break**
- 2 **Technoform Warm-Edge Spacer**



Curtain wall frame U-value

**improves by >76%**



ETTV of building

**improves by >36%**



Fenestration U-value and SHGC

**improves by >34% and 18%**



Cooling energy of building

**improves by >10%**

Source: GBIC Project - R&D: Energy Efficient Facades for Thermal Comfort Environment, 2018

## Ensuring sustainability is what we do.

**Technoform is the world leader in thermal insulation solutions for windows, doors and facades.** For over 45 years, we have helped building owners improve energy efficiency, quality and comfort of their buildings, reducing energy consumption and CO<sub>2</sub> emissions.

**Thermal break<sup>1,2</sup> and Warm-edge spacer<sup>2</sup>** are widely used thermal insulating components in the building sector. Thermal break reduces heat gain through fenestration frames while Warm-edge spacer reduces heat gain through edge of glazing. In addition, our Warm-edge spacer helps to enhance the durability of the glass unit.

### Some of the services we provide include:

- Consultation on design and optimization of the thermal zone in facade systems to meet your performance targets
- Support and documentation for the specification of thermal break technology in your windows and facade design

**Are you designing an energy efficient building facade in the tropics? Let's talk!**

<sup>1</sup>: **Green Mark point can be scored** for the use of SGBC certified thermal break/insulating profiles to achieve frame U-values of <6.0 W/m<sup>2</sup>K under GM NRB:2015, 1.3a (Advanced Green Efforts)

<sup>2</sup>: **Technoform Thermal Break and Warm-edge spacer** are SGBC certified



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# BEAUTIFULLY CRAFTED COMFORT

KEEPING COOL,  
COMBINING COMFORT AND BEAUTY,  
THE PERFECT SOLUTION



*The true smart fan.*

## THE PROBLEM

We all want to be comfortable. No matter where we are, what room we are in, the key to enjoying our time in a given space is comfort. So what makes us comfortable? It is a combination of form and function.

The environment needs to feel comfortable from a functional standpoint, usually an agreeable temperature. Then it is form. We have to enjoy the space we are in from a design and aesthetic perspective.

Whether we are in a conditioned or unconditioned space, there is an element that often goes misapplied or misused: the ceiling fan.

Ceiling fans are perfect air distributors. By sizing and applying the right fan for a space during the design phase, airflow is optimised and energy efficiency maximised.

To find out how comfortable a person will be in a space, we

turn to the **Center for the Built Environment** at the University of California Berkeley's CBE Thermal Comfort Tool calculator (<http://comfort.cbe.berkeley.edu/>).

The designed calculator measures occupant thermal comfort according to ASHRAE Standard 55 criteria and identifies comfort ranges by accounting for: air temperature, mean radiant temperature, air speed, humidity, occupant metabolic rate (physical activity) and clothing.



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## Beautifully Crafted Comfort

This is the defining function for ceiling fans. By knowing how fans can help make us more comfortable, we can apply them correctly in a given space. In addition to providing comfort, efficient fans and efficient fan systems can offer great energy savings.

### A FUNCTIONAL SOLUTION IN A BEAUTIFUL PACKAGE

In general, approximately every degree of occupant cooling saves 6 to 9 percent in energy costs.

But why stop at the basics? Why stop at just getting a functional solution? Why not get everything you want in addition to what you need?

The ceiling fan perfected, the Haiku® series (SGBP ✓✓✓) by Big Ass Fans is the product of years of research, design and innovation, resulting in a consummate expression of home elegance and the epitome of comforting airflow. Built in three sizes and a range of high-quality finishes, including sustainable Moso bamboo, Haiku brings comfort to spaces large and small and serves as a striking complement to any design aesthetic.

With 20 years of experience, such excellence in engineering and efficiency is what millions of customers have come to expect from a Big Ass Fan.

Here is where the Haiku really stands out anodised aluminium finishes are hand polished and hand balanced. Each fan is digitally and audibly tested for noise in a soundproof booth. If there is a flaw, it does not pass inspection and back it goes for tweaking until it is perfect. The fan is meticulously designed and exceptionally engineered for your comfort.

Once in place, proprietary technology monitors room temperature and humidity. Essentially, the Haiku is the world's first smart fan. It can automatically respond based on conditions it reads in your space and it remembers user

preferences to make personalised adjustments.

If your windows are open on a sunny day, the heat would prompt Haiku to speed up. An open window at night would let cooler air into the space, prompting Haiku to slow down. The on-board motion sensor would turn the fan on when the room is occupied, and turn the fan off when the room is vacant, allowing for easy energy savings since fans cool people, not rooms.

What does it all mean in terms of energy savings? In warmer climates, set your thermostat ~3°C higher and stay comfortable courtesy of your fan, saving 20 – 30 percent on cooling costs.



*Fans being tested in a soundproof booth.*

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## Beautifully Crafted Comfort



### THE PROOF

Since the early 2000s, Graham Hill has been a prominent figure in the small-space, less-stuff movement. He came to his current role as a reaction to his former lifestyle, which was anything but minimalist. After making a quick fortune in the Internet's early days, the designer and entrepreneur went on a spending spree, purchasing a four-story home in downtown Seattle and a new Volvo, plus all the furniture,

appliances and gadgets a tech fiend could possibly want.

But it did not take him long to discover that all the possessions he (and his personal shopper) bought were doing nothing but clogging his happiness arteries. If, as Bob Dylan wrote, "You Gotta Serve Somebody," Hill felt the somebody he served was a monster cobbled together out of all his possessions.

Fast forward 15 years. Hill has created and sold another successful online company — Treehugger.com — pared down his personal, material world and become a leading advocate for sustainability.

Through his newest venture, LifeEdited, he is now committed to showcasing to others how to streamline and simplify for the good of people and the planet.



*LifeEdited apartment with Haiku.*

Among LifeEdited's projects are two very small New York City apartments designed and renovated for multipurpose functionality and efficiency. This is where where Haiku comes in.

