PILLARS

We shape a **safe**, **high quality**, **sustainable** and **friendly** built environment | **NOVEMBER 2016**

PLUG AND PLAY

BCA SKYLAB AND ACADEMIC TOWER
SUSTAINABILITY THROUGH INNOVATION

SINGAPORE UNIVERSAL DESIGN WEEK
TO A BARRIER-FREE SOCIETY FOR ALL

YOUNG REVOLUTION
LETTING OUR FUTURE TALENTS LEAD THE WAY

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52 Jurong Gateway Road
#11-01 Singapore 608550
Contact centre: 1800-3425222
For overseas calls: +65 6534 0219
Fax: +65 6334 4287
Website: www.bca.gov.sg

BCA EDITORIAL COMMITTEE
Editorial Advisors
Leong Ee Leng & Kong Yuqi

Editors
Megan Chow & Hafiza Yussaini

Contributors
Lee Hing Cheng, Sherlyn Yap

PUBLISHING AGENT
ThinkFarm Pte Ltd

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Building and Construction Authority

DEAR READERS,

Singapore has achieved much as a global leader in green building, setting standards and benchmarks for the tropics with the BCA Green Mark scheme. To date, 31% of our entire building stock has met the BCA Green Mark standards. Our longer term aspiration is for ***all low-rise buildings in Singapore to be positive energy, all medium-rise buildings to be zero energy, and all high-rise buildings to be super-low energy.*** To realise this aspiration, we need to achieve breakthroughs through research and innovation to accelerate our green building agenda going forward.

One milestone which we are particularly proud of is the BCA SkyLab, the world's first high-rise rotatable lab for the tropics, and Academic Tower, an experiential learning facility. Both were launched by Prime Minister Lee Hsien Loong in July 2016. Find out the significance of this project, and the passionate individuals behind its development in our Cover Story and People Power sections.

In our rapidly ageing society, creating a barrier-free society is an increasingly urgent issue that requires attention. Another area that BCA has been focusing on is Universal Design. Our third Singapore Universal Design Week (SUDW) held earlier this year reached out not just to industry partners and stakeholders but to the public as well. With the theme 'Universal Design in Public Places', the SUDW featured events, workshops, exhibitions and interactive events that ranged from educating children on the importance of Universal Design to conferences that provided a platform for industry stakeholders to discuss Universal Design strategies. Find out more about SUDW in our various stories in this issue of *Pillars*. We aim to make ***Universal Design a big part of life in Singapore such that everyone*** – persons with different abilities, seniors, families and children – can live, work, learn and play in comfort, ease and in friendly surroundings.

Together, we can create a better and future-ready built environment for all.

Dr John Keung
Chief Executive Officer

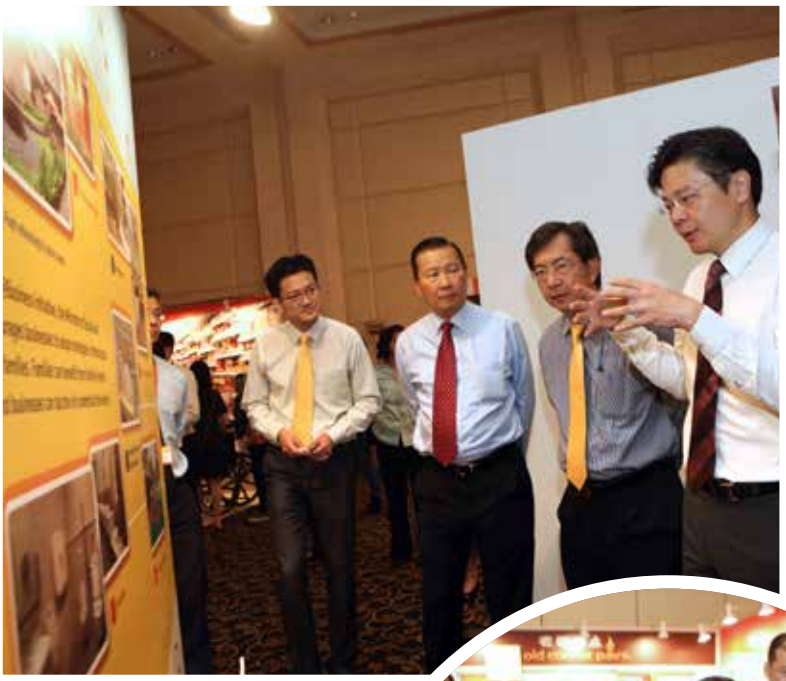
A BETTER BUILT ENVIRONMENT FOR ALL

Paving the way to a barrier-free environment was the Singapore Universal Design Week, with its line-up of events and initiatives.

The third Singapore Universal Design Week (SUDW) in July was more than just an engaging public and industry awareness event.

With the focus on public spaces, it offered learning opportunities for building practitioners, industry stakeholders and the public through an exhibition, a forum, tours of buildings, the UD Conference and other events.

Collectively, SUDW aimed to raise awareness and accelerate the adoption of UD concepts to create inclusive and user-friendly public places, with designs that take into consideration the needs and abilities of everyone.



Left to right: Acting Director, Building Plan and Special Projects Department Mr Tan Jwu Yih, BCA Chairman, Mr Lee Fook Sun, BCA Chief Executive Officer Dr John Keung and National Development Minister Mr Lawrence Wong at the launch of SUDW 2016.

Left to right: BCA Chairman Mr Lee Fook Sun, Guest-of-Honour National Development Minister Mr Lawrence Wong and BCA Chief Executive Officer Dr John Keung unveiling Singapore's first Universal Design Guide for Public Places.

BCA also announced several new initiatives at the SUDW, such as:

- The launch of the Universal Design Guide for Public Places. This new publication will guide architects and developers in adopting user-friendly design considerations to benefit our seniors, families with young children and persons with different abilities. The guide is one of the initiatives under the national Action Plan for Successful Ageing.

- Extension of the S$40 million Accessibility Fund (AF). The AF was set up in 2007 to encourage accessibility

Mr Lawrence Wong getting a feel of a new type of shopping cart with family-friendly features.

upgrading for existing pre-1990 buildings that are not barrier-free. The AF was earmarked to conclude in 2017, but has been extended to 2022 to offset retrofitting costs in light of the new mandatory requirements on barrier-free accessibility in existing buildings from 2017.

As of June 2016, 135 applications to tap on the AF have been approved, out of 197. The amount expended was S$14million.

These new measures mean that owners of commercial and institutional buildings – visited frequently by the public – must include barrier-free accessibility upgrades when they undergo addition and alteration (A&A) works.

UD will benefit everyone, including the elderly

MAKING SINGAPORE BARRIER-FREE

Efforts began about 26 years ago, with the introduction of the Code on Barrier-free Accessibility in Buildings. Since then, multiple revisions have been made to address the mobility needs of a more diverse and ageing population. The Accessibility Master Plan was introduced in 2006 to address barrier-free accessibility in the built environment as well as to promote the adoption of UD through public education and industry outreach programmes such as the SUDW.

Close to 100% of public sector buildings frequented by the public have achieved at least basic accessibility, comprising a barrier-free building entrance, accessibility at the ground or entry level and at least one wheelchair-accessible toilet.

MAKING LIFTS SAFER

Tighter measures by BCA to uplift safety standards of lifts and escalators in Singapore.

