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Best wishes for 2013, and welcome to the second edition of Build Green. Many of you gave us a positive reception when we launched the inaugural issue at the International Green Building Conference 2012. With your feedback and encouragement, we will continue sharing more knowledge, best practices and updates to support your sustainability journey.

The green building movement is certainly gaining momentum in Singapore and drawing international accolades. On her recent visit to Singapore, UNFCCC Executive Secretary Ms Christiana Figueres was full of praises for our country’s efforts in mitigating climate change, particularly singling out our BCA Green Mark scheme for commendation. We were very honoured to be given the opportunity to present our 2nd Green Building Masterplan and the suite of Green Mark Schemes to complement our policies and measures to Ms Figueres on her visit here, under the International Organisations Distinguished Visitors Programme.

Indeed, we have been taking the Green Mark scheme further, by becoming the first in the world to mandate minimum environmental sustainability standards for existing buildings. Green Mark is not confined to just new and existing buildings; it is also being adopted by parks, restaurants, office interiors, infrastructure and other aspects of our built environment now. In this issue, you will find out why we have extended the scheme from October 2012 to cover data centres, supermarkets and retail outlets, traditionally considered to be major consumers of energy. By taking the industry through these occupant-centric schemes, coupled with Green Lease initiatives by developers, we are moving towards not only creating, but operating low-carbon buildings for Singapore’s built environment sector.

Internationally, we continue to share best practices with other countries. We participated in the recent Greenbuild 2012 International Conference and Expo in the United States, and led industry delegations on learning journeys to Seoul and San Francisco. In both cities, we engaged with local agencies and stakeholders to learn and share our experience on improving energy efficiency and reducing energy consumption.

In this issue, you will also read about other areas of progress in greening our built environment. Find out more about our Research & Development (R&D) Green Building Framework, developed in consultation with multiple stakeholders as a guide to help the industry focus its efforts. We have since made two grant calls for R&D projects.

Not to be missed is the article on how property valuations should factor in green building energy performance. We will also share on the enhanced set of criteria for Green Mark Version 4.1, which took effect on 15 January. Finally, we have already started our preparations for the International Green Building Conference 2013. Look out for more information on this!

Dr John Keung
Chief Executive Officer
GREEN HIGHLIGHTS

Completed in 1982, 101 California is a 48 storey building with floor area of approximately 116,000 square metres. In spite of its age, at about 30 years old, the building was awarded the LEED-EB OM Platinum in 2011, with the highest score ever awarded in the Existing Buildings category then.

Hines, the local real-estate company which developed and manages the building, had set its sight on the Platinum award right from the beginning. To achieve this goal, the in-house LEED team looked into every credit possible under the LEED-EB criteria, dedicating 10 months solely on the project and paying special attention to the finest detail.

In the area of energy efficiency, the building had performed well. 101 California is 42% more energy-efficient, saving US$1.45 in energy costs per square foot annually, when compared to the average office building in the country.

The few retrofits the building underwent over the last 15 to 20 years also helped in its LEED certification. Some of the measures implemented in the retrofits included the retro-commissioning of the entire building, the implementation of green cleaning standards and the introduction of a comprehensive recycling and composting program.

The building further adopted the continuous commissioning programme to ensure its systems continued to operate at optimal levels. The 30-year-old chiller plant system efficiency was well maintained at 0.78 kW/RT due to the low ambient temperature and the immaculate care by the facilities management team. We note that the GM criteria set for system aircon efficiency is on par with the international best practices (See Table 1 below).

Table 1: BCA’s Green Mark Rating (for Existing Building)

<table>
<thead>
<tr>
<th>Green Mark Rating</th>
<th>Building Cooling Load (RT)</th>
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<tr>
<td></td>
<td>&lt; 500</td>
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<tr>
<td></td>
<td>≥ 500</td>
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<tr>
<td>Certified</td>
<td>0.85</td>
</tr>
<tr>
<td>Gold</td>
<td>0.8</td>
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<tr>
<td>GoldPlus</td>
<td>0.75</td>
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<tr>
<td>Platinum</td>
<td>0.7</td>
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BCA's Green Mark sets a more stringent requirement of at least 0.75 kW/RT for water cooled chilled water air conditioning systems.
The BCA delegation with the Hines Team at 101 California

The building management also engaged its tenants in the green movement by offering its proprietary GREEN OFFICE for Tenants programme. This programme was designed to assist tenants in reducing their carbon footprint through enhancing the sustainable features and operations of their rented spaces. HinesGO (GREEN OFFICE) for Tenants was rolled out at 101 California in April 2009 and to date, approximately 92% of the property’s leased square footage has been certified GREEN OFFICE.