In 2015, Hill and his team commenced work on the second of the two apartments, which at 350 square feet was even smaller than the first. In an October 2016 feature article in Dwell, Hill said the goal with LE2, as his

team called the project, was to "design it in a way that would look less like a white box and have more texture and patina. We also wanted to make it more affordable." With the help of Brooklyn-based architecture firm Guerin Glass, and Composite Fabrication + Construction, Hill's LifeEdited team created a classic, cost-conscious space that is totally livable for not just Hill but his partner too.

In LE2, the team relied on off-the-shelf products to keep costs down, and one that made a huge difference in comfort and efficiency was the Haiku with SenseMe technology. In a phone interview from the site of his next project, Hill said that, first, installing a ceiling fan was key from an environmental perspective. "Fans use much, much less energy than air conditioning," he said.



Beautifully Crafted Comfort

He was quickly won over by Haiku's SenseMe technology, especially the occupancy sensors. "A lot of people don't understand that a fan only cools a person, not a room, so there's absolutely no point in having it on when you're not there. Having built-in sensors to turn the fan on and off is fantastic." And then there were Haiku's aesthetics: "It's a beautiful fan," Hill said. "The fan works great from an environmental perspective and works well from a financial perspective," he said. "It's beautiful and is super-smart and has incredible technology that even integrates with voice, so it's an absolute no brainer for us."

Hill's "mission work" in the cause of sustainability means he's not at home in his 350-sq-ft NYC apartment as often as he'd like to be. But he preaches his environmental message wherever he goes and plans to incorporate fans in all his future projects.

"The Haiku has everything: Energy savings, technology, aesthetics. It's a great fan. I love it."

*Text and images courtesy of Big Ass Fans.*



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A photograph of a modern building facade. The building features a prominent white, curved overhang supported by a series of horizontal slats. Below the overhang, the wall is composed of dark, horizontal slats. Large glass windows are visible on the left side. In the foreground, there is a paved walkway with a glass railing. The background shows a clear blue sky with some clouds and greenery.

# LIVING OFF THE (POWER) GRID

As one of the pioneering carbon negative homes in Singapore, the B House is a powerhouse in every sense of the word.



## CONTEXT

The built environment's extraction of natural resources, material production, construction and operation has a significant impact on global carbon emissions. Whilst such activities contribute to human and economic development, the side effects of associated energy production and consumption threaten natural resources, the environment and contribute to global warming. Carbon dioxide, which is released when burning fossil fuels such as coal, gas and oil, is one of the more serious pollutants of our planet and is 'embodied' within

materials produced for human daily consumption. With continued deforestation, the ability of trees to absorb the increasing carbon dioxide emissions through photosynthesis is being challenged. The need to measure and therefore monitor our carbon footprint is one way of quantifying the effects our lifestyles have on the environment and consequently reduce emissions in order to mitigate its negative results. We can do this by measuring direct energy consumption, which can be calculated by reviewing a year's energy bills of a home's occupants.





### PROJECT BRIEF

The experience gleaned by Pomeroy Studio in designing the first carbon zero prototype house in Asia (the Sime Darby Idea House in Malaysia), formed the basis of the Studio's continued research into the field of zero energy/ carbon development and its application to commercially-oriented zero energy/ carbon projects. One particular private client had experienced the green qualities of the Idea House first-hand and was willing to push the boundaries of sustainable design for a private commission of two family bungalows in Novena,



Singapore. The two homes, one of which would be retained for private use, the other rented out to another family, sought to ensure that the occupants would never have energy bills again along with greatly reduced water bills. The challenge was therefore to create a zero carbon house of 500 sqm, in an upscale part of Singapore at the same cost of a bungalow comparable in scale. However, what started as a carbon zero housing project would eventually become the pioneering carbon negative house in Singapore (i.e the house actually generating more energy than it can consume).

### BASELINE / LITERATURE REVIEW

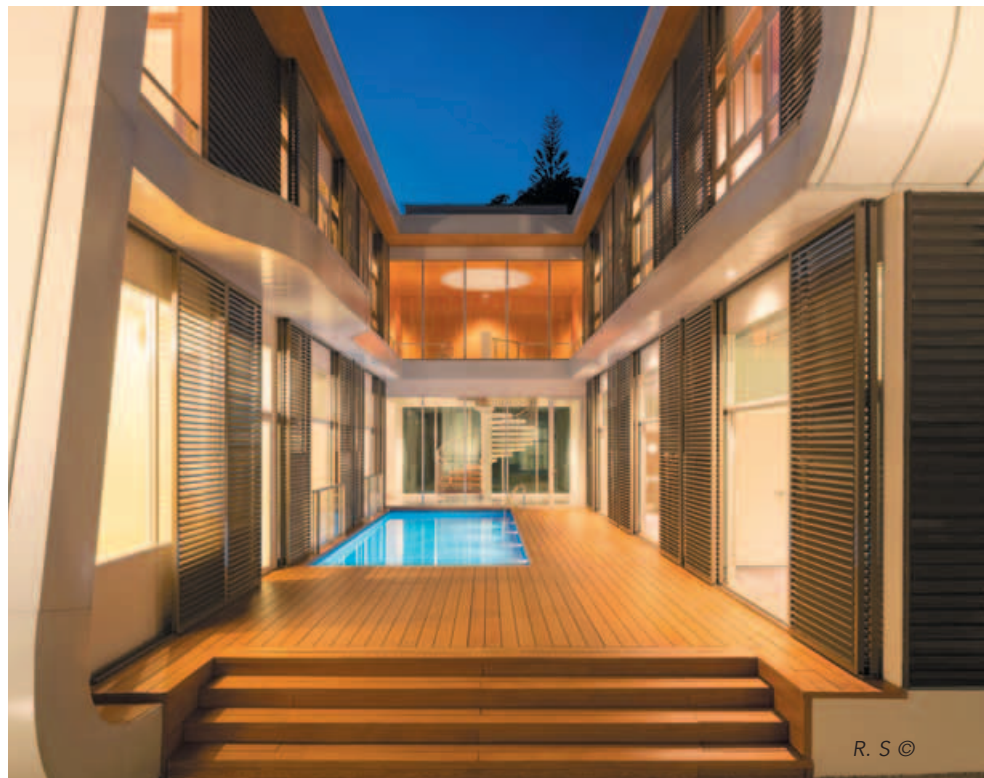
Given the design intent to create a carbon zero development, it became apparent that direct energy modelling (i.e. the house's operating energy consumption) could provide an objective balance to the more subjective green assessment methods in being able to demonstrate the B House's green status. In order to quantify how much more environmentally responsive B House was in comparison to a conventional house, the need to compare like-for-like was essential. Given that B House was planned as a 5-bedroom residence, the conventional Singaporean bungalow was modelled