Lifts and escalators have become part and parcel of our daily lives; hence it is important that they are maintained properly and regularly, to ensure that they are safe for use.

LIFTS

Monthly maintenance includes ensuring the following:

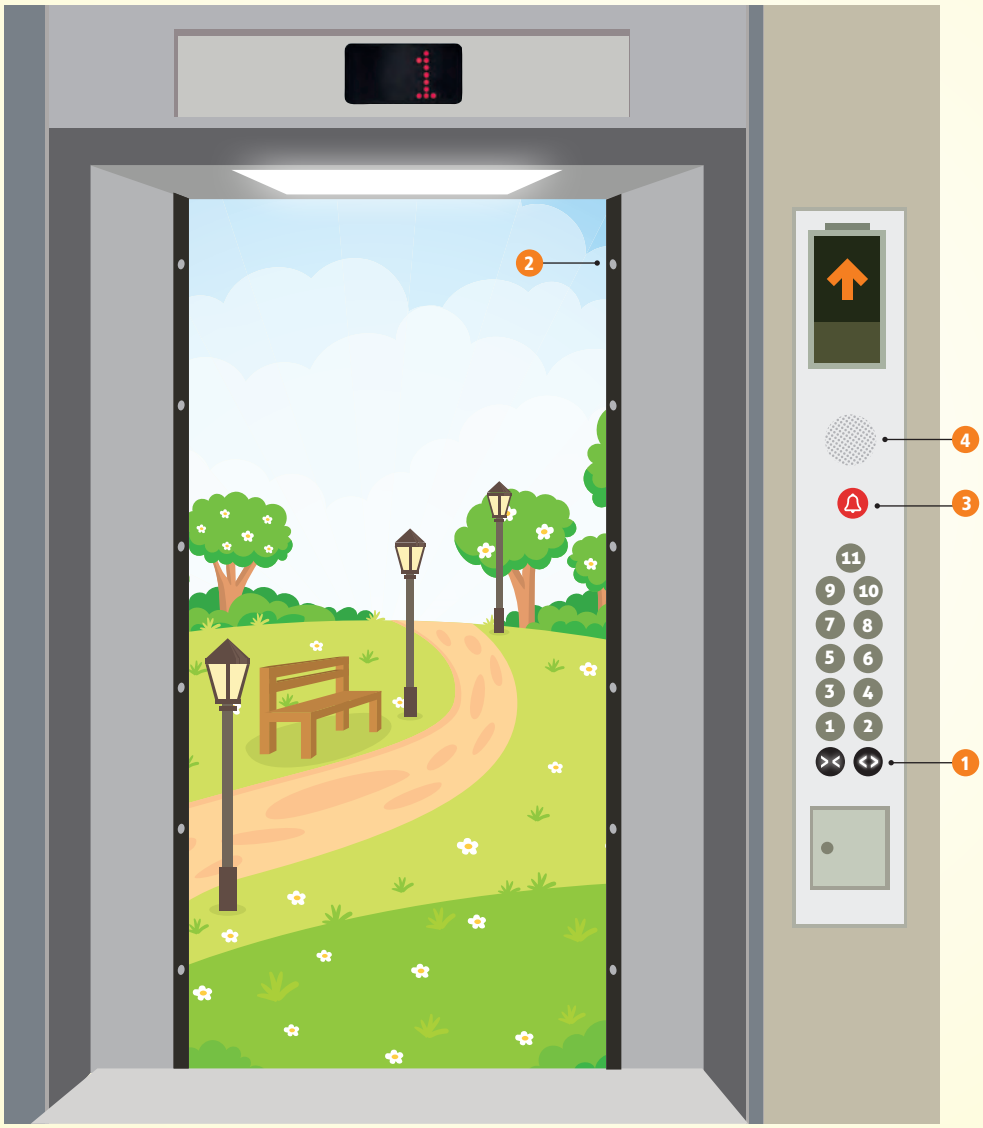
1 Door open control
The door open button in the lift must ensure that the lift car doors and lift landing doors either re-open when they are partially closed, or remain open when they are already opened.

2 Door protective devices
Lift car doors and lift landing doors must be operational at all times and reopen upon activation of door protective devices such as door sensors.

3 Lift car emergency alarm
When the lift car emergency alarm button is activated, the sounding of the alarm must be audible from the outside of the lift on the designated floor.

4 Lift car intercom
When the lift car intercom button (where available) is activated, the intercom system must function as intended.

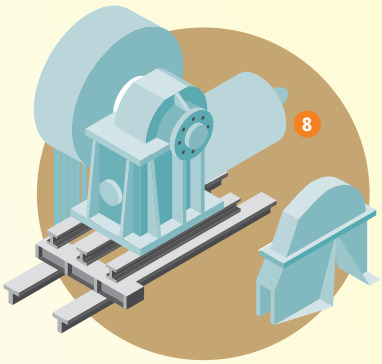
5 Emergency power supply for lift car lighting and ventilation
Emergency power supply for lift car lighting and ventilation fan must function when normal power supply to lift car is disrupted.



6 Movement of lift car
Abnormal sounds or vibrations must not occur when the lift car is in motion.

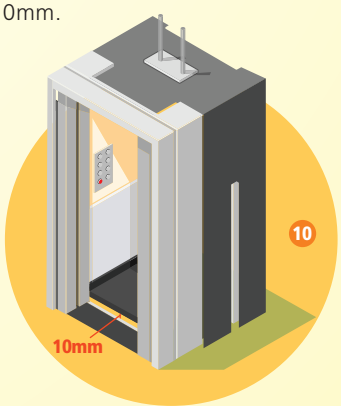
7 Housekeeping
Areas surrounding the lift and the lift motor room must be kept clean and tidy.

8 Brakes of lift machine and drive
Brakes must not be contaminated with, or be at risk of being contaminated with, oil or grease. When activated, brakes must cause lift car to slow down, stop and remain stationary.



9 Conditions of lift parts
Level of corrosion, wear and tear of all parts of a lift must not affect the safe operation of the lift.

10 Stopping or level accuracy
The stopping accuracy of the lift car floor must be no more than 10mm.



ESCALATORS

Other than tightening the regulatory regime for lifts, BCA also requires escalators to be maintained at least once a month in accordance to the periodic maintenance in the code CP15 and ten maintenance outcomes specified by BCA. It includes:

1 Signage and indicator
Safety signage and direction indicators must be clearly and prominently displayed. The edge of escalator steps must be clearly demarcated with yellow lines and there must be sufficient lighting in the vicinity of escalator combs.

2 Emergency stop switch
Activation of the emergency stop switch must initiate emergency stopping of the escalator.

3 Handrail system
Handrail must move in the same direction and speed, within a speed tolerance of no more than 2% as escalator steps. The inlet safety switch must be activated if a foreign object enters inlet and must cause the escalator to initiate emergency stop.

4 All escalator parts
Level of corrosion and wear and tear of all parts must not affect the safe operation of the escalator.

Lift and escalator safety is a shared responsibility; everyone must do their part. The public should report any faults to the owners, and owners should take feedback seriously and engage their contractors to do the necessary maintenance.

SKY-HIGH INNOVATION

The opening of the BCA SkyLab and Academic Tower marks Singapore's dedication to foster innovation in the built environment sector.

PM Lee takes a 'Wefie' with some of the guests.