The building has truly displayed exemplary commitment towards sustainability from its initial development to operations stage, none of which would have been possible without the strong management commitment, the clear targets and goals and the cooperation from the staff.

The Singapore delegation visited San Francisco and Seoul from 7 to 17 November 2012 to meet with local government agencies and to visit iconic green buildings, such as 101 California. The delegates ended the tour by attending the Greenbuild 2012 International Conference and Expo held in San Francisco.

BENCHMARK YOUR OFFICE BUILDING’S COOLING LOAD

THESE ENERGY AUDIT RESULTS COMPILED BY THE BUILDING AND CONSTRUCTION AUTHORITY AND THE NATIONAL ENVIRONMENT AGENCY ON EXISTING OFFICE BUILDINGS SERVE AS A REFERENCE FOR BUILDING DESIGNERS, OWNERS AND OCCUPANTS IN MANAGING THEIR AIR-CONDITIONING DEMAND.

In a typical air-conditioning design for office building projects, the design peak cooling load is usually in the range of 100-180 W/m² for sizing air-conditioning equipment at peak load. However, the actual cooling load may be lower due to the diversity of air-conditioning usage and various contingencies adopted in calculating design cooling load. Most of the time, buildings do not run at the design peak load, so it is important to design the air-conditioning system such that it runs efficiently even when it is operating at part load conditions, for both new buildings or retrofitted existing buildings.

The following cooling load data is obtained from energy audits of existing office buildings (mix of private and public sectors), during normal office operating hours. The cooling load per air-conditioned floor area is in the range of 60 W/m² to 98 W/m². This data may be affected by seasonal changes due to measurements at different times of the year. It may be used for reference but is not meant to be used for air-conditioning design and sizing.
BCA’s Green Mark schemes for buildings assess the environmental sustainability of buildings and focus on landlords’ contributions in ‘going green’. However, tenants, who consume about 50% of the total energy used in commercial buildings, also play a substantial role in greening a building. Recognising this, BCA extended its Green Mark schemes to tenants between 2010 to 2011, by introducing Green Mark schemes for Office Interiors and Restaurants. Then last October, BCA further introduced a suite of new occupant-centric schemes to promote Green Mark in supermarkets, retail outlets and data centres. Find out more on how tenants can leverage these three latest schemes to do their part for a greener Singapore.
BCA GREEN MARK FOR SUPERMARKETS

The BCA Green Mark for Supermarket scheme was developed to promote and recognise environmentally friendly and sustainable practices and features in supermarket operations. The scheme aims to reduce the operators’ energy load, water use and waste production, over and above the base building consumption for greater energy efficiency.

Four supermarkets have been certified Green Mark to date. Out of the four outlets, FairPrice Finest at Zhong Shan Park was awarded the highest Platinum award, while FairPrice Finest at myVillage in Serangoon Gardens received the GoldPlus award.

• Energy Efficiency

Energy efficiency is the key focus in the Green Mark for Supermarket certification criteria. A supermarket in Singapore uses an average of 1,300 kWh of electricity per square metre, costing $30 per square foot, each year. For an average-sized store, this equates to $300,000 annually in energy costs and results in 650 tons of carbon dioxide being emitted into the atmosphere.

Refrigeration and lighting account for over 50% of total energy consumption in a supermarket, where the floor area ranges from 500 to 4500 square metres, making these systems the best places to start looking for energy efficiency opportunities.

In order to achieve the Platinum or GoldPlus award, the supermarket outlet should have doors fitted in at least 75% of its remote refrigeration display cases and compressors controlled by variable frequency drives and electronic expansion valves for the evaporators.

‘FairPrice Finest’, certified Green Mark GoldPlus, saved more than 10% in energy consumption by retrofitting and installing doors to 98% of the outlet’s refrigeration display cases. Furthermore, the entire store’s 872 square metres floor area has been fitted with LED lighting inclusive of display cases, auto zonal lighting controls and occupancy sensors to conserve energy.

• Environmental Protection

The National Environmental Agency 2005/2006 Annual Report stated that Singaporeans used about 2.5 billion plastic bags every year, representing some 19,000 tones of total waste annually.

In a bid to minimise the impact to the environment, the BCA Green Mark for Supermarket scheme awards points to operators for their efforts to reduce, reuse and recycle items or materials such as cardboards, paper and plastic bottles. The operators will also be recognised for implementing a priority “green” checkout lane to serve only consumers with their own recycle bags. As an example of a best practice to reduce waste, the FairPrice Finest supermarket at myVillage in Serangoon Gardens implemented a priority checkout lane to serve only shoppers who brought their own recycle-bags.