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## Living Off the (Power) Grid

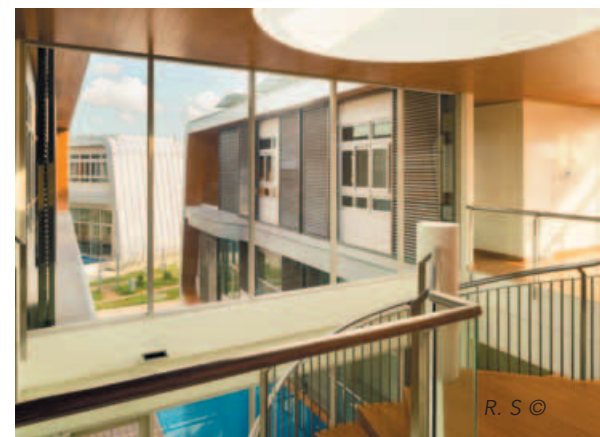
using the same built-up area and footprint. It was assumed that it would be a fully air-conditioned 5-bedroom detached property with full modern conveniences and a resident family of five people. In addition, conventional building products with average thermal performance levels that met the building regulations were used. No environmental technologies or passive design considerations were considered, though a north-south orientation was included as is typical in conventional residential developments. This baseline provided an opportunity to compare the conventional model with a high performance house that embraced passive design and specified materials that had an enhanced environmental performance. It would also include renewable technologies as a means of off-setting energy consumption and thus reach a net carbon zero level.

This also necessitated a definition of net zero energy development. Particular reference was made to UK government legislation – widely regarded as being at the forefront of zero emission legislation in the built environment globally. In the government’s consultation paper **Building a Greener Future: Towards Zero Carbon Development**, all new residential homes from 2016 are required to be zero carbon. In defining zero energy residential development, the paper stated that all new homes built from 2016 would need to take into account the emissions from space heating, ventilation, hot water and fixed lighting, and the expected energy use from appliances. Exports and imports of energy from the development (and directly connected energy installations) to and from centralised energy networks would need to be reflected for the development to have a net zero carbon emissions over the course of a year. It would also need to achieve at least a minimum level of carbon reductions through a combination of energy efficiency, on-site energy supply and/ or directly connected low carbon



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## Living Off the (Power) Grid

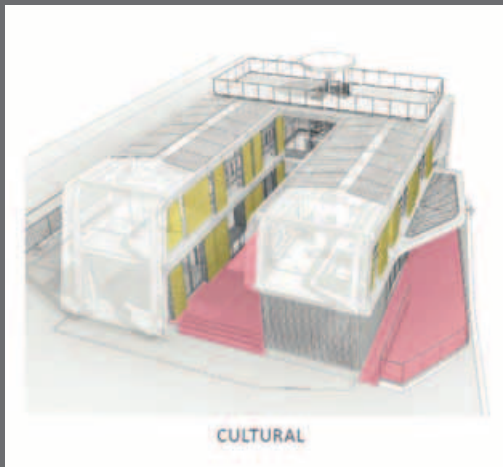


or renewable cooling; and choose from a range of (mainly off-site) solutions for tackling the remaining emissions.

The Code for Sustainable Homes, the UK standard for the sustainable design and construction of new homes, provided a 1-6 scale of carbon emission reduction in order to aid the creation of such developments. Code 6 represents zero energy - a definition that treats every home as an individual energy 'island' which must generate all the power and heat it needs. Code 6 considered zero energy from all energy uses including energy consumed in the operation of the space heating/cooling, hot-water systems, ventilation, all internal lighting, cooking and all electrical appliances (an estimated value), with the calculation taking account of contributions from renewable / low energy installations on / in the dwelling and the limited amount of accredited external renewable energy

sources. The above definition helped inform what would eventually become the brief and definition of net zero energy for the onward design of B House that can be summarised as follows:

- Reducing all energy consumed within a dwelling, including: fabric specification, space cooling, hot-water systems, ventilation, lighting, and all fixed electrical appliances.
- Creating a very high level of energy efficiency  
On-site renewable energy generation that, when exported, would be equal to the energy imported from the grid per year.
- The house would have net zero energy / carbon emissions over the course of a year generation of on-site renewable energies would be enough to offset occupant's energy consumption for a family of five, per year.

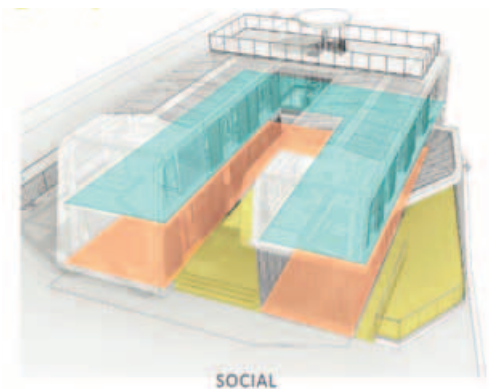


### CULTURAL RESPONSE

The Black and White bungalow is an indigenous typology to Singapore and was built extensively in the late 19th and early 20th centuries. Surviving examples are testament to their physical and aesthetic durability – an Asian tropical responsiveness that provides indoor and outdoor living via the generous open-air veranda spaces, whilst embracing Western architectural influences and motifs - from the spatial organisation for entertainment of house parties, to the use of mock-tudor facades to resemble a slice of home for the homesick Colonials. The B House reinterprets this culturally important typology to create a home that is typified by large veranda spaces for public entertaining and monsoon shuttered windows that similarly reflect elements of the past culture.