On 20 July this year, Prime Minister Lee Hsien Loong officially opened the BCA SkyLab and Academic Tower located at the BCA Academy in Braddell Road. A boost for Singapore's on-going efforts to champion environmental sustainability, the BCA SkyLab is the world's first high-rise rotatable laboratory for the tropics.

Developed by BCA in collaboration with the Lawrence Berkeley National Laboratory in California, a world leader in technologies for energy-efficient buildings, the BCA SkyLab will serve as a research and test-bedding platform for the research community and building industry. This, alongside the Academic Tower, which is an experiential learning facility and living lab for the built environment sector, supports Singapore in its drive to be future-ready through green technology.

Speaking at the launch, Mr Lee noted that Singapore has undergone a tremendous transformation since independence; as building activities develop together with a growing economy, attention must also be paid to environmental sustainability and productivity in the construction industry.

"We are now getting state-of-the-art hardware, but we also need to upgrade our software – how we build and how efficiently we build. Whether we are productive, whether we are building safely, and

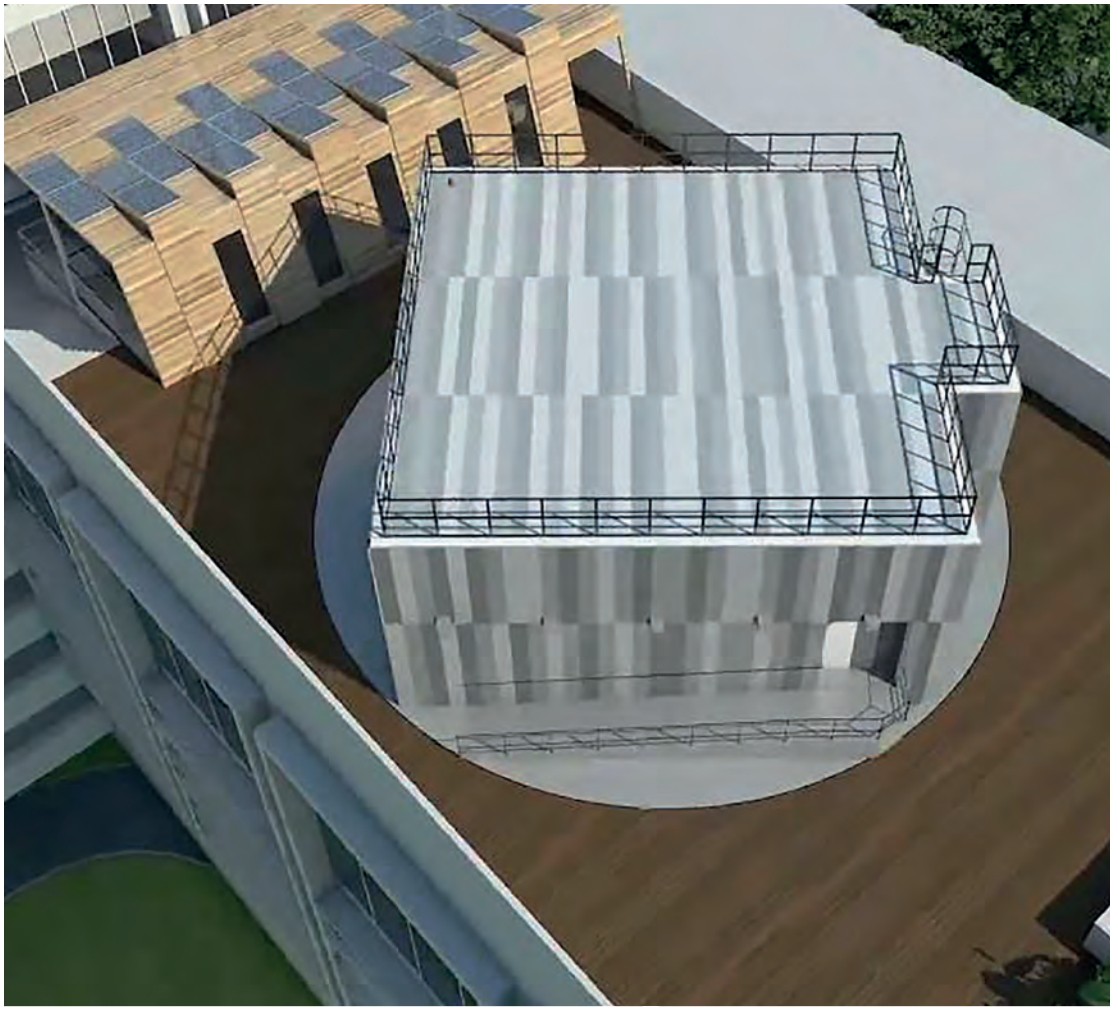
PM Lee taking a tour of the BCA SkyLab and Academic Tower.

whether our products are of high quality. We have some way to go in terms of productivity," he added.

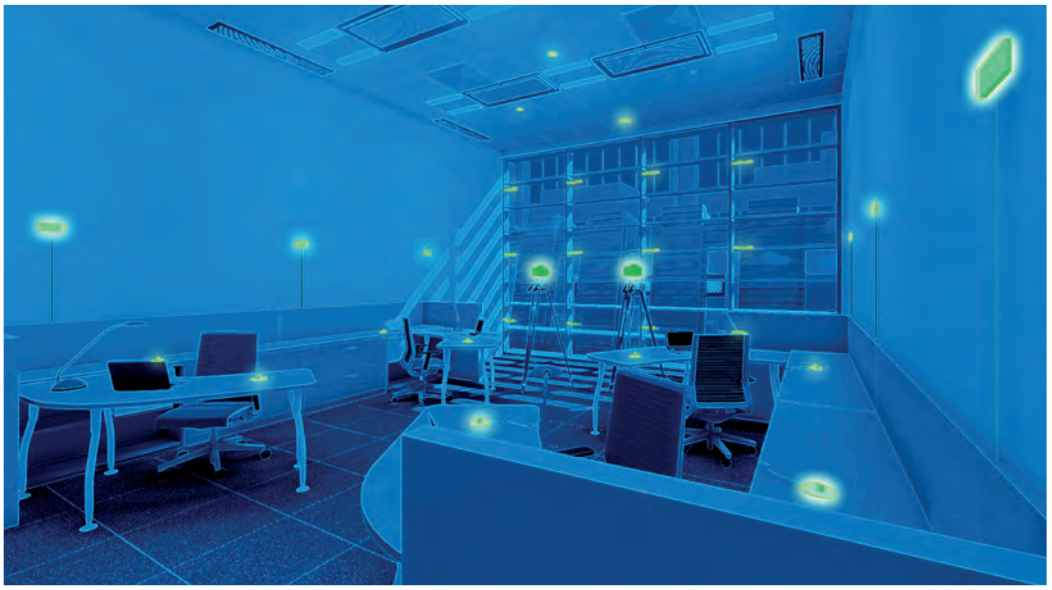
This vision was reaffirmed by Dr John Keung, BCA Chief Executive Officer, who said, "Our built environment sector is not just about the hardware, the technologies and facilities. Building capability in our people forms the core in changing the way we build, and we have to innovate to position our built environment practitioners and future talents ahead of the game. The transformation of BCA Academy is a reflection and microcosm of BCA's initiatives driven by our vision for a future-ready built environment that is safe, high quality, sustainable and friendly."