• Sustainable supermarket operations

The new BCA Green Mark scheme received strong support from major operators such as NTUC FairPrice and Cold Storage who participated in the pilot schemes. Going forward, a truly sustainable supermarket operation should educate consumers on behavioural changes to minimise their carbon footprint and embrace the green journey as a possible way to improve the bottom line.
BCA-IDA GREEN MARK FOR EXISTING DATA CENTRES

Data centres are heavy users of energy and are expected to increase their energy footprint further with the rapid growth of cloud-based services, online media and transactions. According to the Infocomm Development Authority (IDA), Singapore’s 10 largest data centres are estimated to consume energy equivalent to 130,000 households. The Singapore commercial data centre capacity is projected to increase by 50% from 2010 to 2015 with a corresponding increase in energy consumption.

The BCA-IDA Green Mark for Existing Data Centres is a joint collaboration scheme between BCA and IDA to benchmark the performance and rate the greenness of data centres. Using a point scoring system, it assesses data centres on energy efficiency, water efficiency, sustainable construction and management, indoor environmental quality and other green features. The certification is valid for three years after which the project has to apply for re-certification if it wants to maintain the Green Mark logo.

• Credit Suisse Data Centre
  Awarded the new BCA Green Mark Platinum Rating for Existing Data Centres, this data centre was constructed as a five-storey purpose-built light industrial building. It is capable of meeting the data centre growth projections for the next 25 years based on reasonable growth rates and designed to be modular in nature to minimise initial construction cost.

  The certification recognised its use of info-communication equipment with Energy Star rating and energy metering to provide total facility power and energy usage and total equipment power to determine the PUE energy efficiency number. It also uses bi-level lightings, with a lighting sensor control for each row of server racks, and provides a facility for the collection and storage of recyclable wastes such as plastic, metal and paper waste.

• Equinix SG 2 Data Centre
  This co-location data centre service provider received the BCA Green Mark Gold™ Rating for Existing Data Centres as well as the SS564 certification: Singapore Standard for Green Data Centres – Energy and environmental management systems. It occupies two levels, each with its own facility system to provide power and cooling.

  It is also equipped with bi-level lightings with lighting sensor control at each row of server racks and energy metering for energy efficiency. In addition, it uses NEWater for its cooling system and other non-potable water requirements.

• Singapore Tourism Board Data Centre
  This enterprise data centre adopted some of the best practices for data centres in energy efficiency management. It achieved 90% in power train efficiency, defined as the efficiency of the electrical power supply system in providing the required level of redundancy while maintaining high load factors. It also employs energy metering to monitor energy efficiency levels.

  For its efforts, it was awarded the BCA Green Mark Gold Rating for Existing Data Centres as well as the SS564 certification: Singapore Standard for Green Data Centres – Energy and environmental management systems.
BCA GREEN MARK FOR RETAIL

The retail sector is one of the highest consumers of energy per floor area in Singapore. Data collected from retail buildings assessed under the Green Mark schemes showed that tenants within a retail mall accounted for approximately 50% of the building’s total energy consumption.

The Green Mark for Retail is developed to recognise the efforts of individual retail tenants for their sustainability efforts. The scheme aims to guide and encourage tenants to fit out their shops in a sustainable manner that reduces operating costs and energy consumption while maintaining the required aesthetics.

Since its launch, the scheme has certified three retail outlets, namely J’s Hair Studio at ITE College East, Royal Silver at 313 Somerset and Dressaday at 313 Somerset. Going forward, BCA intends to work closely with major retail developers to encourage environmentally friendly design among tenants during the fit-out renovation stage.

- Greening a hair salon

  BCA Green Mark Gold™ recipient, J’s Hair Studio, was opened in 2011 at ITE College East. The owners had designed the salon with a strong objective to adopt eco-friendly features at this outlet. Having taken over the shop space from a previous tenant and to minimise materials wastage, a large portion of the flooring, ceiling and light fixtures were retained during the fit-out process. The eco-friendly retail design also included recycling and reusing wood panels and aluminum panels as part of the furniture.

  Lighting energy is a major contributor to a tenant’s electricity bills and is the largest energy component that is fully within the control of a tenant. J’s Hair Studio was installed with energy efficient T5 and LED lighting to cut down on lighting energy consumption. It also zoned lighting circuits to switch off lights in specific areas when not in use.

  The owners at J’s Hair Salon went further to incorporate greener methods in the daily operations to counter the perception that the industry was a resource-wasting one. Simple innovations now allow the stylists to work effectively with less electricity and water.

  To involve customers in the green movement, the salon also introduced programmes for customers to recycle their used containers as well as including environmentally friendly products in their sales product line-up. A video clip documenting environmentally sustainable procedures in running a hair salon was also produced and distributed to other hair salons.