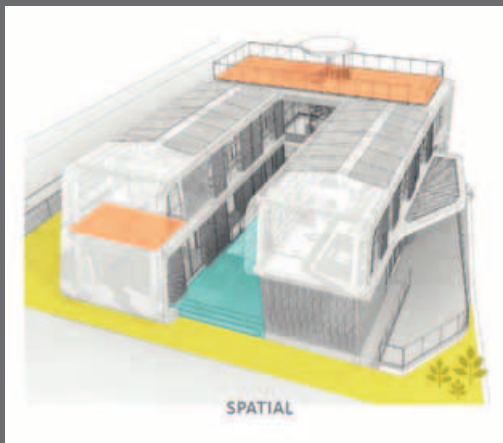
### SOCIAL RESPONSE

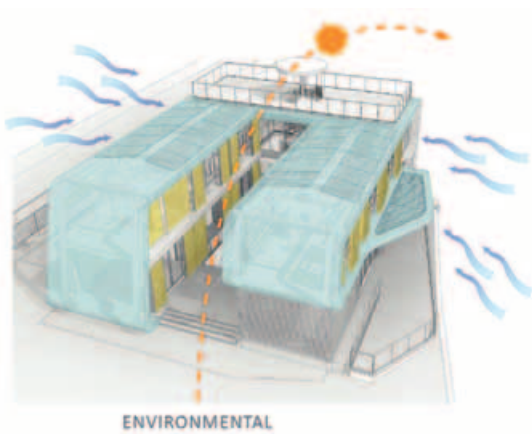
An analysis of end-user requirements and how the spaces were to be used was key to the appropriate shaping and sizing of the habitable spaces. This was made possible by a rigorous understanding of 'the day in the life...' of each individual household member from morning to night. This was then arranged as a series of flow diagrams that would ultimately inform movement patterns between functions and thus help map out the organisation of spaces and rooms. In so doing, it allowed for a clearer delineation between the public (formal reception area), semi-public (courtyard and veranda) and private (bedroom) spaces, whilst ensuring that the movement between such spaces was as efficient as possible.



### SPATIAL RESPONSE

Courtyards are integral elements to many Colonial and Asian forms of dwelling in South East Asia. Spatially, they often formed an effective transitional space between the more public reception areas that would be open to visitors, and the more private areas of the living, kitchen and dining areas that would be reserved for the family and close friends. Such a space was incorporated for the very same reasons, and furthermore offers environmental benefits when working in unison with the lofty interior spaces. Extended verandas also line the two wings of the house and appear to continuously wrap to form both walls and roof - thus giving the building its characteristic, curvilinear appearance.



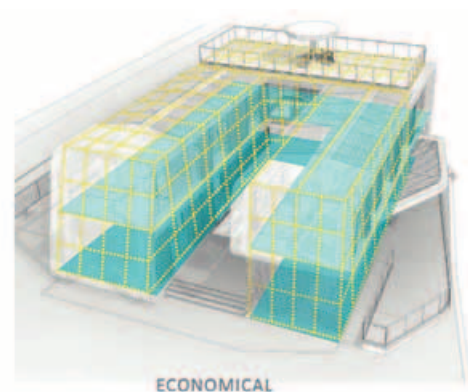
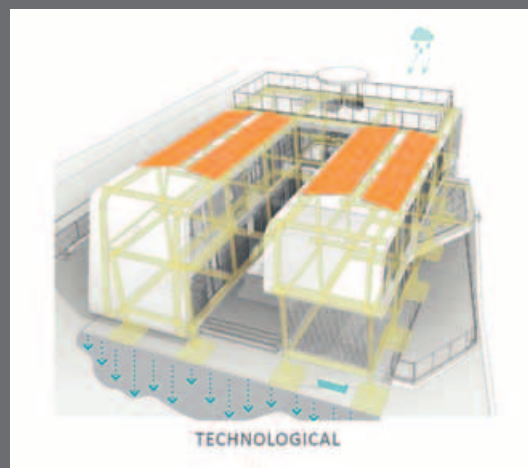


### ENVIRONMENTAL RESPONSE

A form-matching-climate approach that embraced the climatic conditions of Singapore sought to reduce energy and water consumption from the outset. Like the Black and White bungalow that would be orientated to minimise heat gain from the east and west sun, the house was similarly orientated to present the narrower faces to the east and west, thus minimising solar heat gain and maximising cross ventilation given the slidable screens that line the façades. High ceilings and a variety of window opening configurations optimise airflow during dry or monsoon seasons, while the shallow floor plates optimise daylight penetration. All such strategies help reduce the use of artificial cooling and lighting loads, and thus direct energy consumption.

### TECHNOLOGICAL RESPONSE

A modular design approach that employed a 1.2m planning grid allowed components of 300,600,900 and 1200mm to fit within the planning grid. This reduced the need for special components and wasteful off-cuts of material. The pre-fabrication of modules as a 'kit-of-parts' provided off-site quality control, and furthermore facilitated heightened speed of construction that reduced the on-site timeline by 50 percent. Green building materials with low eco-toxicity and high recyclable content were specified throughout, and an array of only 100 sqm of photovoltaic cells per house made the project carbon negative. Extensive use of rainwater harvesting and water saving devices further reduce consumption by 50 percent.