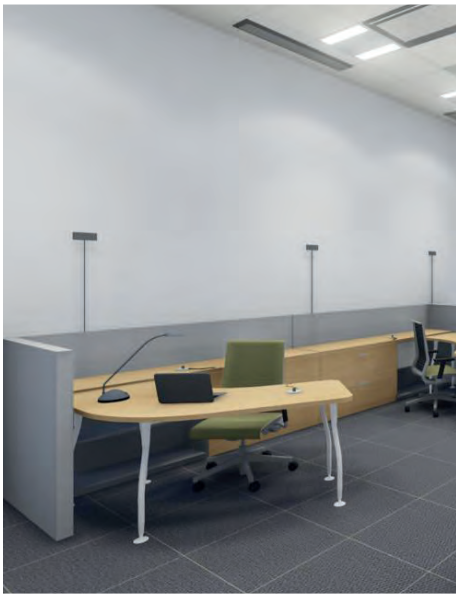
The science behind BCA SkyLab

The BCA SkyLab is a green building researcher's dream come true. The facility boasts a 360-degree rotatable capability, full plug-and-play configurability and extensive instrumentation and sensor networks which are scalable in future.



Below: Testing new systems with actual weather and climatic conditions is much more accurate than using historical data.





The BCA SkyLab is the world's first high-rise rotatable lab for the tropics.

The 132sqm facility is equipped with a network of more than 200 sensors with high accuracy and granularity, across two identical cells for comparison testing. These sensors measure performance metrics such as energy performance, indoor environmental quality, outdoor environmental parameters and building automation system indicators.

All these allow researchers to test new systems with actual weather and climatic conditions, as opposed to simulating them using historical data, which might not be accurate due to climate change and microclimatic conditions.

How it works

Imagine, for instance, that you are a property developer and your architect has proposed a radically different building façade. It looks amazing but you are not convinced that it will help deliver a comfortable indoor environment with reduced energy cost, or that it can withstand Singapore's heat, humidity and changeable weather without requiring frequent and costly maintenance work.

Enter SkyLab, where you have the façade mock-up tested in real-time under actual weather conditions – including the effects of sunlight, wind and rain at different times of the day – over a period of time. Based on the results, your decision is made well before any major financial cost or commitment has been made, saving you and your architect time and money.

With all these features, it comes as no surprise that the BCA SkyLab has already attracted much interest from the industry and research community. More than 20 organisations have been lined up till 2018 to carry out a series of potential experiments. They will be carrying out tests on a range of subjects, from predictive methods for tropical daylighting to cool surface technologies.

BESPOKE RESEARCH
One of the key features of the BCA SkyLab is its plug-and-play capability. This means that it can be customised to test efficient technologies individually or as an integrated system in real-world conditions

DAYLIGHTING & LIGHTING
e.g. LED lighting, light shelf, daylight redirecting film

FAÇADE & SUNSHADE
e.g. Thermo/electro-chromic glass, insulated panel/cladding, automated blinds, cool paint

SENSORS & CONTROLS
e.g. Occupancy sensor, daylight sensor, smart valve/damper

COOLING
e.g. Brushless DC Fan Coil Unit (FCU), chilled beam, radiant ceiling

$4.5MILLION
Cost to build the BCA SkyLab

30 MINUTES
Time taken for the rotatable laboratory to complete one circuit

>200
The number of sensors installed, which provide performance metrics such as energy performance and building automation system indicators

WINNING GREEN IDEAS

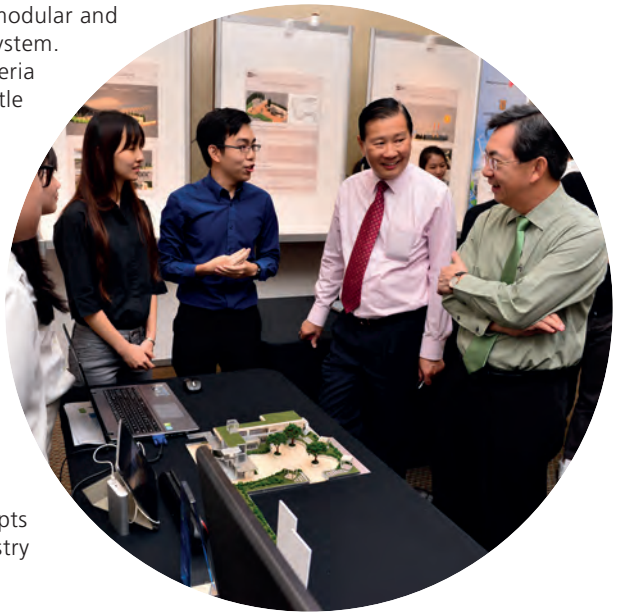
As energy consumption rises, sustainable spaces are the future of Singapore. The biennial Green Sparks Competition seeks to tap on the brainpower of our future generations for the best living green ideas – and we have a winner!

Artist's impression of the winning design, "Stack'd up @ City Square Mall", by 05-ARCHI from Singapore Polytechnic.

A team of five from Singapore Polytechnic beat 21 other teams from seven tertiary institutions to emerge victorious in the 2015-2016 edition of the BCA-CDL (City Developments Limited) Green Sparks Competition. The biennial national green built environment competition is a public-private initiative by BCA and CDL to engage and nurture local tertiary students' effort to green Singapore's built environment.

05-ARCHI's winning idea? To turn City Square Mall's existing Sky Park into a sustainable community space. Their entry, "Stack'd up @ City Square Mall", saw the conversion of the space into an energy-efficient, multifunctional facility for family and community bonding activities. The design taps on the existing infrastructure and capitalises on the vantage views from the site. It also incorporates the use of recycled shipping containers into a modular and stacked building system.

The judging criteria this year were a little different; judges had to factor in the revamped Green Mark scheme. This included good use of resources, energy savings and aesthetic appeal of the design. The eight finalist teams then had to pitch their design concepts to a panel of industry experts.



The winning team's "Stack'd up @ City Square Mall" stood out for its compelling design that converts the space into an energy-efficient, multifunctional facility for family and community bonding activities.

Guest-of-Honour Mr Lee Fook Sun, Chairman of BCA (third from left); Dr John Keung, CEO of BCA (fourth from left); and Ms Esther An, Chief Sustainability Officer of CDL (fourth from right) presented the top prize to the winning team, 05-ARCHI from Singapore Polytechnic.

The teams used a mix of posters, models and videos in their presentations to the panel of judges.

Participants hailed from seven local tertiary institutions: Nanyang Polytechnic, Temasek Polytechnic, Singapore Polytechnic, National University of Singapore, Nanyang Technological University, Singapore Institute of Technology, as well as Singapore University of Technology and Design – up from five participating institutions in the previous season.

Singapore Polytechnic was the big winner this year, with two teams taking top spots.

Besides its winning team 05-ARCHI, another team, AUSIEtecture came in second for their "fusion2" design, which taps on natural ventilation to work with the building's orientation and wind directions.

The first and second teams won a $10,000 and a $7,000 cash prize respectively, as well as a plaque each. The second runner-up, Team Alpha from Temasek Polytechnic, won a $5,000 cash prize and a plaque, while five Merit prize winners each received a $1,000 cash prize and a certificate of participation.