To download the detailed criteria for these new occupant-centric Green Mark Schemes, please go to:

GREEN LEASE – A WIN-WIN PARTNERSHIP

ENJOY THE MUTUAL BENEFITS OF GREEN LEASE BY ENGAGING TENANTS THROUGH A BUILDING MANAGEMENT COMMITTEE.

Last year, BCA rolled out a full suite of occupant-centric Green Mark Schemes to bring occupants onboard the green movement. In addition to the various occupant-centric Green Mark Schemes, building owner can further engage the tenants on going green through a green lease, which provides a mutual lease agreement for building owners and tenants to minimise environmental impact in their daily operations and share benefits such as annual savings from utilities bills and healthy indoor environment.

Although building owners such as Lend Lease, CapitaLand and Mapletree have successfully signed green leases with some of their tenants, green leases have yet to gain significant traction in Singapore’s commercial leasing market. From BCA’s industry consultations, the key hurdles appear to be tenants’ perceived conflicts of interest as well as their lack of knowledge and essential expertise in environmental sustainability. Having said that, Keppel Land is confident that with tenants being better educated on the appreciable benefits of green leasing, green leases will gain increasing acceptance in the industry.

To make green leases work more effectively for all parties, the Better Buildings Partnership in London recommends the formation of a Building Management Committee. A Building Management Committee brings together the representatives of both the building owner and tenants to set targets and review the environmental performance of the buildings periodically.

Case Study: Hollywood House

The refurbishments substantially improved the energy performance of Hollywood House by replacing the inefficient mechanical and electrical systems. At the same time, PRUPIM established a Building Management Committee to work closely with tenants to understand the building’s performance and to drive towards environmental improvement.

With this joint effort, one of the tenants, Skanska, has made tremendous environmental improvements in using 56% less energy per square metres than before the refurbishment. The company also enjoys an annual savings of about £28,000 in its operation costs.

Win-Win Partnership
From London’s example, it follows that having a common goal towards a sustainable built environment could help attain a win-win partnership for building owners and tenants. The Building Management Committee provides an ideal platform to foster effective communication, address obligations and concerns and build the mutual understanding and agreement needed as a foundation to a green lease. Once the green lease is in place, building owners and tenants would be encouraged to collaborate further to adopt green practices in their buildings in the future.

1 Source of Case Study: Better Buildings Partnership, www.betterbuildingspartnership.co.uk

Picture: Hollywood House
Source: Prudential Property Investment Managers Limited (PRUPIM)
ENHANCED CRITERIA FOR NEW BUILDINGS

FROM 15 JANUARY, THE BCA GREEN MARK FOR NEW BUILDINGS WILL ADOPT AN ENHANCED CRITERIA SET OUT IN GREEN MARK VERSION 4.1. THIS SETS TO ENHANCE THE ADOPTION OF RESOURCE-EFFICIENT DESIGN AND PRACTICES. HERE ARE THE KEY CHANGES, AS HIGHLIGHTED IN THE BCA CIRCULAR ISSUED ON 31 OCTOBER 2012.

- Scoring methodology for building cooling system efficiency
  The methodology in determining the system efficiency of building cooling system was revised to be based on the total average cooling load and total power inputs of the various system components or on the energy modelling framework where applicable.

- Energy modelling framework
  The assessment will consider passive design enhancements and small air distribution systems in the energy saving computation.

- Energy-efficient equipment or products
  The new criteria will consider the use of energy-efficient equipment or products that are certified to be environmentally friendly.

- Sustainable products
  This will be an additional pre-requisite for minimum point scoring under Sustainable Products for higher awards.

- Sustainable Construction
  This enhancement will allow more flexibility in terms of scoring for lower usage of recycled materials

- Ventilation Simulation Methodology
  The minimum pre-requisite will be relaxed to require only 70% of selected typical units with optimal air flow. The ventilation simulation can be based on two best prevailing wind directions.

All Green Mark applications for new buildings that are submitted on or after this date will be assessed and certified based on this version. Projects that are submitted prior to 15 January but not assessed by 15 October this year will also be subject to Green Mark Version 4.1 automatically.

More details on Green Mark Version 4.1 can be found at:
Circular to Professional Institutes /Associations:

BCA Green Mark Certification Standard for New Buildings, GM Version 4.1, Oct 2012 Issue:

Code for Environmental Sustainability for Buildings
3rd Edition, Oct 2012 Issue:
SPURRING THE PRIVATE SECTOR

VALUE IN GREEN

THE SINGAPORE INSTITUTE OF SURVEYORS AND VALUERS HAS PUBLISHED A NEW VALUATION GUIDELINE ON GREEN BUILDINGS TO HELP VALUERS CONSIDER ENERGY-EFFICIENT FEATURES WHEN VALUING PROPERTIES.