### ECONOMIC RESPONSE

The construction cost of B House is the same as a conventional bungalow in the same area, despite its green credentials. 100 square metres of photovoltaic solar panels cost S\$60,000 but will generate a predicted energy output of 16,720 kWh per year. The renewable energies therefore only account for 2.3 percent of the overall budget, demonstrating that zero energy design when executed properly need not be costly. As an average bungalow may consume up to 12,500 kWh per year, the passive design means that the residents of B House are likely to consume approximately 8000 kWh per year. This means that the house will generate more energy than the house can consume and is one of the pioneering carbon negative landed residences in Singapore.



### POST OCCUPANCY ANALYSIS

Based on a recent interview in 2018 with Channel NewsAsia for Powering the Future, Episode 2: Lighting up with Solar, Ms Belinda Young - the owner of B House - mentioned that they are able to capture more solar energy than they can actually consume. This translates into energy saving surpluses every month, which allows the owner to sell back to the power grid. These energy savings come up to about 1,087kW/month on an average and at the rate of 21 cents for supply into the grid, the owner is able to save nearly \$120-\$200 per month on electricity consumption. B House is therefore maintaining its design aspirations to be a pioneering carbon negative home in Singapore.

### POMEROY STUDIO DESIGN TEAM

- **Design Director:** Jason Pomeroy
- **Project Director:** Yoshi Shimada
- **Project Designer:** Elizabeth Simonson
- **Sustainability Consultant:** Deepshi Bhogal
- **Sustainability Consultant:** Mayank Kaushal
- **Landscape Designer:** Eugel Villaneuva

### LOCAL ARCHITECT

- **Architect of Record:** Raymond Sim

### CLIENT

- **Belinda Young**

*Text and images courtesy of Pomeroy Studio Pte Ltd*

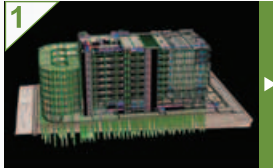


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Don't take your surfaces — floors and walls — for granted especially in the context of public spaces in industries such as healthcare, commercial, education and hospitality.

Surfaces of this nature take the daily beating of feet and machinery wheels. A high-traffic area also increases the risk of accidents happening.

Then there is the daily maintenance of cleaning, wiping, and disinfecting them. As owners of such public zones, you also want surface materials to be rigorous to constant usage while ensuring it does not disintegrate to release toxic by-products. So, what is your approach when creating the right and safe environments in these industries? If you're scouring the market for such products, Goodrich has some of the best solutions to tackle these concerns.



Patients Room (Flooring)



Hospital Lobby (Flooring)

## FLOORINGS FOR PATIENTS' AND TREATMENT ROOMS

Armstrong products may not be household names to some, but it is one of the leading brands when it comes to high-tech, high-performance flooring.

For example, Armstrong Medintone provides the highest scratch, stain, and scuff resistance in the industry which is suitable for patient's rooms and treatment rooms which often endures the worst beatings from the daily grind.

One can also consider Armstrong Medintech Plus – a unique homogenous vinyl sheet flooring. The product offers a layer of UV-cured coating which is anti-Betadine; perfect to avert staining and inhibits the growth of bacteria.

This high-tech flooring is the number one choice for many hospitals worldwide and it's no surprise that it is the brand's best-selling homogenous vinyl.

## FLOORINGS FOR COMMERCIAL PROJECTS

In public areas such as lobbies and gyms, Armstrong also has product offerings to make it resistant to stains and scratches.

The Armstrong Starlux sheet flooring has Diamond 10 technology integrated into the coating. It makes it resistant to scuffs, scratches, and dreadful stains.

Best of all, its durable and easy-to-clean properties makes it a breeze to clean and maintain.



Gym (Flooring)



Lounge Area (Flooring)



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Laboratories (Flooring)



Classroom, USA (Flooring)

## FLOORINGS FOR EDUCATION PROJECTS

When it comes to high-traffic areas such as education rooms and high-susceptibility to stains and corrosion such as laboratories, then Armstrong Startlux sheet flooring is your best solution.

More than just being durable, their resilience to scratches and stains make it a standout product. All this is possible because of Diamond 10 technology coating which also makes it a cinch to clean, lessening manpower in maintenance and saving you money!

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There's always pressure to look good when it comes to managing hotels and retail spaces. You want to create a good impression on your guests and customers. Armstrong ColorArt Medintech and Meditone with Diamond 10 technology coating is your best bet.

This amazing product is bent on tackling high-traffic spaces such as hotel lobbies and retail shops. A product to withstand the heavy footfall while being a low-maintenance product is clearly Armstrong ColorArt Medintech and Meditone with Diamond 10 technology. Unique to this product is the through-pattern construction found in ColorArt homogenous sheet which can prevent abrasions while looking aesthetically pleasing with its spectrum of colours, tones, and patterns.

For retail owners, Armstrong Timberline brings a slice of outdoors indoors. The realistic timbre wood offers detailed wood grains to add warmth to interiors. The Timberline collection is part of its Continuum Solutions which can harmonise with other products in Armstrong's flooring portfolio.



Boutique (Flooring)

Best of all, Armstrong is committed to saving the earth by creating products that will allow business owners to construct sustainable-built environments. Ultimately, this will contribute credits for Green Building Rating Systems such as the Collaborative for High Performance Schools® (CHPS®), WELL Building Standard®, Leadership in Energy and Environmental Design (LEED®), and Green Globes®.

All their flooring products also meet the requirements for the California Building Code (CALGreen®) and the International Green Construction Code (IgCC).