PANEL OF JUDGES

Chief Judge
Er. Ng Eng Kiong, Immediate Past President, Singapore Green Building Council

Other Judges

- **Mr Ang Kian Seng, Group Director (Environment Sustainability), Building and Construction Authority**
- **Mr Anthony Chia, Executive Vice President, Projects, City Developments Limited**
- **Mr Tan Szue Hann, Manager (Sustainable Urban Solutions) & Principal Architect, Surbana Jurong**
- **Mr Tang Kok Thye, Associate Partner, ADDP Architects LLP**
- **Mr Steven Low, Senior Director (Architecture), Ong & Ong Pte Ltd**

SKY'S THE LIMIT

Now that you know about the impressive features of the BCA SkyLab, meet the team behind this state-of-the-art facility.

When in operation, the BCA SkyLab silently rotates in multiple directions, capturing and documenting the effects of different intensities and angles of sunlight, moisture, wind and rain hitting its testing systems.

Behind its working is a department under BCA's Built Environment Research and Innovation Institute (BERII) called the Green Building Research Department (GBRD). GBRD's goal is to drive high-performance green building through research and innovation.

Led by Dr Gao Chun Ping, Director of GBRD, the SkyLab team consists of Alice Goh (Principal Manager), Selvam Valliappan (Senior Manager), Alvin Seoh (Executive Manager) and Shuhadah Abdul (Executive Manager).

To understand the workings of SkyLab, it helps to know that every building comprises multiple systems (such as lighting and

air-conditioning) and façades. Currently, most tests focus on a single system's performance without analysing how one system affects another. The demand for a platform that allows different systems to work together in a complex, integrated environment is fulfilled by SkyLab, a "flexible and authentic" facility in a real-world setting.

"The directive is to build a facility which distinguishes itself by relating closely to industry applications, for our own use and to offer leadership in the region. Despite the many testing labs around, there are differences between a lab environment and our actual living environment, such as those affected by the outdoor weather condition and building orientation. SkyLab's function is to bridge the gap. Its features are designed to meet industry needs and provide integrative testing capability," Dr Gao said.

Key to breakthrough technology: Dr Gao Chun Ping, Director of GBRD

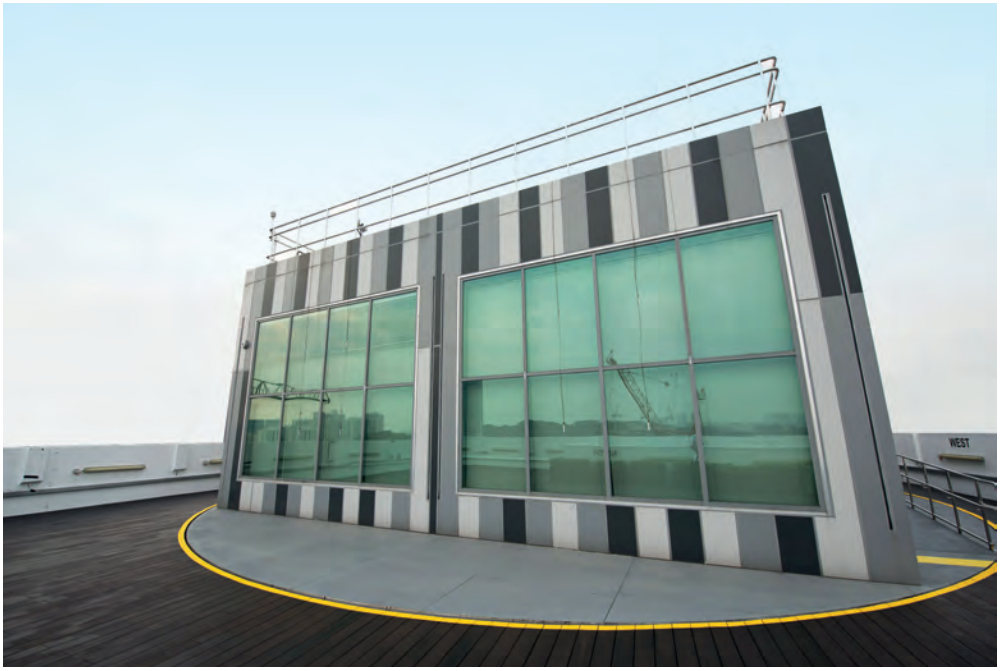
A visit to Lawrence Berkeley National Laboratory (Berkeley Lab) by a BCA delegation kickstarted the idea in 2011. A partnership was subsequently formed to build the first-of-its-kind testing facility in the tropics. Although SkyLab is heavily modelled after Berkeley Lab's Flexlab, it is equipped with features adapted to Singapore's tropical climate and urban setting, such as its connection to a centralised air-conditioning system and its location on the rooftop of a base building. SkyLab was completed in April 2016 at a cost of $4.5 million.

The aspiration for the sustainable built environment in Singapore is to have a city of "positive-energy low-rise, zero-energy medium-rise, super low-energy high-rise buildings". This calls for breakthrough technologies and technology integration.

> **SkyLab is designed to meet industry needs and provide integrative testing capability.**
>
> **Dr Gao Chun Ping**
> Director of GBRD

Dr Gao explained, "Research conducted overseas as well as our own data have shown that single component or isolated system can achieve 5–20% energy savings. However, through an integrated systems approach, it is possible for a multi-system integrated solution to achieve 30–50% of building energy savings in a cost-effective way. This is important as we need to push the envelope in energy efficiency towards Zero Energy Buildings. Currently, a Green Mark Platinum building is typically 30% more efficient than a code-compliant building. SkyLab offers us the opportunity to develop and test innovative solutions to go beyond the boundary."

SkyLab contributes by gathering and encouraging researchers, consultants and contractors — people who know the needs and reality of current practices — to jointly develop solutions and achieve higher-performance green buildings that benefit all communities. Our team will also continually engage industry players to seek their feedback so as to further improve and develop SkyLab," Dr Gao added.



Smooth rotation: Alice Goh (Principal Manager)

Alice's role in the SkyLab project involves managing the project development or setting up the "hardware". This includes coordinating with design consultants, researchers and contractors to ensure that the facility is completed according to specifications, on time and within budget. According to Alice, one of the biggest challenges was to develop SkyLab while the base building, Academic Tower at BCA Academy, was under construction. She shared, "The reason for SkyLab to be located on the rooftop is to avoid shadow-casting. Even the visitor's gallery was designed to prevent that."

As the one-storey facility is built on a rotatable platform, its weight is another crucial factor. Aluminium composite panels, which are light and well insulated, were used in place of heavy building materials. The incorporation of continuous electricity and chilled water systems to the rotatable building was amongst other challenges that the team had to overcome.

"SkyLab is unique as it is rotatable. Another feature of SkyLab is its plug-and-play capability; building systems such as air-conditioning, lighting and even the façade can be easily installed and dismantled. We looked at latest trending technologies, and consulted vendors and industry partners so that if we want to test these systems, they can be easily installed and dismantled for testing," said Alice, who previously oversaw the development of Zero Energy Building in the BCA Academy. "Overcoming the challenges and seeing the projects come to fruition, I am happy to see both ZEB and SkyLab operating well and garnering a lot of interest from the public. It is very rewarding."

Confidence booster: Selvam Valliappan (Senior Manager)

With two decades of in-depth experience across multiple disciplines, Selvam plans and coordinates research activities in SkyLab as a "software" engineer. His job scope includes calibrating sensors, checking testing plans, conducting tests, as well as validating and analysing results to create meaningful reports. A former lecturer, Selvam's eloquence allows him to communicate effectively. He was also the briefing officer during Prime Minister Lee Hsien Loong's visit to SkyLab.