The Singapore Institute of Surveyors and Valuers published a valuation guideline to take green building features into consideration when assessing market value. While the methods of valuation used will still remain the same, the new guideline will make the valuer more aware and account for the green factors within each development, where applicable. (This guideline is a publication and copyright of SISV.)

- **Direct Comparison Method**
  Under this method, green buildings should be appraised by comparing them to similar green buildings which have been sold, and making the relevant adjustments for differences between comparable properties. The direct comparison method can also be applied when assessing the rental of green buildings. With more green buildings and developments being built, this method will become more relevant.

- **Cost Method**
  The cost method will give the valuer an indication of the value enhancement of green features to property value. A building certified Green Mark Platinum may be more costly and likely more valuable than one that is Green Mark certified if other characteristics of the two properties are similar.

- **Income Method**
  Under the income method, the correct net income should be estimated taking into account the enhancement it may achieve as a result of the incorporation or installation of green features and design. This could be in the form of increased rental as well as reduction in operating expenses. The income method may be in the form of a direct capitalisation method using the prevailing rental multiplied by the years of purchase or a discounted cash flow over an appropriate period taking into account the expected useful life of the green features.

“Green buildings have a tremendous impact on value, image and operational efficiency. There is a need to assess the enhancement in the value and benefit of green buildings. The proposed SISV Guideline on Valuation of Green Buildings provides the framework for determining their appropriate market values.”

Professor Lim Lan Yuan, President of Valuation & General Practice, Singapore Institute of Surveyors and Valuers.
PROMOTING R&D IN ENVIRONMENTAL SUSTAINABILITY

R&D FRAMEWORK TO GREEN THE BUILT ENVIRONMENT

A GREEN BUILDING R&D FRAMEWORK HAS BEEN ESTABLISHED TO HELP SINGAPORE GREEN 80% OF OUR BUILDINGS BY 2030.

The Inter-Ministerial Committee on Sustainable Development for Singapore’s built environment had set the target. At least 80% of the buildings in Singapore should achieve BCA Green Mark Certified rating by 2030.

Although BCA had rolled out its 2nd Green Building Masterplan in 2009 with a focus to green the large stock of existing buildings, it recognised that it could still be a technical challenge to retrofit these buildings cost-effectively and with minimum disruption. To address this challenge, the Green Building R&D Workgroup, supported by BCA’s R&D Programmes department, established the Green Building R&D framework as a guideline for grant calls.

The Framework seeks to achieve three desired outcomes – resource efficiency, energy efficiency and liveability (live, work, play). It uses the life-cycle of a typical building as a basis to identify the key R&D focus areas. To determine its practicality and priority, each technology will be assessed in terms of its impact towards carbon abatement, economic potential, resource security and competitive advantage.


With the Framework in place, a pilot R&D grant call was made together with A*STAR and the Ministry of National Development in 2011 on energy efficient and building materials. A total of $9 million was awarded to nine projects. Following this success, BCA rolled out a second joint R&D grant call, specifically in the area of high-performance building façade materials. The award is expected in the first half of 2013.

For more information about the Framework, please visit www.bca.edu.sg/GB_RnD_framework.aspx or email bca_research@bca.gov.sg for your enquiries and feedback.

PROMOTING R&D IN ENVIRONMENTAL SUSTAINABILITY

OPTIMAL USAGE OF CONCRETE

THE GUIDEBOOK TITLED ‘SUSTAINABLE CONSTRUCTION – A GUIDE ON CONCRETE USAGE INDEX’ IS NOW AVAILABLE TO THE INDUSTRY.

BCA has published its sixth guidebook under the Sustainable Construction series on the optimal usage of concrete. It was put together collaboratively with contributions and reviews from key industry stakeholders and the academia, working together to promote sustainable construction.

The guidebook showcases several projects with inputs from respective project teams on how they achieved a good concrete usage index scoring. These projects also achieved good buildability scores, demonstrating the general alignment between concrete usage index, productivity and buildability. The publication also identifies useful technologies and methodologies for structural and non-structural systems, to achieve the objective of design for optimal usage of concrete at the upstream.

To facilitate the concrete usage index calculation, several existing commercially available software, such as Building Information Modelling tools and Structural Analysis Engines, were introduced in the guidebook. Such software can automatically extract the relevant quantities such as volume of material used and constructed floor area, both of which are needed for computation of the index value. Like all other software, BIM tools and analysis engines could be used to their fullest potential to ease CUI calculations only when the modellers are experienced and adequately trained, in order to model building elements and define the material and boundary conditions such as the constructed floor area, correctly.