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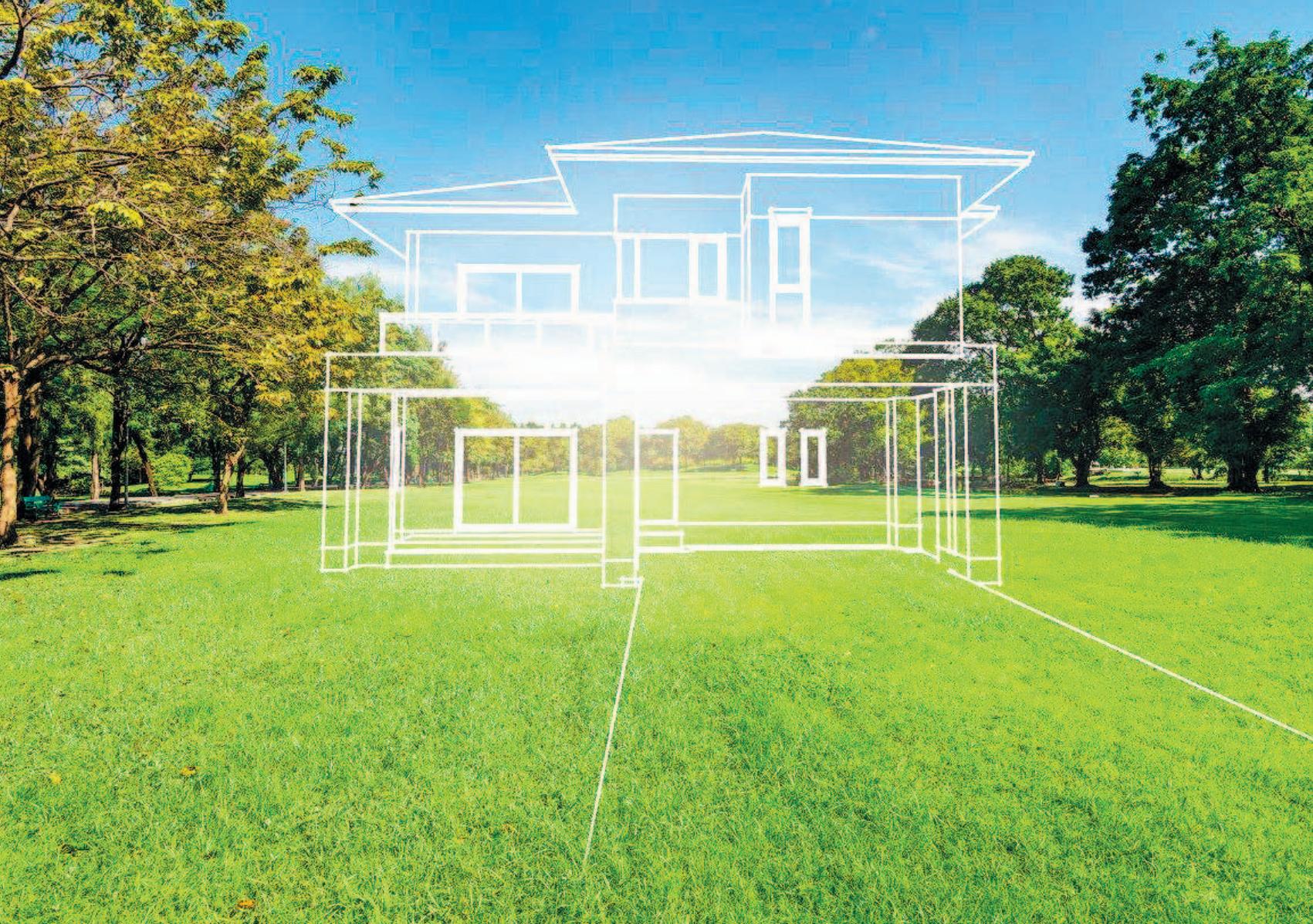




# BREATHE EASY

**The air we breathe in is of paramount importance to our health and wellbeing, especially in our abodes. Find out some ways to improve the Indoor Air Quality in your home.**

As the green building movement gathers momentum in Singapore, homeowners, along with commercial and industrial building owners, have also jumped on the bandwagon to push for a healthier environment within their living spaces. Builders have taken this rising demand for green homes and are able to address these concerns in a few ways.



For a home to be considered green, there are several components that contribute to this status:

- 1 Location of Home** – Avoiding building in inappropriate sites such as close proximity to an existing network of roads, highways or sewers. This allows the builders to automatically reduce the negative impacts of the surroundings on the home.
- 2 Building Materials** – The use of certified green building materials (such as those certified by the Singapore Green Building Council) during the construction phase as well as upon occupation, can positively influence a greener living environment.
- 3 Water & Energy Conservation** – Implementing a home design with efficient lighting and/or renewable energy like solar and economic use of water with low-flow fixtures can help to qualify the residence as a green home.

- 4 Indoor Environmental Quality (IEQ)/ Indoor Air Quality (IAQ)** – Equally important is the Indoor Environmental Quality (IEQ) or broadly known as Indoor Air Quality (IAQ), where the quality of indoor air plays a pivotal role in the occupants' health and wellbeing.

Where the location of the home, materials used in the building and water/energy efficiency infrastructure are not in the hands of the homeowner, the frequently asked question is, *"How can I improve the IAQ in my home?"*

This is undoubtedly a big topic to address over the course of one article, but here are six useful and important ways to improve the IAQ in your home. The following best practices of IAQ can vary in significance as each home/ building is unique in its setup, infrastructure and live-in routines.

### WHAT CAN GO WRONG AT HOME & HOW YOU CAN ADDRESS THESE ISSUES

#### 1 Carbon Dioxide (CO<sup>2</sup>) levels in bedrooms

Assuming that you keep the air-conditioning switched on and the rooms closed for well over 10 hours a day, fresh air intake in these rooms, where you spend more than one third of the day, is significantly limited. This results in odour buildup while also encouraging bio-infestation. This can be avoided by airing the rooms for at least two hours a day during the afternoons when outdoor air is full of free ions and high oxygen content.