One major benefit that SkyLab

"Overcoming the challenges and seeing the projects come to fruition, I am happy to see both ZEB and SkyLab operating well and garnering a lot of interest from the public. It is very rewarding."

Alice Goh
Principal Manager, BCA SkyLab

"By testing different façades in SkyLab, energy consumption rates can be compared and the results will give end users confidence to accept recommendations."

Selvam Valliappan
Senior Manager, BCA SkyLab

brings is the ability to convince building owners to adopt new technologies for their facilities. Selvam explained, "For example, a Cross Laminated Timber (CLT) façade is energy-saving because it prevents heat from entering, but building owners may not know that a change in façade can lower electricity bills. By testing different façades in SkyLab, energy consumption rates can be compared and the results will give end users confidence to accept recommendations."

Out of the box: Alvin Seoh (Executive Manager)

Having participated in the SkyLab project since the design stage, Alvin is now actively involved in operation and research activities. The tech guru specialises in building management systems and handling the "heartware" of SkyLab — the sophisticated instrumentation system comprising more than 200 sensors. His work also includes liaising with vendors and researchers to perform troubleshooting so as to ensure smooth operation of SkyLab on a daily basis.

"Nowadays, more and more sensors are being used in buildings. In SkyLab, a network of sensors with high precision and granularity is incorporated in both the test cell and reference cell. We are able to measure more parameters and understand the technologies better. It also allows resetting of parameters to test various control methods. This challenges and pushes us to think out of the box for solutions. It's amazing to be part of the team that built and operates such a sophisticated rotating facility," Alvin said.

Ahead of the curve: Shuhadah Abdul (Executive Manager)

Shuhadah, the newest member in the team, is thankful for all the opportunities so far. After joining BCA in July, the fresh Mechanical Engineering graduate has taken part in organising the launch of SkyLab and receiving visitors. She will also assist the senior managers to conduct test-bedding and industry engagement.

"I'm getting exposed to various areas of engineering and research, from air-conditioning to solar panels and energy efficiency. Instead of merely carrying out a project, we are pushing technology innovations ahead of the curve and experimenting with technologies before they are widely adopted. It's a steep learning curve but it's great to know that I am growing day by day!"

We are able to measure more parameters and understand the technologies better. It also allows resetting of parameters to test various control methods.

Alvin Seoh
Executive Manager, BCA SkyLab

I'm getting exposed to various areas of engineering and research, from air-conditioning to solar panels and energy efficiency. Instead of merely carrying out a project, we are pushing technology innovations ahead of the curve and experimenting with technologies before they are widely adopted.

Shuhadah Abdul
Executive Manager, BCA SkyLab

TALENT BUILDER

The future looks bright for the built environment sector, thanks to the BCA-Industry Built Environment Scholarship and Sponsorship programmes.

Erecting buildings that are barrier-free using sustainable methods is becoming more of a challenge, with climate change and an ageing society in Singapore. To ensure these plans can be realised, it is important to make professions in the built environment sector attractive to young people.

This is why BCA has been partnering the industry through the BCA-Industry Built Environment Scholarship and Sponsorship programmes to cultivate worthy talents since 1993.

This year's cohort of 158 students received scholarships to built environment courses at the undergraduate and diploma levels.

Left: Mr Desmond Lee, Senior Minister of State for Home Affairs and National Development (seated seventh from right), Mr Norman Ip, Deputy Chairman of BCA (to Mr Lee's right) and Dr John Keung, CEO of BCA (to Mr Lee's left), with the scholarship recipients.

The scholarship award ceremony, which took place on 4 August 2016, was officiated by Mr Desmond Lee, Senior Minister of State for Home Affairs and National Development. In his address to the students, he highlighted that "technology is an enabler in building taller, deeper and better," a reference to Singapore's land crunch.

To further nurture the next generation of leaders in the built environment sector, BCA's Young Leaders Programme (YLP) was also enhanced. YLP is a platform for young professionals already working in the sector to network and collaborate so that they can come up with innovative solutions to strategic challenges within the sector.

The ceremony was officiated by Mr Lee.

> **To overcome the tight manpower situation in the built environment sector, firms need to redesign work processes and jobs through a Design for Manufacturing and Assembly approach and move towards lean construction. We also encourage firms to partner us in offering scholarships to locals to build up a strong local core and meet their manpower needs in the long term.**
>
> **Dr John Keung**
> CEO of BCA

AT A GLANCE

200
Number of firms participating in the BCA-Industry Built Environment Scholarship and Sponsorship programmes since the introduction of the programmes

WHAT JOBS ARE IN DEMAND?
Architecture and Engineering (Civil, Mechanical and Electrical branches), according to industry sponsors

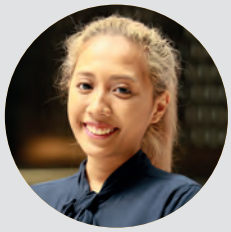
30%
Proportion of female scholars this year

40%
Maximum percentage of course fees the BCA will subsidise for Specialist/Advanced Diplomas

S$18,000
Minimum value of award for each Singaporean or Singapore Permanent Resident, who must serve a bond (at least one year) with the sponsoring company

Firms interested to sponsor these programmes can indicate interest or send enquiries to: BCA_Industry_SS@bca.gov.sg

MEET SOME OF THE SCHOLARSHIP RECIPIENTS AND HEAR WHAT THEY HAVE TO SAY ABOUT THEIR INTERNSHIP EXPERIENCES



"The internship has been a rewarding experience for me. Working closely with an experienced architect allowed me to better comprehend the nature of the job. Knowledge was shared through clearly delineated processes, integrating systems, routines and a set of procedures. I was also exposed to problem-based and collaboration-based approaches tailored to meet the learning goals."

Aqilah Binti Alwi, 21
2016 BCA-S A Chua Built Environment Diploma Scholar
Currently a Year 3 student pursuing her Diploma in Architecture at Singapore Polytechnic

"Within a short span of time, I have experienced and learnt many things outside the classroom. The sector has a broad spectrum, and no two projects are similar. I have also been given a structured plan for my six-month internship right from day one. My supervisors have been incredibly helpful and encouraging. The culture and practices of Tiong Seng have definitely affirmed my career choice!"

Han Zhengguang, 23
2016 BCA-Tiong Seng Built Environment Undergraduate Scholar
Currently a Year 3 student pursuing his Bachelor's Degree in Civil Engineering at the National University of Singapore

GO BIG OR GO HOME

For one weekend in June, the Toa Payoh Hub Atrium was transformed into "Kampong Hijau", Singapore's greenest neighbourhood.

Together with the mascots Greco and Beco, CEO of Building and Construction Authority Dr John Keung (backrow, left), SMS Mr Desmond Lee (backrow, centre), and President of Singapore Green Building Council Mr Chia Ngiang Hong (backrow, right), officially launched the event.

BiG (Build it Green) Day Out, a movement by BCA and the Singapore Green Building Council (SGBC) to inspire Singaporeans to build and live greener, was held in the Toa Payoh Hub Atrium earlier this year.

Launched by Mr Desmond Lee, Senior Minister of State for Home Affairs and National Development, BiG Day Out took place from 24–26 June 2016. Families were out in full force, learning about green buildings and eco-friendly practices while getting immersed in fun and games at various stations at the event.