"BCA has teamed up with academia and industry to develop a guide on Concrete Usage Index, which will be shared here at this conference to raise awareness and to share best practices among industry practitioners."

The guidebook was launched on 10 October 2012 at the opening of Singapore Green Building Week, with more than 400 copies were distributed over three days. The online version is available for download at www.bca.gov.sg/SustainableConstruction/others/sc_cui_final.pdf
SUSTAINABLE CONSTRUCTION: RCA FOR STRUCTURAL APPLICATIONS

Question: Is it true that recycled concrete aggregates (RCA) are inferior in quality compared to natural aggregates making them only suitable for non-structural works?

Dr Ho: In general, there is a lack of confidence in the quality of RCA and consequently, its application in structural concrete. Quality in RCA is highly determined by the existence of proper and stringent control in the RCA quality during processing. With few projects adopting RCA in structural building works previously might also contribute to the slow rising numbers of using RCA for structural applications.

Question: Could the cost of RCA as compared to natural aggregates be a deterrent factor?

Dr Ho: The cost is not one of the deterrent factors for the use of RCA in structural application. In fact, the price of RCA has been very competitive as compared to natural aggregate. We are optimistic that there will be more projects adopting RCA in structural building works with the many schemes such as Green Mark scheme put in place by BCA to encourage industry stakeholders.

Question: What are the challenges faced when undertaking Samwoh Eco-Green Building project? How did you overcome them?

Dr Ho: The studies on the use of RCA in concrete were not new then, but they are mostly confined to laboratory scale and limited literature was available. As such, the practicability of using RCA concrete and its performance in actual building were uncertain and doubtful. Even though the BS EN standard has already allowed 20% replacement of RCA in structural concrete, there are concerns on the possible adverse impacts.

We managed to address the various issues through extensive laboratory tests to evaluate the material properties such as permeability and creep of concrete. We also implemented advanced structural monitoring device like the fibre-optic sensors in key structural elements in columns to monitor the actual behaviour of the building. These initiatives were made possible by the support from the MND Research Fund administrated by BCA. Now, Samwoh Eco-Green Building stood strong and became the first building in the region to achieve up to 100% replacement of RCA in structural concrete works, which has effectively demonstrated the feasibility of using high percentage of RCA in structural concrete and to further boost the confidence of the industry.

Question: What are some of the features that help Samwoh Eco-Green Building to achieve low concrete usage index?

Dr Ho: We have achieved a good concrete usage index value of 0.33 for the building. Although concrete with RCA was used for the key structural elements — which included columns, beams, slabs, lift cores and staircase cores — the internal non-structural walls were constructed using dry walls and hollow-core walls made of fine RCA. For the building façade, a special type of perforated aluminium curtain wall was used to reduce the heat and allow natural daylight to enter the building.

Question: Moving forward, are you planning any research and development activities for green concrete?

Dr Ho: Samwoh has been relentlessly looking into the feasibility of using different types of recycled wastes for construction applications even before sustainable development took flight in Singapore. The efficient utilisation of coarse RCA in structural concrete is definitely not an end to our sustainable journey but an opening to a new chapter. Moving forward, we will explore other potential wastes that can be recycled from the waste stream.
The BCA Zero Energy Building is already a living example of how the smart integration of green building technologies and solar PV technologies can lower and meet the building’s energy demand yet achieve a net zero energy balance. For more than three years, the building has been consuming less electricity than what is produced by the solar panels.

In addition, the Zero Energy Building can accommodate the testing of innovative green building technologies in a real building environment with active occupants. Such testing can allow solution providers to evaluate the performance of green building technologies in order to make suitable adaptions to improve their performances for use in tropical buildings.

A cool test bed
Er Tay Cher Seng was one innovator drawn to the building’s pro-enterprise platform to perfect his work on a cooling technology that allows cold air to be delivered to building occupants by natural convection means, without relying on fans. At Zero Energy Building, he test-bedded his innovative Passive Displacement Ventilation (PDV) system within a classroom setting.

The system bears a unique design to stratify the room space into different temperature zones. As the cooling coils cool the warm air near the ceiling, the chilled air drops within the shaft to be discharged at the bottom, thus creating a cold air reservoir at the floor. As the cold air picks up heat from human bodies, it rises to the ceiling to be cooled by cooling coils before the cycle repeats again. The temperature stratification creates a comfortable zone for room occupants without wasting energy cooling the upper half of the room.