#### 2 Mold Growth on Walls

It is very common to open the windows as soon as we turn off the air-conditioning. However, this practice is absolutely incorrect, as the outdoor air is humid and with open windows, this humid air enters the room and condenses on colder surfaces such as walls. This condensation ultimately contributes to mold growth. It is thus recommended that windows / balcony doors be opened at least 15 mins after the air-conditioning is turned off.

#### 3 Air-Conditioning Temperature Settings

Most families in Singapore set the air-conditioning temperature to 22°C but in some cases, some will have it set at 18°C in an attempt to expedite the cooling of the room. However, this is not necessary and in fact, can lead to a worse case of condensation and 'sweating walls'. New generation air-conditioning systems already have built-in intelligence, so when the temperature setting is kept at 24°C - 25°C, the air-conditioning systems operate at a higher capacity for the first 30 minutes to reduce the temperature of the room before settling at the range of 24°C - 25°C, which is ideal for most homes.

*TIP: Set your air-conditioning unit to Eco/ Night mode when in use at night. On this setting, the system is programmed to gradually increase the temperature in the morning hours as the occupant is preparing to wake up.*



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Breathe Easy





#### **4 Carpets & Rugs**

These fabric floor coverings can overtime become a reservoir of dust, soil and other bio-contaminants in the form of food waste, pet dander or dead human skin. It is vital to regularly vacuum your carpets and engage a professional company on an annual basis to restore them. It is important to appoint a cleaning company accredited by the Institute of Inspection Cleaning and Restoration Certification (IICRC), with the right equipment and knowledge to provide effective restoration of your carpets. Clean and sanitised carpets can significantly improve the IAQ of your home.

#### **5 Total Volatile Organic Compounds (TVOC) & Formaldehyde (HCHO)**

These organic compounds can be present in your indoor environment and can cause short or long-term health effects if continually exposed to. These gases are particularly high in concentration after completion of renovation, a fresh coat of paint or the introduction of new furniture to your home. In the case of renovation, it is recommended to get your vendor to carry out an IAQ test to check for TVOC & HCHO levels. These tests do not cost much and if the gas levels are above acceptable range, appropriate steps can be taken to remediate the indoor environment. One thing to note: vendors have the tendency to claim that TVOC & HCHO levels dissipate over time but if high levels persist for more than three days, occupants need to be wary of its negative impact.



### 6 Air Purifiers & Dehumidifiers

Most people would think that air purifiers and dehumidifiers, once installed, will work continuously and effectively forever. Most of these commercially available devices actually have a shelf life on their filters. While they can handle a small range of contaminants and are effective for only 1-6 months with continuous use, it is best to take IAQ tests before the devices are installed and then after to ensure that the devices are truly beneficial to your indoor environment.

You will find that these suggested practices are not mutually exclusive and tend to reinforce each other. If you are looking to create a healthier living environment, engage an independent IAQ consultant today to breathe easy! ✓



*Text and images courtesy of Big Red Pte Ltd.*



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## Indoor Air Quality Matters



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# GREEN HOME RENOVATION: A STEP TOWARDS GREEN LIVING

Homes must be made green and healthy right from the get-go. Consider these five aspects when undertaking a green home renovation project.

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## Green Home Renovation: A Step Towards Green Living

So, you have decided to green your home. This is a great decision as green renovation is an ideal opportunity to make your house more energy efficient, healthy and sustainable.

From the design phase through to the construction stage, plenty of opportunities exist to help you reduce your environmental footprint and craft sustainable living quarters. According to Mr Astley Ng, Vice President of the Society of Interior Designers Singapore (SIDS) and a Singapore-based interior designer

practicing green renovation, integrating simple sustainable design ideas and principles into our built environment makes a difference and will have far-reaching consequences in both the long and short terms.

Once the conscious decision has been made to renovate a home into a green and sustainable abode, there are a few areas throughout the project that you will need to pay attention to. Read on to find out more about five aspects you should consider when undertaking green renovation.





### 1 Set Your Budget

The primary concern for most homeowners when it comes to renovation is the minimum budget required and that whether going green will increase the cost of the project. We are not going to lie to you and say that it is cheap because the initial cost can be very intimidating at times.

However, do bear in mind that the financial commitment is high in the beginning, along the way and moving into the future, you will eventually be reaping cost savings from the green features in your home. The actual cost depends on the kind of renovation work you are considering to do, as well as the range of green features you want to incorporate into your renovation project.

Therefore, before getting started, be realistic of your availability and budget. We recommend you to set a budget you can meet and stick to it. This ensures that you will roughly know how much you will have to fork out, as well as the quality of the service and product you will be paying for. If you wish to increase the market value of your home for investment purposes, make sure that you are paying for excellent workmanship and quality materials. This will also help your green renovation project to be smooth sailing.

If your renovation plans go beyond your budget, talk with your renovation specialists about alternatives and options, including breaking your project into several phases to spread the costs over a longer period.

### 2 Find A Trusted Contractor

A fundamental step in planning for your green and sustainable home is to find a contractor to design and subsequently build your home. As a general rule of thumb, homeowners should find one that has the same green living goals as you do because they play an important and vital role in creating a “green culture”. If they do not have the same interests or goals as you do, they may not operate on the same level as your eco-friendly building plans.

As you may be spoiled for options in the market, many contractors openly advertise themselves as green contractors. Thus, homeowners must carefully research and assess each contractor and ask questions regarding their practices, ideals, etc. A good match, according to Mr Astley Ng, must accept the role of being an educator, doing their part to inform and educate clients because they can help reduce the consumption of pricey and valuable resources by integrating some useful ideas and concepts into their home designs.

Once you have chosen a green contractor, liaise with the company to help you choose the materials to build your green home. As Mr Ng notes, interior designers and architects are given a unique role to contribute in going green, right from the planning stage and affect the patterns of usage in the spaces we design. This is a responsibility that should not be taken lightly because each aspect of interior design, from material choice all the way to home durability, contribute to our final home green home.