They also got to interact with characters from the book *The Adventures of Greco and Beco: The Glass House*, launched last year by BCA and the National Library Board. It tells the tale of a young architect and his journey to discover the importance of sustainable design.

The Glass House was one of the highlights of the event. Visitors were treated to an immersive 3D excursion, where they were able to experience the effects of a building that is not sustainably designed and fitted, with characters from the book playing host.

SMS Mr Desmond Lee, delivering his opening address at BiG Day Out.

At another station, visitors learned how to make eco-friendly choices for the home through a game that requires players to identify energy and water efficient appliances and products under the Green Labelling Scheme.

Non-profit organisation Ground-Up Initiative (GUI) was there to share their vision for a 5Gs (Gracious, Green, Giving, Grounded & Grateful) Singapore. Visitors heard about GUI's community campus — Kampung Kampus — that aims to nurture resilient and grounded future generations. Visitors could pledge their support for the construction of Kampung Kampus, which also aims to achieve zero carbon footprint with innovative and energy-efficient technologies and a sustainable lifestyle.

The Doodle Sculpture is where visitors can share their thoughts and wishes for the green built environment of Singapore. SMS Mr Desmond Lee contributed his piece at the start of the even

Right: Heat from the incandescent lamps and the distinct smell of non-eco-friendly paint in the Glass House are some of the simulated effects that visitors can experience.

Below: Visitors at the green home can experience how an eco-friendly building helps to provide a better indoor air quality.

OTHER HIGHLIGHTS AT BIG DAY OUT

Doodle Sculpture
Visitors got to display their creative flair while expressing their thoughts about the future green built environment.

Sunshine Roof Garden
A showcase of how roof gardens and green walls can help to reduce a building's façade temperature, bringing down the energy usage and cost required to cool the interior.

Sundial Park
Attendees learnt the importance of orientating houses and buildings to match the sun's direction.

Lake Hijau
Participants reeled in their answers as part of a quiz on green buildings.

Rainbow House of Paint
Toxic paint begone! A "shoot-the-can" style game emphasised the importance of eco-friendly paint.

INCLUSIVE DESIGN FOR AN INCLUSIVE SOCIETY

From an old age home to a retrofitted vehicle, BCA is reaching out to ensure that everyone understands and has access to a barrier-free environment.

Top: Student volunteers from Singapore Polytechnic share their experience with industry players.

Left: SMS Mr Desmond Lee interacts with elderly residents during his tour around the revamped Lee Ah Mooi Old Age Home.

Project Breaking Barriers is a refurbishment project to improve the accessibility of facilities at the Lee Ah Mooi Old Age Home. Founded in the mid-1960s, it is home to more than 100 aged residents. Among the enhancements are the construction of a shelter, ramp and handrails at the drop-off point, installation of a motorised retractable awning and fans, and construction of new furniture at the dining area.

This was made possible with cash and in-kind contributions worth more than $350,000 from 24 built environment industry firms. Ten student volunteers from BCA Academy, Institute of Technical Education, National University of Singapore and Singapore Polytechnic did the hands-on work at the home.

Project Breaking Barriers was graced by Mr Desmond Lee, Senior Minister of State for Home Affairs and National Development, on 30 July 2016.

Right: SMS Mr Desmond Lee puts the finishing touch by attaching anti-slip stickers on the entrance ramp.

Crystal Lee from NUS Project & Facilities Management faculty.

Student volunteer Crystal Lee, from the NUS Project & Facilities Management faculty, said, "Participating [in the project] taught us the importance of incorporating universal design into living and social spaces so that they become more user-friendly and barrier-free for everyone."

Sen Maria, who has worked as a staff nurse at the Home for 16 years, was also appreciative. "It helps the residents feel more at home. Now they don't always have to stay in the wards. They can walk around safely to see the greens. There used to be a gate near the drop-off point. After the refurbishment, the space feels more open and inclusive," she said.

Another project – UD Explorers on Wheels Academy – was unveiled on 29 July 2016 at CHIJ Primary (Toa Payoh) by Mr Chee Hong Tat, Minister of State for Communications & Information and Health.

Sen Maria, Staff Nurse at Lee Ah Mooi Old Age Home.

The UD Explorers on Wheels Academy is a retrofitted vehicle with UD features. There are five stations within it, including an interactive exhibition introducing children to various aspects of UD, and a touchscreen library providing hands-on experience for children to better understand the hurdles faced by the mobility-challenged.

The UD Explorers on Wheels Academy hopes to reach out to students from 120 primary schools, enabling them to better appreciate inclusive designs that can benefit everyone, regardless of their abilities and ages.

From left: BCA Chairman Mr Lee Fook Sun, Minister of State for Communications & Information and Health Mr Chee Hong Tat and BCA CEO Dr John Keung launching the UD Explorers on Wheels Academy.

As one of the first CHIJ Primary (Toa Payoh) students to experience the UD Explorers on Wheels Academy, Anya Kripalani has certainly learned a lot.

CHIJ Primary (Toa Payoh) was the UD Explorers on Wheels Academy's first stop.

The UD Explorers on Wheels vehicle is a moving exhibition dispensing knowledge on Universal Design to primary school children.

CHIJ Primary (Toa Payoh) students Nina Nora and Anya Kripalani

"I learned that having features like ramps in a building are important because they can really help the wheelchair-bound and blind move around easily without getting injured or too tired," said the 10-year-old.

Added schoolmate Nina Nora, also 10, "I was not aware of UD before, but today I learned that UD helps people from all walks of life lead better lives."

Also making appearances with the vehicle are the BCA's UD mascots, Dotz and Hexa, who will be treating the students to special performances. In addition, young visitors to the UD vehicle will also get to take home a UD Design Comic Book and a limited-edition UD Explorers Kit after completing the activities.

Project Breaking Barriers and UD Explorers on Wheels Academy are projects showcased at BCA's Singapore Universal Design Week (SUDW). (see page 2)

> **I learned that having features like ramps in a building are important because they can really help the wheelchair-bound and blind move around easily without getting injured or too tired.**
>
> **Anya Kripalani, 10**

BCA'S PRO-ENTERPRISE INITIATIVES

BCA is taking active steps to help construction businesses succeed with a number of pro-enterprise initiatives and schemes.

Operating a business in the construction industry can be an uphill task, with the strong regulatory requirements and a constant need to upgrade skills and technology to stay relevant and competitive.

Here's a snapshot of BCA's Pro-Enterprise Initiatives to support companies' operations relating to regulatory matters, taking into account safety and pro-enterprise considerations.

SUPPORTING NEWBIES TO THE CONSTRUCTION INDUSTRY

New entrants to the construction industry often find it daunting to understand and comply with the various submission processes and requirements of regulatory agencies. This often leads to mistakes and time wasted on resubmissions.

To help new entrants gain better understanding of the regulatory requirements and get their approvals granted earlier, BCA introduced a 'Programme Series on Building Control Requirements and Processes - for New Entrants to the Building Industry'. It provides participants with regulatory know-how through a series of courses, making their journey into the sector a seamless one. This initiative won the 2015 PEP-SBF Public Sector Pro-Enterprise Initiative (Bronze) Award.