After performing his test in December 2011, Er Tay Cher Seng found that the system had more than met the thermal criterion of 24°C and 60±5%RH. The chart below shows the temperature at several locations inside the room to be 24°C and the relative humidity markedly below 55%. A smoke test also showed that the cold air driven by natural convective force was distributed uniformly and effectively. In the occupants survey, 90% of the occupants surveyed indicated acceptance of the ambient environment generated.

This result was shared at the ASEAN Energy Summit in 2012 and the PDV system won a coveted award in the special category for innovation. One of the first adopters of this technology is the NTU Office of Development & Facilities Management. After visiting the PDV classroom at the Zero Energy Building, the NTU Office of Development & Facilities Management became an early adopter of the PDV system to perform a pilot test on campus before full implementation at its new eight-storey NTU Learning Lab.

If you are interested in Zero Energy Building’s test-bedding facilities, please submit your proposal detailing the technology, test methodology, cost and timeline to BCA’s Centre for Sustainable Buildings and Construction for consideration. Further enquiries may be directed to Ms Alice Goh at alice_goh@bca.gov.sg or Mr Stephen Mok at stephen_mok@bca.gov.sg.
BCA GREEN MARK IS A SINGAPORE GEM

“I am only beginning to understand what Singapore is doing on climate at the national level. I am impressed by the breadth and the depth of the efforts”
~ Ms Christiana Figueres

The ‘Little Red Dot’ received the world’s top climate change official on 18 and 19 October 2012. Ms Christiana Figueres, the Executive Secretary of the United Nations Framework Convention on Climate Change (UNFCCC) was here at the invitation of the Minister for the Environment and Water Resources under the International Organisations Distinguished Visitors Programme.

A Costa Rican, Ms. Figueres was appointed Executive Secretary of the UNFCCC by UN Secretary-General Ban Ki-moon on 17 May 2010. She has also served on several boards of non-governmental organizations involved in climate change, including the Voluntary Carbon Standard.

On the first day of her visit, BCA and the National Climate Change Secretariat presented on Singapore’s Climate Change strategies. Ms Figueres found out more about the landmark legislation on greening existing buildings, which was highlighted as a key lever to drive minimum environmental sustainability in existing buildings and to ensure building energy systems were operated and maintained at optimal levels.

With this new requirement, Singapore was the first in the world to mandate a minimum standard in the built environment to meet the national target of greening 80% of the building stock.

Ms Figueres also learnt about how BCA had introduced a suite of Green Mark schemes – ranging from new to existing buildings, districts to parks and office interiors to restaurants – to complement its policies and measures. She lauded BCA for its efforts in driving sustainability in the built environment; in particular the Green Mark schemes for all buildings.

During her visit, Ms Figueres gave a lecture on "Climate Change: Why We Need a Multilateral Solution" to government delegates, industry leaders, the media, and students. At the lecture, she extolled Singapore’s efforts, emphasising that the tiny island country was punching above its weight. However, she also pointed out that as with the rest of the world, more could always be done locally. Driven by either national interests or global necessity, countries needed to accelerate and widen their horizons when it came to climate change. She further edified the audiences to be “heavyweights” to secure a sustainable tomorrow that future generations could depend on.

Over the years, BCA’s local industry stakeholders had worked closely with the government to support the green building movement in Singapore. With our national commitment to reduce emissions by 7% to 11% from the 2020 BAU level and to achieve the 80% target to green buildings, there is still much work to be done. This would require further collective public-private efforts in various aspects of the green building movement as well as industry leaders taking the lead in building up their green collar workforce and research capabilities in new and innovative technologies.

“...but we are on our way.”
~ Ms Christiana Figueres

Other active roles that Ms Figueres has played over the decade:-

- Represented Latin America and the Caribbean on the Executive Board of the Clean Development Mechanism in 2007
- Served as Vice President of the Bureau of the Conference of the Parties 2008-2009.
- Founded and directed the Centre for Sustainable Development of the Americas (CSDA) between 1995 and 2003, a non-profit think tank for climate change policy and capacity-building.
- Served as Director of the Technical Secretariat, Renewable Energy in the Americas (REIA) from 1994 to 1996.
BIA, in partnership with the Singapore Green Building Council (SGBC), introduced the BCA-SGBC Green Building Individual Awards in 2011 to honour outstanding individuals from the built-environment sector for their achievements and contributions to sustainable development in Singapore. The Awards serve to motivate our green professionals to challenge their limits in developing innovative green building solutions.

“The introduction of these awards is testament to the firm commitment of government and industry stakeholders to recognise the contributions of these outstanding individuals in green buildings practices,” Mr Tai Lee Siang, President of the SGBC, explains. “It is also our ardent wish to encourage talented individuals to aspire towards greater heights in creating a sustainable global city.”