### 3 Purchase Energy-Efficient Appliances

One of the best ways to go green is to replace old and inefficient appliances with new and economical ones that are certified for their energy efficiency, such as the National Environment Agency’s (NEA) Energy Label. In Singapore, it is mandatory for refrigerators, air conditioner systems and clothes dryers to have Energy Labels prominently displayed on the appliances before purchase. The label adopts a ‘ticks’ rating system and generally indicates the consumption of electricity the appliance will consume. The more ticks awarded, the better its energy efficiency and therefore cost savings.

Having an eco-friendly home can change the quality of life for you and your family in many significant ways. Thanks to these certifications, new home appliance models are being constantly developed with increasingly stellar performance and reliability. Ultimately, these appliances help homeowners to save money and protect the environment through superior energy efficiency.



#### **4 Select Eco-Friendly Building Products**

Knowing what to purchase for your green home arguably the most challenging aspect. Indeed, Mr Ng opines that specifying a wrong material will increase consumption as the durability of a wrong material may not be up to scratch, resulting in further replacement. This will result in unnecessary, wasteful costs.

In this case, homeowners should always look for environmentally-friendly and sustainable building products. They should also understand the lifespan of the materials and their potential impact on human health as well as the environment. Interior designers are also responsible when it comes to choosing materials and finishes: they should not use products that are not eco-friendly or that may cause too much wastage. These concerns work together and are essential to help create a sustainable home.

Homeowners should also avoid volatile organic compounds (VOCs) as they pose long-term health problems. In general, natural home products are more durable and effective than man-made products. For instance, a wool rug will outlive a synthetic rug by about 45 years. In the same manner, natural linoleum lasts twice as long as vinyl flooring.

Granite is one of the most popular countertop materials since it can last for a lifetime. Always read the label carefully, as 'natural' and organic' products, sometimes, may only contain a small percentage of natural ingredients. Also, try to avoid using building materials that leak toxic chemicals into the air such as particular paints and glues. This will help optimise the indoor air quality of your home.

A number of eco-certification programmes are active in the market to help homeowners and consumers identify and subsequently select building materials that have been certified for their environmental performance. One such programme is the Singapore Green Building Product (SGBP) certification scheme, dedicated to the evaluation of green building products. Similar to the NEA's Energy Label, the SGBP ranks building materials on a ticks-based system: the higher the ticks, the more eco-friendly a product is.

From interior paints to ceiling fans and vinyl flooring finishes, the SGBP's certified products are all contained in an online Directory for easy reference. A section that contains a list of certified products with low VOC levels is very useful for green renovation ideas. Visit [www.sgbc.sg](http://www.sgbc.sg) to find out more.





### 5 Go Minimalist

Until fairly recently, the idea of green living has had a radical, revolutionary tinge to it. While it has certainly proven to be revolutionary, the effects of the green living movement are so far-reaching that it has become a standard for homeowners looking for new ways to pursue sustainable living.

To make it possible, one of the new ways that is highly sought-after in recent times is the minimalist interior design, especially in land-starved countries such as Singapore. Indeed, rather than adapting an overly large and inefficient space, homeowners today prefer to make the most of their available square metres in order to reduce the need for valuable floor space.

In many ways, minimalism equates to being eco-friendly because it simply involves a great deal of common sense and creativity in home renovations that one would consider “green”. At the end of the day, homeowners cannot go wrong as long as they stick to the mantra of doing more with less.

### CONCLUSION

Going green is about educating and being educated. The most challenging aspect of going green is getting people to believe, and then being involved. Generally, people are reluctant to change and feel that going green means extra work or that it may cost more just to be green. Some even feel that taking care of their environment is not their job and someone else should be doing it. All these aspects result in ignorance and a lack of understanding on how going green starts from proper interior design and planning.

Nevertheless, renovating our home with sustainability in mind will contribute to a positive impact on the world’s energy consumption and also result in cost savings in the long run. As we begin to work this way, we start to identify clients, architects, suppliers and many others who are also caring about the environment and being green from a holistic point of view. Most important of all, we hope this article has provided you with some good, eco-friendly ideas to help you make the right decision for your health and wellbeing.

Last but not least, we want to assure you that by embarking on a green renovation journey, you have already made a green choice. While it is a personal decision for the most part, a growing number of people has gradually put a premium on “living green” and simply want their home to be healthier to live in and have less environmental impact.

Cheers to green living! 🍀

*Text and Images courtesy of Renotalk and the Society of Interior Designers Singapore*

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Symphony, J. Josephson (Wallcovering)

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Shield Leather (Fabric)

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T709G, Tuntex (Carpet)

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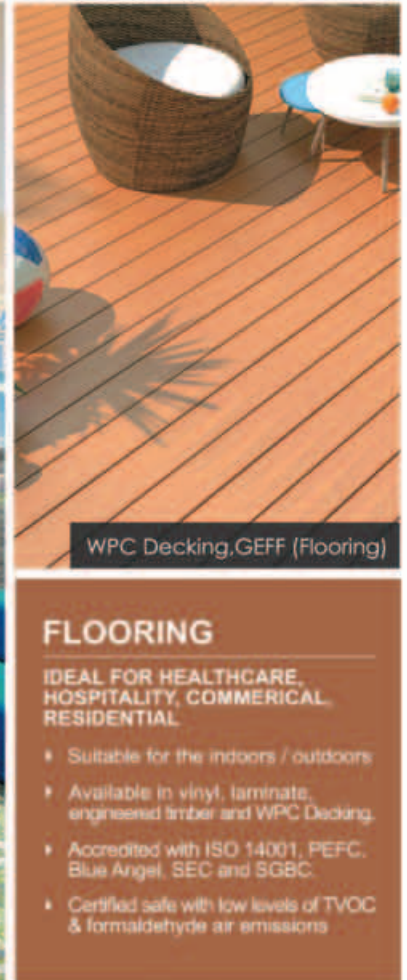


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