Module 1	Building Control System in Singapore and Understanding Building Control Regulations, Code & Guidelines – Non-Structural Building Works
Module 2	Understanding Building Control Regulations, Code & Guidelines – Safe Structural Design and Construction Practices
Module 3	Understanding Building Control Regulations, Code & Guidelines – Household Shelters and Storey Shelters
Module 4	Application for Temporary Occupation Permit/ Certificate of Statutory Completion

Modules under the 'Programme Series on Building Control Requirements and Processes - for New Entrants to the Building Industry.'
FInd out more: https://www.bcaa.edu.sg/what-we-offer/courses

SUPPORT FOR INNOVATIVE IDEAS

iGrant is a two-stage innovation grant that was implemented by BCA in October 2013. It is a unique funding scheme in which the two-stage mechanism helps to manage risks involved in a typical innovation project. The scheme allows the industry players to submit proposals on an ad-hoc basis via a two-stage process:

Stage 1: Proof-of-Concept study — which co-funds up to 70% of the qualifying costs or $20,000, whichever is lower — may be obtained to allow applicants to jump start their R&D projects quickly;

Stage 2: Project Implementation — which co-funds up to 70% of the qualifying costs or $250,000, whichever is lower — may be obtained based on the favourable findings and commercialisation potential identified in Stage 1, to allow applicants to further develop, adopt and commercialise the project.

Mr Ong See Ho, Managing Director of BCA's Built Environment Technology Centre (third from left), receiving the 2015 PEP-SBF Public Sector Pro-Enterprise Initiative (Bronze) Award from Guest-of-Honour Ms Low Yen Ling, Parliamentary Secretary, Ministry of Education and Ministry of Trade & Industry.

New entrants attending BCA's 'Programme Series on Building Control Requirements and Processes' to learn the regulatory know-hows on entering the sector.

Originally implemented only for Green Buildings, BCA enhanced the funding scheme in August 2014 to extend funding support for projects related to Construction Productivity. More recently, in July 2016, iGrant was further expanded to include additional strategic focus areas of Safety, Quality and Maintainability, to fill in the gaps for technologies requiring fast-track, proof-of-concept studies to bring novel concepts to market deployment in Singapore's fast-moving business environment.

Find out more details at http://www.bca.gov.sg/ResearchInnovation/2stage_InnovationGrant.html.

BRIDGING DIFFERENCES

To further enhance its pro-enterprise efforts, the BCA is leading the Inter-Agency Coordinating Committee (IACC) that looks into conflicting regulatory requirements encountered in projects.

The IACC directly supports the national objective to raise construction productivity. The Committee comprises government agencies involved in regulating construction projects, and industry associations such as the Singapore Institute of Architects (SIA) and Institution of Engineers Singapore (IES). It helps industry professionals to resolve conflicting regulatory requirements by different agencies that may affect the progress of their projects.

More case studies on IACC will be featured in upcoming issues of *Pillars*. For more information, please contact the IACC secretariat at: BCA_IACC_SECRETARIAT@bca.gov.sg.

COMING UP@BCAA

NOVEMBER 2016

21–23 Nov 2016
Certified QM/CONQUAS Managers Course (53rd Run)

23–24 Nov 2016
Managing Project Teams Effectively (16th Run)

24–25 Nov 2016
BMSMA for Building Management Personnel (17th Run)

28 Nov, 1 & 5 Dec 2016
Site Management of Precast Concrete Construction (22nd Run)

29 Nov 2016
Good Industry Practices (Timber Doors, Wardrobe & Kitchen Cabinet)

30 Nov 2016
The Security of Payment Act – Technicalities and Practicalities NEW

29–30 Nov 2016
Certification Course in BIM for MEP Coordination (3rd Run)

29 Nov, 1, 6 & 8 Dec 2016
Pile Foundations Design and Construction for Engineers (30th Run)

Starting on 29 Nov 2016
Specialist Diploma in Workplace Safety & Health (5th Run)

DECEMBER 2016

1, 2, 5 & 6 Dec 2016
Develop a Workplace Safety and Health Management System Implementation Plan (bizSAFE Level 4) (11th Run)

2 Dec 2016, am
Code of Practice on Buildability

2 Dec 2016
Requirements for Environmental Sustainability in Buildings and the Green Mark Scheme (39th Run)

5–8 Dec 2016
Certification Course in BIM Management (60th Run)

6–7 Dec 2016
Develop a Risk Management Implementation Plan (bizSAFE Level 2) (115th Run)

8 Dec 2016
Preparing and Defending Loss and Expense Claims (25th Run)

8–9 Dec 2016
Behavioural Safety for the Construction Industry (18th Run)

9 Dec 2016, pm
Workshop for Company CEO/Top Management (bizSAFE Level 1) (41st Run)

Starting on 5 Dec 2016
Graduate Certificate in Workplace Safety & Health NEW

JANUARY 2017

6 Jan 2017
Built Environment and Property Prospects Seminar 2017

9–12 Jan 2017
Certification Course in BIM Management (61st Run)

12–13, 16–17 Jan & 10 Feb 2017
Certification Course for Green Mark Manager (69th Run)

16–17 Jan 2017
BIM Planning Course (Building Developers and Facility Managers) (19th Run)

17 Jan–28 Feb 2017
Certification Course on Construction Law & Contracts (19th Run)

18 Jan 2017, am
Building Control Regulations for Site Supervisors (41st Run)

19–20 Jan 2017
Practical Applications of WSH Legislations in Construction Projects Through Case Studies NEW

Starting in Early Jan 2017

- Specialist Diploma in Virtual Design & Construction NEW
- Specialist Diploma in Design for Manufacturing & Assembly (2nd Intake)
- Specialist Diploma in Lean Construction (2nd Intake)

Contact
BCA Academy
Marketing & Business Development
DID: 6730 4503/6248 9824
Email: bca_academy@bca.gov.sg
Web: www.bcaa.edu.sg

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Contact
Ms Nurhadhinah / Ms Ang Geok Lung
Tel: 6730 4503 / 6248 9887
Email: nurhadhinah_osman@bca.gov.sg; ang_geok_lung@bca.gov.sg

Starting in Mar 2017 (Full-time)
Application closing date: 17 Feb 2017
Bachelor of Construction Management (Building)(Honours) FULL-TIME (9th Intake) (awarded by The University of Newcastle, Australia)

Contact
Ms Nurhadhinah / Ms Zhuo Xiuyun
Tel: 6730 4503 / 6248 9881
Email: nurhadhinah_osman@bca.gov.sg; zhuo_xiuyun@bca.gov.sg

Starting in Apr 2017 (Part-time)
Application closing date: 10 Mar 2017
Bachelor of Construction Management (Building) NEW (4th Intake) (awarded by The University of Newcastle, Australia)

Contact
Ms Nurhadhinah / Ms Elaine Chow
Tel: 6730 4503 / 6730 4528
Email: nurhadhinah_osman@bca.gov.sg; elaine_chow@bca.gov.sg

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* *Times Higher Education World University Rankings 2015-2016 and QS World University Rankings 2015/2016*

** *Times Higher Education 'Top 100 under 50' 2014 and QS 'Top 50 under 50' 2014*

*** *QS World University Rankings by Subject 2016*

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- Lean Construction (SDLC) – 2nd Intake
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- Interior & Landscape Design (SDILD) – 27th Intake

Starting in January / February 2017

SCAN QR Code or visit www.bcaa.edu.sg for more details on above programmes