Since its launch in 2011, eight outstanding green building individuals have been awarded for their strong commitment and conviction in propelling environment sustainability in their own capacity. The conviction of these passionate individuals to protect and improve the environment has injected new purpose and meaning into the built environment careers in order to attract more newcomers and retain existing talents.

Sharing his thoughts on green buildings, Mr Eugene Seah, who won the Green Advocate of the Year 2012, said: “Sustainable buildings need not necessarily cost excessively more. Throughout my career I have value engineered and brought projects back to budget with similar or higher sustainable rating in Green Mark and other rating tools. I enjoy looking for sustainable value to add in projects, be it economic, environment or social.”

Mr Seah advocates the importance of going green in his personal and professional capacity. He has a passion for developing green buildings and has worked on master planning sustainable projects like the Jurong Lake District, the Zero Energy Building and Foshan Sustainable City in China. Serving in institutions and committees, both locally and regionally, he hopes to further uplift the sustainable paradigm of the industry.

What’s new for 2013?
This year, in its third run, the search is on for green champions who befit these accolades. Apart from the four main categories which are for Advocate, Architect, Engineer and Innovator, a new category, the “Young Green Building Individual Award” is introduced for the first time. This award recognizes the contributions of promising young professionals to the green building sector. Applicants below the age of 40 years old will be automatically eligible when they apply for any of the four main categories.

Details on the application for the BCA-SGBC Green Building Individual Awards can be found on www.bca.gov.sg/gbia/bcasgbc_gbia.html. For more information, please contact Mr Tan Soo Huat (tel: 6325 5022, email: tan_soo_huat@bca.gov.sg) or Ms Fern Zheng (tel: 6325 5924, email: fern_zheng@bca.gov.sg).

Meet Our Past Winners

Green Advocate | Green Advocate | Green Architect | Green Innovator
---|---|---|---
Mr. Eugene Seah | Mr. Tan Phay Ping | Mr. Tang Kok Thye | Er. Tay Cher Seng
Deputy Chairman, Langdon & Seah Singapore Pte Ltd | Managing Director, Building System and Diagnostics (BSD) Pte Ltd | Associate Partner, ADDP Architects LLP | Managing Director, Natflow Pte Ltd

Winners for Year 2012

Green Advocate | Green Engineer | Green Architect | Green Innovator
---|---|---|---
Mr. Allen Ang | Er. Tan Kiat Leong | Mdm. Vivien Heng | Dr. Ho Nyok Yong
Deputy General Manager, Projects and Head, Green Building, City Developments Limited | Executive Director, Beca Carter Hollings & Fomer (S.E. Asia) Pte Ltd | Director, RSP Architects Planners & Engineers (Pte) Ltd | Technical Director/ Director, Samwoh Corporation Pte Ltd

Winners for Year 2011
THE TIME IS NOW

BCA CEO DR JOHN KEUNG STRESSES THE URGENCY FOR ENGINEERS AND BUILT ENVIRONMENT PROFESSIONALS TO SUPPORT SUSTAINABILITY AND GREEN GROWTH NOW.

In the second edition of a series of lead-up events for the World Engineers’ Summit 2013 held on 13 December 2012 at SIM University, Dr Keung joined Dr Christopher Hails, Chairman of WWF Singapore, to address 300 participants. He outlined the relevance of an accelerating worldwide green economy to engineers and built environment professionals and stresses upon industry representatives on the growing global impetus for a more responsible building construction and maintenance regime.

“There has never been a better time than now to ride the wave of global green growth,” he said. “With our reputation as one of the key green building leaders of Asia, our firms and built environment engineers and professionals are well-positioned to play their part in a rising green economy while assuming the critical role of mitigating the impact of climate change, urban development and rising energy consumption on the environment”.

Participants were also encouraged to build up their capability through green-related programmes such as the Green Mark Manager or Professional courses at BCA Academy. At the same time, firms could build up their pool of green building expertise to sharpen their competitive edge locally and overseas.

A frequently heard comment is that it is expensive to retrofit an existing building to achieve Green Mark certification. Based on a study on “Valuation of Green Buildings” jointly conducted by BCA and NUS in 2011, the average retrofitting cost works out to be only about 2% of a similar new building. If the retrofit cost is expressed as a percentage of the current market value of property, the cost is even smaller at around 0.4% for retail and 0.77% for office.

In addition, the key benefit of obtaining a Green Mark certification is the significant reduction in the consumption of energy. The average savings from the sample after retrofitting are about 17% savings of the total building’s energy consumption compared to before retrofitting.
PERCENTAGE OF GREEN BUILDINGS IN SINGAPORE

AS AT JANUARY 2013

2004 | 0%
2013 | 17.7%
2030 | 80% (Target)